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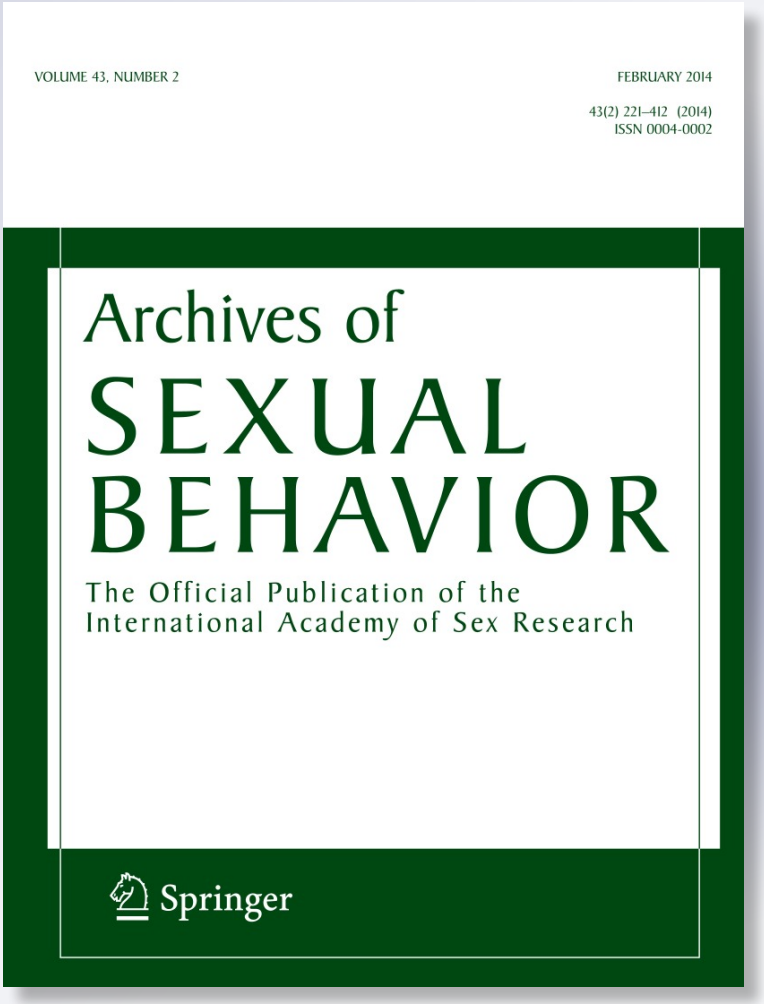

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ORIGINAL PAPER

Traits of Autism Spectrum Disorders in Adults with Gender Dysphoria

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Abstract The literature examining the co-occurrence of gender dysphoria (GD) and autistic traits has so far been limited to a series of small case studies and two systematic studies, one looking at autistic traits in gender dysphoric children and the other set within the context of the extreme male brain hypothesis and looking at adults. The current study examined this co-occurrence of GD and autistic traits in an adult population, to see whether this heightened prevalence persisted from childhood as well as to provide further comparison of MtF versus FtM transsexuals and homosexual versus nonhomosexual individuals. Using the Autistic Spectrum Quotient (AQ), 91 GD adults (63 male-to-female [MtF] and 28 female-to-male [FtM]) undertaking treatment at a gender clinic completed the AQ. The prevalence of autistic traits consistent with a clinical diagnosis for an autism spectrum disorder (ASD) was 5.5 % ($n = 3$ MtF and $n = 2$ FtM) compared to reports of clinical diagnoses of 0.5–2.0 % in the general population. In contrast to the single previous report in adults, there was no significant difference between MtF and FtM on AQ scores; however, all of those who scored above the clinical cut-off were classified as nonhomosexual with respect to natal sex. Results were considered in the context of emerging theories for the observed co-occurrence of GD and autistic traits.

