Sexual Orientation and Gender-identity in High-Functioning Individuals with 
Autism Spectrum Disorder

by

Dr. Rita George

BAppSc(Psych) (Hons), GDipPsych, BDS

Submitted in fulfilment of the requirements for the degree of

Doctor of Philosophy

Deakin University

August, 2016
DEAKIN UNIVERSITY

ACCESS TO THESIS-A

I am the author of the thesis entitled

“Sexual Orientation and Gender-Identity in High-Functioning Individuals with Autism Spectrum Disorder”

submitted for the degree of Doctor Of Philosophy

This thesis may be made available for consultation, loan and limited copying in accordance with the Copyright Act 1968.

'I certify that I am the student named below and that the information provided in the form is correct'

Full Name: Rita Marilyn Edna George

Signed: [Signature Redacted by Library]

Date: 05/11/2016
I certify that the thesis entitled

“Sexual Orientation and Gender-Identity in High-Functioning Individuals with Autism Spectrum Disorder”

submitted for the degree of Doctor of Philosophy

is the result of my own work and where reference is made to the work of others, due acknowledgment is given.

I also certify that any material in the thesis which has been accepted for a degree or diploma by any university or institution is identified in the text.

‘I certify that I am the student named below and that the information provided in the form is correct’

Full Name: Rita Marilyn Edna George

Signed: [Signature Redacted by Library]

Date: 08/08/2016
Acknowledgements

Firstly, I would like to express my sincere gratitude to my supervisor, Dr. Mark Stokes for your continuous support and guidance that enabled me to prepare a thesis that I am so proud of. Your patience, motivation, insight, and immense knowledge not only helped put this work together, but also taught me about myself and life, in general. I am a richer person in spirit for having known you. I could not have imagined having a better advisor and mentor during this journey. In addition, your attention to detail drove me to finally learn to appreciate punctuation, grammar and prose in a way that I hadn’t cared for earlier.

I would also like to thank my fellow-PhD candidates at Deakin University who have shared my joys and woes over the last four years. Your stimulating discussions and sense of humor has helped keep the ‘wind in my sails’ and our shared passion for research spurred me on.

I want to especially thank my family. Words cannot express how grateful I am to my husband, Shawn for your never-ending positive attitude and encouragement, and above all, giving me the chance to do something I have always had a passion for. You have been my rock. I also want to thank my three precious sons, Timothy, Jeremy and Isaac for giving me the space and time to work at my thesis, and for the many sacrifices you made to make this work possible. Thank you for putting some of your dreams on hold, so I can have mine. I am deeply thankful to my mother, Prema, for your prayers that sustained me thus far and pushed me to strive towards my goal. You never hesitated to
help me when I needed it, and believed in me, when others did not. It would be unfair not
to mention my golden retriever, Toby, who faithfully sat by my side on many cold lonely
nights, while the family was in bed, and I worked on my thesis. It was often during our
evening walks together that I’ve had a few ‘Eureka’ moments that helped piece my
writing together. Finally, I thank God for His Spirit of Refreshment and for His day-by-
day guidance. Just when I thought raising a family and undertaking a PhD might have
been too-ambitious a plan, His quiet Presence and strength tarried with me and made this
work a possibility. Thank you, Lord.
Publications

Chapter 4

Conferences


Abstract

Clinical impressions indicate a sexual profile within the Autism Spectrum Disorder (ASD) population that is suggestive of sexual and gender diversity. Existing literature is limited in its generalizability owing to methodological issues. The hypotheses of increased non-heterosexuality and gender non-conformity among individuals with ASD was assessed using quantitative and qualitative online surveys. A sample of 310 individuals with ASD (Male= 90, Female= 219, 1 intersex individual) and 261 typically-developing individuals (TD; Male= 103, Female= 158) participated in the quantitative studies. Another sample of 109 individuals with ASD (Male= 41, Female= 68) and 70 TD individuals (Male= 36, Female= 34) participated in the qualitative study.

Study 1 compared sexual orientations among individuals with and without an ASD by using the Sell Scale of Sexual Orientation. Relative to sex-matched TD peers, males and females with an ASD were less heterosexual, but more homosexual and asexual with their sexual attractions and contacts. Males and females with an ASD identified more strongly with a homosexual identity than their TD peers, but only females with an ASD rated themselves less heterosexual than their TD peers. Males and females with an ASD reported more diversity in their sexual identities than their TD peers, and this diversity was greater among females than males with an ASD.

Study 2 compared the gender-identities of individuals with and without an ASD. Relative to their TD peers, a higher number of individuals with ASD reported gender non-conforming identities, and this rate was higher among females than males with an ASD. The levels of gender-dysphoric traits were also compared between individuals with
and without an ASD by using the Gender Identity and Dysphoria Questionnaire for Adults. Findings demonstrated that individuals with ASD reported a higher number of gender-dysphoric traits than their TD peers. Furthermore, gender-dysphoric traits partially mediated the relationship between autistic traits and sexual orientation.

Study 3 compared the rates of depression, anxiety, stress and levels of personal well-being between groups with and without an ASD, and between heterosexual and non-heterosexual groups, as well as gender-conforming and gender non-conforming groups. A profile analysis revealed that belonging to a non-heterosexual orientation and a gender non-conforming identity worsened mental health among individuals with ASD.

Study 4 compared qualitative accounts related to sexual orientation and gender-identity among individuals with and without ASD. Relative to their TD peers, individuals with ASD struggled with understanding their gender-identity and sexual orientation, and believed their autism underpinned these difficulties. Struggles to fit in socially were a source of mental distress, and this was more severe among females with an ASD.

Collectively, the data from this thesis supported the hypotheses of increased non-heterosexuality and gender non-conformity among individuals with ASD. Results suggested the limited ability to articulate an inner experience, deficits in Theory of Mind and a weak central coherence, a nonchalance toward social norms, and a cognitive inflexibility inherent to ASD presented unique challenges to the formation and consolidation of sexual and gender identity. Sexuality and gender diversity in ASD might be outcomes of social rather than biological factors.
Table of Contents

1 Chapter 1. Autism 1
   1.1 Introduction 2
   1.2 Epidemiology of Autism 5
      1.2.1 History 6
      1.2.2 Taxonomy and Diagnostic criteria 8
      1.2.3 Prevalence 14
      1.2.4 Demographics 17
   1.3 Aetiology of ASD 28
      1.3.1 Psychological theories 28
      1.3.2 Neurobiological theories 38
      1.3.3 Genetic aetiologies 43
      1.3.4 Biochemistry 49
      1.3.5 The Immune System 52
   1.4 Conclusion 54

2 Chapter 2. Sexuality and Gender-Identity in ASD 56
   2.1 Sexuality in ASD 57
      2.1.1 Historical perspectives of Sexuality and ASD 57
      2.1.2 Sexuality in ASD 58
   2.2 Gender-identity, Sexual Orientation and ASD 65
   2.3 Is there an association between Gender-Dysphoria, Sexual Orientation and ASD? 72
      2.3.1 Biological postulates 73
      2.3.2 Psychogenic postulates 76
   2.4 Conclusion 81
   2.5 Research Questions for this Thesis 84

3 Chapter 3. Sexual Orientation in Autism Spectrum Disorder: “I like Sex and I’m not choosy!” 86
   3.1 Introduction 87
   3.2 Method 91
      3.2.1 Participants 91
3.2.2 Procedure and measures 93
3.3 Results 96
  3.3.1 Data screening 96
  3.3.2 Demographic trends 97
  3.3.3 Male Sexuality 99
  3.3.4 Female Sexuality 105
3.4 Additional Analysis 111
  3.4.1 Heterosexuality Identity versus Attractions and Contacts 113
  3.4.2 Homosexuality Identity versus attraction and contact 114
  3.4.3 Asexuality Identity versus Attraction and Contact 115
3.5 Discussion 116
  3.5.1 Conclusion and Limitations 124
4 Chapter 4. Gender Identity and Autism: “Gender is not on my Agenda!” 127
  4.1 Introduction 128
  4.2 Method 134
    4.2.1 Participants 134
    4.2.2 Materials 134
  4.3 Results 138
    4.3.1 Data Screening 138
    4.3.2 Demographic trends 138
  4.4 Hypothesis testing 141
  4.5 Additional tests 143
    4.5.1 Autistic traits, Gender-dysphoria and Sexual Orientation. 143
    4.5.2. Gender-Dysphoria and Transgenderism rates 146
    4.5.3. Do Gender-dysphoric traits mediate how an individual with ASD sexually-orients? 147
    4.5.4 Socializing patterns and gender-identity 148
  4.6 Discussion 152
5 Chapter 5. Mental Health Among Sexual and Gender Minorities in ASD: ‘Stealth Mental Health’. 162
  5.2 Method 167
    5.2.1 Participants 167
    5.2.2 Demographic trends 167
5.2.3 Procedure and measures 168
5.2.4 Data Screening 171
5.3 Results 172
  5.3.1 Profile Analysis of Diagnosis, Sexual Orientation and GDT-condition on Mental Health 173
  5.3.2 Profile Analysis of Diagnosis and Sexual Orientation on Mental Health 175
  5.3.3 Profile Analysis of Diagnosis and GDT-condition on Mental Health 180
5.4 Discussion 183

6 Chapter 6. Attitudes toward Sexual Orientation and Gender-Identity in ASD: “Between my ears and not my legs!” - A Qualitative Analysis. 193
  6.1 Introduction 194
  6.2 Method 195
    6.2.1 Participants 195
    6.2.2 Demographic trends 198
    6.2.3 Data analysis 201
  6.3 Results 202
    6.3.1 Social Development- Disconnectedness 203
    6.3.2 Gender-Identity 211
    6.3.3 Sexual Orientation 214
  6.4 Discussion 218
    6.4.1 Androgyny in Autism- “I lean towards the middle!” 224
    6.4.2 Conclusions and Future Directions 226

