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A comparison of the manifestation of psychopathic traits between women with and without Polycystic Ovary Syndrome (PCOS): A brief report

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Abstract: Polycystic Ovary Syndrome (PCOS) impacts 5-10% of women of reproductive age and is characterized by increased testosterone, psychological distress, and dampened affect. However, little research exists into wider personality traits associated with testosterone, such as psychopathy. Psychopathic traits in a community sample of women with (n = 82) and without (n = 85) PCOS were compared using MANOVA. No group differences were detected across facets of psychopathy (interpersonal manipulation, callous affect, erratic lifestyle, anti-social behavior). These null results contribute to our knowledge pertaining to personality in women with PCOS, particularly with relation to historically-deviant personalities, such as psychopathy.

Keywords: Testosterone; Interpersonal manipulation; Anti-social behavior; Polycystic ovary syndrome; Psychopathy.

Introduction

Polycystic ovary syndrome (PCOS) effects up to 20% of women of reproductive age (Sirmans & Pate, 2014) and is characterised by obesity, in/subfertility, polycystic ovaries, hirsutism (male patterned hair growth), and male-patterned hair loss (Barry et al., 2011; Norman et al., 2007). One potential cause of PCOS is thought to be elevated levels of testosterone in utero; persistent throughout adulthood (Tehrani et al., 2014; Wu et al., 2010). Barry, Qu, and Hardiman (2018) detail that testosterone both acts upon receptors which facilitate testosterone uptake and may also impact mood via ruminating on PCOS-related physical symptoms. Due to the elevated levels of testosterone in PCOS, this group offers a unique opportunity to explore potential testosterone-related differences in behaviour and personality.

Largely, research into PCOS and personality has centred on psychological distress (Dokras et al., 2018). Although emerging literature outlines associations between the biochemical features of PCOS and the presence and severity of psychological disorders (Borghi et al., 2018), limited attention (with small effect sizes) has been given to personality traits associated with variation in testosterone such as callousness, aggression, and empathy (Gotby et al., 2015; Scaruffi et al., 2019). Gotby et al. (2015) found Swedish women with PCOS (n = 12,730) were at an increased risk for both violent (and non-violent) crime; reflecting findings of forensic samples with increased levels of testosterone being characterised by a greater propensity for extreme violent offending and diagnoses of anti-social personality disorder (Aromäki et al., 1999; 2002; Stålenheim et al., 1998). More recently, Scaruffi et al. (2019) reported higher levels of alexithymia in women with PCOS; alexithymia being characterised by poor emotional arousal, dampened empathy, and deficiency in identifying and distinguishing feelings (Guttman & Laporte, 2002).

One disorder characterised by increased aggression, as well as reduced empathy and callous affect is psychopathy (Hare, 2003); a developmental disorder thought to exist on a continuum within the general population (Smith & Lillienfeld, 2013). In utero elevations of testosterone in women (and men) is a potential risk factor for the manifestation of psychopathy and is thought to account for deficits in emotional arousal (Josephs et al., 2006) and heightened dominant, cold, and antisocial behaviour (Eisenegger et al., 2011; Turan et al., 2014). More specifically, testosterone positively predicts self-reported psychopathy (Blanchard & Lyons, 2010), and so facilitates discussion around the potential association between increased testosterone and psychopathic-related traits (i.e., anti-social behaviour) in women with PCOS. Both Gotby et al. (2015) and Scaruffi et al. (2019) call for further research into hypoandrogenic conditions, such as PCOS, and as neither paper explicitly measured psychopathy, there is a notable gap in the current literature for exploration of associations between testosterone and psychopathy in women with PCOS.

This initial investigation explores differences in non-clinical psychopathy between women with and without PCOS in the general population. We hypothesised women with PCOS would report higher levels of psychopathy (specifically, interpersonal manipulation, callous affect, erratic lifestyle, and anti-social behaviour) than women without PCOS.

Methods

Subjects

A total of 167 participants (M_{age} = 30.95±8.82, 84.4% UK), aged 18 years or older were recruited through opportunistic sampling via social networks. Participants were excluded if they were taking hormone altering medication (e.g., oral contraceptive pill) or reported a current clinical diagnosis of any mental health condition excluding anxiety and depression due to their prevalence in PCOS (Dokras et al., 2018).