Keywords Autism spectrum disorder · Asperger's Disorder · Comorbidity · Gender dysphoria · Transsexualism

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Introduction

Gender dysphoria (GD) refers to the incongruence between assigned sex and the psychological experience of being male or female. Characteristic symptoms include a strong and persistent cross-gender identification and sense of inappropriateness in one's own gender (American Psychiatric Association, 2000). Prevalence rates have been approximated at 1:10,000–1:20,000 for males and 1:30,000–1:50,000 for females (Zucker & Lawrence, 2009). Autism refers to the presence of abnormalities in social and communication development, in conjunction with marked repetitive behavior and limited imagination, while the criteria for Asperger's Disorder (AD) are similar to autism but with no history of delays in cognitive or language development and Pervasive Developmental Disorder (PDD) has been ruled out (APA, 2000). Autism spectrum disorder (ASD) refers to the spectrum presentation which includes autism and AS. ASD has been estimated to occur in 20.6 per 10,000 (0.21 %) with a male:female ratio of 4.2:1 (Fombonne, 2005) though a more recent report has suggested that rates may be as high at 1 per 50 (2.0 %) for boys and 1 per 150 (0.67 %) for girls (Blumberg et al., 2013). The true prevalence is hard to know given variance in methodological approaches and likely falls between the two reports cited here. As such, prevalence rates of GD and ASD suggest that both disorders are relatively rare and that the comorbidity may be considered an even rarer occurrence. Nevertheless, there have been reports of ASD from gender clinics (Robinow & Knudson, 2005) and a series of case reports have detailed features of the co-occurrence (Gallucci, Hackerman, & Schmidt, 2005; Kraemer, Delsignore, Gundelfinger, Schnyder, & Hepp, 2005; Landén &

Rasmussen, 1997; Mukaddes, 2002; Perera, Gadambanathan, & Weerasiri, 2003; Tateno, Ikeda, & Saito, 2011; Tateno, Tateno, & Saito, 2008; Williams, Allard, & Sears, 1996).

To date, there have been two reports on the co-occurrence of autistic traits and GD (de Vries, Noens, Cohen-Kettenis, van Berckelaer-Onnes, & Doreleijers, 2010; Jones et al., 2012); the first in a cohort of gender dysphoric children and the second in a cohort of adult transsexuals. In a sample of 204 children/adolescents referred for GD, de Vries et al. (2010) reported a rate of ASD of 7.8 %, up to 37 times more prevalent than has been reported the general population, suggesting that this is not as rare a combination as first thought. Curiously, of the 16 children/adolescents who presented with both GD and ASD, only five persisted with GD at follow-up. The single report of autistic traits in transsexual adults, while reporting the co-occurrence, was primarily focussed on lending support to the extreme male brain theory (EMB) (Baron-Cohen, 2002) by demonstrating higher rates of autistic traits in transmen than in transwomen (Jones et al., 2012). Indeed, they found that transmen scored significantly higher on the Autistic Quotient (AQ), a measure used to assess autistic traits, compared to transwomen as well as to control males and females assessed using the same measure in an earlier study (Baron-Cohen, Wheelwright, Skinner, Martin, & Clubley, 2001). However, even though Jones et al. (2012) systematically reported on the co-occurrence, their data were collected online and were reliant on participants to report accurately their status as transsexual. Furthermore, in that study, many participants were removed from analyses for reporting diagnoses of other types (e.g., bipolar disorder). It is unclear whether these self-reports were accurate or why such cases should have been removed from analysis. In the current study, all participants were interviewed at the gender clinic where they were receiving treatment and all diagnoses were confirmed. Finally, we did not exclude any participants from analysis as we saw no theoretical reason to do so.

The apparent potential for desistence of GD in ASD cases in the de Vries et al. (2010) report suggests that perhaps co-morbidity of the two may be a phenomenon of childhood. If it is not a phenomenon of childhood as the Jones et al. (2012) report suggests, the effect needs to be further investigated. The aim of the current study was to assess autistic traits using interview and questionnaire methods in a sample of adults with the confirmed diagnosis of transsexualism. Persistence in co-morbidity would further emphasize the relevance for clinical consideration in management of either of these disorders and may further elucidate possible underlying mechanisms.