7 Chapter 7. General Discussion 229
  7.1 Overall Summary 230
    7.1.1 Research questions 230
    7.1.2 Empirical findings 231
    7.1.3 Key Findings from each Study 232
  7.2 An Unholy Triad: Autistic traits, Gender-Dysphoric traits, and Sexual Orientation 235
  7.3 Explanations for Sexual and Gender Diversity in ASD- Biological or Social? 236
    7.3.1 Disregard for social norms 238
7.3.2 Adaptations and compromises to meet sexual needs 238
7.3.3 Socio-communicative deficits and cognitive inflexibility 240
7.3.4 Impaired Theory of Mind 241
7.3.5 Weak Central Coherence 242
7.4 Clinical implications of study findings 243
7.5 Methodological Strengths and Limitations 246
7.6 Future Research 248
7.7 Conclusions 250
References 252
Appendices 318
List of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 3.1</td>
<td>Range of sexual orientations by Diagnostic group and Birth-sex</td>
<td>98</td>
</tr>
<tr>
<td>Figure 3.2</td>
<td>Heterosexuality and Homosexuality among males and females with ASD compared to sex-matched controls</td>
<td>111</td>
</tr>
<tr>
<td>Figure 3.3</td>
<td>Heterosexual ID and Attraction</td>
<td>114</td>
</tr>
<tr>
<td>Figure 3.4</td>
<td>Heterosexual ID and Contact</td>
<td>114</td>
</tr>
<tr>
<td>Figure 3.5</td>
<td>Homosexual ID and Attraction</td>
<td>115</td>
</tr>
<tr>
<td>Figure 3.6</td>
<td>Homosexual ID and Contact</td>
<td>115</td>
</tr>
<tr>
<td>Figure 3.7</td>
<td>Asexual ID and Attraction</td>
<td>116</td>
</tr>
<tr>
<td>Figure 3.8</td>
<td>Asexual ID and Contact</td>
<td>116</td>
</tr>
<tr>
<td>Figure 4.1</td>
<td>Gender Identity by relative proportion reported by respondents by diagnosis and birth-sex</td>
<td>140</td>
</tr>
<tr>
<td>Figure 4.2</td>
<td>Levels of GDT by Sexual Orientation (in descending order of GDT).</td>
<td>144</td>
</tr>
<tr>
<td>Figure 4.3</td>
<td>Relationship between autistic traits and Gender-Dysphoria</td>
<td>145</td>
</tr>
<tr>
<td>Figure 4.4</td>
<td>Model of AQ traits as predictor of sexual orientation and mediated by GDT.</td>
<td>148</td>
</tr>
<tr>
<td>Figure 4.5</td>
<td>Comparisons of Friendship and Loneliness ratings based on Gender-dysphoric status among individuals with an ASD</td>
<td>151</td>
</tr>
<tr>
<td>Figure 5.1</td>
<td>Conceptual model of a ‘minority within a minority’</td>
<td>165</td>
</tr>
</tbody>
</table>
Figure 5.2  Comparison of comorbid psychiatric diagnoses between minority groups versus control groups.  

Figure 5.3  Mental Health Profile by Group Membership.  

Figure 5.4  Mental health profiles of individuals based on diagnostic-status.  

Figure 5.5  Mental health profiles of individuals based on sexual orientation.  

Figure 5.6  Mental health profiles of individuals with GDT and No-GDT.  

Figure 6.1  A Bi-axial Gender-Spectrum  

Figure 6.2  A Mono-dimensional Gender-Spectrum.
List of Tables

| Table 1.1 | Definition of Sexual Orientation and Gender-Dysphoria | 3 |
| Table 1.2 | Comparison of Pervasive Developmental Disorders | 9 |
| Table 1.3 | Severity Levels for Autism Spectrum Disorder | 12 |
| Table 1.4 | Prevalence estimates of ASD across countries | 16 |
| Table 1.5 | Studies assessing the relation between foetal testosterone and autistic traits | 22 |
| Table 1.6 | Neurobiological studies in ASD | 39 |
| Table 2.1 | Summary of Studies Examining Sexual Knowledge, Interest and Behaviors among Individuals with Autism | 60 |
| Table 2.2 | Summary of Case-Histories presenting the comorbid presentation of ASD and GD | 67 |
| Table 3.1 | Demographic characteristics of the study sample | 92 |
| Table 3.2 | Codes assigned to responses on the Sell Scale for statistical analysis | 95 |
| Table 3.3 | Sexual Orientation by Diagnosis and Birth-sex | 98 |
| Table 3.4 | MLR Analyses comparing Homosexuality and Heterosexuality between Males with an ASD versus Control Males | 103 |
| Table 3.5 | MLR Analyses comparing Homosexuality and Heterosexuality of Females with an ASD versus Control Females | 110 |
Table 3.6  An assessment of the level of agreement between sexual identity and sexual attractions and contacts. 113

Table 4.1  Gender-Identities reported by individuals in the ASD and TD groups by Birth-sex 140

Table 4.2  Contingency of diagnosis on various demographic variables showing number of cases in each category 141

Table 4.3  t-test between Diagnosis and GD scores 142

Table 4.4  t-test results between males and females with and without an ASD on GD scores 143

Table 5.1  Mental Health scores by group membership 173

Table 5.2  Multivariate profile analysis examining effects of Diagnosis and Sexual Orientation on Mental Health 176

Table 5.3  Simple Effects comparing Mental Health for Diagnostic groups by Sexual Orientation 178

Table 5.4  Multivariate Analysis examining effects of Diagnosis and GDT-condition on Mental Health 181

Table 5.5  Simple Effects comparing Mental Health for Diagnostic groups by GDT-condition 182

Table 6.1  Demographic trends between diagnostic groups by birth sex 196

Table 6.2  Domain-specific questions used in the survey 199

Table 6.3  Descriptive data comparing responses between individuals in the TD and ASD group by birth-sex 202

Table 6.4  Framework for analysis of themes 217
## List of Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD</td>
<td>Autistic Disorder</td>
</tr>
<tr>
<td>ADHD</td>
<td>Attention Deficit Hyperactivity Disorder</td>
</tr>
<tr>
<td>ADI</td>
<td>Autism Diagnostic Interview</td>
</tr>
<tr>
<td>ADOS</td>
<td>Autism Diagnostic Observation Schedule</td>
</tr>
<tr>
<td>AGRE</td>
<td>Autism Genetic Resource Exchange</td>
</tr>
<tr>
<td>AMH</td>
<td>Anti-Müllerian hormone</td>
</tr>
<tr>
<td>APA</td>
<td>American Psychiatric Association</td>
</tr>
<tr>
<td>AQ</td>
<td>Autism Spectrum Quotient</td>
</tr>
<tr>
<td>ART</td>
<td>Assisted Reproductive Technology</td>
</tr>
<tr>
<td>AS</td>
<td>Asperger's Syndrome</td>
</tr>
<tr>
<td>ASD</td>
<td>Autism Spectrum Disorder</td>
</tr>
<tr>
<td>AVEN</td>
<td>Asexual Visibility and Education Network</td>
</tr>
<tr>
<td>BDV</td>
<td>Borna Disease Virus</td>
</tr>
<tr>
<td>CAH</td>
<td>Congenital Adrenal Hyperplasia</td>
</tr>
<tr>
<td>CAST</td>
<td>Child Autism Spectrum Test</td>
</tr>
<tr>
<td>CBCL</td>
<td>Child Behavior Check List</td>
</tr>
<tr>
<td>CDC</td>
<td>Centers for Disease Control and Prevention</td>
</tr>
<tr>
<td>CDD</td>
<td>Childhood Disintegrative Disorder</td>
</tr>
<tr>
<td>CNS</td>
<td>Central Nervous System</td>
</tr>
<tr>
<td>CNV</td>
<td>Copy Number Variants</td>
</tr>
<tr>
<td>DASS</td>
<td>Depression, Anxiety, and Stress Scale</td>
</tr>
<tr>
<td>DSM</td>
<td>Diagnostic and Statistical Manual for Mental Disorders</td>
</tr>
<tr>
<td>EF</td>
<td>Executive Functioning</td>
</tr>
<tr>
<td>EMB</td>
<td>Extreme Male Brain</td>
</tr>
<tr>
<td>FQQ</td>
<td>Friendship Quality Questionnaire</td>
</tr>
<tr>
<td>fT</td>
<td>Foetal Testosterone</td>
</tr>
<tr>
<td>FXS</td>
<td>Fragile X Syndrome</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Full Form</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------</td>
</tr>
<tr>
<td>GABA</td>
<td>Gamma-Aminobutyric Acid</td>
</tr>
<tr>
<td>GAD</td>
<td>Generalized Anxiety Disorder</td>
</tr>
<tr>
<td>GD</td>
<td>Gender Dysphoria</td>
</tr>
<tr>
<td>GD-NOS</td>
<td>Gender Dysphoria-Not Otherwise Specified</td>
</tr>
<tr>
<td>GDT</td>
<td>Gender Dysphoric Traits</td>
</tr>
<tr>
<td>GIDYQ-AA</td>
<td>Gender-Identity/Gender-Dysphoria Questionnaire for Adolescents</td>
</tr>
<tr>
<td>HFA</td>
<td>High Functioning Autism</td>
</tr>
<tr>
<td>HIV</td>
<td>Human Immunodeficiency Virus</td>
</tr>
<tr>
<td>HRT</td>
<td>Hormone Replacement Therapy</td>
</tr>
<tr>
<td>5-HT</td>
<td>5-Hydroxytryptamine</td>
</tr>
<tr>
<td>ICD</td>
<td>International Classification of Diseases</td>
</tr>
<tr>
<td>ID</td>
<td>Intellectual Deficiencies</td>
</tr>
<tr>
<td>IMGSAC</td>
<td>International Molecular Genetic Study of Autism</td>
</tr>
<tr>
<td>IQ</td>
<td>Intellectual Quotient</td>
</tr>
<tr>
<td>JS</td>
<td>Joubert Syndrome</td>
</tr>
<tr>
<td>LFA</td>
<td>Low Functioning Autism</td>
</tr>
<tr>
<td>LGBTQA</td>
<td>Acronym for Non-Heterosexual Orientations-Lesbian, Gay, Bisexual, Transgender, Questioning, Asexual</td>
</tr>
<tr>
<td>LSDQ</td>
<td>Loneliness and Social Dissatisfaction Questionnaire</td>
</tr>
<tr>
<td>MMR</td>
<td>Measles, Mumps and Rubella vaccination</td>
</tr>
<tr>
<td>OCD</td>
<td>Obsessive Compulsive Disorder</td>
</tr>
<tr>
<td>OFC</td>
<td>Orbitofrontal Cortex</td>
</tr>
<tr>
<td>PDD</td>
<td>Pervasive Developmental Disorder</td>
</tr>
<tr>
<td>PDDNOS</td>
<td>Pervasive Developmental Disorder Not Otherwise Specified</td>
</tr>
<tr>
<td>PET</td>
<td>Positron Emission Tomography</td>
</tr>
<tr>
<td>PWI</td>
<td>Personal Wellbeing Index</td>
</tr>
<tr>
<td>SES</td>
<td>Socioeconomic Status</td>
</tr>
<tr>
<td>SIECUS</td>
<td>Sexuality Information and Education Centre</td>
</tr>
<tr>
<td>TD</td>
<td>Typically Developing</td>
</tr>
<tr>
<td>TOM</td>
<td>Theory of Mind</td>
</tr>
<tr>
<td>WCC</td>
<td>Weak Central Coherence</td>
</tr>
</tbody>
</table>
Chapter 1. Autism
1.1 Introduction

