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University
of Glasgow

**A Neuropsychological Exploration of Autistic Traits in a Transgender
Population**

& Clinical Research Portfolio

Volume 1

(Volume 2 bound separately)

Andrew Smith, MSc

Submitted in partial fulfilment of the requirements for the degree of
Doctorate in Clinical Psychology

Institute of Health and Wellbeing
College of Medical, Veterinary and Life Sciences
University of Glasgow

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Chapter 1: Systematic Review

The Co-occurrence of Autism and Gender Incongruence: A Systematic Review

Andrew Smith¹

Prepared in accordance with the guidelines for submission to

Archives of Sexual Behavior

(See Appendix 1.1 for contributor's notes)

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Abstract

Autistic traits have been reported to be more prevalent in transgender persons attending gender identity clinics than would be expected in general population (Robinow, 2009). This review aims to synthesize the literature on the co-occurrence of gender incongruence and autistic symptomatology in both transgender and autistic populations. A comprehensive search strategy applied to Medline, Psychinfo, CINAHL and Web of Science yielded 941 articles, a systematic process of exclusions led to a total of seven articles being included in the review. Overall the studies showed higher rates of cross-gender symptomatology in autistic samples and vice versa for transgender samples in comparison to control data. The findings of this review are supportive of possible comorbidities of these two presentations, yet these results may have been limited somewhat by rigidity of search terminology and inclusion and exclusion criteria applied to selected studies.

Keywords

Autistic Spectrum disorders • Autistic traits • Transgender • Gender incongruence •

Review

Introduction

The conceptualisation of autistic symptomatology existing on a spectrum has led to certain subgroups within non-clinical populations being shown to have more cognitive traits of autism than normative samples (Baron-Cohen et al., 2001). In particular, there has been increasing attention paid to the occurrence of autistic-type cognitive and behavioural traits in clients who present at gender identity services (Jones et al., 2011 & Paterski et al., 2014).

Overall, the clinical impressions conveyed in the literature suggest that there may be a higher rate of clients presenting at gender identity services with symptoms suggestive of Asperger's Syndrome than would be expected in the general population (Robinow, 2009).

The majority of the literature on the occurrence of autistic cognitive and behavioural symptoms (traits) in transgender individuals have been clinical observations or single case reports (cf. Perera et al., 2003; Gallucci et al., 2005; Kraemer et al., 2005; Mukaddes, 2002; Tateno et al., 2002 & Lemaire et al., 2014). Although each article highlighted factors to be considered in clinical practice, these findings are not comprehensive enough to offer guidance to clinicians about the occurrence of autistic traits within gender incongruent clinical populations. However, there have been a small number of studies that have adopted more scientifically rigorous approaches to investigating the occurrence of autistic traits in gender incongruent child, adolescent and adult populations utilizing a variety of screening tools and diagnostic measures (de Vries et al., 2010; Jones et al., 2011 & Paterski et al., 2014).

The purpose of this paper is to provide a structured systematic review of observational studies regarding the co-occurrence of autistic and gender incongruent presentations. The aim is to offer a synthesis of the methodologies and findings of the existing literature to guide further research on this topic.

Gender Incongruence

Gender Incongruence (GI) in itself is no longer viewed as a psychiatric diagnosis and is now considered a reflection of individual differences. The former diagnosis of Gender Identity Disorder has now been superseded with Gender Dysphoria (DSM-V, APA, 2013), thus the diagnosis now focuses upon the distress caused by the perceived GI as opposed to the gender nonconformity itself.

Gender nonconformity refers to the extent to which a person's gender identity, role, or expression differs from the cultural norms prescribed for people of a particular sex Gender dysphoria refers to discomfort or distress that is caused by a discrepancy between a person's gender identity and that person's sex assigned at birth (and the associated gender role and/or primary and secondary sex characteristics).

Coleman et al. (2013) WPATH -Standards of Care, version 7, page 5.

Gender nonconformity therefore reflects a gender experience which is incongruent with societal expectations based upon the person's birth sex, whereas Gender Dysphoria refers to the discomfort distress that some, but not all, gender incongruent individuals may experience. Gender Incongruent individuals may choose to have their gender reassigned through hormonal and surgical treatments. Not all individuals choose to undergo such interventions. Initial presentations may emerge in early childhood and for many of these children the dysphoria does not continue into adulthood (Coleman et al., 2013). The existing research literature spans from young children to working age adults thereby potentially encompassing both time-limited and more pervasive gender dysphoric presentations.

The term transgender is used to describe individuals whose experienced gender does not conform to the cultural norms (Coleman et al., 2013). Transgender individuals' perceived gender differs to varying extents from their birth sex (Bockting, 1999). The terms transsexual is used to describe an individual who wishes to change their primary and/or secondary sexual characteristics, usually via medical interventions, in line with their perceived gender (Coleman et al., 2013). Transmen are female transsexuals who identify as being male and Transwomen are male transsexuals who identify as being female. These terms refer to binary conceptualisations of gender but it should be noted that individuals can experience non-binary gender identities which can be either stable or a more fluid gender experience.

Autistic Spectrum Disorders

The DSM-5 (APA, 2013) classifies autistic spectrum disorders (ASD) under the umbrella of Pervasive Developmental Disorders (PDD). Autism is characterised by a triad of impairments relating to social functioning (Wing & Gould, 1979), which form the basis of the diagnostic criteria for both the DSM-5 (APA, 2013) and the ICD-10 (WHO, 2008). This triad is comprised of impairments in social relationships, social communication and social imagination relative to developmental level (Aarons & Gittens, 2001).

Published literature has reported the prevalence rates of Autistic Spectrum disorders within a Scottish locality to be 44.2 per 100,000 (0.04%) in children under 15 years olds (Harrison et al., 2006). Chakrabarti & Fombonne (2005) reported conducting developmental screenings of over 10,000 4-6 year old children and found the presence of PDDs (0.6%), autistic disorder (0.2%) and other PDD (0.4%) respectively. Further research indicated the rate to be around

1% of the UK population (Brugha et al., 2009). The existing literature indicates that ASDs and PDDs affect only a small percentage of the population with the majority of the literature using children and adolescents as the sample.

The assessment process for ASD is underpinned by gaining an accurate developmental history reflective of developmental trajectory combined with the factors mentioned in the triad of impairments. Diagnostic tools such as the Autism Diagnostic Observation Schedule - Generic (ADOS-G) (Lord et al., 2000) and Diagnostic Interview for Social Communication Disorders (DISCO) (Leekam et al., 2002) have been developed to provide a systematic and standardised procedure to assess autism.

In both clinical practice and the research literature, autistic disorder (sometimes referred to as classic autism) is differentiated from Asperger's Syndrome (formerly high-functioning autism). The presence of developmental delay (namely language) and impaired communication skills are the key factors differentiating Autistic Disorder from Asperger's Syndrome.

Autistic Traits in Gender Incongruent Persons

As aforementioned there has been increasing attention paid to the occurrence of autistic traits in transgender persons. Robinow (2009) proposed that the number of clients attending a gender identity service with ASD type difficulties may be statistically higher than expected in the general population. In Robinow's sample, 20 out of 45 transgender attendees presented with symptoms consistent with ASD which supported this theory. The existing case reports published look at either Asperger's Syndrome or a diagnosis of Autistic Spectrum Disorder, the latter encompassing developmental delay. The use of screening measures designed to be

sensitive to the cognitive phenotype of autism such as the Autism Spectrum Quotient (AQ; Baron-Cohen et al., 2001) do not screen for developmental delay, nor do they include informant data sources or in vivo assessments, therefore are limited in the diagnostic criteria captured. This systematic review aims to collate the literature on autistic traits in gender incongruent samples together with studies measuring GI in autistic samples to determine if similar levels of this co-occurrence exist in both populations.

Review Questions:

- a. What evidence is there of higher levels of both self-reported and external assessed gender incongruence in persons diagnosed with autism
- b. What evidence is there of self-reported or externally assessed autistic traits in persons diagnosed with Gender Dysphoria or Gender Identity Disorder?

Method

Search strategy

Relevant reference articles for this review were primarily sourced by searching various academic electronic databases. Once found, the reference lists of such articles were searched for further information. Additionally, peer-reviewed journals were accessed and reviewed to capture any further pertinent studies that may otherwise have been missed from the databases. OVID (Medline & CINAHL), EBSCOhost (PsychInfo, Psychology and Behavioural Sciences collection) and Web of Science were all searched using exactly the same search terms and the results were compiled using the Refworks 2.0. The search terms used fell under two broad categories firstly gender identity issues (transgender or transgendered persons or transsexual or gender identity disorder or gender identity or transgend* or transsex*). A separate search was conducted for Autistic Traits (autism, autistic disorder, autistic spectrum disorder, Asperger's syndrome, autistic traits, autistic phenotype, autism traits, autism phenotype, pervasive developmental disorder, Autis* or Asperg*). These two broader searches were combined, thus only articles containing both terms remained for the next stage of review.

In addition to the searches of electronic journals, the titles of articles in the International Journal of Transgenderism, Archives of Sexual Behavior and the British Journal of Psychiatry were reviewed using the article websites and screened for any of the search terminology.

Inclusion and exclusion criteria

The inclusion criteria for this review were articles published prior to 31st of March 2014, or available electronically by this date. Studies used must have examined gender perception, role or conformity in the given sample if gender non-conformity was not diagnosed (i.e. GD or GID). The studies' participants required them to have autism diagnosed or autistic traits measured in some way. Exclusion criteria for the studies included participants with a diagnosed disorder of sexual development as this would have provided an additional influence on the client gender incoherence/identity that would have complicated comparisons between studies. In addition, articles were required to be published in English.

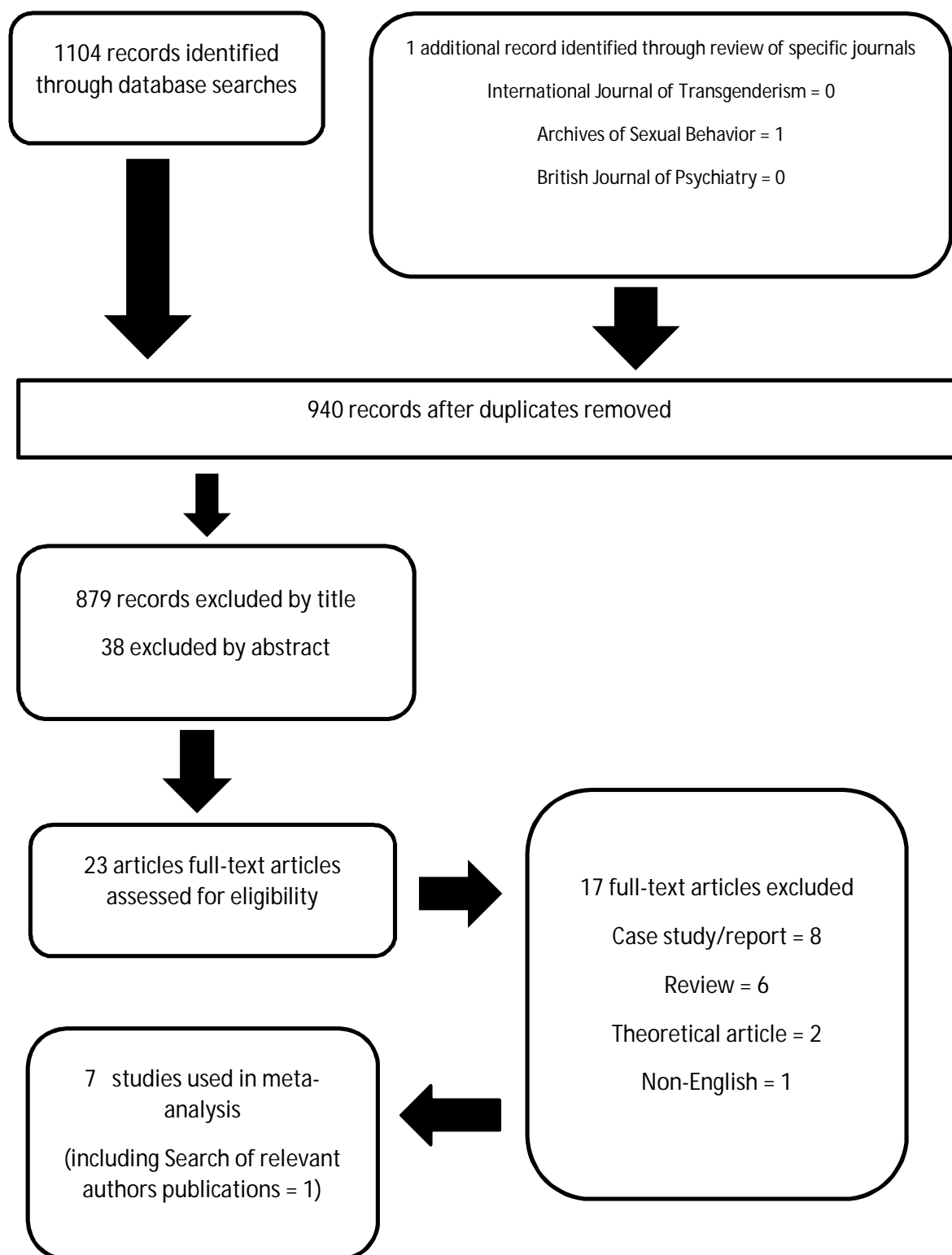
Inclusion Criteria

1. The study uses either a gender incongruent sample or a sample diagnosed with autism.
2. The study measures autistic traits or autism using either a screening tool or diagnostic instrument.
3. The study sample used does not contain individuals with a disorder of sexual development.
4. The study sample used does not contain individuals with a diagnosed learning disability.
5. The study must have been published or available electronically prior to the 31st of March 2014.

Exclusion criteria

1. Case studies.
2. Review articles.
3. Theoretical papers.

Papers not published in English.

Figure 1.0: Flowchart of Article identification

Assessment of design

The consideration of research quality in observational studies has been fraught with methodological flaws, in some cases with systematic reviews have adapted reporting guidelines to provide scores of research quality (de Costa et al., 2011). Jarde et al (2012) highlighted several tools that have been used in observational studies to assess the quality of the research such as the measures developed by DuRant (1994) and Downs & Black (1998). Downs and Black (1998) assesses 5 of the 6 domains recommended by Jarde et al. (2012): Representativeness, Selection, Measurement, Data collection, Confusion controlled for in the statistical analysis together with incomplete data and Funding. The Downs & Black (1998) measure has been reported to have utility across cross-sectional and case-control studies. The checklist devised by DuRant (1994) is considered one of the best tools based upon a previous systematic review (Deeks, 2003).

This systematic review combines selected items from DuRant (1994) and Downs & Black (1998). A total of 31 items were decided upon, of which case-control studies scores could receive a maximum score of 42 and cross-sectional being out of 37 (appendix 1.2). In order for study designs to be considered on their own merit the total scores were converted into percentages. A second trainee rated 57% of the studies independently, two cross-sectional and two case control. The quality ratings were negotiated prior to submission of the paper.

Results

Outcome of Search Process

Initial electronic searches yielded 1104 articles and review of selected journals and the relevant authors on the topic added another 1 article. The articles were recorded using an electronic database system which was used to manage the information gathered. After removing duplicates, 940 articles remained. Initial review of article titles screening for studies that were not mentioning gender identity or autism (or psychiatric co-morbidities) excluded 879 articles. Of the 60 articles which remained, a further 38 were excluded as review of the provided abstract indicated the population were not gender incongruent, that the article did not measure/assess autistic symptomatology or that review of the abstract indicated that the article was a theoretical essay, book chapter or review. At that point 23 articles remained for full-text review. Full-text review lead to 17 further exclusions, 8 as these were case reports and relied on a sample size of ≤ 2 ; a further 6 articles were review articles and a further 2 were theoretical papers and one was in Japanese. Therefore, 6 articles remained for qualitative review, based upon the improvised measure mentioned above and additional searches of the relevant authors of these 6 articles yielded a further 1 article for the meta-analysis, therefore a total of 7 articles were included in this review (see table 2).