Method

Participants and Procedure

Table 1 shows participant characteristics. The sample included 63 male-to-female (MtF) (M age = 45.47 years) and 28 female-to-male (FtM) (M age = 27.38 years) transsexuals undertaking medical treatment at a private London-based gender clinic, which sees approximately 1,000 patients per year. In many cases, patients attended the private clinic for treatment while they were waiting for National Health Service (NHS) treatment, which can often be quite delayed. Some of the patients will have gone on to be treated within the NHS, while others may have continued private treatment in the United Kingdom self-referred or in the United States, based on personal preference. Note that most patients were referred by their NHS general practitioner according to NHS guidelines and that the private clinic is bound by and has abided by World Professional Association for Transgender Health (WPATH) guidelines for all treatments.

All participants had previously received a formal diagnosis of GD/GID in the course of their treatment. Three MtF and two FtM participants reported that they were not living publicly in the cross gender role, but were doing so privately. Five MtF and 10 FtM reported that they had not started on cross-sex hormones, though all were living in some capacity as the other sex. Participants were also categorized as homosexual or nonhomosexual, due to previous reports suggesting that there are two subtypes (Blanchard, 1985, 1988) with potentially meaningful differences. Those who reported sexual preference for the same natal sex were classed as homosexual and the rest, who either reported a preference opposite to their natal sex, bisexuality, or asexuality, were classed as nonhomosexual. Notably, there were no significant differences in age at the time of the interview, age at onset (i.e., self-report onset of gender dysphoria), or age at presentation (i.e., to any form of clinical service for gender dysphoria) by sexual orientation in either MtF transsexuals or FtM transsexuals though comparisons approached significance for the FtM group. The nonhomosexual group was younger at interview ($d = 0.70$), onset ($d = 0.45$) and presentation ($d = 0.75$) compared to the homosexual group. Additionally, the FtM group was younger than the MtF group at interview ($d = 1.55$) and presentation ($d = 0.75$) though not at onset.

The study was advertised in the gender clinic along with other clinic notices on a notice board. Those who expressed interest were given further information, detailing that the interview- and questionnaire-based study concerned the experiences of gender transition and general psychological well-being in patients with GD. For those who chose to participate, and once informed consent was obtained, a 30-min interview was administered and questionnaires, which took approximately 40 min, were completed. Measures detailed in the current report were part of the above described larger study. Protocols were approved by the relevant institutional ethics review board. Because participation in the study was voluntary in response to an advert posted along with other clinic notices, we were unable to determine exactly how many people saw the advert versus how many responded to it. Note that this is similar to other studies which have advertised online (Jones et al., 2012).

Data for participants' scores on the primary measure (AQ; see below) were compared to scores for a control group reported

Table 1 Sample characteristics

		Age (years) at interview	Age (years) at onset[a]	Age (years) at presentation[b]
Male to female transsexuals (MtF)				
Homosexual	*M*	45.62	10.50	29.10
	SD	12.51	6.38	14.48
	N	20	20	20
Non-homosexual	*M*	45.39	14.95	30.60
	SD	14.35	10.83	14.75
	N	43	43	43
Homosexual/ non-homosexual comparison	*p*	ns	.095	ns
	d	0.02	−0.47	−0.10
Female to male transsexuals (FtM)				
Homosexual	*M*	29.71	13.14	23.50
	SD	8.75	8.61	7.20
	N	14	14	14
Non-homosexual	*M*	25.07	10.07	18.93
	SD	4.50	4.97	4.92
	N	14	14	14
Homosexual/ non-homosexual comparisons	*p*	.090	ns	.062
	d	0.70	0.45	0.75
MtF/FtM total samples comparisons	*p*	<.001	ns	<.001
	d	1.55	0.21	0.78

[a] Note that age at onset is a self-report of the age at which the individual first felt feelings of gender dysphoria. Participants were asked, "How old were you when you first realized the internal desire to be the other sex, or that you were not happy as the sex to which physically belonged?"