Sexuality is a universal denominator for most human-beings and is a fundamentally important aspect in aiding one’s healthy development, their overall adjustment and the formation of their self-concept (Sexuality Information and Education Centre [SIECUS], 2004). Yet, when it comes to the life of individuals with Autism Spectrum Disorder (ASD), a neurodevelopmental disorder characterized by deficits in socio-emotional reciprocity, strongly repetitive behavior and islets of interests, sexuality can be an under-researched area, owing to the mistaken propensity to regard those with ASD as somehow unmindful of their sexuality and naïve when it comes to issues of human intimacy.

More recent literature has debunked this myth and indicated that individuals with ASD experience sexual desire not unlike typically-developing (TD) individuals. Moreover, among those individuals with high-functioning autism or HFA (a quasi-diagnostic informal label applied to individuals with ASD who are not as cognitively-challenged as individuals with low-functioning autism or LFA, and have an intelligence quotient of 70 or above; Newschaffer et al., 2007), research demonstrates that they desire social contact (Attwood, 1997), sexual intimacy (Stokes & Kaur, 2005) and marriage (Newport & Newport, 2002).

Earlier, when sexual behaviour was noted amongst individuals with ASD, it was generally regarded negatively due to the social deficits and particular stereotypies hallmarking ASD (DeMyers, 1979; Dewey & Everard, 1974) and as such literature regarding the nature of and the frequency of sexual behaviours in this population is scarce. While some reports mention sexual behaviors that are compatible with those seen
among TD individuals, there are other reports suggestive of sexual activity that is described as inappropriate and deviant (Hellemans & Debutte, 2002). Some of this could be attributed to a deficiency in sexual knowledge (Ousley & Mesibov, 1991; Haracopos & Pedersen, 1992; Hellemans & Debutte, 2002; Ruble & Dalrymple, 1993; Realmuto & Ruble, 1999).

Interestingly, some literature suggests that minority sexual orientations (non-heterosexual orientations such as lesbian, gay, bisexual, transgender, questioning and asexual (LGBTQA) orientations; see Table 1.1) are over-represented among those with ASD (Gilmour, Schalomon, & Smith, 2012; Hellemans et al., 2010). Additionally, studies have suggested a higher incidence of ASD among individuals with gender-dysphoria (GD) (de Vries et al., 2010) (see Table 1.1) and gender-ambivalent attitudes in the ASD population (Bejerot & Eriksson, 2014).

Table 1.1

<table>
<thead>
<tr>
<th>Definitions of Sexual Orientation and Gender-Dysphoria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sexual orientation</strong>: Sexual orientation refers to an individual’s underlying sexual preferences and is described as a stable pattern of sexual arousal, referring to behaviors, fantasies, attachments and longings, or absence of such feelings towards persons of either the opposite sex and/or same sex (Worthington et al., 2009), which may be hetero-, homo-, bi- or a-sexual in nature.</td>
</tr>
<tr>
<td><strong>Gender-Dysphoria (GD)</strong>: The DSM-5 recognizes individuals with GD as those who experience a persistent and strong incongruence between their birth-assigned gender and their experienced gender, which causes clinically significant distress, with impairments in social and occupational functioning, and the desire to live a cross-gender life.</td>
</tr>
</tbody>
</table>

The past decade has witnessed the emergence of an impressive body of rigorous empirical research on different health issues among individuals with minority sexual orientations (Patterson, 1995). As the socio-political climate becomes more accepting toward sexual minorities (Diamond, 2003), this attitudinal-shift has impacted directly
upon public opinions and perspectives on non-heterosexuality, facilitating more liberal lifestyles. Substantial literature indicates that those with a minority sexual orientation are at higher risk than the general population for poorer physical and mental health outcomes (Mayer et al., 2008) and higher risks for attempted suicide, suicidal ideation, and substance use (King et al., 2008), most likely as a function of persisting discrimination and stigmatization. At the same time, empirical evidence indicates that individuals diagnosed with ASD face a developmental trajectory marked by considerable psychosocial difficulties (Mazefsky, Conner & Oswald, 2010). Despite an increasing acceptance of neurodiversity and sexual diversity, persisting social marginalization against individuals with ASD (Mazurek, 2013) and minority sexual populations (Herek, 2009) put these populations at an increased risk for psychopathology. Individuals with an ASD and a minority sexual orientation can then be conceptualized as a ‘minority within a minority’ and may be experiencing a ‘layered stigma’ through the synchronous impact of living with ASD and belonging to a sexual minority (Meyer, Dietrich & Schwartz, 2008). The combination of the two are likely to amplify concerns for the health of these individuals.

If psycho-social interventional support is to be comprehensively provided to the individual with ASD, then the relatively neglected aspect of their sexuality, its development and different expressions requires a fund of empirical knowledge with subsequent informed planning. It is to contribute to this process that this current research has been embarked upon. In order to fully appreciate and understand ASD, a comprehensive review of its epidemiological and etiological underpinnings is undertaken and this is presented in some detail in this chapter.
1.2 Epidemiology of Autism

Evidence for the existence of autism before the twentieth century comes from fairy tales and folklore long before its formal recognition in 1943 (Leask, Leask, & Silove, 2005). There are several descriptions of autistic-like persons in the records of medical history dated back to the middle ages, as mythology weaved fascinating tales about faeries leaving ‘changelings’ behind in place of the real child, and how this ‘stolen child’ was only returned if the changeling had been loved and cared for. Explanations for some of the behaviors noted were consistent with the prevailing views of the time. As with some of the myths surrounding autism from the middle ages, there were myths created about mentally-challenged individuals and sexuality, in an attempt to explain what could not be understood clearly or what was just feared.

From beliefs that people with autism were demon-possessed to having saintly powers, currently the DSM-V (Diagnostic and Statistical Manual for Mental Disorders) conceptualizes autism as a neurodevelopmental condition that includes two areas of deficit: deficits in social communication and interaction, and repetitive and restrictive behaviors, interests and activities. Autism is understood to exist on a spectrum, reflecting a heterogeneous profile of symptom-presentation and varying severity of the same between people on the spectrum.
1.2.1 History

The label “autism” (from the Greek word “autos”) was first coined by Eugen Bleuler, a Swiss psychiatrist in 1911, to describe the distinctive “withdrawal from the social fabric into oneself” characteristic of schizophrenia. This same term was again uncannily resurrected almost in synchronicity though independently, by Leo Kanner (1943), a psychiatrist and Hans Asperger (1944) a paediatrician and medical theorist, to describe the developmental syndrome in a group of children whose conspicuous feature was a lack of social interaction (Lyons & Fitzgerald, 2007). Kanner however, termed the condition “early infantile autism” while Asperger used the term “autistic psychopathy”.

In his paper entitled “Autistic Disturbances of Affective Contact”, Kanner (1943) describes the eleven children that he examined as lacking in the ability to relate to people and situations in the typical way, such as refusing to be picked up and adapt to the posture of the person holding him/her, and that this “extreme autistic aloneness” was apparent from the beginning of life. He additionally noted that these children showed an excellent rote memory, but an inability to use language in other pragmatic ways, while sometimes “parroting” words in ‘echolalic’ fashion. Other notable features described were the children’s lack of use of personal pronouns, intolerance to loud and unexpected noises, the obsessional desire to maintain sameness, and a strong tendency toward repetitive actions and words, this latter proclivity inhibiting any spontaneous activity.

Asperger’s account of the behaviours of the four children he described was more widely encompassing than Kanner’s description, ranging from severely impaired-functionally to those bordering on neurotypical functioning (Frith, 2004). Asperger
remarked on certain characteristic features in the children such as idiosyncrasies of eye
gaze, paucity of facial expressions and expressive gestures, rhythmic stereotypic
movements such as rocking, monotonous repetitive play such as the lining up of toys in
“patterned rows”, and creative as opposed to mechanical learning, and inattentiveness. He
suggested that it was their “original” mode of learning that underpinned academic
difficulties in school. Their remarkable salient difficulties in social relationships,
acquisition and comprehension of social skills and social rules intrinsically led Asperger
to comment in his paper that ‘The autist is only himself”. He additionally highlighted the
children’s abnormalities in sensory perception such as their hyperesthesia, which is an
extreme tactile sensitivity to certain textures and tastes, and an intolerance to certain
sounds.

However, Asperger’s work which was originally in German was lost to an
international audience owing to conditions in post-World War II Europe. It was Lorna
Wing in 1981 who brought his findings to the English-speaking world and introduced the
neutral term “Asperger’s syndrome” (AS), as she reasoned that Asperger’s title of
“Autistic Psychopathy” held connotations of an abnormality of personality which
typically equates with sociopathic behaviour. This term was widely accepted as the label
for the individuals who demonstrate autistic characteristics, but do not have
communication and language impairments, whilst the term autism was reserved for those
individuals who are socially passive and aloof, with a high incidence of global learning
described as an impairment of two-way social interaction, but added that this impairment
was not primarily due to a lack of desire for social contact, but owing to challenges
experienced in understanding the basic unwritten, implicit, complex and constantly-in-flux rules governing social behaviour.