Table 2: Summary of articles used in review

<u>Author</u>	<u>Design</u>	<u>Sample</u>	<u>Ax of Autism</u>	<u>Ax of gender congruence</u>	<u>Results</u>	<u>Strengths</u>	<u>Limitations</u>
Bejerot et al. (2012)	Case control	ASD Adults (N=50) Neurotypical adults (n=53)	<u>clinical assessment</u> ADOS medical records, AQ RMIE	<u>non-standardised assessment</u> photographs of face and body and voice recordings	Facial features less feminine in ASD females than controls & negatively correlated with AQ scores ($P=0.004$). ASD males' body constitution was negatively correlated with AQ scores ($r=-0.46$; $P=0.0007$). Negative Correlation between AQ scores and gender congruence: face ($p=-0.33$; $P<0.05$) and voice ($p=-0.24$; $P<0.05$).	A measure of physiological gender congruence suggestive of evaluations that individuals may be subjected to. The AQ scores were used in the analysis and correlated against these measures of congruence	Subjectivity of the externally rated gender congruence. Assessors' concepts of gender congruence will be influenced by societal and cultural factors Participants perspective of their physical GI not measured
Bejerot &	Case control	ASD Adults (N=50)	<u>Clinical Assessment & self-report</u>	<u>Self-report</u>	Both males and females in the ASD group rated themselves as having a less masculine gender	Recording of participants' gender experience based on two self-report measures in	did not examine of the relationship between AQ scores or results of the

Eriksson (2014)		Neurotypical adults (n=53)	AQ RMIE	Bem Sex Role Inventory (modified) & Improvised measures of gender identity, androgynous behaviours in childhood and gender typicality	<p>role than the control group. ASD males (M= 41.7; SD= 6.2) and ASD females M= 40.0; SD= 6.6) compared with male controls (M=47.9; 6.0) and female controls (M= 47.2; SD= 5.8).</p> <p>More ASD subjects reported an atypical gender identity ($X^2(1, n=103) = 10.1, \Psi = 0.31, P = 0.001$).</p> <p>When separated by sex, this reached significance only for the female ASD participants.</p> <p>No significant differences were shown with regards to self-perceived gender typicality</p>	<p>conjunction administered together with AQ and RMIE</p>	<p>RMIE test and gender identity</p> <p>Dichotomising a variety of responses to the “gender identity” item may overshadow the subtle differences in these responses.</p>
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					(male: $U = 335$, $P = 0.98$; female: $MWU = 235$, $P = 0.34$).		
De Vries et al. (2010)	Cross-sectional	children and adolescents with potential Dx of Gender Dysphoria (n=204)	<u>Clinical Assessment</u> Expert assessment Medical records, DISCO-10	<u>Clinical Assessment</u> Improvised screening measure based on DSM (DDC-GID)	Results showed that 7.8% (n=13) of the overall sample met diagnostic criteria for ASD. Analysis of the difference between ASD diagnosis rates between persons with GID & GID-NOS (sub diagnostic traits), the results shows the diagnosis rates were significant lower in the GID group than the GID-NOS ($p < 0.05$).	Cross section of referrals to GIC over a 3-year period Study included the use of diagnostic tools for both ASD and GID.	DISCO-10 not administered to all participants, only suspected participants. Inclusion of transvetic fetishism in sample, which is clearly differentiated from gender identity presentations. Comparative figures with non-GIC CAMH population (Dutch) could have been helpful
Jones et al. (2011)	Cross-sectional	Gender Dysphoric adults (n=259)	<u>Self-report</u> AQ	<u>Clinical Assessment</u> Lacks specific details	Transmen to have significantly higher AQ scores than genetic sex comparators ($t(157) = 6.1$, $p < 0.001$).	comprehensive use of the AQ measure using the total score and the autism phenotype classifications to provide information on the	Sample reliant on volunteers, not necessarily representative of the population as a whole

		Control data taken from validation studies of measures			<p>The transsexual group (transmen and transwomen) scores significantly higher than controls and perceived gender comparators ($F(1, 433) = 38.2$, $p < 0.0001$).</p> <p>Transmen had an 11-fold increase in the rate of scores in Narrow Autism Phenotype range in comparison to control males.</p>	extentof autism symptoms reported	<p>Controls were recruited from a different population, academic and cultural factors could skew comparisons.</p> <p>Gender Identity of controls not assessed, could skew comparability</p> <p>IQ was assessed in control study but not this study</p> <p>Testing EMB theory so using the EQ and SQ (EMB theory measures) could have added to this</p>
Paterski, Gilligan & Curtis (2014)	Cross-sectional	Gender dysphoric adults (n=91)	<u>Self-report</u> AQ measure	<u>Clinical</u> <u>Assessment</u> Lacks specific details	Prevalence rates were at higher in their Gender Dysphoric sample (5.5%), than the data	Recorded <ul style="list-style-type: none"> • Sexual orientation • Age of onset recorded 	Comparison study used different measures of

		Control data taken from validation studies of measures			from the general population (0.5-2%).	<ul style="list-style-type: none"> Age of presentation at GIC <p>Participants formally diagnosed with GD</p>	<p>autism/autistic symptomatology</p> <p>IQ was assessed in control study but not this study</p>
Strang et al. (2014)	Case control	<p>ASD children & Adolescents (n=147)</p> <p>Control data taken from validation studies of measures & geographical control group</p>	<p><u>Clinical Assessment</u></p> <p>Dx based on DSM-IV-TR</p>	<p><u>Self-report</u></p> <p>parent-report CBCL</p>	In comparison to non-referred controls ASD participants were 7.59 times more likely to have gender variance reported by their parents ($P < 0.001$).	<p>IQ measures administered</p> <p>Diagnostic measures of ASD</p> <p>Study include two control groups: one being 'local controls' a recruited sample from the community and the 'non-referred controls' which is the standardisation sample for the CBCL measure.</p>	<p>Gender variance based upon parental response to one item on the CBCL. No child report</p> <p>Responses dichotomised</p> <p>The odds ratio of the relationship with the local control group is not included.</p>

Stauder et al. (2011)	Case control	Adults with ASD (n=25) Adult controls (n=25)	<u>Self-report</u> AQ EQ SQ	<u>Self-report</u> Gender-masculine and Gender Feminine scale of the MMPI-2	<p>ASD males and females scored lower than controls on the EQ measure (male: $t(30) = -5.72$, $p < 0.00$; female: $t(16) = -5.35$, $p < 0.00$).</p> <p>ASD females scores on SQ were significantly higher than control females ($t(16) = 2.60$, $p = 0.02$).</p> <p>Significant difference between control males and females on the SQ, however there was not in the ASD group ($t(23) = 0.16$, $p = 0.88$).</p> <p>Scores in the GM scale of the MMPI-2 differences between the ASD and control groups.</p> <p>ASD males scored lower than</p>	<p>Use of the EMB measures</p> <p>Measures of gendered personality traits from the MMPI-2</p> <p>Use of the cognitive assessments/IQ calculations to control for a heavily academic normative control group</p>	<p>AQ not administered to the ASD participants.</p> <p>University students used as controls – socioeconomic comparability?</p>
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					<p>control males ($t(30) = -5.67, p < 0.00$).</p> <p>ASD females scored lower on the GM scale than control females ($t(16) = -2.11, p < 0.05$).</p> <p>ASD females scored higher on the GM scale than ASD males ($t(23) = 2.81, p = 0.01$) which is the reverse of the control group scores with control males scoring higher on this masculinity measure than control females ($t(23) = 7.69, p < 0.00$).</p>		
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ADOS Autism Diagnostic Observation Schedule (Lord et al., 2000)

AQ Autism-spectrum Quotient (Baron-Cohen et al., 2001)

ASD Autism Spectrum Disorder

CBCL Child Behavior Checklist (Achenbach & Rescorla, 2001)

DISCO-10 Diagnostic Interview for Social and Communication Disorders-10th revision (Wing, 1999)

EQ

GID

GID-NOS

MMPI-2

RMIE

Empathy Quotient (Baron-Cohen & Wheelwright, 2004)

Gender Identity Disorder

Gender Identity Disorder – Not Otherwise Stated

Minnesota Multiphasic Personality Inventory -2 (Butcher et al., 1989)

Reading the Mind in the Eyes (Baron-Cohen et al., 1997)

DDC-GID	Dimensional Diagnostic Criteria of Gender Identity Disorder (de Vries et al., 2010)	SQ	Systemizing Quotient (Wheelwright et al., 2006)
DSM-IV-TR	Diagnostic and Statistical Manual of Mental Disorders – 4th Edition – Text Revision (APA, 2000)		

Sample demographics

Collectively the seven studies included in this review assessed 776 individuals (425 adults and 351 children and adolescents) with either a diagnosis of Gender Dysphoria or Autistic Spectrum Disorder. Five of the studies used an adult sample with two using a child & adolescent sample. Of the 776 individuals, 541 were genetic males and 235 were genetic females. 554 individuals had a diagnosis of Gender Dysphoria or GD-NOS and 222 had a diagnosis of an autistic spectrum disorder.

The assessment of GI across the studies varied significantly. For example, de Vries et al. (2010) used specific diagnostic tools such as the Dimensional Diagnostic Criteria of Gender Identity Disorder. Others have used self-report measures or adaptations or extracts of existing self-report measures (Cf. Bejerot & Eriksson, 2014; Strang et al., 2014 & Stauder et al., 2011). Bejerot et al. (2012) used ratings of the participants' anatomical masculinity or femininity based on ratings from an independent panel. It should be noted that no two studies used the same measure for GI or identity.

The assessment of autistic symptomatology ranged from comprehensive diagnosis using diagnostic measures, developmental histories or specific neuropsychological tests to the use of brief screening measures. The use of the Autism Diagnostic Observation Schedule (ADOS) or the Diagnostic Interview for Social and Communication Disorders (DISCO-10) in combination with clinical assessment and detailed developmental history offered a clinical diagnosis of ASD in two of the studies (Bejerot et al., 2012 & de Vries et al., 2010). The Reading the Mind in the Eyes Test (RMIE), a measure of mentalizing abilities, was used in two studies (Bejerot et al., 2012 & Bejerot & Eriksson, 2014). Five studies used the Autism Spectrum Quotient (AQ) a measure of cognitive traits associated with autism that has been used as a screener for clinical threshold autistic traits (Cf. Bejerot et al., 2012; Bejerot &

Eriksson, 2014; Jones et al., 2011; Patterski et al., 2014 & Stauder et al., 2011).. The Stauder et al. study (2011) also used the extreme male brain theory measures of systemizing (SQ) and empathy (EQ) in conjunction with the AQ.

Article Review

What evidence is there of gender incongruence in persons diagnosed with autism

These studies recruited ASD participants who volunteered from community clinical settings and a proportion from the advertisements one from ASD support websites (Bejerot et al., 2012 & Bejerot & Erickson, 2014). These studies encompassed participants of various ages and controls were either matched on age and sex or used population level controls. The comparison groups for the majority of controls were predominantly locally recruited comparators without ASD, allowing for direct comparisons between ASD and non-ASD participants (Bejerot et al., 2012; Bejerot & Erickson, 2014; Strang et al., 2013 & Strauder et al., 2011). The Strang et al. (2013) study included in the use of the normative dataset for the CBCL measure as a second comparison group and elected to use this as the primary comparison for the experimental group, therefore their primary comparisons were with secondary data as opposed to a geographically, temporally and culturally comparable dataset. All ASD participants had a formal diagnosis prior to the participating in the studies, however there was disparity in the assessment measures used even within studies (e.g. ADOS, ADI or DSM-based clinical interview/assessment).

The four articles examining GI in ASD all reported increased GI in ASD participants in comparison to non-ASD controls. The lack of consistent approaches for assessing gender congruence was clear throughout the articles ranging from self-report measures to opinions of others. Two of the selected articles involved measurement by or opinions of others, not the individual participants themselves (Strang et al., 2013; Bejerot et al., 2012). The inclusion of these studies is important as this will be reflective of familial, peer and the general public's potential evaluations of the participants. The studies varied in how they measured this incongruence (whether this was externally rated physical features or behaviours; self-reported cognitive traits or identity).

The studies collectively illustrated that ASD participants showed significantly greater levels of gender congruence than non-ASD comparators. In terms of physical congruence ASD females were reported to have significantly less feminine facial features than non-ASD comparator, when assessed by a panel of assessors (Bejerot et al., 2012). ASD males were found to have less masculine voice and body composition, when assessed by the same panel of assessors (Bejerot et al., 2012). More ASD participants reported their own gender identity to be 'atypical' than non-ASD controls (i.e. not birth-sex, non-binary or transsexual) (Bejerot & Erickson, 2014). Parents of children and adolescents with ASD were more likely to report their child wishing to be the opposite sex than parents of non-ASD children (Strang et al., 2013). ASD participants were also shown to report reduced stereotypically male behaviours regardless of gender, when compared with non-ASD comparators (Strauder et al., 2011).

What evidence is there of autistic traits in persons diagnosed with Gender Dysphoria or Gender identity disorder?

The remaining three studies measured autistic symptomatology in transsexual subjects. Two of these studies used the AQ, a screening measure for cognitive autistic symptomatology and the remaining study used the ADOS, a diagnostic tool used the clinical diagnosis of ASD (Jones et al., 2011; Paterski et al., 2014 & de Vries et al., 2014 respectively). The Paterski et al. (2014) study reported higher prevalence of diagnostic level scores on the AQ, than would be expected in the general population (5.5% of sample as opposed to less than 2%). The Jones et al. (2011) article failed to report the rates of clinical threshold scores. However based on the reported data, the prevalence rate was manually calculated to be approximately 4.25% of the transgender sample and these were shown to have AQ scores in excess of the clinical threshold. It was acknowledged that this was not the focus of their study, however these data could have been useful in providing further support to the existing literature. The Jones et al. (2011) study reported that the transsexual group scored significantly higher on the AQ than both birth sex and perceived gender comparator data. The control data used in both these studies was the validation sample for the AQ measure, yet it used a heavily academic sample group, taken from a different geographical regions, approximately 10 years previously. This does not nullify the use of the secondary data, however this should be interpreted with caution. The de Vries et al. (2010) study reported ASD rates at 7.8%, again higher than would be expected in the general population. Methodologically, the studies' participating clients all had varying degrees of gender dysphoria, either past or present and may have been considering medical interventions to facilitate transition. There are publications that have criticised studies that have only used gender dysphoric clients recruited from gender clinics as this does not take into account Gender Incongruent persons not currently engaged with specialist gender services (Serano, 2007). The Jones et al. (2011) study used a website to recruit participants in addition to clinic-based recruitment, which would increase the likelihood of recruiting a more representative sample of transgender clients.

Discussion

Collectively, the papers presented all showed some evidence either of increased prevalence of autistic symptomatology in Gender Incongruent persons or more GI in ASD individuals.

Only one of the studies (de Vries et al., 2010) used comprehensive measures of both GI and autistic symptomatology allowing for comparisons of levels of symptoms for both presentations. Future studies investigating any potential co-morbidity between GI and ASD would benefit from measuring both presentations. This review identified several factors that need to be considered with reviewing the co-occurrence of ASD and GI. The nature of gender incongruence is very subjective and when studies omit the individual's perspective on their own gender congruence (physical, cognitive or behavioural) they neglect the crucial fact that gender is experienced at an individual level and difficulties needs to be considered at that level (Bejerot et al., 2012 & Strang et al., 2013). Two of the studies used secondary data for comparison AQ scores for non-ASD participants (Jones et al., 2011 & Paterski et al., 2014). The Baron-Cohen (2001) and Wheelwright et al.(2006) studies which were used as the basis for the comparison did not record the gender identity of participants and despite being used as non-ASD comparators, the unknown gender identity of participants casts doubt on the suitability of this sample as comparators for transgender samples as a proportion may well be transgender themselves. In addition the Baron-Cohen (2001) study formally assessed intelligence in a proportion of the control sample unlike the studies mentioned in the review (Jones et al., 2011 & Paterski et al., 2014). This could indicate that these studies' participants may be functioning at differing intellectual levels from the control samples, limiting the comparability. The studies included in the review include samples from the Netherlands, Sweden, USA and UK which all have marked cultural differences and may have different gender norms which needs to be considered as this would markedly influence externally- and self- assessed masculinity/femininity of physical features, cognitive and behavioural traits.