[b] Age at presentation is the age at which the individual first presented to any clinical service for gender dysphoria

originally by Baron-Cohen et al. (2001) and again by Jones et al. (2012). Controls in the original study (Baron-Cohen et al., 2001) included 454 male and 386 female university students with mean age of 21.0 years. We compared our participants to this published cohort rather than collect new control data as the reported sample was many times larger, and likely more reliable, than the smaller sample our resources would allow. This same group of controls has also been reported in comparison to transsexuals in the Jones et al. (2012) report.

Measures

Autism Quotient

The Autism Spectrum Quotient (AQ) is a 50-item, self-administered instrument designed to measure where a given individual lies on the continuum from normal to autistic in the spectrum (Woodbury-Smith, Robinson, & Baron-Cohen, 2005). The AQ utilizes a 4-point Likert scale (from definitely agree to definitely disagree) and is comprised of five scales with 10 items each, aimed at teasing out autistic traits: (1) *social skills,* which includes items such as "I prefer to do things with others rather than on my own" and "I find myself more strongly drawn to people than to things"; (2) *attention switching*, which includes items such as "I frequently get so strongly absorbed in one thing that I lose sight of other things" and "I tend to have very strong interests, which I get upset about if I can't pursue"; (3) *attention to detail*, which includes items such as "I often notice small sounds when others do not" and "I am fascinated by dates"; (4) *communication*, which includes items such as "I enjoy social chit-chat" and "I frequently find that I don't know how to keep a conversation going"; and (5) *imagination*, which includes items such as "If I try to imagine something, I find it very easy to create a picture of it in my mind" and "I find making up stories easy." Note that some items are reversed as a means of counter-balancing. People who score highly on the AQ often have poor social skills, are often very focused and cannot switch their attention easily, pay great attention to details, find communication for its own sake difficult, and tend to lack what one might think of as typical imagination.

Scores were the sum of the number of items which were endorsed (definitely agree or slightly agree), with a possible range of 0–50. A threshold score of 32+ out of 50 has been shown to have good discriminative validity for detecting adults with autistic traits (sensitivity = 76.71 % and specificity = 74.07 %; Woodbury-Smith et al., 2005). In the original validation study, 79.3 % of clinical cases of ASD scored at or above this cut-off (32+), in comparison to only 2 % of controls (Baron-Cohen et al., 2001). Though lesser cut-offs have been employed to detect high functioning autism or Asperger syndrome (Woodbury-Smith et al., 2005), we employed the stricter cut-off to avoid false positives.

Sexual orientation

Sexual orientation as homosexual or non-homosexual was measured using a modified version of the Kinsey Heterosexual-Homosexual Scale (Kinsey, Pomeroy, & Martin, 1948). We used a 5-point Likert scale ranging from 1 = strictly men to 5 = strictly women to assess orientation in four domains with the following questions: (1) When you think about persons you have had sexual fantasies about, which sex have they been?; (2) When you think about the persons you have been sexually attracted to, which sex have they been?; (3) When you think about the persons you have had sex with, which sex have they been?; (4) When you think about the persons you have been in love with, which sex have they been? Terms "men" and "women" replaced "homosexual/heterosexual" or "same-sex/other-sex" to avoid confusion with respect to gender labels and to accommodate individuals who were in gender transition. Scores were the mean

of the four items. Participants were considered to be homosexual if they received a mean score <2.0 for natal males or >4.0 for natal females. All others were labeled non-homosexual. Note also that the measure allowed for participants to indicate whether any change in these four aspects of sexual orientation had changed after social transition. Given that all participants had begun or completed social transition, we used the post social transition scores.