1.2.2. Taxonomy and Diagnostic criteria

Prior to the first official recognition of autism in DSM-III, the term ‘childhood schizophrenia’ reminiscent of Bleuler’s work, was broadly used to embrace a range of childhood disorders, of which one was autism. Available research strongly supported the recognition of autism as a new condition, where it was included under a class of conditions called Pervasive Developmental Disorder (PDD). While the DSM-III applied a monothetic diagnosing criteria, where all criteria had to be satisfied for a diagnosis, the DSM-III-R switched to a polythetic criterion, necessitating only a subset of the diagnostic criteria as sufficient to warrant a diagnosis of autism (Volkmar & Klin, 2005). However, the DSM-III-R appeared to over diagnose autism in individuals with greater cognitive disability and underdiagnose those at the higher end of the intellectual quotient (IQ) range. The modifications in the DSM-IV focussed on balancing sensitivity and specificity across the IQ range. The DSM-IV also recognized three disorders new to DSM: childhood disintegrative disorder, Asperger’s disorder, and Rett’s disorder. To elucidate the related multi-variants of the disorder, with symptoms differing in severity, but sharing the same characteristic core symptomology, the term ASD was spawned, which is the term the DSM-IV taxonomy adopted.

ASD was placed in the category of pervasive developmental disorders (PDDs), to indicate that though the disorders are identified in childhood, they are pervasive in that the impairments are not relatively minor but affect the individual significantly throughout
their lives (Barlow & Durand, 2011). PDDs include autistic disorder (AD) (Kanner’s ‘autism’), Asperger’s Syndrome (AS) and pervasive developmental disorder not otherwise specified (PDDNOS); excluding childhood disintegrative disorder (CDD) and Rett’s disorder (APA, 2011). A comparison of the PDDs is presented in Table 1.2.

Table 1.2

Comparison of Pervasive Developmental Disorders

<table>
<thead>
<tr>
<th>Disorder</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autistic Disorder</td>
<td>Limited use and understanding of non-verbal communication cues, lacking theory of mind; lacking social reciprocity; failure to develop appropriate age-related friendships; delayed language development; circumscribed and restricted interests; non-functional routines or rituals; repetitive body movements</td>
</tr>
<tr>
<td>Asperger’s Syndrome</td>
<td>Relatively good verbal language, impaired use of non-verbal behaviours such as eye-to-eye gaze, failure to develop peer relationships appropriate to developmental level; restricted range of interests and persistent preoccupation with parts of objects</td>
</tr>
<tr>
<td>PDD-NOS</td>
<td>A sub-threshold form of autism or a manifestation of atypical autism; may not display the early avoidance of social interaction but may still exhibit significant social problems</td>
</tr>
</tbody>
</table>

Adapted from Volkmar, Lord, Bailey, Schultz, & Klin, 2004

Beyond the unifying description that ASD is a complex neurodevelopmental disorder that is distinguished by the cardinal characteristic triad of impairments in the social, communicative and behavioural domains (Wing, 1981; APA, 1994; Lord & Bishop, 2010), there lies extreme clinical heterogeneity, ranging along a continuum from incapacitating impairment to mild personality traits, where individuals may be loosely classified (no official diagnostic criteria) as low-functioning or high functioning autism (HFA) respectively, depending on subjective clinical judgement (Autism Victoria, n.d.). However, substantial evidence questions the validity of the early language impairment
criterion as differentiating between AD and AS (Mayes & Calhoun, 2001; Manjiviona & Prior, 1999) with any differences in language impairment between children with AD and AS becoming largely non-existent by early adolescence (Eisenmajer et al, 1998; Ozonoff, South, & Miller, 2000).

Wing and Gould (1979) undertook one such epidemiologic and classification study on children and screened for the autistic triad (N= 132) to try and ascertain the strong possibility that AS was simply a variant of AD and that there were no clear boundaries separating the two. Results indicated that symptoms were on a continuum, even though the authors gave their arguments for and against this viewpoint. An additional outcome of this study was that the authors categorized the children based on social-interaction styles; the socially-aloof child who remains withdrawn in all situations; the passive child who will not initiate social contact themselves, but will do so when invited into games or other social interactions; and the active, but odd child who makes social approaches, but the behaviours exhibited were inappropriate and revolved around their own preoccupations. Wing (1997) later added a fourth category, a subtle form of the triad, that she calls ‘the loners’, who were defined as individuals with average, high or outstanding ability and fluent speech, who tend to prefer solitude, lack empathy, and are concerned with their own interests. Most achieve academic excellence and can learn to adapt to social situations if needed, by cognitively learning the rules of social interaction by rote.

Based on the substantial revisions to the DSM-V criteria for ASD, the terms AS, PDD-NOS and AD were officially discontinued, and the three diagnoses were subsumed under the singular umbrella term ASD. However, persons having received one of these
diagnoses under an earlier version of DSM will remain having this earlier diagnosis recognised. To warrant a diagnosis of ASD according to the DSM-V, the individual would have to meet all stated criteria: A: persistent deficits in social communication and interaction across contexts, not accounted for by general developmental delays; and B: restricted and repetitive patterns of behavior, interests, or activities. For the first time sensory difficulties; hypo or hypersensitivity to aspects of the environment, is explicitly included in diagnostic criteria under criteria B.

A universal onset criterion is proposed such that symptoms though present in childhood may not become obvious until social demands exceed underlying deficiencies; this is not age limited. Additionally, the requirement of a delay in language development is no longer necessary for a diagnosis. Clearly, the DSM-V incorporates a dimensional approach to ASD, and requires that a severity rating be applied for both domains A and B, ranging from ‘Level 1: Requiring Support’ to ‘Level 3: Requiring Substantial Support’. A description of severity ratings is presented in Table 1.3.
Table 1.3  
**Severity Levels for Autism Spectrum Disorder**

<table>
<thead>
<tr>
<th>Severity Level</th>
<th>Social Communication</th>
<th>Restricted, repetitive behaviours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level 3</strong></td>
<td>Severe deficits in verbal and nonverbal social communication skills cause severe impairments in functioning, very limited initiation of social interactions, and minimal response to social overtures from others. For example, a person with few words of intelligible speech who rarely initiates interaction and, when he or she does, makes unusual approaches to meet needs only and responds to only very direct social approaches</td>
<td>Inflexibility of behavior, extreme difficulty coping with change, or other restricted/repetitive behaviors markedly interfere with functioning in all spheres. Great distress/difficulty changing focus or action.</td>
</tr>
<tr>
<td><strong>“Requiring very substantial support”</strong></td>
<td>Marked deficits in verbal and nonverbal social communication skills; social impairments apparent even with supports in place; limited initiation of social interactions; and reduced or abnormal responses to social overtures from others. For example, a person who speaks simple sentences, whose interaction is limited to narrow special interests, and how has markedly odd nonverbal communication.</td>
<td></td>
</tr>
<tr>
<td><strong>Level 2</strong></td>
<td>Inflexibility of behavior, difficulty coping with change, or other restricted/repetitive behaviors appear frequently enough to be obvious to the casual observer and interfere with functioning in a variety of contexts. Distress and/or difficulty changing focus or action.</td>
<td></td>
</tr>
<tr>
<td><strong>&quot;Requiring substantial support&quot;</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Severity Level</td>
<td>Social Communication</td>
<td>Restricted, repetitive behaviours</td>
</tr>
<tr>
<td>----------------------</td>
<td>---------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Level 1</strong></td>
<td>Without supports in place, deficits in social communication cause noticeable impairments. Difficulty initiating social interactions, and clear examples of atypical or unsuccessful response to social overtures of others. May appear to have decreased interest in social interactions. For example, a person who is able to speak in full sentences and engages in communication but whose to-and-fro conversation with others fails, and whose attempts to make friends are odd and typically unsuccessful.</td>
<td>Inflexibility of behavior causes significant interference with functioning in one or more contexts. Difficulty switching between activities. Problems of organization and planning hamper independence.</td>
</tr>
</tbody>
</table>
Concerns are raised over such revisions which could sacrifice sensitivity for specificity of diagnosis, leaving more cognitively-able individuals in the higher functioning end of the ASD spectrum and/or existing Asperger’s diagnoses failing to meet the criteria to warrant a diagnosis. The import of this is that it could significantly alter the composition of those meeting the criteria of ASD and accordingly prevalence rates may drastically shift. Other negative repercussions would be reduced comparability of post DSM-V studies to research where DSM-IV and ICD-10 (International Classification of Diseases) criteria underpin diagnoses, leading to potential misinterpretation of the wealth of ASD studies to date. Public-health ramifications could range from already limited therapeutic resources stretched to cover expanding diagnostic boundaries to lost entitlement to deserving individuals (McPartlan, Reichow, & Volkmar, 2012).

1.2.3. Prevalence

Epidemiological studies of ASDs started first in England in the mid-1960s (Lotter, 1966) and since then have been undertaken in many countries. Overall, epidemiological surveys have relied on a categorical approach to diagnosing ASD, which shifted across time based on the set of criteria operational at the time. However, irrespective of which DSM criteria was effective at the time, a common agreement in terms of definition of ASDs is that it is characterized by a triad of impairments in the social, communicative, and imaginative domains (Barlow & Durand, 2011), and gives rise to a mystifying and sometimes debilitating condition that is related to some unusual cognitive strengths and behavioural idiosyncrasies and an inherent dysfunction underlying affective engagement (Eisenberg & Kanner, 1956). While some children with
ASD can be easygoing, others can be disruptive; their interests can be unconventional for
children their age, where some may exhibit odd penchants such as making repetitive
sounds or motions, or recount different subway routes or time-tables. This section
reviews the current prevalence rates of ASD, and demographic correlates of ASD,
namely socio-economic status and gender distributions.

Kanner, when he first diagnosed autism in 1943, assumed it was rare (Wing,
2002). But this view has dramatically changed owing to an explosive rise in ASD-
prevalence estimates across race, ethnicity and socioeconomic status during the past 2
decades. Where earlier the incidence of ASD was 2-5 per 10,000 (Howlin, 2002),
currently 1 in 50 (200 per 10,000) children are being diagnosed with ASD (Blumberg et
al., 2013), earning ASD a national epidemic status in the USA, as mentioned in Autism
speaks (2010). This is nearly a 100-fold increase. Such increases in ASD diagnoses have
been observed in other parts of the world as well with current estimates at approximately
1:100-160, which is a 15-fold increase from studies published half a century ago (Blaxill,
2004; Prior, 2003).