The measurement of cognitive ASD traits was based upon completion of a self-report cognitive screening tool (AQ) which is not a diagnostic measure, but indicates the presence of a cognitive style consistent with that of a person with a diagnosis of ASD (Baron-Cohen et al., 2001). When comparing the results of the AQ with the findings of studies using clinician-administered diagnostic assessments, the results need to be interpreted with caution as they offer distinctly different results. The use of screening measures offer indications of when more formal assessment could be warranted whereas clinician-administered such as the ADOS or ADI/ADI-R contribute towards a clinical diagnosis.

The design and reporting of the seven observational studies varied considerably. None of the studies reported their power calculations and it was not made explicit whether or not sample size was sufficient for their respective analyses. In terms of strengthening further studies on this topic, it would be beneficial for authors to adhere to the Strengthening the Reporting of Observational studies in Epidemiology (STROBE) guidelines (von Elm et al., 2007). This would allow for clear methodological comparisons and potentially more comprehensive reporting. The tool used for quality assessment of the studies offered a basis from which to evaluate quality, however there are a variety of possible tools that could offer an alternative method of critique. However the tool did promote further consideration of sample recruitment, measures and control selection and type, factors which can contextually influence the conclusions drawn from the data.

The limitations of this current review are related to the rigidity of the search terminology and exclusion criteria. The search terminology focused around ‘gender identity’ whereas the inclusion of terms including “GI” and “gender congruence” may have yielded further articles to strengthen the review literature. The inclusions of search terms “masculinity” and “femininity” may have increased the number of articles generated from the searches. Given the focus of this review on GI it was decided to use the broader term gender identity to

encompass both of these terms. The exclusion criteria meant that articles with participants with disorders of sexual development (e.g. gonadal or chromosomal abnormalities) and those with a diagnosis of a comorbid learning disabilities learning disability were excluded as such dual diagnoses may have skewed comparisons. However in hindsight, these studies may have contributed to the overall findings.

The articles presented in this review offered findings supportive of the co-occurrence of autistic and cross gender symptomatology in the given samples. GI was shown to be more prevalent in the four articles investigating this in persons with a diagnosis of autism. This GI may present in a variety of ways: attenuated masculine/feminine features, or they may perceive their gender as atypical, or they may identify as being transgender or the have weakened/reversed cognitive traits associated with their birth sex. Autistic symptomatology was also shown to be more prevalent in transgender persons than in comparisons to normative samples. The review of the articles highlighted the lack of consistency in the measure of GI across all studies. In addition to this, only one study measured both dimensions (GI and autistic symptomatology) which could be advantageous for further research on the topic. The evidence presented in this review has implications for clinical practice for both Gender Incongruent and autistic populations. Therefore, autistic support services need to be mindful that a proportion of service users may present with cross-gender pre-occupations and thus should consider potential distress caused by gender dysphoria and input for specialist GICs where required. Likewise, clinicians working in gender identity clinics need to be aware that evidence in the literature presented shows higher than expected levels of ASD diagnoses in a child and adolescent sample and higher levels of cognitive autistic in adult samples, particularly in transmen.

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Chapter 2: Major Research Project

A Neuropsychological Exploration of Autistic Traits in a Transgender Population

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Prepared in accordance with the guidelines for submission to

Archives of Sexual Behavior

(See Appendix 1.1 for contributor's notes)

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Plain English Summary

Background

Autistic characteristics or ‘traits’ exist to varying degrees throughout the general population. The transgender population has been reported as a population within which these traits occur at a higher levels than would generally be expected. Within this, female-to-males have been shown to score significantly higher on a measure of autistic traits.

Research has suggested that people with autism have a masculine pattern of cognitive traits. In addition, several different areas of difficulty have been identified in people who have autism. These include difficulties in inferring emotional states from facial expressions, mental planning and flexibility of thinking.

Aims

This study examined whether higher levels of these traits of autism were found in a sample of transgendered adults.

Research Questions

1. Do transmen show higher levels of autistic traits than transwomen?
2. Do transgender individuals show the 'extremely male' thinking predicted by previous research?
3. Higher levels of autistic traits will link to poorer emotion recognition abilities?
4. Higher levels of autistic traits will link to lower scores than expected on executive function tasks of
 - a. Planning efficiency
 - b. Flexible thinking

Methods

Participants

The participants of this study were adult service users from a regional Gender Identity Clinic (GIC). Twenty-six service users volunteered, 17 transwomen and 9 transmen. Participants were at various stages of transition and the majority of whom were receiving hormone treatments.

Recruitment

Service users registered with the GIC received a letter from the GIC advising that the study was taking place, including the participant information sheet with contact details should they wish further information or to participate.

Design of Study

The study had two components. Firstly, questionnaire measures that were completed measuring aspects associated with autism. Secondly, computerized tasks were administered that were sensitive to the difficulties associated with autism.

Data Collection

Information required was:

- Birth sex
- Age
- Reassignment treatments and hormones
- Self-report questionnaires (autistic traits & male/female thinking)
- Computerised task scores (emotion recognition, planning and flexible thinking)

Results

The overall results of the study found no evidence of autistic difficulties in the transgender group recruited. The transgender group recruited showed higher levels of autistic traits than expected, but this was below clinical levels.

Transmen showed slightly higher levels of autistic traits. Male and female thinking showed a pattern similar to perceived gender on certain measures.

Higher autistics traits were potentially associated with poorer emotion recognition. No association between autistic traits and planning or flexibility was found.

Transgender populations may have a higher levels of autistic traits, albeit this is still a minority. The social communications difficulties may form part of clinical presentation and services could benefit from awareness of this co-occurrence.

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Abstract

There have been a small number of studies reporting a higher prevalence of autistic symptomatology in people with Gender Dysphoria (GD), in particular transmen (male-to-female), when compared with the general population. This study aimed to further these findings by recruiting a sample of 26 transgender adults and administering the Autism-Spectrum Quotient (AQ), together with measures of the cognitive traits of sex-differentiated thinking associated with autism and neuropsychological measures sensitive to the deficits associated with Autistic Spectrum Disorders (ASD's), including emotion recognition, planning and set-shifting . The transgender sample was shown to occupy an area of the autism spectrum that was intermediate between ASD and neurotypical comparators. A potential trend of higher median AQ scores in transmen was observed but non-significant ($r=.19$). Cognitive sex differences on the Systemising Quotient-Revised (SQ-R) and Empathy Quotient (EQ) showed trends in the direction of their perceived gender in selected domains. Further examinations of relationships suggested that correct identification of emotions on the Cambridge Neuropsychological Test Automated Battery (CANTAB) Emotion Recognition Task (ERT) subtest was inversely related to levels of autistic traits and positively related to empathy-traits. No significant relationships were found between number of autistic traits and performance on planning and set-shifting tasks for the entire transgender sample. The overall findings of the study indicate that the pattern of performance expected in ASD was not found in the transgender sample recruited.

Keywords

Autistic Traits • Transgender • Neuropsychological Assessment • Emotion Recognition • Executive Function

Introduction

It has been reported that a higher than expected proportion of attendees at a Gender Identity Clinic (GIC) had impairments in social skills and preoccupations that were thought to be consistent with Asperger's Syndrome (AS) (Robinow, 2009). This article reported that 20 of 45 attendees at the GIC exhibited symptoms consistent with AS; much higher than anticipated prevalence rates in the general population (Robinow, 2009). The findings offered support to the observed co-morbidity between cross-gender preoccupations and ASD symptomatology reported in other studies (cf. de Vries et al., 2010; Gallucci et al., 2005; Jones et al., 2011; Kraemer et al., 2005; Mukaddes, 2002; Paterski et al., 2014; Perera et al., 2003 & Tateno et al., 2002).

Transgender persons are individuals whose gender experience does not conform to their cultural norms. There is considerable variety in the gender experiences of transgender people including cross-gender, non-binary (both male and female), fluid and changeable experiences and those who would identify with neither gender (Coleman et al., 2013). Persons born female who identify as male and may be considering medical interventions to aid transition into their desired gender role are referred to as transmen (McNeil et al., 2012). A birth sex male with a female gender identity is referred to as a transwoman (McNeil et al., 2012). The prevalence rate of Gender Dysphoria in Scotland has been reported to be 8.18 per 100,000, with a 4:1 male to female ratio (Wilson et al., 1999).

Gender Identity Disorder (GID) was the diagnostic label assigned to individuals who have a strong and persistent cross-gender identification and enduring discomfort with their own sex

or feel these gender roles to be inappropriate (APA, 2000). The Diagnostic and Statistical Manual of Mental Disorders-Fifth Edition (DSM-5) replaces GID with Gender Dysphoria (GD); the most noticeable differences being that this is less pathologising terminology, the diagnosis refers to a period of distress which can resolve and gender non-conformity itself is not pathological (APA, 2013). Gender nonconformity in itself is not a diagnosable psychological disorder the diagnosis of GD is dependent the individual experiencing distress caused by the disparity between their perceived gender and birth sex

The majority of the literature on gender identity and autistic spectrum disorder consists of case studies, however three group studies to date have been published (de Vries et al., 2010; Jones et al., 2011 & Paterski et al., 2014). De Vries et al. (2010) screened children and adolescents attending a GIC in the Netherlands for ASD; overall findings were that 7.8% (n=16) were diagnosed with autism. This figure was markedly higher than the prevalence rates (less than 2%) in the general population (Chakrabarti & Fombonne, 2005 & Blumberg et al., 2013).

There have been studies using adult transgender samples in the UK which used the AQ (Baron-Cohen et al., 2001) to quantify levels of autistic traits. The first of these studies examined autistic traits in gender dysphoric adults and found that the proportion of participants with autistic traits in the clinical range was 5.5% (n=5) (Paterski et al., 2014). The second of these studies indicated the prevalence rate in transgender adults to be 4.8% (Jones et al., 2011). This study aimed to test the 'Extreme Male Brain' theory of autism, which has never previously been applied to a transgender sample. The results showed that mean AQ scores were significantly higher in the transmen than transwomen and birth sex

comparators but not significantly different from perceived gender comparators (Jones et al., 2011). Comparisons of mean AQ scores between transmen and perceived gender comparators (control males) may offer support to the theory that transgender individuals demonstrate a cognitive profile consistent with their perceived gender as opposed to their birth sex (la Torre et al., 1976). The use of cross-sex hormones has also been considered to potentially have an ‘activating effect’ in terms of triggering a pattern of performance consistent with the opposite sex, however the findings were often varied (cf. van Goozen et al. 1995; Slabbekoornvan et al., 1999 & van Goozen et al., 2002)

ASD’s have typically been conceptualised by a ‘triad of impairments’ in social relationships, social communication and social imagination (Wing & Gould, 1979). This triad forms the foundation of the diagnostic criteria for both the DSM-5 (APA, 2013) and the International Classification of Diseases–Tenth Edition (ICD-10; WHO, 2008). The DSM-5 reflects the most recent diagnostic conceptualisation of ASD’s. Former diagnoses of AS and Pervasive Developmental Disorder, Not Otherwise Specified (PDD-NOS) have now been subsumed by the diagnosis of ASD. Published prevalence rates range from less than 1% to a reported 2% of the populations sampled (Cf. Chakrabarti & Fombonne, 2005 & Blumberg et al., 2013). A variety of conceptualisations of autistic symptomatology have been presented in the published literature, however, the Extreme Male Brain (EMB) Theory of Autism and neuropsychological functioning were the focus of this study.

Extreme Male Brain (EMB) Theory of Autism (Baron-Cohen, 2002)

The cognitive sex differences that have been identified between males and females have been found to be masculinised in both men and women with autism. Baron-Cohen (2002) suggested that there were two domains that were previously unaddressed in terms of sex differences, systemising and empathising abilities. Empathising is the drive to recognise the thoughts and emotional states of another person and respond appropriately to these. Systemising is the drive to understand and utilise technical, natural, abstract, social, organisable and motoric systems (Baron-Cohen, 2002). Baron-Cohen (2002) reported that systemising characterises the men, where systemising abilities are greater than empathising; in women empathising abilities are greater than systemising. Baron-Cohen (2002) identified that both males and females with autism show greater levels of systemising traits, to an extent that is higher than non-ASD males. The Systemising Quotient (SQ) and Empathy Quotient (EQ) are self-report measures that can quantify these domains (Baron-Cohen et al., 2003). The scores on these measures have successfully differentiated ASD individuals from non-ASD comparators and males from females (Baron-Cohen et al., 2003). At the time of conducting this study neither the EQ nor SQ have been used with transgender participants despite a previous study having examined EMB theory in transgender participants (Jones et al., 2011)

Neuropsychological Functioning

Neurological studies have reported reduced activity in the amygdala, and fusiform gyrus to morphing emotional expressions in people with autism, in comparison to neurotypical controls (Pelphrey et al., 2007). Additional studies with autistic samples identified deficits in emotion recognition. Adults with autism were shown to have impaired ability to infer

emotional states from pictures of the eye-region, compared with neurotypical controls (Baron-Cohen et al., 1997). Clark et al. (2008) found that when presented with a facial expression, autistic participants were significantly worse at extracting the emotions presented. These tasks involved the encoding of visual stimuli and interpreting the emotions being presented and may be a potential reflection of abnormalities in these neuroanatomical structures (Pennington & Ozonoff, 1996). There has also been evidence of reduced blood flow and significantly different Electroencephalogram (EEG) readings in the frontal lobes of people with autism (Pennington & Ozonoff, 1996). The frontal lobes are generally associated with executive functioning abilities, examples of these being problem solving, planning, sequencing and cognitive flexibility. Impairments in the functioning of the frontal lobes could offer an explanation for the rigidity and perseveration that is often observed clinically in people with autism (Hill, 2004). Children with autism were found to perform poorly on tasks involving planning, and perseveration (Ozonoff et al., 1991). Ozonoff et al. (2004) compared participants with and without ASD's performance on computerised measures of executive function using CANTAB neuropsychological test battery. They found that on planning tasks such as the 'Stockings of Cambridge (SOC)' test, ASD participants had worse performance on tasks involving longer sequences of moves (Ozonoff et al., 2004). In addition, the 'Intra-/Extra-Dimensional (IED) Set Shift' test assessed set-shifting abilities and therefore levels of perseveration. Individuals with autism were found to perseverate when an extra-dimensional shift was necessary and therefore had made more errors after the extra-dimensional shift took place (Ozonoff et al., 2004).

ASD's are understood in terms of the characteristic symptoms existing on a spectrum from levels that would be expected in the non-ASD population to those expected in diagnosed individuals (Wing, 1996). Screening measures have been developed over time to quantify

autistic symptomatology and to help identify individuals for whom more detailed assessment may be warranted. The Autistic Spectrum Quotient (AQ; Baron-Cohen et al., 2001) is one such self-report screening measure. The AQ measure has demonstrated sensitivity to autistic traits in the general population and found higher levels in certain men and students studying science subjects (in comparison to those studying humanities and social sciences). As previously noted it has been reported that transgender samples show higher than expected levels of autistic traits as measured by the AQ (Jones et al., 2011 & Paterski et al., 2014)

This study therefore attempted to clarify whether the ‘extremely male’ pattern of cognition and the neuropsychological deficits reported in previous ASD samples are observed within a transgender population, given that rates of ASD are reported to be higher in the transsexual samples.