Results

Table 2 shows means scores and group comparisons for the AQ and its subscales. We compared mean scores on the full scale AQ between MtF and FtM, using ANCOVA with age as the covariate. While the difference in age at interview for the two groups was significantly different, $F(1, 90) = 7.24$, $p < .01$, there was no significant difference between MtF and FtM, $F(1, 90) = 2.19$. With respect to subscales, there was only one difference between MtF and FtM transsexuals, with MtF transsexuals scoring higher on the *attention to detail* subscale, $F(1, 90) = 3.94$, $p = .050$, $d = 0.35$.[1] In terms of threshold scores indicated by Baron-Cohen et al. (2001) as indicative of an ASD diagnosis, two MtF and three FtM participants met the threshold with scores ≥32. Again, the two groups were not significantly different from one another in frequencies of participants who reached the threshold for caseness, $\chi^2 < 1$.

Next, we compared mean scores for our sample to those for male and female control samples published with the validation of the measure (Baron-Cohen et al., 2001) (see Table 2). For overall AQ scores, there was no significant difference between the MtF transsexuals in our sample and control males, while the FtM transsexuals scored slightly higher than control females on the full scale AQ, $t(124) = 1.45$, $d = 0.31$, and on three subscales: (1) *Social skills,* $t(124) = 2.27$, $p = .025$, $d = 0.44$; (2) *Attention switching,* $t(124) = 3.55$, $p < .001$, $d = 0.68$; and (3) *Imagination,* $t(124) = 2.11$, $p = .037$, $d = 0.38$. On one scale, *Attention to detail,* control females scored higher than FtM transsexuals in our sample, $t(124) = 3.41$, $p < .001$, $d = -0.77$.

Finally, we compared full scale AQ scores for homosexual ($M = 15.26$, $SD = 6.19$) and non-homosexual ($M = 18.42$, $SD = 7.15$) participants in a 2 (Natal Sex) × 2 (Sexual Orientation) ANOVA. There was a main effect of sexual orientation, $F(1, 90) = 4.91$, $p = .029$, such that non-homosexual participants had higher scores than homosexual participants.

[1] Effect size, *d*, was calculated as follows: $M_1 - M_2/[(SD_1 * N_1) + (SD_2 * N_2)/(N_1 + N_2)]$.

Discussion

The current report makes two contributions to what we know about the observed co-occurrence of GD and autistic traits. First, we have shown that the association appears to be genuine and persists into adulthood. While de Vries et al. (2010) reported an incidence of ASD to be 7.8 % in a cohort of gender dysphoric children/adolescents, only 5/16 persisted with the comorbid diagnosis (4 of whom were adolescents). In the current report, we show similar rates of individuals with autistic traits threshold for potential diagnosis in an adult cohort: 7.1 % in FtM, 4.8 % in MtF, and 5.5 % overall. Secondly, while male:female prevalence ratios for both GD and ASD, independently, show that more males present with these diagnoses in childhood, there was not a significant difference in the co-occurrence between biologic males and females in the current report. This finding was also in contrast to findings in the only other study investigating autistic traits in gender dysphoric adults (Jones et al., 2012). While Jones et al. found increases in scores on the AQ in gender dysphoric adults compared to controls, they also found a sex difference suggesting that FtM transsexuals displayed more autistic traits than did MtF transsexuals. In this case, they invoked the EMB theory (Baron-Cohen, 2002), suggesting that the autistic traits were part of a masculinized phenotype in FtM transsexuals in general. We did not find a difference in AQ scores between natal males and natal females. In fact, we found that 4.8 % of the MtF transsexuals in our study were threshold for caseness according to recommended cut-offs (Baron-Cohen et al., 2001), which was not statistically different from the 7.1 % we found for FtM transsexuals. These finding have both theoretical and clinical implications.

Theoretically, the current report sheds light on speculations as to potential influences of prenatal androgen on GD comorbid with autistic traits. While varied androgen exposure may explain the masculine gender identity and autistic traits for natal females, it does not explain the observed coincidence in natal males. According to the EMB theory, one would predict an excess of prenatal androgens where we see a masculine gender identity as well as increases in autistic traits (Auyeung et al., 2009; Baron-Cohen, 2002). This is consistent with studies of women with congenital adrenal hyperplasia (CAH) who have been exposed to excess androgen prenatally reliably show shifts toward a more masculine gender identity (Hines, Brook, & Conway, 2004) and have been shown to score higher than controls on the AQ (Knickmeyer et al., 2006). The EMB theory does not, however, explain the increased autistic traits seen in the natal males in our sample. This suggests that there may be differing underlying mechanisms for development of gender identity and/or autistic traits for males and females.