There are however differences in the prevalence rates of ASD across countries, as
demonstrated in Table 1.4. ASD epidemiological surveys outside of North America and
Europe generally indicate rates that are lower than those commonly reported.
Methodological factors may be partly responsible for such variance, where common
concerns among researchers in Asia include choice of diagnostic criteria and diagnostic
methods (Zaroff & Uhm, 2012). Other hypothesized reasons for these differences are
socioeconomic variables such as language-barriers, income discrepancies between
different ethnicities, poor medical infrastructure (Weinick & Krauss, 2000), social-
support differences during pregnancy between communal and individualistic communities (Collins, Dunkel-Schetter, Lobel, & Scrimshaw, 1993), and the potential influence of cultural-specific social cognitive processing styles (Wang & Fivush, 2005), cultural norms and stigma (Liu, Wellman, Tardif, & Sabbagh, 2008), and these variables may be undermining prevalence rates of ASD in developing countries.

Table 1.4.

<table>
<thead>
<tr>
<th>Study</th>
<th>Site</th>
<th>Prevalence of ASD per 10,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baron-Cohen et al. (2009)</td>
<td>United Kingdom</td>
<td>157.0</td>
</tr>
<tr>
<td>Center for Disease Control and Prevention (2014)</td>
<td>United States of America</td>
<td>147.0</td>
</tr>
<tr>
<td>Gillberg et al. (2006)</td>
<td>Sweden</td>
<td>80.5</td>
</tr>
<tr>
<td>Icasiano et al. (2008)</td>
<td>Australia</td>
<td>39.2</td>
</tr>
<tr>
<td>Eapen et al. (2007)</td>
<td>United Arab Emirates</td>
<td>29.0</td>
</tr>
<tr>
<td>Wong &amp; Hui (2008)</td>
<td>China</td>
<td>16.1</td>
</tr>
</tbody>
</table>

Whether ASD is truly on the rise or the rise is an artifact of diagnostic dynamics and increased surveillance (Fombonne, 2005; Rutter, 2005), remains controversial. However, it may also partly reflect a genuine increase in the incidence of ASD (Newschaffer et al., 2007). Different explanations have been postulated for the rising trend, among which environmentally-driven factors such as environmental toxins and/or changes in reproductive practices are impugned (Barrett, 2004). Research efforts to uncover the etiology underlying this complex disorder remain frustratingly elusive to date (Amaral, Schumann, & Nordahl, 2008), but a world-wide consensus exists in that what
once was considered to be a relatively rare syndrome, is today one among the most common developmental disorders.

1.2.4. Demographics

**Socioeconomic status (SES).** There has been a notion that individuals with ASD are mostly from an affluent and well-educated background (McCarthy, Fitzgerald, & Smith, 1984), and such thinking dates back to Kanner’s observations regarding his sample (Kanner, 1943). However, more recent epidemiological studies have debunked the idea that there is an association between ASDs and SES (Larsson et al., 2005; Fombonne, 2003). Any association that may have been suggested earlier between ASD and SES could likely be an outcome of referral and diagnostic biases, including screening resources, their availability to certain communities and their affordability.

**Sex-ratio.** Kanner’s (1943) study of a small group of children with “autistic disorder” described seven boys and four girls, while Asperger (1944) originally believed that no girls were affected by the syndrome, although clinical evidence later caused him to revise this statement. One of the most consistent findings that has been robustly demonstrated despite changes in diagnostic classifications over time, is a higher rate of ASD diagnoses in males than females, where on average, males are 4 times more likely to have an ASD diagnosis than females are both among clinical samples and population studies (Werling & Geschwind, 2013). A male preponderance is not unique to ASD and such trends are noted in other intellectual and behavioral developmental disorders as well (Pinborough-Zimmerman et al., 2007). The sex bias within ASD might be moderated by one’s IQ, such that the sex bias evens out at the lower end of the IQ range, with the most
extreme sex differences found among high-functioning cohorts with a higher IQ (Baio, 2012). The sex bias may be further compounded by a lower mean IQ among girls with ASD that are identified in scientific research studies compared to the males (Frazier et al., 2014). Taken together, this suggests that at least some of the reported differences in the prevalence rates of males to females in ASD can be attributed to ascertainment procedures (Zwaigenbaum et al., 2012).

While overall, males tend to be more susceptible to organic damage than girls, whether through hereditary, acquired infection or other conditions, considering that ASD has an organic base, it is reasonable to expect increased male vulnerability (Zahn-Waxler, Shirtcliff, & Marceau, 2008). Asymmetrical gender-ratios in ASD have played an important role in speculation about how sex differences may be relevant to different etiological and/or developmental mechanisms underlying ASD. The finding that females with autism may be more intellectually-impaired than males seemed suggestive that females would require a higher threshold of genetic vulnerability to result in an affected phenotype and would therefore be affected less often but more severely (Tsai & Beisler, 1983). Some studies contradict this (Pickles et al., 1995; Szatmari et al., 2007), though some support it (Posserud, Lundervold & Gillberg, 2006). Various hypotheses have been proposed for the gender bias in ASD, and some of these are examined below.

**Female Camouflage hypothesis.** The male bias could possibly be reflective of the difficulty of diagnosing ASD in females, who may present with a different profile. Though LFA might be more easily diagnosed in females, HFA and AS could be missed, if it presented as some other condition, such as anorexia (Oldershaw, Treasure, Hambrock, Tchanturia, & Schmidt, 2011) or borderline personality disorder (New,
Both Triebwasser, & Charney, 2008), both of which share common manifest behaviours that involve the exercise of extreme control over the environment and/or people close to them, and a certain degree of narcissism. Similarly, females could be under-diagnosed if in comparison to males, they may be more motivated and better at camouflaging their difficulties and conforming socially by “pretending to be normal” (Willey, 2014). Hence, a girl with ASD, owing to a more even profile of social skills may be able to develop reciprocal dialogue, social-use of affect, non-verbal use of body-language and eye gaze, which would place her under the radar when compared to the more ASD-male typical phenotype, thus averting a diagnosis, and simply be missing from the statistics (Attwood, 2006; Ehlers & Gillberg, 1993). However, under the façade of ‘normalcy’ and with the effort invested in ‘masking’ of symptoms, females with ASD report high levels of stress and anxiety in ‘keeping up the act’ (Attwood, 2006).

**Skewed diagnostic criteria.** A male bias in ASD might merely reflect the inability of the widely used diagnostic instruments such as the Autism Diagnostic Observation Schedule (ADOS) or Autism Diagnostic Interview (ADI), to capture female presentations of ASD, as the diagnostic criteria for ASD are male-orientated and based on the behavioural characteristics of boys, who are often more noticeably disruptive. The ADOS was normed on predominantly male samples, with almost no girls (Lord et al. 2000). Indeed, the ADOS and the ADI are additionally insensitive to girls at ages they are likely to be diagnosed at; when they are older or in their adolescent years, when social pressures may overcome compensatory behaviors the ADOS is also insensitive to girls at ages they are likely to be diagnosed at; older children and younger adolescents (Mazefsky & Oswald, 2006; Kopp, Kelly, & Gillberg, 2010). Furthermore, the Revised (ADI-R) does
not reliably identify HFA-ASD females. Moreover, Lord et al. (2000) report no gender specific results, so it remains impossible to assess how well the ADOS related to females in the norming sample.

**The Foetal Testosterone (fT) Theory.** Asperger (1944) noticed that the autistic personality is an extreme variant of male intelligence. The Extreme Male Brain (EMB) theory is a cognitive model (Baron-Cohen, 2002) that relates to the premise that there are two mental dimensions or cognitive profiles that exist within the population on a continuum, which classifies individuals as possessing a Systemizing profile, an Empathizing profile or something in between these two poles. Systemizing is the ability to comprehend and develop the rules of a system (mechanical, natural and/or abstract types) and requires deductive and analytical skills. Empathizing, on the other hand relates to understanding human emotion and behaviour, this ability requiring social and communication skills. On average, parental reports for children (Auyeung et al., 2009) and self-reports for adults (Baron-Cohen & Wheelwright, 2004) suggest that females score higher on measures of empathy and males score higher on measures of systemizing.

The EMB theory posits that ASD-characteristic behaviour is an exaggeration of male-typical sex differences, where individuals with ASD possess a hypermasculinized cognitive profile defined by extreme systemizing as their fixation with patterns and detail-oriented behaviour can be related to this aspect, while their impairments in social communication can be explained by a deficit in empathizing. Whilst socialization and life-experience may account for some of the observed sex differences, a biological factor implicated in this hypermasculinization is foetal testosterone (fT). fT theory posits a masculinisation of the brain through prenatal testosterone exposure, explaining sex
differences in presentation. Recognising this neurohumeral exposure as etiologically important and thus epidemiologically influential, is necessary, as it is a risk factor for ASD itself (Baron-Cohen, 2002). Such EMB-type behaviours can be enormously useful in certain areas of life such as engineering and science, where attention to detail and focused-attention may be more valuable than social skills.