Hypotheses

1. Transmen will have higher scores on the AQ than transwomen.
2. The transgender sample will show a higher systemising and lower empathy scores.
3. Higher AQ scores will be associated with reduced accuracy and increased response latency on the ERT.
4. An inverse relationship will be observed between AQ score and performance on executive function tasks of:
 - i. Set Shifting
 - ii. Planning

Method

Design

This study used a cross-sectional design to investigate cognitive autistic traits in transgender adults. The study utilised both self-report and computerised neuropsychological measures to examine cognitive traits associated with ASD, based upon the 'Extreme Male Brain' theory of autism (Baron-Cohen, 2002) and the neuropsychological dysfunctions identified in previous literature (cf. Clark et al., 2008 & Ozonoff et al., 2004) .

Recruitment

The author extracted data of all attendees of a regional National Health Service (NHS) Gender Identity Service (GIS) in Glasgow, United Kingdom between January 2012 and April 2014 which totalled 564 appointments. In liaison with the professionals at the GIS, potential participants who were known to be acutely unwell (physical or psychiatric), had a diagnosis of learning disability or known acquired brain injury at the time of recruitment were excluded (n=9). The removal of duplicate attendances and removal of the aforementioned exclusions resulted in a total of 222 potential participants. Potential participants were posted an invitation letter (appendix 2.2) from the GIS including the Participant Information Sheet (Appendix 2.3) for the study. Interested volunteers were invited to contact the author to arrange an assessment session taking place at the GIS.

Participants

Twenty-six service users currently registered with the GIS agreed to participate. There were 17 transwomen (M Age = 41.8 years; SD = 10.96 years) and 9 transmen (M Age = 27.0 years; SD = 6.54 years). 15 of the 17 transwomen reported identifying as female, one identified as being male and other identified as having a non-binary gender identity (identifying as being both male and female). All of the transmen who participated in the study identified as being male. The majority of participants, 88.5% (n=23), were using cross-sex hormones at the time of the study. Of the participants who reported using cross-sex hormone treatments, 11.4% had been using these for less than 12 months, 34.6% for 1-2 years, 30.8% had used hormones for 3.5 years and 7.7% for over 5 years.

Procedure

The 26 participants attended a single assessment session. Written consent was gained from all participants (Appendix 2.4). The 90-minute assessment session consisted of three sets of tasks (questionnaires, interview about psychiatric symptoms and neuropsychological tests) as part of the wider Scottish Transgender Research Study (STaRS). This study focused on data yielded from the self-report measures and neuropsychological tests. The questionnaire section involved the completion of a demographic questionnaire (appendix 2.5) which included questions regarding gender experience and stage of transition, taken from the Trans Mental Health and Emotional Wellbeing Study (McNeil et al., 2012). Other self-report measures administered were the AQ, the SQ-R and the EQ. In addition to the questionnaires participants completed 3 computerised neuropsychological tests from the CANTAB providing measures of emotional perception, cognitive flexibility and planning. The results

were using between group comparisons and bivariate correlations on IBM SPSS statistics v21 (IBM, 2012).

Measures

Autism Spectrum Quotient (AQ; Baron-Cohen et al., 2001) -

http://www.autismresearchcentre.com/arc_tests

The AQ is a 50-item self-report measure designed to measure the cognitive traits of autism in adults of normal intelligence. The AQ has been shown to have validity in discriminating between those with a diagnosis of an autistic spectrum disorder and those without (Baron-Cohen et al., 2001 & Wheelwright et al., 2006). Each item is responded to using a four-point Likert scale generating scores of either one or zero for each item. A total score of up to 50 points is generated and scores in excess of 32 are viewed as being indicative of clinical range symptomatology (Baron-Cohen et al., 2001).

The Systemizing Quotient - Revised (SQ-R; Wheelwright et al., 2006) - accessible via:

http://www.autismresearchcentre.com/arc_tests

The SQ-R is a 75 item self-report measure designed to quantify the extent to which respondent's try to understand their environment in terms of rule, patterns and systems. Each item is responded to using a 4-point Likert scale generating a score of 0, 1 or 2 for each of the 75 items. The SQ-R has not been extensively evaluated for reliability and validity.

Neurotypical males have been shown to score significantly higher than female comparators

on the SQ-R and participants with ASD were shown to score higher than neurotypical samples (Wheelwright et al., 2006). No prior studies have used this measure with transgender samples.

The Empathy Quotient (EQ; Baron-Cohen & Wheelwright, 2004) – accessible via http://www.autismresearchcentre.com/arc_tests

The EQ is a 40 item self-report measure which quantifies the extent to which the responder is focused on understanding emotional states in others and to respond to these with appropriate emotions. Each item is rated using a 4-point Likert scale generating a score of 0, 1 or 2 for each of the 40 items. The EQ has not been extensively evaluated for reliability and validity. Neurotypical males have been shown to score significantly lower on the EQ than female comparators and ASD participants' score are significantly lower than neurotypical comparators (Baron-Cohen & Wheelwright, 2004). No prior studies have used this measure with transgender samples.

Cambridge Neuropsychological Test Automated Battery (CANTAB)

The CANTAB is a computerised battery of neuropsychological tests designed to measure specific domains of cognitive functioning. For the purpose of this study 3 specific tests designed to measure domains of functioning where deficits have been found in autistic people have been selected.

Emotion Recognition Task (ERT)

The ERT measures the examinees ability to correctly identify emotions from briefly presented facial expressions. Examinees are presented with a computer-morphed image of a face conveying one of 6 emotions (anger, disgust, fear, happiness, sadness or surprise) for 200ms each. Examinees must use the touch screen to select which of the six emotions best describe the facial expression that they have just seen. The ERT presents two sets of 90 stimuli, with each emotion being presented 15 times, with varying levels of intensity. The ERT yields number correct responses and mean response latency.

Intra-/Extradimensional Shift Task (IED)

The IED provides a measure of mental flexibility based upon rule acquisition and reversal (see Ozonoff et al. [2004] for a detailed overview). There are nine blocks of items presented, each representing a change to the rules. The examinee is visually presented in the first instance with two differing geometric shapes and advised that one is correct and the other is incorrect and they have to discover the rule. Examinees are advised that the computer will periodically change the rule. The intra-dimensional shift is when the existing geometric shapes were reconfigured and requires the examinee to attend to the previous rule. The extra-dimensional shift requires the examinee to switch from the geometric shapes being attended to throughout the task to the previously ignored stimuli. The IED generates standard scores for number of extra-dimensional shift errors and an adjusted score trials and errors made to meet criterion which compensate for those who were unable to complete tasks

Stockings of Cambridge (SOC)

The SOC provides a measure of spatial planning and spatial working memory (see Ozonoff et al. [2004] for a detailed overview). The examinee is presented with two displays showing two arrangements of coloured balls, which are able to be stacked within stockings. The examinee must rearrange the balls in the lower arrangement to match the pattern shown in the upper arrangement within a defined number of moves (2, 3, 4 or 5 moves). The measure generates multiple scores but for the purposes of this study number of problems solved in minimum moves, mean number of moves and means subsequent thinking time for 3, 4 and 5 move questions have been reported to be items ASD participants scored differently on (Ozonoff et al., 2004).

Justification of Sample Size

The data generated by the AQ (total score) was expected to be normally distributed data, therefore parametric conditions were assumed. Sample size was calculated using G*Power v3.1 for one-sample T-test using the data generated from the Jones et al. (2011) study, as the AQ measure was used to identify individuals with autistic traits indicative of an ASD. Jones et al. compared non-autistic female controls with transgendered females on the AQ and found differences to be large ($d=0.97$). Based on this effect size, with power at 0.8 and alpha set at 0.05, then at least 14 participants per group of transmen and transwomen were required.

Ethical Consideration

The study was reviewed and approved by the University of Glasgow and the NHS West of Scotland Research and Ethics Committee (Appendix 2.1). Written consent to participate was

gained from all participants and their ability to withdraw from the study at any time was made clear. Limitations of confidentiality were also discussed with all participants consenting to these conditions.

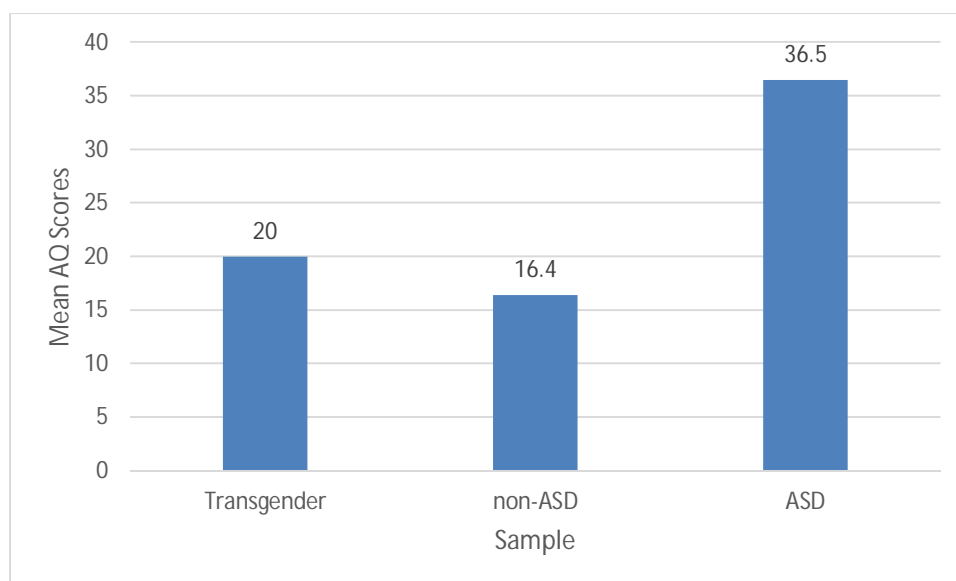
Results

The following results reflect the data gathered via this study. Where non-ASD and autistic comparators are used these reflect secondary data taken from Baron-Cohen et al. (2001) for the AQ score and Wheelwright et al. (2006) for EQ and SQ scores.

1) Transmen will have higher scores on the AQ than transwomen

Participants scores in the AQ were shown to be normally distributed (based upon reviewing histograms, boxplots and Shapiro–Wilk test), therefore one-sample t-tests were used to examine differences between participants' scores and the normative data published in Baron-Cohen et al. (2001) (see Figure 1.1). AQ scores were shown to be significantly higher for the transgender participants ($M=20$ $SD = 8.81$) than non-ASD controls ($M=16.4$, $SD = 6.3$), $t(25) = 2.084$, $p= 0.048$ [one-tailed], $d= .47$. AQ scores were shown to be significantly lower in the transgender sample than the ASD sample ($M= 35.8$, $SD= 8.0$), $t(25) = -9.551$, $p= <.005$ (one-tailed), $d= 1.88$. These results suggest that the transgender sample in this study demonstrated AQ scores that were intermediate between non-ASD and those with a diagnosed ASD, closer to non-ASD than ASD. The AQ scores for transwomen participants were shown to be abnormally distributed (Shapiro-Wilk < 0.05 , review of histograms and boxplots), therefore non-parametric measures of between group differences in AQ scores was selected. The comparison of median AQ scores within the transgender sample showed transmen ($Mdn= 23$, $IQR= 15-27$) had higher AQ scores than transwomen ($Mdn= 16$, $IQR= 12-23.5$) but, differences were not significant ($U= 94$, $z= .946$, $p= .367$, two-tailed, $r=.19$).

Figure 1.1: Mean AQ scores of transgender, non-ASD and autistic adults using control data from Baron-Cohen et al. (2001)



Differences in transmen and transwomen achieving clinical threshold scores (total score ≥ 32) on the AQ was assessed using Fisher's Exact Tests due to frequencies being lower than five on some counts (see figure 1.2). A Fisher's exact test found no significant association between gender and clinical range traits of ASD ($p = .732$).

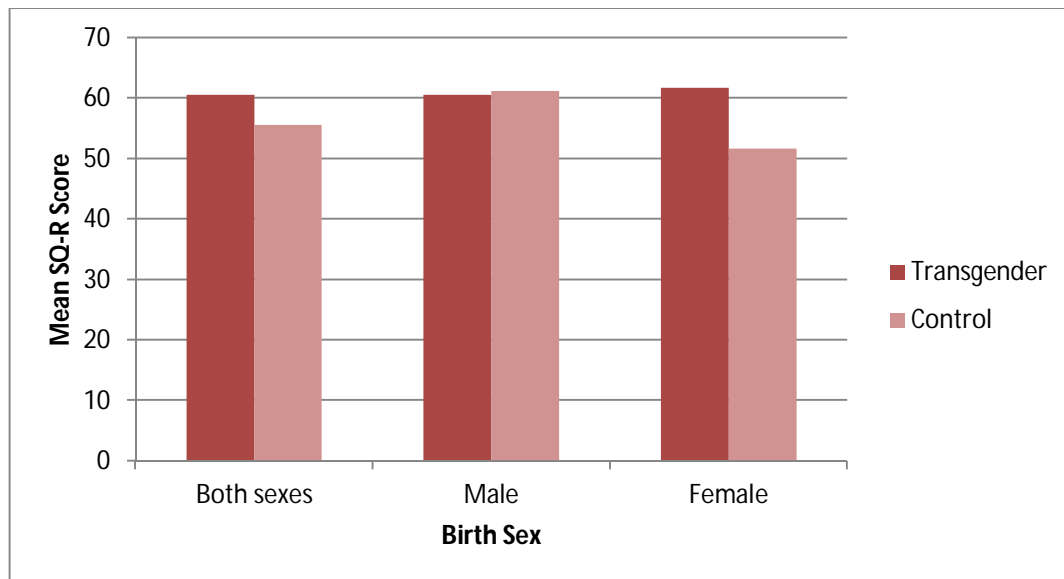
Table 1.2: Proportions of transmen and transwomen showing diagnostic levels of autistic traits

	Transwomen (n=17)	Transmen (n=9)
Average AQ score	15 (88.2%)	8 (88.9%)
Clinical range AQ score	2 (11.6%)	1 (11.1%)

- 2) The transgender sample will show a strongly systemizing pattern of responding using SQ / EQ measure in comparison to a normative sample.

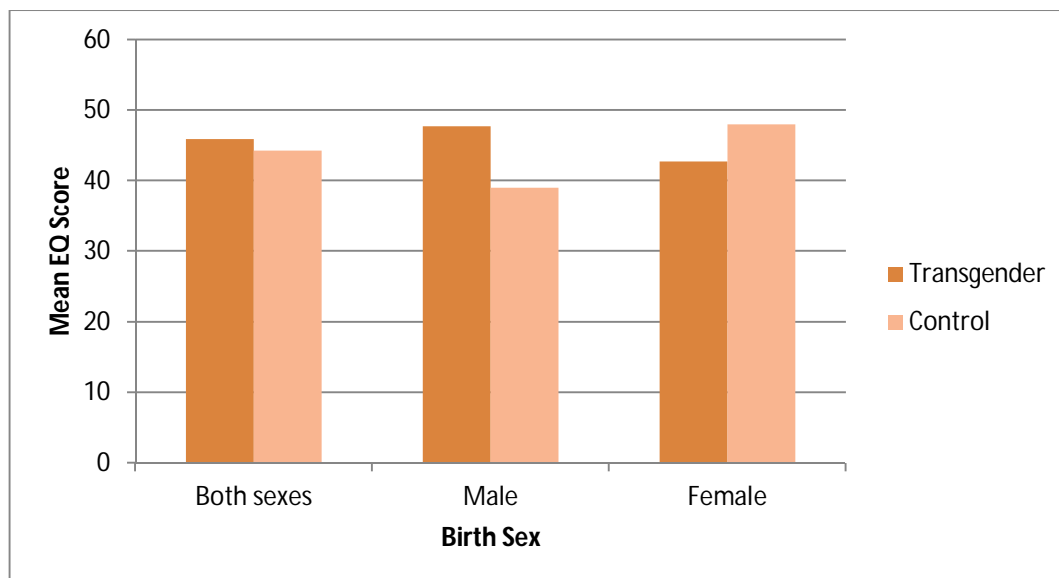
Participants' scores on the SQ-R and EQ were normally distributed (review of histograms, boxplots and a non-significant Shapiro–Wilk test). The mean SQ-R score was not significantly higher for the transgender sample ($M=60.62$ $SD = 22.45$) in comparison to the non-ASD controls ($M= 55.6$, $SD= 19.7$) (see figure 2.1), ($t[25]= 1.139$, $p= 0.266$; $d= .24$). Comparisons between the transgender samples mean SQ-R scores and birth-sex comparators were undertaken. No significant differences were found between transwomen ($M= 60.6$, $SD= 21.74$) and control males ($M=61.2$, $SD= 19.2$) ($t[16] = -.216$, $p= 0.831$, $d= -.01$) and transmen ($M= 61.67$, $SD= 25.08$) and control females ($M=51.7$, $SD= 19.2$) ($t[8]= 1.192$, $p= .236$, $d= 0.45$). Mindful of the potential for influence of hormonal treatments those not currently using hormones were excluded ($n=1$). The revised analysis showed transmen's scores on the SQ-R ($M= 67.13$, $SD= 20.30$) were not significantly different from control females ($t[7]= 2.149$, $p= .069$, $d= .78$).