Materials and Procedure

This work was approved by a UK university research ethics committee. An online questionnaire was hosted in Qualtrics (online survey platform), within which was housed on online consent form and information sheet that was completed by participants both before and after completion of the questionnaires. Participants self-reported demographics and diagnoses of PCOS, before completing the Self-Report Psychopathy-III (SRP-III; Paulhus, Neumann, & Hare, 2009), a 64-item, 5-point scale measure of psychopathy anchored from "*Disagree Strongly*" to "*Agree Strongly*" (α = .92). Subscales included: interpersonal manipulation (16 items; e.g., "I purposely flatter people to get them on my side", α = .85), callous affect (16 items; e.g., "Most people are wimps", α = .84), erratic lifestyle (16 items; e.g., "I have taken illegal drugs (e.g., marijuana, ecstasy)", α = .83), and anti-social behaviour (16 items; e.g., "I have threatened people into giving me money, clothes, or makeup", α = .68). High scores (summed) indicated greater psychopathy.

Analytic Strategy

Means and standard deviations were calculated for demographics and (sub-)total measures of psychopathy. Demographics were compared between PCOS+/- groups using independent *t*-tests and differences in (sub-)total psychopathy were calculated via MANOVA to account for multiple comparisons.

Results

Descriptive statistics for variables of interest and group comparisons are documented in Table 1. Women with PCOS were significantly older (*t*

(165) = 3.78, p = .001, d = .51) and had greater BMI scores (t (165) = 7.01, p < .001, d = 1.08) than women without PCOS. Using a MANOVA, no statistically significant differences in (sub-)total psychopathy scores were found between PCOS+/- groups (F (4, 162) = .716, p = .582; Wilk's Λ = .983, partial η^2 = .017), with small individual effect sizes ranging from η^2 < .001 (interpersonal manipulation) to η^2 = .011 (anti-social behaviour).

Table 1. Means and standard deviations for demographic questionnaire data and psychopathic trait scores across PCOS+ and PCOS- groups.

	Total (n = 167)	PCOS+ (n = 82)	PCOS- (n = 85)	p
Age	30.95 ± 8.82	33.16 ± 7.29	28.81 ± 9.66	.001
BMI	30.33 ± 9.07	34.74 ± 9.82	26.08 ± 5.69	< .001
Interpersonal Manipulation	36.55 ± 9.55	36.34 ± 9.71	36.75 ± 9.46	.782
Callous Affect	35.38 ± 9.32	35.61 ± 9.18	35.16 ± 9.50	.759
Erratic Lifestyle	40.04 ± 10.21	40.06 ± 10.39	40.01 ± 10.10	.975
Anti-social Behaviour	23.18 ± 6.51	23.87 ± 6.93	22.52 ± 6.05	.182
Total SRP-III	135.15 ± 29.10	135.88 ± 30.08	134.45 ± 28.04	.751

Discussion

This study investigated differences in non-clinical psychopathy between women with and without a self-reported diagnosis of PCOS. With psychopathy and PCOS both thought to be underpinned, at least in part by in utero elevations of exposure to testosterone, the hypothesis tested was that women with PCOS, relative to those women without PCOS, would report higher scores on psychopathy. Unexpectedly, no differences between women who were and who were not diagnosed with PCOS could be detected in regard to interpersonal manipulation, callous affect, erratic lifestyle, and anti-social facets of psychopathy.

One potential explanation for these results could be the use of a non-forensic sample, who are naturally expected to report lower levels of psychopathy, relative to offender populations. However, psychopathic traits are broadly distributed within the general population (Skeem et al., 2003), and relationships between testosterone and psychopathy, or psychopathic-related traits, have been extensively delineated. Previously, women with PCOS have been found to score higher on measures of anger expression (Borghi et al., 2018), and increased levels of testosterone have been associated with low emotional arousal (Josephs et al., 2006) and antisocial behaviour as a function of increased sub-clinical manifestations of psychopathy (Blanchard & Centifanti, 2017). Moreover, increased levels of

testosterone have been associated with psychopathic traits in the context of a social stressor (Dane et al., 2018), when a proxy measure of testosterone was used (Blanchard & Lyons, 2010), and when testosterone was calculated as a ratio of testosterone to cortisol (Glenn et al., 2011).

Alternatively, as a large amount of existing literature into associations between testosterone and psychopathy has been conducted in male, rather than female cohorts, the purely female sample reported in this investigation may have contributed somewhat to the observed findings. Indeed, it is acknowledged that there is both a smaller prevalence of psychopathic traits in females compared to males (Verona & Vitale, 2006) and the manner by which said psychopathic traits and behaviours manifest might differ as a function of sex (Cale & Lillienfeld, 2002). However, not only have associations between testosterone and psychopathy been documented in women (Glenn et al., 2011, Roy et al., 2019), but there was no variation between PCOS+ or PCOS- groups across *any* of the facets of psychopathy, either affective (i.e., interpersonal manipulation, callous affect) or behavioural (i.e., erratic lifestyle, anti-social behaviour) in nature.