Animal studies with rodent models confirm that early exposure to sex steroid hormones such as testosterone, act on the brain to direct formation of sexually-dimorphic circuits that produce sex differences in behaviour, cognition, and function (Simerly, 2002). It is widely accepted that fT has similar effects in humans (Baron-Cohen, Knickmeyer, & Belmonte, 2005). Serum testosterone levels peak in human male foetuses between weeks 14 to 20 of gestation, during which time brain masculinization processes take place (Hines, Brook, & Conway, 2004). Since amniocentesis is done during this same period (the second trimester of pregnancy), it presents a unique opportunity to study any relationship of fT to ASD traits. Accordingly, research has confirmed a correlation between higher fT levels and an increase in autistic traits, as presented in Table 1.5.
Table 1.5

*Studies assessing the relationship between foetal testosterone and autistic traits*

<table>
<thead>
<tr>
<th>Study</th>
<th>Sample</th>
<th>Finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auyeung, Ashwin, Knickmeyer &amp; Taylor, 2010</td>
<td>Mothers of 118 boys and 117 girls</td>
<td>Positive correlation between fT and autistic traits as measured by the Child Autism Spectrum Quotient (AQ, $r = .41$, $p &lt; .01$) and the Child Autism Spectrum Test (CAST, $r = .25$, $p &lt; .001$)</td>
</tr>
<tr>
<td>Chapman et al., 2006</td>
<td>100 boys and 93 girls, aged 6 to 9 years</td>
<td>Negative correlation between fT and empathy as measured by performance on the Empathizing Quotient- Child Version measure ($r = -.28$, $p &lt; .01$, $d = 1.85$) and negative correlation between fT and Reading the Mind in the Eyes Task- Child Version ($r = -.43$, $p &lt; .01$, $d = 1.21$)</td>
</tr>
<tr>
<td>Knickmeyer, Baron-Cohen, Raggatt &amp; Taylor, 2005</td>
<td>25 boys, 14 girls, aged 4.0 to 4.25 years</td>
<td>Negative correlation of fT in human social development. Females used more affective terms than males, $d = .82$, while males used more neutral terms, $d = 0.63$, when viewing animations suggestive of social relationships and psychological motivations</td>
</tr>
<tr>
<td>Lutchmaya, Baron-Cohen, &amp; Raggatt, 2002</td>
<td>40 girls and 47 boys, 18 to 24 months</td>
<td>Girls demonstrated larger vocabulary than boys at both ages; negative correlation between fT and vocabulary size, $d = 0.4$</td>
</tr>
<tr>
<td>Lutchmaya, Baron-Cohen, &amp; Raggatt, 2002</td>
<td>29 girls and 41 boys, 12 months</td>
<td>Girls made more eye-contact than boys; negative correlation between fT and eye-contact, $d = 0.4$</td>
</tr>
</tbody>
</table>
The reliability with which findings indicate a negative correlation between fT and social domains, and a positive correlation with non-social domains, across development, supports the notion of an “organizational” sexually-dimorphic role for fT on brain development, shaping neural mechanisms underlying communicative development (Lutchmaya, Baron-Cohen, & Raggat, 2002), and thus likely confer a male bias in ASD.

**The X-chromosome theory.** Alternative biological theories proposed to explain the sexual dimorphism in ASD are the X and Y chromosome theories. Among the two chromosomes, the X chromosome contains more genes that are expressed in the brain (Disteche, 2006). Evidence from two genetic syndromes that are comorbid with ASD more often than probable by chance alone, namely Turner’s syndrome (Skuse, 2005) and Fragile X-syndrome (Bailey, Raspa, Olmsted, & Holiday, 2008), support the hypothesis that certain loci on the sex-linked X chromosome contribute to increased susceptibility to ASD. Females have two X-chromosomes, and are afforded protection from the effects of a putative abnormal X-chromosome, as they may have one healthier X-chromosome from which to develop, while males lack this protection. However, genetic linkage studies have failed to find any conclusive evidence related to the X chromosome (Weiss, Arking, Daly, & Chakravarti, 2009), and it could be reasoned that any co-morbidity between ASD and both Turner’s syndrome and Fragile X-syndrome may be stemming from shared neural-substrate abnormalities rather than by shared chromosomal etiologies (Boucher, 2009; Sybert & McCauley, 2004).

A different account of the X-chromosome theory of ASD draws on the theory of X-chromosome inactivation, where one of the two X-chromosomes for females is randomly suppressed while the other remains active. This mechanism is posited to negate
the ‘measure-difference’ in X-chromosomes between the sexes. However, it is supposed that 10-15% of genes may continue to be expressed from the inactive X-chromosome (Baron-Cohen et al., 2011). This hypothesis was directly tested in a sample of 543 mothers of children with ASD and in a sample of 163 young females diagnosed with ASD, and compared against two control groups matched for age (144 adult females and 40 young females). Results indicated no significant excess of skew in X-chromosome inactivation in families with ASD (Gong et al., 2009). Conflicting findings were reported when this theory was tested by Talibezadeh et al. (2002), who examined mothers of affected children and affected girls and found a significant excess of X-chromosome inactivation skewing among females in the ASD group (10 of the 30, 33%) when compared to controls (4 out the 35, 11%), suggesting that the patterns of X-chromosome inactivation are not the same in females with ASD compared to controls.

X-chromosome gene dosage could play an important role in ASD, if the non-silenced genes have a protective effect. However, comparing the incidence of ASD across different sex aneuploidies is not suggestive of a simple dosage effect. Of interest is that ASD often co-occurs with learning difficulties, which are recognized as a risk factor for ASD (Wind & Gould, 1979). More than 10% of those with learning difficulties demonstrate an X-linked pattern of inheritance (Laumonnier, Cuthbert, & Grant, 2007), involving mutations in over 90 different X-linked genes (Gécz, Shoubridge, & Corbett, 2009). Thus, any examination of the X-chromosome theory would best be conducted if these two conditions were examined separately (Baron-Cohen et al., 2011). It should be remembered that about 90% of all cases of ASD come from families where they are the
only affected member, suggesting X-chromosomal theories at best may account for a limited proportion of all cases (Constantino et al., 2010).

**Genomic imprinting.** Genomic imprinting attempts to explain the sexual dimorphism demonstrated in ASD. This process is known to play a vital role in normal development, where genetic effects are influenced based on whether the genes are transmitted paternally or maternally (Keverne, 1997). Generally, this would not affect sex-ratios in any given condition, but could become a possibility if imprinting affects the X-chromosome. This model hypothesizes that an imprinted locus on the X-chromosome that is protective in nature, influences phenotypic expression. It is proposed that there exists an imprinted locus on the paternal X-chromosome and since only females inherit the paternal X-chromosome, these female carriers are conferred an increased threshold for phenotypic expression of ASD-related traits, compared to males who do not receive this imprinted X-chromosome (Skuse, 2000). As the rate of social difficulties among women with Turner’s syndrome has been found dependent upon the parental source of their single X-Chromosome (Skuse et al., 1997), it follows there appears to be some epigenetic imprinting involved in social function. Women who inherit their maternal X-chromosome are found to have more and greater social problems relative to those who inherit the paternal X-chromosome. While typical females inherit one X-chromosome from each the father and the mother, males always inherit the maternal X-chromosome. By extrapolation, since males lack this extra protection afforded to females via the protective X-chromosome locus inherited from their fathers, the number of males affected with ASD is greater (Skuse et al., 1997). Lord and Schopler (1987) have outlined several possible mechanisms for the transmission of autism on the sex-linked X-
chromosome, and also for autosomal transmission (i.e., involving non-sex chromosomes). However, these are currently theoretical models without any empirical evidence. Involvement of the X-chromosome in ASD while ambiguous cannot be excluded at this stage either.

**The Y chromosome theory.** The Y chromosome theory of male excess in ASDs is underpinned on research that demonstrates an increased risk of ASD among those males with XYY and XXYY aneuploidies (Serajee & Huq, 2009). Males with sex chromosomal aneuploidies are known to have inconsistencies in their developmental profile with a common occurrence of expressive language deficits. Subsequently, they have an increased likelihood of language-based learning deficits and social-emotional problems that persist through the developmental trajectory, increasing their vulnerability to ASDs (Visootsak & Graham, 2009). Two studies compared Y type haplotype groups between controls and those individuals with ASD to identify Y-effects and found conflicting results, one finding significant differences (Serajee & Huq, 2009) and other inconclusive (Jamain et al., 2002). With current evidence so sparse to evaluate the mechanisms at play in ASD, further research into Y chromosome effects are merited.

**Reduced penetrance in females.** Gene-mapping studies have identified cells having an abnormal number of copies or copy number variants (CNVs) of neuronal genes of patients with ASD (Szatmari et al., 2007), which are structural variations or one or more regions in cell-DNA (Sebat et al., 2007). CNV’s are either inherited from a parent or arise as de novo mutations via duplication, deletion, translocation or inversions of a chromosomal region. The model of reduced penetrance in females proposes that a significant proportion of ASD diagnoses are the result of dominant de novo mutations on
the autosomes which for reasons yet unclear, have high penetrance in males and relatively poor penetrance in females (Zhao et al., 2007).

**Sex-specific serum biomarkers in Asperger’s syndrome.** Immunologic assays profiled blood-serum from adults with AS ($N = 45$) and control subjects ($N = 50$). Results demonstrated distinct sex-specific blood-serum biomarkers for male and female adult-subjects (Schwarz et al., 2011). While this study does not directly explain the male bias in ASD, it does provide evidence in support of the different underlying mechanisms for ASD in males and females. Males revealed altered levels of 24 biomarkers including cytokines and other inflammatory molecules, while ASD females showed altered levels of 17 biomarkers including growth factors, hormones such as growth hormone, androgens and insulin-related molecules. Classification of males and females into their respective ASD and control groups using each group’s sex-specific biomarker-profiles produced marked results, while testing males and females using the opposite-sex’s biomarkers did not result in a separation between ASD and control groups, suggesting that understanding the etiology of ASD would be clearer by stratification by sex (Schwarz et al., 2011).

Despite a growing body of research, the etiology of ASD remains obscure, lacking a clear unifying pathology at the molecular, cellular and systems level. Aetiological speculations have oscillated back and forth in vain from biological to psychological theories. Some of these theories are discussed in the next section.
1.3 Aetiology of ASD

Akin to most psychological conditions, the diagnosis of ASD is currently phenomenologically arrived at, based on observable and reproducible behavioural phenomena, these behaviours hypothesized as being the “end-points” of highly complex biological systems. With a condition as complex and variable in presentation as ASD, it would be misguided to search for one primary deficit that could explain the several different manifestations, but more fruitful to consider the interplay of a range of several distinct aetiologies and pathophysiological underpinnings; genetic, immunological, neurological, and environmental; this reality posing great challenges in identifying mechanism-based treatments.

Some of the more prominent theories attempting to explain the conundrum that represents ASD are presented in this section. Each of these theories comes with their persuasive features and their shortcomings. ASD which was once considered a condition of purely psychogenic origin is today more realistically recognized as having a strong biological component with an enigmatic polygenetic architecture, upon which biopsychosocial forces act upon to contribute to its individual course and life-outcome (Goldstein, Ozonoff, Cook, & Clark, 2009).