Figure 2.1: Mean SQ-R scores of transgender sample and control data from Wheelwright et al. (2006)



No significant difference in EQ scores between the transgender group ($M=45.92$, $SD= 14.11$) and the non-ASD comparators ($M= 44.3$, $SD =12.2$) ($t[25]=.586$, $p= 0.563$, $d= -0.12$) (see figure 2.2). Comparisons between the transgender samples EQ scores and birth-sex comparators were conducted. EQ scores were significantly higher in transwomen ($M=47.65$, $SD= 14.08$) than control males ($M=39.0$, $SD= 11.6$) ($t[16]= 2.531$, $p= 0.022$, $d= 0.67$). Excluding transwomen not taking hormones at the time of the assessment showed that transwomens' EQ score ($M= 49.20$, $SD= 11.37$) was again significantly higher than control males ($t[14]= 3.476$, $p= .004$, $d= .87$).

Figure 2.2: Mean EQ scores of transgender sample and control data from Wheelwright et al. (2006)



3) Higher AQ scores will correspond with reduced accuracy and increased response latency on the ERT

The total number of correct scores (Mdn= 126, IQR= 113 - 132) and mean response latency (Mdn= 1710ms, IQR= 1394.27 – 2190.67ms) on the ERT were correlated against the transgender samples AQ scores (Mdn= 20, IQR= 13 - 23.5) (see table 3.1). The total number of correct responses and mean response latency on the ERT were shown to be abnormally distributed (review of boxplots and Shapiro-Wilk <0.05) therefore Spearman's Correlation Coefficients were selected. Review of the scatterplot generated showed one outlier with regards to the participants AQ score (Z score > 3.29) which was over 3 standard deviations from the sample mean, a sensitivity analysis was therefore conducted as a precaution (Field, 2005). A significant negative association between AQ scores and number of correct

responses on the ERT was found ($r_s[24] = -.358$, $p = .036$, one-tailed) indicating that 12.8% of the variance in correct responses on the ERT can be explained by the participant's AQ scores. These data remained abnormally distributed with the exclusion of the outlier and the correlations were repeated excluding this case, no significant relationship between AQ scores and number of correct responses on the ERT ($r_s[23] = -.277$, $p = .090$) or response latency ($r_s[24] = .114$, $p = .289$, one-tailed) were seen when the outlier was excluded ($r_s[23] = .025$, $p = .453$). No significant associations were observed between the total EQ scores (Mdn = 49, IQR = 37.5 – 57) and number of correct responses ($r_s[24] = .271$, $p = .091$) and mean response latency ($r_s[24] = -.079$, $p = .351$).

Using only participants currently on cross-sex hormone treatments which excluded the outlier discussed above, and two additional participants, no significant associations between correct responses on the ERT and EQ scores number ($r_s[21] = .280$, $p = .098$) and AQ scores ($r_s[21] = -.338$, $p = .057$) were found.

Table 3.1: Correlation coefficients of ERT performance against AQ and EQ scores

		No of correct responses	Mean response latency
AQ total score	Correlation Coefficient	-.277*	.025*
	Significance	.090*	.453*
	n	25*	25*
EQ total score	Correlation Coefficient	.271	-.079
	Significance	.091	.351
	n	26	26

*Outlier excluded

- 4) Due to their higher levels of autistic traits, transgender individuals will have lower scores than a normative sample on executive function tasks

The CANTAB neuropsychological battery used to deploy measures of executive function generates both raw scores and scaled scores automatically calculated based on normative data stored within the system, where possible scaled scores have been used. Based upon the previous study conducted by Ozonoff et al. (2004) the age related norms were used to generate the scaled scores.

i. *Intra-Extra Dimensional Set Shift (IED)*

In order to investigate whether higher autistic traits would infer impaired performance, a series of non-parametric correlations were conducted (based on aforementioned procedures for assessing normality). Spearman's Correlation Coefficients were calculated between AQ scores and the scaled scores for number of EDS errors (Mdn= 106.25, IQR= 96.91 – 110.56), adjusted scores for both total number of trials (Mdn= 106.46, IQR= 98.55 – 108.33) and number of errors committed (Mdn= 107.51, IQR= 99.9 – 109.35). These data show that performance was not indicative of deficits in performance. For the transgender sample used in this study, no significant relationships were found between levels of cognitive autistic traits and extra-dimensional shift errors ($r_s[24] = -.176$, $p = .195$), normative scores for number of trials required to complete the task ($r_s[24] = -.114$, $p = .289$) or the number of errors committed in doing so ($r_s[24] = .007$, $p = .487$).

Table 4.1: Correlation coefficients between AQ scores and scaled scores for IED performance

		EDS errors	Total trials (adjusted)	Total errors (adjusted)
AQ Score	Correlation Coefficient	-.176	-.114	.007
	Sig. (1-tailed)	.195	.289	.487
	N	26	26	26

ii. The Stockings of Cambridge (SOC)

The basis for these analyses were standard scores for the number of problems solved in the minimum amount of moves (Mdn= 108.66, IQR= 95.75 – 116.75) and mean subsequent thinking time for 3-move (Mdn= 106.45, IQR= 105.36-108.89), 4-move (Mdn= 112.20, IQR= 105.11-117.41) and 5-move problems (Mdn= 108.76, IQR= 103.98-110.360. These data show that performance was not indicative of deficits in performance. Table 4.2 shows no significant relationships between AQ scores the number of problems solved within the minimum number of moves ($r_s[24] = -.126$, $p = .270$), or mean subsequent thinking time required for 3-move ($r_s[24] = -.103$, $p = .308$), 4-move ($r_s[24] = .107$, $p = .302$) and 5-move items ($r_s[24] = -.028$, $p = .447$).

Table 4.2 Correlation coefficients of total AQ scores and scaled scores for the SOC

		Problems solved in minimum moves	Mean subsequent thinking time (3 moves)	Mean subsequent thinking time (4 moves)	Mean subsequent thinking time (5 moves)
AQ Score	Correlation	-.126	-.103	.107	.028
	Sig. (1-tailed)	.270	.308	.302	.447
	N	26	26	26	26

Discussion

Findings of the Current Study

This study demonstrated that a small proportion (11.54%; $n=3$) of the transgender sample had AQ scores which were suggestive of clinical range symptomatology, which was higher than rates predicted in the general population ($\leq 2\%$). The primary goal of this study aimed to determine whether transmen scored significantly higher on the AQ than transwomen. This hypothesis was underpinned by the EMB theory of autism predicting that transmen would exhibit higher AQ scores as their cognitive and behavioural traits would be masculinised akin to their gender identity. No significant differences were found between the transmen's and transwomen's median scores on the AQ, however scoring in the predicted direction was observed based on analyses of the medians and IQRs, however the effect size was small ($r=.19$). Systemising and empathy traits did not differ significantly from normative samples, therefore the autistic pattern of performance was not evidenced. In terms of systematising and empathising, transgender participants seemed to score closer to their perceived gender with moderate to high effect sizes for the hormone using participants only (transmen's SQ scores: $d=.78$; transwomen's EQ scores: $d=.87$). On the dimension hypothesised to be higher based on their birth-sex based their performance seems largely preserved (i.e. systemising for transwomen and empathising for transmen).

The remaining hypotheses were based upon the patterns of neuropsychological reported by Clark et al. (2008) and Ozonoff et al. (2004). No statistically significant association was detected between AQ scores and number of correct responses on the ERT subtest once an extreme outlier was excluded ($r_s = -.277$). Inclusion of the outlier showed that higher AQ

scores were associated with lower number of correct responses on the ERT ($r_s = -.358$), with AQ scores only accounting for 12.8% of the variance in responses. Review of the medians and inter-quartile ranges for the scaled scores generated on the IED and SOC tasks indicated that the participants' performance generally lay in the average range (scaled score = 90~110) based on age-related norms, therefore no 'deficits' were evidenced. Performance on the IED and SOC showed no significant associations between AQ scores and the scaled scores generated. Therefore no deficits in performance were found on the CANTAB subtests administered nor were hypothesised relationships between AQ scores and subtest performance found. Overall the study did not find the pattern of cognitive traits or neuropsychological performance evidenced in previous ASD samples in the current transgender sample.

Comparisons to Prior Studies

The primary aim of this study was to investigate whether the significantly higher autistic traits reported by Jones et al. (2011) would be replicated in a new transgendered sample. The results of the analyses did not show any significant differences between transmen's' and transwomen's' median scores on the AQ, (small effect size); albeit that transmen's' median scores on the AQ were higher, smaller differences than the findings of Jones et al. (2011). The results also showed that three of the transgender sample used in this study had AQ scores which were suggestive of clinical range symptomatology. This prevalence is roughly consistent with the literature suggesting higher levels of autistic traits in transgender samples when compared with prevalence rates in the general population. There are factors that need to be considered when interpreting the validity of these data. The rates that have been reported in previous studies are small; 16 out of 204 participants (de Vries et al., 2010) and 5

out of 91 participants (Paterski et al., 2014). Reporting the percentage for this study could be misleading as the small sample size makes the percentage seem disproportionately high when compared with these larger-scale studies.

The use of the EMB theory measures did not show any significant differences between transgender participants and their birth sex comparators, therefore the autistic profile in previous literature was not observed (Baron-Cohen et al., 2003). The EMB measures, both SQ-R and EQ, were selected primarily in terms of their reported sensitivity to autism and secondly that these measures are said to be representative of stereotypically male (SQ-R) and female (EQ) cognitions and behaviours. These measures have not been used with transgender samples in prior published studies. La Torre et al. (1976) suggested that transgender participants may score in the predicted direction of their perceived gender comparators rather than birth sex. The mean scores produced may suggest possible trends of the participants scoring the direction of their perceived gender as opposed to their birth sex on the SQ for transmen and the EQ for transwomen only. For the participants using cross-sex hormones an increase in effect sizes between birth-sex controls transwomen on the EQ ($d = .87$) and transmen on the SQ-R ($d = .78$). Based solely upon these data it is unclear whether these participants would have scored exactly the same without hormone treatment and coincidentally happen to be taking these, or if the analyses could indicate a possible activating effect of the cross-sex hormones acting solely upon the hypothetical birth-sex based deficit. There have been previous studies finding that homosexual men scored higher on the EQ than heterosexual counterparts, which could offer a possible explanation for the differences observed. (Sargeant, et al., 2006).

Autistic traits measured by the AQ did not show a negative association to accuracy of emotion recognition on the ERT once an outlier was excluded. This was not supportive the findings of Clark et al. (2008) that those with autistic symptomatology may have impairments in emotion recognition, although the present study did not use an ASD-diagnosed sample. Ozonoff et al. (2004) reported poorer scoring on the IED and SOC subtests of the CANTAB in participants with ASD. The present study found no relationship between AQ scores and the age-based scaled score generated. The findings that the executive dysfunction hypotheses were based upon used samples with a clinical diagnosis of ASD. It must be taken into account that whilst the findings of this indicate higher AQ scores than would typically have been expected for the population, these were generally not in the clinical threshold even for those within the clinical threshold this does not equate to a formal diagnosis of ASD. ASD diagnosis incorporates additional factors (e.g. developmental trajectory) which this study has not taken into account and these may better account for the reported deficits in performance on the IED and SOC subtests.

Strengths

The study included the use of EMB measures as measures of ASD related and sexually dimorphic cognitive style, which have not to my knowledge been used with transgender samples in prior published literature. Whilst the measurement of sexually dimorphic cognitive style is not their primary purpose it has allowed for a patterns of scoring in the direction of perceived gender to be highlighted. Where possible the scores on the IED and SOC were converted into standard scores allowing for scores reflective of age related normative scores to be use. The use of sensitivity analyses allowed for consideration of the

possible influences of cross-sex hormone treatments on hypothetically sex-differentiated performance.

Limitations

This study was underpowered for the primary hypothesis in terms of original sample size estimates and despite the secondary hypotheses never being investigated in this way before they are likely to also be underpowered (Van Voorhis & Morgan, 2007). It should be also be considered that there may actually be no significant differences / associations observed for this population regardless of the sample size. The study recruited volunteers from a regional gender identity service and managed to recruit 11.71% of those approached. The nature of a study asking people to attend an assessment appointment may exclude potential participants for several reasons. Transgender people have often been subjected to discrimination, bullying and social isolation throughout their lives and asking people to attend a busy clinic may be an aversive experience for them. For potential participants being approached (in writing) by an individual reporting to be a trainee / student may have led them to decline to volunteer as these titles may trigger attributions of immaturity, lack of experience and/or ability. The nature of the study was exploring cognitive style and aspects of psychopathology in an already marginalised and pathologised sub-group of the population. Participating in the study could potentially have been distressing for some and may even have been considered as being detrimental to the transgender community by adding further labels to a vulnerable group of people.

The cross-sectional design of this study relied heavily on secondary data for normative comparisons and half the study was based-upon self-report measures. The normative data sources were two separate groups of heavily academic samples (Baron-Cohen et al., 2001 & Wheelwright et al., 2006). The demographic of the sample used in this study was markedly varied in terms of educational attainment and no measures of intelligence were employed in this study, had this been assessed it could have controlled for any potential confounding effects of intelligence. The literature examining ASD in transgender individuals spans various nations and most likely participants for varied cultural backgrounds within these. As gender is culturally defined it must be considered that there will be variations in the definitions of masculinity and femininity and acceptability of gender non-conformity and transgender individuals between these studies. Therefore when studies are considering social-communication difficulties in a transgender population this could be influenced by the cultural variations.

The use of the AQ measure was based upon its ability to discriminate clients with ASD from non-ASD comparators (Baron-Cohen et al., 2001). The measure attempts to quantify cognitive and behavioural traits associated with ASD, however, the individual traits measured are not unique to a diagnosis of ASD. The traits measured span social, communication, and imagination skills together with attention to detail and tolerance of change. Transgender individuals may well have been subject to social isolation, distant relationships and bullying due to the stigma and poor understanding of their gender experiences and potential feared consequences of disclosure of their gender identity. All of which could negatively impact upon their social and communication traits measured by the AQ. The social skills, attention to detail and tolerance of change items whilst being relevant to ASD also may reflect traits of social anxiety, generalised anxiety disorder, obsessive compulsive disorder and psychosis which should be considered when interpreting the results of this measure.

The use of self-report measures brings with it some considerations about the validity of the results they generate. The respondents may have provided socially desirable responses to some if not all item on the questionnaires, skewing the validity of findings. The association between the total EQ score and ERT total correct responses approaching significance could suggest representative responses for both of the tasks, even when the outlier was excluded. This study asked a considerable amount of participants as they were required to complete multiple self-report measures and 3 neuropsychological subtests. It is possible that impact of this assessment process upon attention and motivation could have influenced the validity of their responding. The neuropsychological subtests administered were heavily focused on visual-based tasks, the study may have benefited from a variety of visual- and verbal-based subtests, such as those provided within the Delis–Kaplan Executive Function System (D-KEFS) to provide a broader assessment of executive abilities.