With psychopathy-related traits such as dominance, aggression, and risk-taking behaviour being consistently found to associate with increased testosterone when measures of cortisol were low (*see* Mehta & Prasad, 2015 *for a review into the dual-hormone hypothesis*) the role of cortisol cannot be ruled out. Interestingly however, when measuring psychopathy explicitly, the positive relationships between testosterone and psychopathy documented in Welker et al. (2014) and Roy et al. (2019) were only present in the context of high, not low, cortisol. Specifically, the associations reported in Roy et al. held for the interpersonal manipulation, erratic lifestyle, and antisocial, but not affective facets of psychopathy. Although this reversal of the dual-hormone hypothesis might be explained by social context (Mehta & Prasad, 2015) and the presence of high psychopathic traits (Welker et al., 2014), there appears a lack of comprehensive understanding and reasoning for this disparity; potentially owing to variation in methodology, measurement, and consumption of prescription medications (Mehta & Prasad, 2015). In the current study, although women with PCOS are considered to have higher levels of baseline cortisol, relative to those without PCOS (Kondoh et al., 1999; Tsilchoroziduo et al., 2005), no measure of cortisol was taken; a factor which needs to be addressed in future investigations. Taken together, it is surprising that levels of psychopathy in women with PCOS, a condition characterised by increased testosterone and cortisol, did not differ from those without PCOS.

Limitations of this research are discussed below. First, elevated testosterone in women with relative to without PCOS was inferred as a function of diagnosis (Tehrani et al., 2014), with no direct measure of testosterone taken. Diagnosis of PCOS, however, is considered a more stable indication of testosterone than a single saliva- or blood-measurement (Gotby et al., 2015). Second, although opportunity was provided to evidence diagnosis of PCOS via secure medical record provision, no participants

obliged. Though we have no reason to doubt our participants' self-reports, confirmation of diagnosis would strengthen our sample and allow us to control for specific phenotypes of PCOS. Third, although participation was restricted to those not actively taking combined oral contraceptives (COCs) - previously shown to reduce androgen levels (Costello et al., 2007) - additional factors that might impact testosterone were not controlled for. Moreover, it cannot be ignored that women taking COCs may include those who experience symptoms reflective of higher testosterone and as such, assessment of women post-diagnosis, but pre-treatment, may benefit this body of research. Fourth, psychopathy was measured using a single self-report measure; fallible to socially desirable reporting due to the negative connotations associated with psychopathy. Moreover, certain items of the SRP-III (e.g., "I always plan out my weekly activities" and "I never miss appointments") may neither be appropriate for PCOS individuals specifically, nor individuals with long-term conditions more generally. Women with PCOS learn to modify their lifestyle around diet, exercise, and treatment, and so structure their weekly activities accordingly (Williams, Sheffield, & Knibb, 2014; 2015). Finally, this sample size was not large enough (due to feasibility) to detect small effect sizes, such as those reported in Gotby et al.'s (2015) investigation into PCOS and violent crime, and so results should be treated with caution and warrant future replication.

In conclusion, no differences in levels of self-reported, non-clinical psychopathy could be detected between women with and without a diagnosis of PCOS in our general population sample. Larger-scale replications are required to confirm the absence psychopathy-related differences as a function of PCOS, and we propose that further studies should establish blood levels of testosterone and assess cortisol as a potential mediator in the manifestation of psychopathy in PCOS.

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Declaration of conflict of interest
The authors declare no conflicts of interest.

Availability of data and material
Supplementary materials available here:
https://osf.io/wabxp/?view_only=36e687faee444f1687575b0f3e3e3a15

Author's contributions
Dr Dean Fido and Dr. Sophie Williams played equal roles in the planning, design, data collection, and write-up of the manuscript. Dr. Dean Fido led on the data analysis, but this was verified by both authors.

Ethics and informed consent

All participants provided informed consent by completing an online consent form and affirmed their consent after completion in line with British Psychological Society's guidance for Internet Mediated Research. All participants were fully debriefed afterwards.

Ethics Approval

Ethical approval was granted by the University of Derby Online Learning Ethics Committee, which has now been amalgamated into the College of Health, Psychology, and Social Care Research Ethics Committee.

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