1.3.1 Psychological theories

“Refrigerator mothers”. Autism was diagnosed and became eminent against the backdrop of Freudian psychodynamic thinking. Among the many factors that were considered in the etiology of autism were maternal attitudes where the schizophrenogenic mother was blamed for her cold and professional parenting style giving rise to the
popular “refrigerator mother” theory. This cruel parental culpability myth implicated a psychogenic cause for autism and was widely accepted at the time, and served to inflict guilt on parents and impede scientific progress of research into understanding the causes of autism. The repercussions of such misinformation are still felt by parents against the sway over diagnosis. However, through the 1960’s and 1970’s there was a scientific swing away from psychodynamic theories as research sought to generate testable theories based on scientific evidence, and the “refrigerator mother” theory was systematically challenged and began to lose credibility (Rimland, 1964).

As demonstrated by Wing and Gould (1979), impairments in socialization, communication, and imagination cohere. In an attempt to better explain these co-occurring symptoms, it has been suggested that a single cognitive deficit could underlie this triad. Presently there are three main psychological explanations that are implicated in ASD-type cognitions and behaviours.

Theory of Mind (ToM). To have a ‘theory of mind’ (ToM) is to be able to attribute independent mental states to oneself and to others in order to deduce the contents of one’s thoughts or ‘mind-read’ and subsequently predict behaviour (Premack & Woodruff, 1978). It is essential for human social interaction and plays a significant role in moral-reasoning (Waytz, Gray, Epley, & Wegner, 2010), making our ToM a cornerstone in our capacity to effectively adapt to a variety of complex social situations. Together, Baron-Cohen, Leslie and Frith (1985) in their landmark study, reformed the focus and trend of research into the causes of ASD, by proposing that individuals with ASD have an impaired ToM and argued that this could be the main cause of social and communication deficiencies in ASD. Specifically, if one lacks an understanding of
another’s knowledge and beliefs, such a person would be socially impoverished and communicatively egocentric in their perspectives. Baron-Cohen et al. (1985) attributed these cognitive disturbances in individuals with ASD to a lack of a capacity for meta-representation. Meta-representations are the ability to represent in one self’s mind another individual’s false belief as separate from their own true belief; or alternatively someone else’s unawareness of a particular fact or incident as separate from their own understanding of a particular fact/incident (Leslie & Roth, 1993). This hypothesis was explored by Baron-Cohen et al. (1985) in false-belief tests such as the classic Sally-Ann task (Wimmer & Perner, 1983), where typically-developing children (N=27) and children with Down’s syndrome (N=14) were tested against children with ASD (N=20). In this scenario, two dolls are posed as actors for the world; Sally and Ann. Sally places a marble in a basket then leaves the room, at which point Ann removes the marble from the basket, and conceals it in an adjacent box. When children were asked about where Sally would look for her marble, the control group correctly pointed to the old unchanged position of the marble, the basket (as Sally would have no way of knowing that anyone had changed its position and act on her false belief), the children with ASD all pointed to the new changed position of the marble, the box.

While research findings indicate that young children with ASD fail at false-belief tasks, reports are less straightforward with regards to more advanced ToM tasks with older individuals with ASD of normal intelligence, or HFA. Scheeren, Rosnay, Koot and Begeer (2012) found that school-aged children and adolescents, aged between six to twenty years (N= 194) with HFA were able to perform at the same level of their TD peers (N= 60) on advanced mental reasoning, but that they may still fail to apply the theoretical
reasoning that was employed to solve the tests, in real life everyday social interactions. Moreover, Senju (2012) suggested that the failure of children with ASD in the standard false-belief tests may be due to the cognitive demands of the test and difficulties with pragmatic understanding, rather than an incapacity to ‘mind-read’. Concurrently, Happé (1995) conceded that children with autism ($N=70$) who had higher verbal skills do pass the standard false belief test.

However, while the mind-blindness theory provides some understanding for the social handicaps evidenced in ASD, it does not shed light on features such as insistence on sameness and stereotypical mannerisms. Additionally, the theory fails to meet the specificity criterion in that non-autistic deaf children are delayed in being able to pass the test (Peterson & Siegal, 1995) and non-autistic individuals with intellectual deficiency may never acquire ToM (Giaouri, Alevriadou, & Tsakiridou, 2010). Another limitation with the theory is that it does not satisfy the primacy criterion. While the ToM is not observed with younger TD children under the age of 4, many of the social impairments typical to the child with ASD, such as lack of gaze following or joint attention are apparent in children with ASD from early infancy (Frith, 1989). Impaired ToM therefore loses its explanatory power to explain these early occurring deficiencies. Thus, while ToM may be a convergence point on the causal pathway to ASD, there could well be other more fundamental processes at work. Other psychological theories attempt to address some of these gaps in the etiology of ASD.
**Executive Functioning (EF) theory.** Numerous independent investigations within cognitive neuropsychological research have identified a pattern of cognitive disabilities amongst individuals with ASD that relate to deficits in executive functioning. Executive functioning (EF) is the ability that allows one to maintain an appropriate problem-solving repertoire of component mental-processes for the purpose of some future goal-attainment; it includes processes such as planning, impulse-control, inhibition of pre-potent responses that are no longer relevant for the task at hand, the initiation and generation of new ideas and activities, and flexibility of thought and action and attentional set-shifting (Duncan, 1986). Another strategy employed to ascertain the causal relationship of EF impairments in ASD is to investigate close relatives of individuals with ASD (Bailey, Palferman, Heavey, & Le Couteur, 1998). Research points to hereditary links between ASD and EF impairments (Bailey et al., 1998), where both parents (Hughes, Leboyer, & Bouvard, 1997), siblings of children with ASD (Ozonoff, Rogers, Farnham, & Pennington, 1993), and stereotypies in behaviour that are believed to be strongly associated with EF (Turner, 1997) occur more often among relatives of those with ASD than among relatives of those with other neurodevelopmental disorders (Bolton et al., 1994).

There have been parallels drawn between EF deficits in ASD (Bishop, 1993; Ozonoff & McEvoy, 1994) and a similarity of behaviours seen in individuals with ASD and those with acquired frontal lobe lesions; children with autism often become severely distressed over changes in their environment. Many may additionally demonstrate a perseverative behaviour or narrow, restricted and stereotypical behaviour, taken to indicate a mental inflexibility, in addition to impaired inhibition of a prepotent response. Rumsey and Hamburger (1990) tested for such cognitive rigidity using the Wisconsin
card-sorting task and found that individuals with autism ($N=10$) were significantly more perseverative than age and IQ-matched controls ($N=25$). However, there is some skepticism over the universality of EF impairments, where the proportion of those individuals with ASD who score significantly lower than TD individuals may be no greater than 50% on some EF tasks (Pellicano et al., 2006). Furthermore, EF deficits may not be specific to ASD, and is seen in other developmental disorders such as attention deficit hyperactivity disorder (ADHD) (Grodzinsky & Diamond, 1992), Tourette syndrome (Baron-Cohen, Cross, Crowson, & Robertson, 1994), and Conduct Disorder (Chelune, Ferguson, Koon, & Dickey, 1986). Thus, EF tasks offer good sensitivity but poor specificity and thus are criticised for their poor discriminant validity (Burack, Charman, Yirmiya, & Zelazo, 2001). Researchers have been known to argue over whether the EF theory is of primary etiological significance in ASD or whether it is merely a secondary consequence of ASD, that becomes manifest along the developmental trajectory of the child (Yerys, Hepburn, Pennington, & Rogers, 2007). EF skills develop quite late even in TD children in adolescence. The theory then would not offer any clear account of how difficulties are apparent from 18 months or earlier relate to EF deficits (Yerys et al., 2007).

However, when an information-processing approach is adopted, where specific rather than global measures of performance are assessed for, both quantitative and qualitative distinctions can be established between different clinical groups (Ozonoff, Pennington, & Rogers, 1991). Individuals with HFA demonstrate more perseverative styles of responding on the Wisconsin Card Sorting test (which tests for mental flexibility in reaction to changes in the rules of the game) when compared to TD controls and
individuals with ADHD (Szatmari, Tuff, Finlayson, & Bartolucci, 1990) and dyslexia (Rumsey & Hamburger, 1990). However, Broadbent and Stokes (2013) found with TD subjects ($N=50$) and subjects with HFA ($N=50$) when the Wisconsin Card Sorting test rules are modified so that only positive feedback is provided for correct performance, individuals with HFA outperform TD individuals, suggesting that processes other than EF are involved.

Some real-life implications of executive dysfunction in individuals with ASD is the link between distinct aspects of EF and problems of sociability and communication (Turner, 1999) as several aspects of socio-communication places significant demands on diverse executive functions such as online processing, rapid attention-shifting, and expectation of obstacles. Kanner’s (1943) suggestion that there exists a link in autism between problems in sociability and cognitive flexibility is drawn on their emphasis on “aloneness” and “preservation of sameness”. Wing and Gould (1979) further confirmed that restricted interests and repetitive activities always co-occur with social impairment. For example, individuals with ASD inappropriately repeat or persevere recurrently on a sequence-generation task (not unlike stereotypies in behaviour) and fail to switch attention away from a previously salient response which is inappropriate to newer tasks (which can be likened to circumscribed interests or intricate verbal rituals).

Furthermore, longitudinal studies suggest that EF may be a fundamental contributor to the development of ToM skills both in TD children (Hughes & Ensor, 2007), and in children with ASD (Pellicano, 2007). Newer intervention studies have demonstrated that gains in EF can translate into reduction of deficits in other domains (Fisher & Happe, 2005), supporting the notion that ASD is underpinned by a
constellation of deficits rather than by any single impairment (Bailey, Palferman, Heavey, & Le Couteur, 1998).