There is also evidence showing that people with autism may struggle to have close relationships (Howlin, Mawhood, & Rutter, 2000). This tendency to be naive, immature, and inexperienced in socializing may lead an individual, male or female,

Table 2 Mean scores and group comparisons for the Autism Quotient (AQ) and its subscales

Variables		Gender dysphoric		Sex difference[a]		Comparisons to controls[b]							
						MtF compared to:				FtM compared to:			
		MtF $N=63$	FtM $N=28$	p	d	Control males		p	d	Control females		p	d
AQ total score:	*M*	17.21	17.32	ns	−0.02	*M*	17.80	ns	−0.09	*M*	15.40	ns	0.31
	SD	6.78	7.64			*SD*	6.80			*SD*	5.70		
Social skills	*M*	3.37	3.29	ns	0.04	*M*	2.80	ns	0.24	*M*	2.30	.038	0.44
	SD	2.20	2.21			*SD*	2.50			*SD*	2.20		
Attention switching	*M*	4.17	5.04	ns	−0.43	*M*	4.30	ns	−0.07	*M*	3.60	<.001	0.68
	SD	1.96	2.20			*SD*	1.90			*SD*	1.80		
Attention to detail	*M*	4.52	3.75	.050	0.35	*M*	5.20	.081	−0.30	*M*	5.40	<.001	−0.77
	SD	2.24	2.10			*SD*	2.30			*SD*	2.30		
Communication	*M*	2.33	2.61	ns	−0.16	*M*	2.80	ns	−0.24	*M*	2.10	ns	0.21
	SD	1.86	2.57			*SD*	2.00			*SD*	1.80		
Imagination	*M*	2.81	2.64	ns	0.08	*M*	2.70	ns	0.06	*M*	1.90	.037	0.38
	SD	2.06	2.06			*SD*	1.90			*SD*	1.50		
Met caseness according to recommended cut-off 32+		4.7 %	7.1 %	ns			3.9 %	ns			1.0 %	ns	

Note Higher scores denote an increase in autistic traits. AQ total score range is 0–50; Range for each subscale is 0–10

[a] All comparisons between MtF and FtM participants were ANCOVA with age as the covariate

[b] Comparisons are to controls published in Baron-Cohen et al. (2001), using one-sample *t* tests for AQ scores and Fisher's exact test for frequencies (%); Control males $N=76$, control females $N=98$

to conclude that s/he does not fit in with his/her cohort, and that s/he would better fit in with the opposite gender. Many of the individuals in the current study have reported that they did not fit in with others; indeed, both MtF and FtM cohorts showed more dysfunctional scores in the social skills subscale of the AQ, supporting a reported sense of impairment. Curiously, nearly all of those who met the clinical cut-off for ASD in the current study reported an onset of GD at or after puberty. On the contrary, one might have expected to see cross-gender ideation in early- to mid-childhood when gender segregation is at its peak (Pasterski, Golombok, & Hines, 2011).

Some have suggested that gender dysphoric symptoms may be linked to the behavioral and psychological characteristics of autism. That is, the transvestism in ASD may arise from preoccupation with specific female clothes which satisfy tactile sensations or from a sense of belonging to the female sex after being bullied by male peers (Tateno et al., 2008). This idea is supported by some of the detail found in the Gallucci et al. (2005) case report of patient RW. RW was attracted to, and preoccupied by, items of soft clothing to the extent that it was reported that he would seek out and touch them for extended periods of time. However, this cannot explain the observation of autistic traits in FtM transsexuals as reported in the current study and elsewhere (Jones et al., 2012).