This study could have benefited from the introduction of more than one control group. A locally recruited control group could potentially control for cultural norms in the wider population. Studies using transgender participants have been criticised by the trans-community as they recruit solely from the gender identity clinics, therefore their clients will be acutely gender dysphoric at the time of recruitment and not representative of the transgender population as a whole (Serano, 2007).

Examining relationships between the measured autistic traits and the scores generated from the CANTAB has some limitations. Firstly, that the literature indicating the patterns in performance used participants with a diagnosis of Autistic Disorder based on the comprehensive clinical assessment (Ozonoff et al., 2004). Autistic Disorder would usually

entail a developmental history including delays often in language development, which may better account for the deficits in performance rather than a self-report of cognitive and behavioural traits. In addition to these, the interpretation of these results must be made cautiously as the sample used would not generally be expected to meet full diagnostic criteria for ASD. Any 'deficits' observed could merely be a reflection of idiosyncratic performance as opposed to being directly influenced by levels of autistic traits.

Future Research

Future research exploring cognitive traits of ASD in transgender individuals would benefit from a gender-congruent and non-clinical transgender controls as discussed previously. The exploration of information relating to family histories of ASD could also serve to strengthen further explorations. Given the difficulty in recruiting a niche population it could be advantageous to consider the measures being completed online preventing the need for clinic attendance thus increasing the chance of recruiting more participants.

Conclusion

The findings of this study do not entirely support the literature indicating that higher levels of autistic traits are observed in transgender samples. The overall findings suggest that elevated, yet mostly sub-clinical, levels of autistic traits are present in the transgender sample recruited. Sex-differentiated cognitive styles were demonstrating trends in the direction of their perceived gender in domains where the literature would hypothesise differing performance, particularly in those using cross-sex hormone treatments. Participants' accuracy on an emotion recognition task was indicated to be inversely related to levels of autistic traits, which could indicate the AQ's utility in screening for some risk factors of interpersonal difficulties. Performance, in comparison to normative data, on planning and cognitive flexibility tasks did not show associations with levels of autistic traits.

The occurrence of ASD style symptomatology is likely to be a far more complex clinical presentation than a battery of self-report measures can identify. Given the changes to the DSM-5 terminology for ASD, factors such as developmental delay and language acquisition, social and interpersonal functioning are all factors which may further the reporting and investigation of ASD traits in transgender adults. The bias in the literature to recruit from acutely gender dysphoric population recruits a subset of the transgender population, as does this study. Further research could benefit from recruitment of non-dysphoric controls to provide a more comprehensive investigation of autistic traits in the population.

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CHAPTER 3: Advanced Clinical Practice 1 – Reflective Account (Abstract)

A crisis for whom? Reflecting upon managing disclosures of suicidal ideation as a trainee

clinical psychologist

Andrew Smith¹

Prepared in accordance with the guidelines for submission to

Archives of Sexual Behavior

(See Appendix 1.1 for contributor's notes)

¹ Mental Health and Wellbeing

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A crisis for whom? Reflecting upon managing disclosures of suicidal ideation as a trainee clinical psychologist

Abstract

Disclosures of suicidal ideation and potential self-injurious behaviours are a common presentation for clinical psychologists throughout their training and beyond. Each clinician will have their own emotional responses to these presentations and this paper represents my analyses of two such presentations across my training so far. Two theoretical models are applied to offer contrasting understandings of these experiences; the Integrated Developmental Model (IDM) of Supervision (Stoltenberg, McNeil & Delworth, 1998) and Gibbs' Reflective Cycle (Gibbs, 1988). The first of these experiences reflects my work with a client earlier in my training and highlighted the self-focus and performance based analysis that was reflective of my experience levels at that time. The latter experience from a more recent client offers a differing developmental focus highlighting issues of transference and countertransference. This experience also paralleled issues that arose in my personal life around that time and the impact that these can have on our therapeutic work with clients. Overall, the experience of completing this reflective piece really highlighted my cognitions throughout my ongoing development as I near completion of my training.

CHAPTER 4: Advanced Clinical Practice 2 – Reflective Account (Abstract)**Consultative Practice: Working with Therapeutic Pessimism in Teams**

Andrew Smith¹

Prepared in accordance with the guidelines for submission to

Archives of Sexual Behavior

(See Appendix 1.1 for contributor's notes)

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Consultative Practice: Working with Therapeutic Pessimism in Teams

Abstract

This paper details my reflections on my experiences of providing a consultative role to teams in my role as a trainee clinical psychologist. These experiences spanned my second and third years of training and involved working with staff to support clients with challenging behaviours. For this paper I have used the Reflective Cycle (Gibbs, 1988) and the Integrated Developmental Model (IDM) of supervision (Stoltenberg et al., 1998). These models allowed for analyses of my experiences and highlighted personal performance related anxieties and an accompanying perfectionistic drive. The latter had me so focused on rectifying my practice from the first experience that I made a new set of mistakes on the second experience. This process made me aware that being mindful of my goal of perfecting my practice could get me so immersed in that thinking, I could subsequently miss the (purpose / aim) of the intervention.

Appendix 1.1: Guidelines for Manuscript submission - Archives of Sexual Behavior

Manuscript Style

- Type double-spaced and left-justified in 12-point Times New Roman font in 12-point font using 1-inch margins on all sides. Number all pages (including table pages and figure-caption page), except the title page, consecutively with Arabic numerals placed in the upper right-hand corner. In order to facilitate masked (previously termed “double-blind”) review, leave all identifying information off the manuscript, including the title page and the electronic file name. Appropriate identifying information is attached automatically to the electronic file. Upon initial submission the title page should include only the title of the article.
- An additional title page should be uploaded as a separate submission item and should include the title of the article, author’s name (including highest degree received), and author’s affiliation. Academic affiliations of all authors should be included. The affiliation should include the department, institution, city, and state (or nation) and should be typed as a numbered footnote to the author’s name. The title page should also include the complete mailing address, telephone number, fax number, and e-mail address of the one author designated to review proofs.
- An abstract, preferably no longer than 250 words, is to be provided as the second page.
- A list of 4–5 key words is to be provided directly below the abstract. Key words should express the precise content of the manuscript, as they are used for indexing purposes.

Illustrations

Illustrations (photographs, drawings, diagrams, and charts) are to be numbered in one consecutive series of Arabic numerals and cited in numerical order in the text. Photographs should be high-contrast and drawings should be dark, sharp, and clear. Artwork for each figure should be provided on a separate page. Each figure should have an accompanying caption. The captions for illustrations should be listed on a separate page.

Tables should be numbered consecutively with Arabic numerals and referred to by number in the text. Each table should be typed on a separate page and should have a descriptive title. Center the title above the table, and type explanatory footnotes (indicated by superscript lowercase letters) below the table.

References

List references alphabetically at the end of the paper and refer to them in the text by name and year in parentheses. References should include (in this order): last names and initials of all authors, year published, title of article, name of publication, volume number, and inclusive pages. The style and punctuation of the references should conform to strict APA style.

Appendix 1.2: Quality Rating Tool

<u>Introduction</u>	
1. Have the authors established a theoretical framework/ rationale for their study?	2 = comprehensive rationale 1 = adequate rationale 0 = rationale unclear
2. Do the research questions/hypotheses logically flow from the theoretical model/rationale?	2 = all hypotheses/questions logically flow 1 = majority of hypotheses/questions logically flow 0 = little or no logical flow evident
<u>Methods</u>	
3. Are the design/methods selected appropriate to adequately test the research questions?	1 = Yes 0 = No 0 = Unable to determine
4. Is there evidence of protection of subjects – i.e. approved by an institutional review board?	2 = Reviewed by ≥ 2 1 = Reviewed by 1 0 = Not reported / Unable to determine
5. Is the study sample(s) appropriate to the problem being studied or the hypothesis being tested?	1 = sample clearly related to rationale 0 = sample appears unrelated
6. Was there a comparison (i.e. a control group or comparative data)	1 = Yes 0 = No
7. How were the comparison (i.e. control) subjects selected?	1 = Comparison subjects pre-selected prior to assessment of variables 0 = Comparison subjects defined after assessment of variables 0 = Not reported / Unable to determine
8. Were the subjects approached to participate in the study representative	4 = geographical cohort

<p>of the entire population from which they were recruited?</p> <p><i>(i.e. considered more representative if they include the entire source population, an unselected sample of consecutive patients, or a random sample)</i></p>	<p>3 = random sample</p> <p>2 = convenience sample</p> <p>1 = volunteer sample</p> <p>0 = unable to determine</p>
<p>9. Were those subjects who were prepared to participate representative of the entire population from which they were recruited?</p> <p><i>(i.e. the proportion who agreed to participate should be stated. Validation that the sample was representative would include demonstrating that the distribution of the main confounding factors was the same in the study sample and the source population)</i></p>	<p>1 = representativeness of sample clearly demonstrated</p> <p>0 = representativeness of sample not demonstrated</p>
<p>10. Were the cases and controls recruited from the same population?</p>	<p>1 = Yes</p> <p>0 = No</p> <p>0 = Unable to determine</p>
<p>11. Were the experimental conditions the same for cases and controls?</p> <p><i>(e.g. were they recruited over the same time period, was the time period between administration of measures the same etc.)</i></p>	<p>1 = Yes</p> <p>0 = No</p> <p>0 = Unable to determine</p>
<p>12. Were controls matched to cases?</p>	<p>2 = matched on ≥ 2 variables</p> <p>1 = matched on 1 variable</p> <p>0 = not matched</p> <p>0 = Unable to determine</p>
<p>13. What kind of population do cases represent?</p> <p><i>(i.e. are they a heterogeneous representation of the disease/outcome in question or are they a highly selective population with limited generalizability)</i></p>	<p>1 = appropriate heterogeneity</p> <p>0 = restrictively homogenous</p> <p>0 = Unable to determine</p>
<p>14. Have the number of non-respondents/refusals/subjects lost to follow-up been kept small (<10%)</p>	<p>1 = Yes</p> <p>0 = No</p> <p>0 = Unable to determine</p>
<u>Measurement</u>	

15. What method of assessment was employed for autism?	<p>3 = Both Self-report and clinician rated assessment/interview</p> <p>2 = Clinician rated assessment / interview</p> <p>1 = Self-report</p> <p>0 = Unable to determine</p>
16. If clinician measure used for autism, was a measure of inter-rater reliability employed?	<p>1=Yes</p> <p>0=No</p> <p>0=Unable to determine or N/A</p>
17. If clinician measures were used for autism, is there evidence that they were trained in the measure?	<p>1=Yes</p> <p>0=No</p> <p>0=Unable to determine or N/A</p>
<p>18. Are the tools/assessments used to measure autism valid and reliable?</p> <p><i>(i.e. have they undergone validity and reliability testing? If more than one measure used, 1=majority of measures valid & reliable)</i></p>	<p>1=Yes</p> <p>0 = No</p> <p>0 = Unable to determine</p>
19. What method of assessment was employed for gender incongruence?	<p>3 = Both Self-report and clinician rated assessment/interview</p> <p>2 = Clinician rated assessment / interview</p> <p>1 = Self-report</p> <p>0 = Unable to determine</p>
20. If clinician measures used for gender incongruence, was a measure of inter-rater reliability employed?	<p>1= Yes</p> <p>0= No</p> <p>0 = Unable to determine or N/A</p>
21. If clinician measures were used for gender incongruence, is there evidence that they were trained in the measure?	<p>1= Yes</p> <p>0 = No</p> <p>0 = Unable to determine or N/A</p>
22. Are the tools/assessments used to measure gender incongruence valid and reliable?	<p>1 = Yes</p> <p>0 = No</p>

<i>(i.e. have they undergone validity and reliability testing? If more than one measure used, 1=majority of measures valid & reliable).</i>	0 = Unable to determine
23. Were the outcome variables measured using appropriate 'blinded' methods?	1 = Yes 0 = No 0= Not Reported / Unable to determine
24. Were any efforts made to control for recall bias? <i>(i.e. are multiple methods used, file review information or collateral information used to measure important variables that could be influenced by recall bias?)</i>	1 = efforts to control for recall bias are evident. 0 = efforts to control for recall bias are not evident 0 = Unable to determine or N/A
<u>Results</u>	
25. Were the statistical tests chosen to analyse the data appropriate?	1 = tests selected clearly consistent with research q's 0 = consistency with research q's
26. Is there sufficient analysis to determine whether significant differences may be due to some other variable (e.g. lack of comparability of the groups in sex, age or clinical characteristics or in other relevant variables)	1= confounding variables addressed 0 = no evidence of confounding variables being addressed
27. Are adequate summary data presented (i.e. are continuous level data presented as means & standard deviations)? (including controls and/or normative scores if comparisons made)	1= Yes 0 = No
28. Is the study sample large enough to test the hypotheses – i.e. did it have sufficient power to detect a clinically important effect where the probability value for a difference being due to chance is less than 5%	1= Yes 0 = No 0 = Unable to Determine

<u>Discussion</u>	
29. Are conclusions substantiated by the data that are presented in the results section?	1 = conclusions clearly drawn from results presented 0 = conclusions drawn from sources other than data generated
30. Are generalizations confined to the population from which the sample was drawn?	1= generalisations not confined to population from which the sample was drawn. 0 = generalisations confined to the population from which the sample was drawn. 0 = Unable to determine.
31. Are the limitations of the study considered and are they taken into consideration when conclusions are drawn?	1 = potential influence of limitations on results acknowledged 0 = potential influence of limitations on results not acknowledged

Note

- Grey questions apply only to case control studies

Appendix 2.1: Ethical Approval Correspondence



Coordinator/Administrator: Dr Erica Packard/Mrs Elaine O'Neill
 Telephone Number: 0141 211 9448
 E-Mail: erica.packard@ggc.scot.nhs.uk
 Website: www.nhs.gov.uk/r&d

R&D Management Office
 Western Infirmary
 Tennent Institute
 1st Floor 38 Church Street
 Glasgow, G11 6NT,

18 March 2014

Mr Andrew Smith
 Trainee Clinical Psychologist
 Institute of Health and Wellbeing
 Gartnavel Royal Hospital
 1055 Great Western Road
 Glasgow G12 0XH

NHS GG&C Board Approval

Dear Mr Smith,

Study Title:	Scottish Transgender Research Study (STaRS): Investigating Cognitive Style in a Transgendered Population
Principal Investigator:	Mr Andrew Smith
GG&C HB site	The Sandyford Initiative
Sponsor	NHS Greater Glasgow and Clyde
R&D reference:	GN14CP059
REC reference:	14/WS/0035
Protocol no:	V2.0; 14/01/14

I am pleased to confirm that Greater Glasgow & Clyde Health Board is now able to grant Approval for the above study.

Conditions of Approval

1. **For Clinical Trials** as defined by the Medicines for Human Use Clinical Trial Regulations, 2004
 - a. During the life span of the study GGHB requires the following information relating to this site
 - i. Notification of any potential serious breaches.
 - ii. Notification of any regulatory inspections.

It is your responsibility to ensure that all staff involved in the study at this site have the appropriate GCP training according to the GGHB GCP policy (www.nhs.gov.uk/content/default.asp?page=51411), evidence of such training to be filed in the site file.

-
2. For all studies the following information is required during their lifespan.
- a. Recruitment Numbers on a monthly basis
 - b. Any change of staff named on the original SSI form
 - c. Any amendments – Substantial or Non Substantial
 - d. Notification of Trial/study end including final recruitment figures
 - e. Final Report & Copies of Publications/Abstracts

Please add this approval to your study file as this letter may be subject to audit and monitoring.

Your personal information will be held on a secure national web-based NHS database.

I wish you every success with this research study

Yours sincerely,



Dr Erica Packard
Research Co-ordinator

Cc: Dr Daniel Smith

Subject: Non-substantial Amendment - R&D Ref GN14CP059 Protocol V3.0; 15/05/2014 Non-substantial Amendment 1 (15/05/2014)
From: "O'Neill, Elaine" <Elaine.O'Neill2@ggc.scot.nhs.uk>
Date: 30/05/2014 09:55
To: Andrew Smith <a.smith.5@research.gla.ac.uk>
CC: "Yekta, Arash" <Arash.Yekta@ggc.scot.nhs.uk>, Daniel Smith <Daniel.Smith@glasgow.ac.uk>

Dear Mr Smith,

R&D Ref: GN14CP059 **Ethics Ref:** 14/WS/0035
Investigator: Mr Andrew Smith
Project Title: Scottish Transgender Research Study (STaRS): Investigating Cognitive Style in a Transgendered Population
Protocol Number: V3.0; 15/05/2014
Amendment: Non-substantial Amendment 1 (15/05/2014)
Sponsor: NHS Greater Glasgow and Clyde

I am pleased to inform you that R&D have reviewed the above study's Amendment 1 (15/05/2014) and can confirm that Management Approval is still valid for this study.

Reviewed

Documents: Version Date

Notice of minor amendment email 14 May 14
 Protocol (clean & tracked) 3.0 15 May 14

I wish you every success with this research project.
 Yours sincerely,

Research and Development

NHS Greater Glasgow & Clyde
 Research & Development
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Please note that NHS GG&C R&D operate an electronic record system and that only electronic submissions are accepted.

NHSGG&C Disclaimer

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Non-substantial Amendment - R&D Ref GN14CP059 Protocol V3.0;...
1 of 1 16/09/2014 19:51

Appendix 2.2 - Participant Invite Letter



Gender Identity Service
2-6 Sandyford Place
Sauchiehall Street
Glasgow
G3 7NB

Tel: 0141 211 8130

[Patients Name]

[Address1]

[address2]

[Address3]

[Postcode]

Dear {Patient's First Name},

Re: Scottish Transgender Research Study (STaRS)

I am writing to let you know that the above research study will be taking place at the Sandyford Initiative in early 2014.

The study aims to recruit both transwomen and transmen who will attend a one-off assessment session at the Sandyford Initiative, focussed on participants' thinking styles.

The research is being conducted by Andrew Smith (Trainee Clinical Psychologist, NHS Greater Glasgow & Clyde) and Dr xxx xxx (Psychiatrist, NHS Greater Glasgow & Clyde)

I have included a participant information leaflet for your information. Should you wish to find out more about the study or are considering participating please feel free to contact Andrew on the details provided on the information sheet.

Yours sincerely

Dr xxx xxx

Consultant Psychiatrist

Gender Identity Service

Appendix 2.3 – Participant Information Sheet



University of Glasgow
Institute of Mental Health & Wellbeing
Gartnavel Royal Hospital
Administration Building
Trust HQ, 1st floor
1055 Great Western Rd
G12 0XH

Email: a.smith.5@research.gla.ac.uk
Telephone: (0141) 211 0692

Study title: Scottish Transgender Research Study

We would like to invite you to take part in a research study.

Before you decide you need to understand why the research is being done and what it would involve for you.

Please take time to read the following information carefully.

Talk to others about the study if you wish.

Ask the researcher, Andrew Smith (Trainee Clinical Psychologist) if there is anything that is not clear or if you would like more information. This study is in part-fulfilment of Andrew's Doctorate in Clinical Psychology.

What is the purpose of the study?

Differing thinking styles are present at varying levels within every individual in the general population. Previous research has identified that in transgendered persons there may be a different pattern of thinking to those expected in the general population. This study aims to further investigate if a differing thinking style exists in the transgendered population using a variety of different measures.

Why have I been invited to take part?

We are inviting people who are currently registered with the Gender Identity Service to take part in this study. The study is looking to measure characteristics of social communication in

both transwomen and transmen. Overall, approximately 56 service users from Gender Identity Service at the Sandyford Initiative will be recruited for this study.

Do I have to take part?

Participation in this study is completely voluntary. It is up to you to decide whether or not to take part. If you do decide to take part, you will be asked to sign a consent form to show you have agreed to take part. You will receive a copy of the consent form to keep. Please take time to decide whether you would like to participate.

What is involved in taking part?

Participation in the study would involve attending a 90 minute assessment session, which has two parts. For the first part of this study, you asked to complete some questionnaires relating to your individual behaviours and personality characteristics. The purpose of these being to gather some basic information and characteristics that have been shown to relate to female and male thinking and also aspect of social communication.

The second part of the study will involve you being asked to answer some questions about your treatments at the clinic and at this time and also about your mental health history. Then complete some tasks on a computer. These tasks are puzzles you are presented with the screen and you use a touchscreen to enter your answer. This assessment should take no more than 30 minutes. There will also be a 10 minute interview asking about your mental health.

Participating in the study would therefore involve a total of approximately 90 minutes. You Will be asked to complete all tasks on the same day. There is no time limit for you to complete the assessment or questionnaires and you can take breaks at any point.

What are the possible benefits of taking part?

There is no direct benefit to you from taking part in this study. However, the information gathered would allow us to better understand the extent to which a differing pattern of thinking exists within a group of transgendered people.

Are there possible disadvantages or risks of taking part?

It is not anticipated that taking part in this study will cause you any physical or psychological harm, nor cause any significant disruption to your life. The study does not aim to diagnose psychiatric conditions in the participants, only to measure some of the aspects of thinking and behaviour that some literature has associated with social communication difficulties. It is

acknowledged that computer tasks can be challenging at points, therefore regular breaks will be offered to ensure participation progresses at your own pace.

What if I want to withdraw from the study at any time?

You are free to withdraw from the study at any time and you do not have to give a reason for doing so. Any data collected from you for the study would be destroyed. Withdrawal from the study would not affect the standard of care you receive or your future treatment.

Would my results be kept confidential?

All information collected about you during this study will remain strictly confidential and will be stored within a locked cabinet at the Sandyford Clinic. Your information will be anonymous and coded using a number so that it will not be possible to recognise you. The researcher and research supervisor will have a record of the identifying numbers so that if you choose to withdraw throughout the study your information can be removed easily.

As part of participant safety, if you become distressed or report thoughts/acts of harm to yourself or others while taking part, the researcher will report this to a health care professional at the Gender Identity Clinic in the first instance, and also the study supervisors.

If you disclose sensitive information, or the researcher has any other concerns, this will be discussed with the project supervisors.

What happens to the results from the study?

The results will be used in the researcher's thesis for the degree of Doctorate in Clinical Psychology, which will be submitted in August 2014. It is also hoped that the study will be submitted for publication in a scientific journal. Your information will remain anonymous and you will not be identified in the thesis or any publications.

What happens after I have taken part?

When the study is complete, a summary of the overall results from the study will be sent to the health care staff at the gender identity clinic. There will also be summary produced for participants. If you would like to receive a copy, please tell the researcher who will ask Gender Identity Clinic team to forward a copy on to you.

What if I have a complaint about any aspect of the study?

If you are unhappy about any aspect of the study and wish to make a complaint, please contact the researcher in the first instance but the normal NHS complaint procedures are also available to you.

Who is organising and funding the study?

The study is being organised by Andrew Smith, Trainee Clinical Psychologist, University of Glasgow.

The study is being supervised by Dr Daniel Smith, Reader of Mental Health (University of Glasgow) and Professor Jon Evans, Professor of Applied Neuropsychology (University of Glasgow).

In addition to these supervisors Dr xxx xxx, Consultant Psychiatrist (NHS Greater Glasgow & Clyde) is acting as a clinical representative for the Sandyford Initiative and its service users.

The study is sponsored by NHS Greater Glasgow and Clyde.

Who has reviewed the study?

The study will reviewed by the West of Scotland Research Ethics Committee.

If I do decide to take part, what happens next?

If you decide you do wish to take part, contact the investigator using the contact details provided in this letter as soon as possible.

The researcher will be able to answer any questions you have about the study. If you still wish to take part, you will be asked to sign a consent form, which you will also receive a copy of. The researcher will then arrange a time convenient for you to complete the assessments and questionnaires involved in the study.

If you have any further questions?

If you would like more information or have a query about the study please contact the researcher:

Andrew Smith
Trainee Clinical Psychologist
University of Glasgow
Institute of Mental Health & Wellbeing
Gartnavel Royal Hospital
Administration Building
Trust HQ, 1st floor
1055 Great Western Rd
G12 0XH

Email: a.smith.5@research.gla.ac.uk
Telephone: (0141) 211 0692

If you wish to speak about this research to someone **not** closely linked to the study, please contact the Research Supervisor [Professor xxx xxx]. *Thank-you for your time.*

Appendix 2.4 – Participant Consent Form

University of Glasgow
Institute of Mental Health & Wellbeing
Gartnavel Royal Hospital
Administration Building
Trust HQ, 1st floor
1055 Great Western Rd
G12 0XH

Email: a.smith.5@research.gla.ac.uk
Telephone: (0141) 211 0690 or 211 3927

Study title: Scottish Transgender Research Study

Consent Form

Name of researcher: **Andrew Smith, Trainee Clinical Psychologist**

Participant number: _____

Please initial the boxes

1. I confirm that I have read and understand the information sheet dated for the above study and have had the opportunity to ask questions.

☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my medical care or legal rights being affected.

☐

3. I understand that all the information gathered about me will be kept anonymous and that I will not be identified in the results.

☐

4. I understand that although the study has a focus on aspects of social communication, the measures used would not lead to a psychiatric diagnosis. If I have concerns about my mental health this can be raised by myself to the health care professionals who are involved in my care.

☐

5. I understand that if I become distressed or report thoughts/acts of harm to myself or others while taking part in the study, the researcher will report this to a health care professional at the gender identity clinic in the first instance, and the study supervisors. I also understand that if I disclose sensitive information, or the researcher has any other concerns, this will be discussed with the project supervisors to identify whether any support or advice might be appropriate and beneficial to me.

☐

6. I agree to take part in the above study.

☐

Participant Name

Participant signature

Date

Researcher Name

Researcher signature

Date

1 copy to the patient; 1 copy to the researcher; 1 Original for the patients' notes

Appendix 2.5 – Demographic Information Form



Scottish Transgender Research Study (STaRS)

Demographic & Background Info

Patient Identifier

Age

Birth Sex (please ✓ the answer that best describes you)

Female ☐ Male ☐ Other* ☐

* please provide details

.....

.....

.....

Marital Status (please ✓ the answer that best describes you)

Single ☐ Co-habiting ☐ Married ☐

Civil Partnership ☐ Divorced ☐ Rather not say ☐

Do you have any children? (please ✓ the answer that best describes you)

Yes ☐ No ☐ Rather not say ☐

Ethnicity (please ✓ the answer that best describes you)

White- Scottish ☐ White – British ☐ White – Other ☐

Middle-Eastern ☐ Asian ☐ African/Caribbean ☐

Hispanic ☐ Mixed Race ☐ Other* ☐

* please provide details

.....

.....

Employment Status (please ✓ the answer that best describes you)

Unemployed ☐ Employed ☐ Student ☐

Retired ☐ Rather not say ☐

Highest academic qualifications to date (please ✓ the answer that best describes you)

No formal qualifications ☐ Standard Grade/O-level Q ☐

Highers/Advanced Higher ☐ HNC/HND ☐

Undergraduate Degree ☐ Postgraduate Cert/Dip ☐

Masters Degree ☐ Doctorate/PhD ☐

Rather not say ☐ Other* ☐

* please provide details

.....

.....

How would you describe your Gender Identity? (please ✓ the answer that best describes you)

- I have a constant and clear gender identity as a woman ☐
- I have a constant and clear gender identity as a man ☐
- I have a constant and clear gender identity as both male and female ☐
- I have a changeable gender identity, identifying as male and female at times ☐
- I have no gender identity ☐
- I am unsure of my gender identity ☐

How would you describe your interest in or stage of transition (please ✓ the answer that best describes you)

- I have not undergone and do not propose to undergo any part of a process of gender reassignment or transition ☐
- I am proposing to undergo a process (or part of a process) of gender reassignment or transition ☐
- I am currently undergoing a process (or part of a process) of gender reassignment or transition ☐
- I have undergone a process (or part of a process) of gender reassignment or transition ☐
- Unsure ☐
- Rather not say ☐

Hormone Treatments (please ✓ the answer that best describes you)

Have you ever used hormone treatments?

Yes ☐ No ☐ Rather not say ☐

Which ones?

Female hormones ☐ Male hormones ☐ Both ☐

When?

Currently ☐ In the past* ☐

* when did you stop taking the hormone treatments?

How long did you take them for?

< 3 months ☐ 3-6 months ☐ 6-12 months ☐

1-2 years ☐ 3-5 years ☐ > 5years ☐

Physical Health (please ✓ the answer that best describes you)

Do you have any physical health conditions (i.e. chronic health problems)

Yes* ☐ No ☐ Rather not say ☐

* please provide details

.....

Are you currently on any medications?

Yes*

☐

No

☐

Rather not say

☐

* please provide details

.....

.....

.....

Appendix 2.6 – Major Research Project Proposal**DOCTORATE IN CLINICAL PSYCHOLOGY****SUBMISSION FRONT PAGE****Matriculation Number:** 1103911**Name of Assessment:** MRP Proposal**Title of Project:**

Scottish Transgender Research Study (STaRS): Investigating Cognitive Style in a Transgendered Population

Academic Supervisor: Dr. Daniel Smith & Prof. Jon Evans**Field Supervisor:**
(If Applicable)**Clinical Supervisor:**
(If Applicable)**Version Number:** 10**Word Count:** 3261

For Office Use Only

Date Received:

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Background: Autistic traits exist to varying degrees throughout the general population. The transgender population has been reported through both case studies and research literature as a population within which these traits occur at a higher frequency than the general population. Numerous research studies have developed psychometric and neuropsychological measures sensitive to differing aspects of autism, yet few studies have applied these measures to a transgendered sample of individuals.

Aims: This study aims to investigate autistic traits in a transgendered population, using measures from previous studies focused on autism to investigate in detail autistic traits within a transgendered population.

Methods: The study is an exploratory design of a closed cohort transgendered population attending a regional Gender Identity Service. The study involves participants attending an assessment session, during which self-report measures measuring autistic traits and computerised psychometric tests sensitive to autistic deficits will be completed.

Applications: The results of the study could serve to substantiate previous studies reporting elevated levels of autistic traits in the transgendered population. The addition of cognitive testing sensitive to autistic traits could serve to evidence areas of cognitive deficits in participants, having clinical implications for those working with transgendered clients.

Introduction

The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5, APA, 2013) reflects the most recent diagnostic conceptualisation of Autistic Spectrum Disorders. Autism has historically been characterised by a triad of impairments relating to social functioning (Wing & Gould, 1979), and these formed the foundation of the diagnostic criteria for both the DSM-IV-TR (APA, 2000) and the ICD-10 (WHO, 2008). This triad includes impairments (relative to developmental level) in social relationships, social communication and social imagination (Aarons & Gittens, 2001). The DSM-V merges the relationships and communication impairments creating a dyad of symptoms. Former diagnosis of Asperger's Syndrome and PDD-NOS have now subsumed by the diagnosis of autistic spectrum disorder (Matson et al., 2012).

Recent research has calculated the prevalence rates of Autistic Spectrum disorders within a Scottish locality to be 44.2 per 100,000 (0.04%) in children under 15 years old (Harrison et al., 2006). Chakrabarti & Fombonne (2005) conducted developmental screenings of over 10,000 4-6 year old children and found the presence of PDDs (0.6%), autistic disorder (0.2%) and other PDD (0.4%).

Diagnostic tools such as the Autism Diagnostic Observation Schedule - Generic (ADOS-G) (Lord et al., 2000) and Diagnostic Interview for Social Communication Disorders (DISCO) (Leekam et al., 2002) have been developed to provide a standardised procedure to assess for autism. These measures are time-consuming and resource-intensive due to the defined periods of observation and gaining a comprehensive developmental history for the individual. Therefore, alternative screening measures have been developed over time to highlight autistic symptomatology to help identify individuals for whom more detailed assessment may be warranted. The Autistic Spectrum Quotient (AQ) (Baron-Cohen et al., 2001) is one such self-report screening measure, examining 5 domains, including social skills, communication skills, imagination abilities, attention switching and attention to detail.