With respect to diversity of the sample, FtM transsexuals were significantly younger than their MtF counterparts at the interview and at presentation for treatment. Though statistics show that gender dysphoric males present younger than gender dysphoric females in childhood (APA, 2000), this appears to be reversed for those who have a later onset or for who did not seek help in childhood. Nevertheless, it is likely the same mechanism is at work. That is, cross-gender ideation is less acceptable in natal males than in natal females. In childhood, parents of gender dysphoric daughters are not as concerned and wait longer before seeking attention whereas, in adulthood, societal acceptance means that young females are more likely to reveal their cross-gender status than are males.

Of clinical relevance is the finding that transsexuals in the current study who were attracted to partners opposite to their natal sex (non-homosexual) scored significantly higher on the AQ than those who were attracted to their natal sex (homosexual). This finding is a source of concern given that previous studies have found that those not sexually attracted to their natal sex are less satisfied with postoperative functioning (Smith, van Goozen, Kuiper, & Cohen-Kettenis, 2005; but see Lawrence, 2010). There may be features of ASD which influence perceptions or which lead individuals to believe that sex reassignment is right for them, when it may not be.

It is important to acknowledge the limitations of this study. First, the recruitment of participants may have resulted in lower numbers than we might have otherwise expected. The AQ was a smaller part of a larger study and recruitment was achieved through advertisement and was voluntary. Those who may hold more severe characteristics of the autistic spectrum, such as difficulties with communication and social skills, may have been unlikely to volunteer for such a study, and so would not have been represented. However, inclusion of such cases would likely strengthen the results reported here.

One further limitation is that while our results were comparable to the previous prevalence of 7.6 % found by de Vries et al. (2010), the tools that were used may not have been as sensitive in teasing out autistic traits. De Vries et al. used the Diagnostic Interview for Social and Communication Disorders (DISCO), which uses algorithms to investigate whether the necessary criteria of different diagnostic systems for ASD are met. The AQ, as a self-report measure, may be less sensitive and more vulnerable to subjective bias.

With regard to the question of comparisons to controls, the rate of 5.5 % for caseness in our transsexuals is only slightly higher than the 2.3 % found in the large sample of controls reported by Baron-Cohen et al. (2001). However, Baron-Cohen et al. pointed out that their sample was taken from students at the University of Cambridge which may attract higher numbers of students, particularly males, with traits along the autistic spectrum such as narrow focus or interest in numbers and mathematics. That sample may be slightly skewed toward caseness. This may also explain why the controls had full scale AQ scores that were not significantly different from our groups though the effect size between our FtM transsexuals and female controls was $d = .31$, with the FtM transsexuals scoring higher. The MtF group from our study had scores very similar to the group of control males in Baron-Cohen et al. The difference between effect sizes in comparisons to natal sex controls ($d = -0.09$ for MtF compared to control males and $d = 0.31$ for FtM compared to control females) suggests that the effect may be stronger for FtM. However, we did not see a significant difference between our MtF and FtM groups, which does not support the EMB theory (Baron-Cohen, 2002).

Comparisons to controls in the current report notwithstanding, 5.5 % of transsexual participants meeting caseness is higher than reports in the base population (range 0.5–2.0 %). If we were to consider that the true prevalence in the general population is approximately 1.25 % (median of two reports), prevalence in our sample is significantly higher, $p < .01$. However, in considering comparisons of autistic traits and/or ASD across studies or with respect to rates in the base population, one must be cautious in drawing conclusions. Methodological variance may confound true comparisons and relationships between sets of data.

Future studies should aim to further elucidate underlying mechanisms with attention to potential clinical relevance, in terms of subtypes of transsexuals. The findings by de Vries et al. (2010) and those reported here suggest that there may be a relationship between autistic traits and postoperative outcomes. Finally, in both previous reports (de Vries et al., 2010; Jones et al., 2012) and the one here focus on autistic traits found in populations referred for GD. Future studies should look at GD in populations referred for autistic traits. This would allow for group comparisons which may increase the chances of disentangling causal mechanisms for symptoms in both conditions.

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