The concept of 'autistic traits' or a 'Broad Autism Phenotype' (BAS) has also been suggested. Much of this research focused on family members of those with an ASD diagnosis and (perhaps unsurprisingly given the high heritability of autistic traits) findings indicated that the social and communication difficulties were present in family members of children with an ASD (Piven et al., 1997; Losh et al., 2009). In addition, application of the Autistic Spectrum Quotient (AQ) self-report measure showed higher levels of autistic traits in parents of those with ASD than those of non-ASD children (Bishop et al., 2004). These studies indicated potentially heritable traits, however, for the purposes of this study the existence of sub-clinical autism-type characteristics or traits in the normal population is the focus. Baron-Cohen et al. (2001) found the AQ measure to be sensitive to autistic traits in the normal population and found higher levels in certain men, and students studying science subjects (in comparison to those studying humanities and social sciences).

Theoretical explanations for autism

Autistic Spectrum Disorders is now proposed as an all-encompassing diagnosis replacing multiple previously diagnosable conditions, thus there can be considerable disparity between individuals with this diagnosis. Wing (1997) suggested that autism and variant diagnoses exist on a spectrum of severity with the triad of impairment being their commonality. The heterogeneous nature of autism has led to a variety of different theories being offered to better understand the condition.

Baron-Cohen has suggested the Extreme Male Brain Theory of Autism (Baron-Cohen, 2002). The sex differences that have been identified between males and females in terms of cognitive functioning had been found to be 'masculinised' in individuals with autism. Baron-Cohen (2002) suggested that there are two domains that were previously unaddressed in terms of sex differences, namely systemizing and empathizing abilities. Empathizing is the drive to recognise the thoughts and emotional states of another

person and respond appropriately to this. Systemizing being the drive to understand and utilize technical, natural, abstract, social, organisable and motoric systems (Baron-Cohen, 2002). Baron-Cohen (2002) reported that the systemizing type characterises the male brain, where systemizing abilities are greater than empathizing. The female brain is where empathizing abilities are greater than systemizing. Baron-Cohen (2002) identified that the autistic brain is markedly systemizing. The Systemizing Quotient (SQ) and Empathizing Quotient (EQ) self-report measures can quantify these domains (Baron-Cohen et al., 2003). The measures found male participants to have higher systemizing scores and females to have higher empathizing scores and those with Asperger's syndrome scored significantly higher on the systemizing domain and significantly lower on the empathizing domain than a control group (Baron-Cohen et al., 2003).

The impairments in social relationships and communication may be explained by deficits in Theory of Mind (ToM) abilities (Baron-Cohen et al., 1985). This entails deficits in the ability to 'mentalize' or see a situation from another's perspective and hence predict their behaviour (Hill & Frith, 2004). Further to this, individuals with autism have been reported to have difficulty comprehending pretence, irony and deception (Hill & Frith, 2004). Further to the deficits in mentalization skills, adults with autism were shown to have impaired ability to infer emotional states from pictures of the eye-region only, compared with neurotypical controls (Baron-Cohen et al., 1997). More recently, Clark et al (2008) found that when presented with a facial expression, autistic participants were significantly worse at extracting the emotions presented. The results of this study could be a contributing factor to deficits in reading other people's intentions.

Executive dysfunction has also been noted in individuals with autism. This could offer an explanation for the rigidity and perseveration that is often observed clinically in people with autism (Hill, 2004). Children with autism were found to perform poorly on tasks involving planning (Ozonoff et al., 1991), and perseveration (Heaton et al., 1993). Ozonoff et al. (2004) compared 79 participants with ASD and

70 ‘neurotypical’ controls performance on computerised measures of executive function using CANTAB. The results found that on planning tasks such as the “Stockings of Cambridge” test, autistic participants had worse performance on tasks involving longer sequences of moves (Ozonoff, 2004). In addition, the “Intra-dimensional–Extra-dimensional Shift” test assessed set -shifting abilities and therefore levels of perseveration. Individuals with autism were found to perseverate when an extra-dimensional shift was necessary (Ozonoff, 2004).

Autism in the transgendered population

Robinow (2009) found that a higher than expected proportion of attendees at a Gender Identity Clinic had impairments in social skills and preoccupations that were thought to be consistent with Asperger’s Syndrome. He reported that 20 of 45 attendees at the gender identity clinic were reported to exhibit symptoms consistent with Asperger’s syndrome, higher than the expected prevalence rates in the general population (Robinow, 2009). The findings offered support to cross-gender preoccupations and behaviours in persons with ASDs reported in other studies (cf. Perera et al., 2003; de Vries et al., 2010; Gallucci et al., 2005; Kraemer et al., 2005; Mukaddes, 2002 & Tateno et al., 2002).

Gender Identity Disorder (GID) was the diagnostic label assigned to individuals who have a strong and persistent cross-gender identification and persistent discomfort with their own sex or feel these gender roles to be inappropriate (APA, 2000). Those experiencing this disparity between their birth sex and their perceived gender identity (gender dysphoria) are referred to as being transgendered. Birth sex males who identify as female are referred to as transwomen and birth sex females who identify as males are referred to as transmen. The proposed revisions to the DSM-V replaces GID with Gender Dysphoria, the most noticeable differences being that this is less pathologizing terminology and that gender non-conformity itself is not pathological (APA, 2013).

The Wilson et al. (1999) study calculated the prevalence rates of gender dysphoria in Scotland at 8.18 per 100,000, with a 4:1 male to female ratio. Transgendered individuals may choose to undertake gender reassignment treatments, which involve prolonged hormone treatments and surgical changes to their body and genitalia. The reassignment process follows from diagnosis including a minimum 12-month preoperative experience of “living in the role” of the desired gender, which is monitored by specialist clinicians at the gender identity clinic (NHS Scotland, 2012). This period may include non-genital surgery, hormone therapy, speech therapy and psychotherapy components (NHS Scotland, 2012). Following successful completion of this stage the transgendered patient would be considered for genital surgery.

Neuropsychological studies of transgendered people have suggested two possible explanations for a differing cognitive profile in this population, a particular cognitive style (la Torre et al., 1976) and the potential influence of cross-sex hormone treatments (cf. van Goozen et al., 1995; Slabbekoorn et al., 1999 and van Goozen, 2002). The La Torre (1976) study reported that on the Embedded Figures Test there are significant differences between male and female scores. La Torre (1976) found that male participants with female identities scored like females. Reassignment treatments involve intensive hormone treatments, in Male-to-Female (MtF) hormone therapy would be Estrogen and Gonadotropin-releasing hormone (GnRH) analogue, conversely, Androgens and GnRH Analogue in Female-to-Male (FtM) patients. Research has found a mixed picture in terms of the influences of cross-sex hormones upon transgendered individuals cognitive functioning, with organizing (van Goozen et al., 2002) and activating effects (van Goozen et al., 1995 & Slabbekoorn et al., 1999). Despite there being mixed opinion on whether hormones can influence performance on cognitive tests, it should be considered as a potential variable when administering neuropsychological measures.

Studies of transgender populations have found that levels of autistic traits measured using the AQ measure were significantly higher in transmen but not transwomen, when compared to non-transgender

controls (Jones et al., 2011). Men have been noted to have higher AQ scores which may account for there being no significant difference between the control men and the transwomen who participated (Baron-Cohen, 2010). The mean AQ score for transwomen were lower than male controls, but not significantly lower, which could potentially be an indication of the reversed neuropsychological profile suggested by la Torre (1976).

This study therefore attempts to clarify findings on the levels of autistic traits and associated cognitive dysfunction observed within a transgendered population. This will be done by measuring levels of autistic traits (Baron-Cohen, 2001) and the measures of the Extreme Male Brain Theory of Autism (Baron-Cohen, 2002). In reference to the latter, transgendered persons should, in theory, have a strongly systemizing (extremely male) scoring pattern on these measures, as this would be reflective of autistic symptomatology. In addition to these self-report measures, cognitive assessments sensitive to the deficits associated with autism, namely emotion recognition (Clark et al., 2008), planning and set-shifting (Ozonoff et al., 2004) will be used.

Aims and hypotheses

Aims

To investigate whether transgender individuals present with a psychometric and cognitive profile that is similar to people with autism.

Hypotheses

5. Based upon the Baron-Cohen (2002) extreme male brain theory, Trans patients will show a strongly systemizing type using the SQ/EQ measure as this is the expected pattern in more autistic individuals.
6. Based upon the Jones et al. (2011) study transmen will have higher scores on the AQ than the norms provided for their biological birth sex (Baron-Cohen et al., 2001).
7. Based upon Clark et al. (2008), transgender individuals will have lower scores than a normative sample on extracting emotional expressions.
8. Based upon the reviews of Hill (2004), due to their higher-levels of autistic traits, transgender individuals will have lower scores than a normative sample on executive function tasks of:
 - a. One Touch Stockings of Cambridge (Ozonoff, 2004)
 - b. Intra-Extra Dimensional Set Shift (Ozonoff, 2004)

Plan of Investigation

The proposed study will be part of the Scottish Transgender Research Study (STaRS) (see Appendix A). Overall, the STaRS study will investigate psychopathology, with a particular focus upon traits of autistic spectrum disorders within a transgendered population. This part of the study will involve transgendered people participating in a battery of psychometric and neuropsychological measures as outlined above.

Participants

The participants for this study will be transgendered adults who are currently registered with the NHS Sandyford Initiative and already attend this service in relation to their diagnosis of Gender Identity Disorder. The clinic currently has in excess of 500 adult service users receiving input in relation to their gender dysphoria, with a 4:1 transwomen to transmen ratio. This study will recruit a minimum of 56 participants from the registered service users.

Inclusion and Exclusion Criteria

The inclusion criteria for this study will be adult persons with a diagnosis of Gender Identity Disorder, who are registered with the Gender Identity Clinic at the Sandyford Initiative (NHS GG&C). Participants must be over the age of 18 years old and provide written consent to participate. The assessment process will involve visual discrimination of detailed stimuli so participants with significant visual impairments may need to be excluded from the study as the CANTAB measures all rely on complex visual stimuli.

Recruitment Procedures

An invitation letter will be sent to all patients currently registered with the clinic. It is planned that the

letter will include the Participant information Sheet for the study with contact details for the investigator. The potential participants would then contact the investigator to initiate further stages.

Measures

Autistic Spectrum Quotient (AQ) (Baron-Cohen et al., 2001)

A questionnaire-based measure designed to measure the traits associated with autistic spectrum disorders. The questionnaire is a self-report measure comprised of 50 questions, which are answered using a 4 point likert-scale. Based on the original literature scores over 32 are thought to be indicative of those persons with autism and over 26 for Asperger's Syndrome (Woodbury-Smith 2005). Wheelwright et al. (2010) provided scoring ranges to reflect the Broad Autism Phenotype (BAP, 23-28), Medium Autism Phenotype (MAP, 29-34) and Narrow Autism Phenotype (NAP, ≥ 35).

The Systemizing Quotient (SQ) and Empathizing Quotient (EQ) (Baron-Cohen et al., 2003)

A set of measures designed to measure 'systemising' which was likened to male brain functioning and 'empathizing' which was associated with female brain functioning. These measures have been used to support the extreme male brain theory of autism (Baron-Cohen, 2002).

CANTAB Measures

- *Emotion Recognition Task (ERT)*
 - Measures ability to correctly identify emotions from briefly presented (200ms) faces.
 - Yields number correct/incorrect & response latency.

- *Intra-Extra Dimensional Set Shift (IED)*
 - Measures rule acquisition and shifting, including rule reversal. Yielding number of trials and errors made to meet criterion.
- *One Touch Stockings of Cambridge (OTS)*
 - Spatial planning measure. Yields number of correct responses and response latency.

Design

The proposed study is a within-group exploratory analysis of autistic traits within a closed cohort of transgendered individuals currently registered with a regional gender identity service.

Research Procedures

The research will take place in two stages. Once participants have given implied consent to participate, the first stage will involve the participants being sent the consent form and questionnaire measures. Following this, the participants will attend an assessment session, at the gender clinic where formal consent will be attained, questionnaires returned and the CANTAB measures completed.

Data Analysis

The proposed study is envisaged to utilise basic frequency analysis. Analysis of the primary hypothesis will involve one sample tests of means or medians with the population norms provided for each measure. Secondary analysis will involve correlations to examine the relationship between AQ scores and the scores on the three CANTAB subtests ERT, IED & OTS. Potentially, a multiple regression may be conducted if a relationship is observed between the variables.

Justification of sample size

The data generated by the AQ will be discrete data therefore non-parametric conditions are being assumed. Sample size was calculated using G*Power v3.1 for one-sample Wilcoxon signed rank test using the data generated from the Jones et al. (2011) study, as the AQ measure was used to identify individuals with autistic traits indicative of an ASD. The study stated mean AQ scores for non-autistic female controls ($H_0 = 15.4$), Transgendered females ($H_1 = 23.2$, $SD = 9.1$) and assuming standard confidence intervals ($\alpha = 0.05$) for the given power ($1 - \beta = 0.95$) for the stated effect size ($d = 0.97$) there must be a minimum of 14 participants for each gender group, thus an absolute minimum of 28 participants.

Settings and Equipment

It is planned that the assessment session would take place at the Sandyford Initiative, where the participants would normally attend the gender identity clinic. The CANTAB equipment would be on loan, with prior agreement, from the Department of Psychological Medicine, University of Glasgow. The AQ, SQ and EQ are all freely available from the Autism Research centre at the University of Cambridge (<http://www.autismresearchcentre.com/>) A nominal amount of stationary (e.g. pens) would be required for participants to complete the questionnaire measures.

Health and Safety Issues

The nature of the proposed study does not highlight any immediate health and safety concerns. Participants will be community patients and the research protocol does not include any immediate health and safety concerns, however this will be reviewed on an on-going basis.

Researcher Safety Issues

The proposed study will involve the researcher conducting the assessment session unaccompanied with the participants. Administrative staff at the clinic will be notified of the appointment times, the expected duration of sessions and will be notified upon completion of each session. Research supervisors will also be aware when sessions are taking place.

Participant Safety Issues

At this point there have been no physical patient safety issues identified, as only psychometric measures (questionnaires and neuropsychological subtests) are being administered. However, potential anxieties that participants may have about the study being autism focused need to be addressed and so the rationale for the study will be explained in a Participant Information Sheet.

Ethical Issues

The potential that the autism measures could highlight potential social communication difficulties needs to be considered, should participants have concerns about this the researcher will raise this to supervisors and the clinicians at the clinic. In addition, the participants may struggle with the executive function and emotion recognition measures. Given the potential that participants may be very aware of difficulties completing certain tasks, the arrangement of the tasks involved in the assessment sessions will be organised accordingly. The proposed study is being submitted to the West of Scotland Ethics Committee.

Financial Issues

Printing and postage are the main expenses in this study. The CANTAB Eclipse is being borrowed from the Department of Health and Wellbeing (University of Glasgow) and all measures are freely available. The study will involve an invitation being sent to the entire caseload of the adult GID clinic (approx. 500 patients) of which we hope to recruit at least 50 participants, therefore postal expenses are high. Due to the recruitment costs exceeding the suggested limit, the research supervisor has agreed to cover the photocopying and postage costs.

Timetable

A proposed timescale has been provided incorporating the timescale suggested by the university.

- Proposed submission to NHS WoS ethics and NHS GG&C R&D – Nov 2013
- Ethics and R+D approval by December 2013
- Start recruitment December 2013
- Potential start date of assessments – December 2013
- Potential completion date of assessments – March 2014
- Data analysis April - 2014
- Formal write-up – May 2014
- First draft of thesis - June 2014
- Revised draft of thesis – July 2014
- Final submission of thesis – August 2014
- Viva – September 2014

Practical Applications

The findings of this study contribute to the previous literature indicating that higher levels of autistic traits are present in transgendered populations. This could lead to tailoring psychosocial interventions and broader supports to compensate for the deficits identified. More responsive interventions and a better understanding of the difficulties individuals in clinical population face could lead to improved engagement in services and potentially increased quality of life for service users.

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