**Weak Central Coherence.** Central coherence is a perceptual-conceptual ability that enables one to ‘see the bigger picture’ and extract the “gist” and gestalt in information-processing (Frith, 1989). While the EF theory accounts for the challenges individuals with ASD demonstrate in cognitive flexibility and planning, it does not account for their attention to detail or address areas of relative strength found amongst ASD individuals, in particular with visuo-spatial abilities. Frith (1989) attributes this information-processing style peculiar to those with ASD to ‘weak central coherence’ (WCC), or a poor ability to process information holistically when such is called for, but rather to process stimuli locally or in a fragmented style (Rajendran & Mitchell, 2007). According to the WCC theory, individuals with ASD would demonstrate impaired performance on tasks requiring global processing, and such has been found in several studies (Pellicano, Gibson, Maybery, Durkin, & Badcock, 2005), while weak central coherence may contribute towards savant skills and exceptionally superior performance on tasks that benefit from a local processing style (Jolliffe & Baron-Cohen, 1997). There is however disparity among studies and findings are not definite (Mottron, Burack, Iarocci, Belleville, & Enns, 2003).

Event-related potential brain imaging studies suggest that right hemisphere abnormalities may underlie some of the global insufficiencies and local preferences in information processing that are found in ASD (Gallace, Imbornone, & Vallar, 2008). Neural substrates implicated in WCC include abnormalities in the ventral occipito-temporal region, and dorsolateral prefrontal and parietal regions (Ring et al., 1999).
Additionally, another neural mechanism implicated in local processing biases is the functional underdevelopment of connectivity within and between different neural systems in the ASD brain (Happé & Frith, 2006).

Integration deficits stemming from WCC might explain deficits in conceptual-semantic realms of study and provide an understanding for poor task performance relating to context-insensitive pronunciation of homographs, such as the inability to draw together and extract the deeper intent from a speech stream, typical of a social interaction, or even from challenges in bringing coherence to social experience (Frith, 1989). Given that the ToM is proposed as an account for social impairments, studies have tried to find an association between both the WCC and ToM theories. While some studies yielded a positive relationship between performance on central coherence tasks and ToM tasks among children with ASD (Jarrold, Butler, Cottington, & Jimenez, 2000), other studies have failed to find any relationship between the two domains (Happé, 1997; Morgan, Maybery, & Durkin, 2003). Methodological issues may have confounded results, but ultimately any causal relationship between the two theories, WCC and ToM will have to be studied longitudinally.

WCC as an aetiological theory of ASD has been known to lack specificity in that biases in local information processing have been found in other clinical populations such as those with right hemisphere damage, schizophrenia, depression, and William’s syndrome (Happé & Frith, 2006). Moreover, WCC falls short of meeting the universality criteria as it does not appear to be a characteristic of all individuals with ASD (Happé & Frith, 2006).
However, evidence of a WCC has been demonstrated among first-degree relatives of those with ASD (Baron-Cohen & Hammer, 1997), suggesting that WCC may be better conceptualized as a cognitive processing style that is biased to local-processing and reduced tendency to integrate information in ASD, rather than a deficit in global processing (Happé & Booth, 2008).

Minshew, Goldstein, and Muenz (1992), compared 15 adolescents and adults with HFA to 15 gender, age and IQ matched controls on a wide-ranging battery of neuropsychological tests. Individuals with ASD demonstrated superior performance on tasks of low information-processing such as memory and language tasks, rule-learning and visuo-spatial tasks, whereas their performance was deficient on tasks that required complex information processing such as concept formation, problem-solving, complex memory and language. This peculiar cognitive profile of intact simpler abilities and impaired higher-order abilities across similar domains supports the conceptualization of ASD as a disorder of complex information processing, which may be better thought of as a characteristic of ASD across development, rather than presenting as a primary deficit (Williams et al., 2006).

Some of the prominent psychological theories have been described and while they may fall short of satisfying all the evaluative criteria for explaining impairments that comprise the ‘core’ of ASD, they provide invaluable insights into the disorder that eventually help bring science a step closer to unraveling some of the mysteries of ASD. Moreover, integrating the different theories together so as to understand which deficits make themselves manifest at which stage of an individual’s life will aid with developmentally-appropriate treatment interventions tailored to suit the individual’s
particular areas of strengths and weaknesses. The next section covers biological theories and their attempts to shed further light on the enigmatic etiology of ASD.

1.3.2 Neurobiological theories

Given the complexity of the behavioural manifestations of ASD, it is not unexpected that various sites of brain abnormalities were implicated by researchers contributing to this; these include the vestibular system (Ornitz & Ritvo, 1968), the medial temporal lobe (Boucher & Warrington, 1976), the basal ganglia (Vilenski, Damasio, & Maurer, 1981), the thalamus (Coleman, 1979), and the limbic system (Bauman & Kemper, 2005).

Anatomic findings continue to support the notion that ASD has its onset prenatally and that the underlying processes continue into adulthood (Bauman & Kemper, 1994). Presented in the Table 1.6 are the neuropathologies reported by such research and their implications for ASD.
<table>
<thead>
<tr>
<th>Study</th>
<th>Finding</th>
<th>Implication in ASD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assaf et al. (2010)</td>
<td>The default mode network hypothesis posits that the autistic brain demonstrates functional underconnectivity in the medial frontal gyrus, the anterior and the posterior cingulate, and the precuneus when compared to controls.</td>
<td>It is believed that connectivity in ASD is disrupted by reduced pruning, also known as brain overgrowth, which leads to inefficient communication across brain regions</td>
</tr>
<tr>
<td>Just et al. (2004)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Koshino et al. (2005)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bailey et al., 1998</td>
<td>Decreased number of purkinje cells in the cerebellum of 8 brains</td>
<td>Cerebellum plays a role in the regulation of the speed, consistency and appropriateness of mental and cognitive processing and may impact on behaviour, emotional motivation, control and integration of motor and sensory information. These functions are frequently disordered in ASD (Schmahmann, 2001).</td>
</tr>
<tr>
<td>Bauman &amp; Kemper, 1994</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bauman &amp; Kemper, 2005</td>
<td>Post-mortem findings highlight anatomical abnormalities in different regions of the brain; the cells in the hippocampus, amygdala, and entorhinal cortex are smaller in size and more densely packed; reduced number of purkinje cells in the cerebellum, but preserved number of cells in the related inferior olive; abnormalities in the brainstem, where dysgenesis of the facial motor nucleus was seen</td>
<td>Findings from this review along with studies pointing to age-related changes in brain size and volume suggest that the neuropathology of autism begins prenatally and continues postnatally.</td>
</tr>
<tr>
<td>Casanova et al., 2002</td>
<td>Found micro column morphology in areas 9 of the prefrontal cortex and areas 21 and 22 of the temporal lobe smaller, more frequent and less compact in 9 autistic brains</td>
<td>It is suggested that changes in the width of mini-columns could affect the organization and processing of information</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study</td>
<td>Finding</td>
<td>Implication in ASD</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Courchesne et al., 2004</td>
<td>Increased brain size as appearing between 2-4 years of age, possibly due to production of immature myelin during first years of life that may not be fully functional during critical period of development</td>
<td>Myelin disturbances could lead to dysfunctional processing of information throughout the brain</td>
</tr>
<tr>
<td>Kemper &amp; Bauman, 1993</td>
<td>Age-related changes in cell size and increased cell packing density in the forebrain and limbic system, number of neurons in deep cerebellar nuclei, the inferior olive, and the nucleus of the diagonal band of Broca in 8 brains</td>
<td>Changes with age suggests that the pathologic changes in ASD may include an ongoing postnatal process that affects brain connectivity. It is suggested that these changes may represent the autistic brain’s attempt to compensate for atypical circuitry</td>
</tr>
<tr>
<td>Strömland et al., 1994, (Thalidomide study)</td>
<td>86 Swedish adults were exposed to thalidomide in-utero. Only 15 were exposed to thalidomide during critical period (20-24 days after conception), 4 individuals developed autism.</td>
<td>Certain environmental teratogens have been known to increase the risk of ASD when only brainstem neurons are forming. Exposure to thalidomide increased the risk of autism more than 40-fold</td>
</tr>
<tr>
<td>Perkins, McGillivray, Cox, Bittar, &amp; Stokes (2015)</td>
<td>Individuals with ASD have lessened “mirror-like” neural activation when they observe other people’s activities. Mirror neuron differences were found between TD persons and persons with HFA in the frontal cortex</td>
<td>A dysfunctional mirror neuron system may explain the imitation deficits, and socio-cognitive and emotional impairments in ASD.</td>
</tr>
<tr>
<td>Study</td>
<td>Finding</td>
<td>Implication in ASD</td>
</tr>
<tr>
<td>------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Roulet, Lai, &amp; Foster, 2013</td>
<td>Exposure to valproic acid (VPA) during the first trimester of pregnancy is recognized as a possible risk factor for ASD. VPA influences the developing nervous system in utero. VPA neuroanatomical abnormalities in animal models include dose-dependent and time-of-exposure-dependent changes in packing density, number of neurons, and volume in various regions of the brain</td>
<td>Treatment of the mother with VPA resulted in seven-fold increased incidence of ASD or key symptoms of ASD such as language impairment, reduced attention, social deficits and narrow interests.</td>
</tr>
</tbody>
</table>
A neural model of brain dysfunction in ASD must also be able to account for experiential and maturation-related developmental changes as the individual with ASD ages and accommodates to a fluctuating social milieu (Bachevalier & Loveland, 2003). ASD-brain research is typically ‘post-hoc’. Animal models provide an opportunity for better understanding abnormal brain development and its consequences in a-priori fashion. Rhesus monkeys demonstrate social behaviors not unlike humans and with a neural system that is phylogenetically similar to humans (Bachevalier, 2000), this provides opportunities for neurobiological research in ASD. Experimental lesions to the developing amygdala, the hippocampus, the orbitofrontal cortex (OFC) and temporal areas (Bachevalier et al., 2006) demonstrated dramatically lowered social interactions, flat affect, locomotor stereotypies and self-directed activities. Other avenues of research investigated developmental damage in Borna disease virus (BDV)-infected newborn rats for exploring the pathogenesis of ASD, which resulted in behavioural deficits reminiscent of several core features of ASD such as deficient social behaviours, disturbed emotionality, cognitive disturbances, and locomotor stereotypies (Pletnikov, Moran & Carbone, 2002).

In sum, the last few decades have furnished us with a wealth of information about the biological correlates of ASD. Neuroanatomic observations provide an index to assess etiological hypotheses and suggest important pointers for future genetic and neurochemical studies, which should sanction more precise prompt diagnosis and more effective clinical mediation.
1.3.3 Genetic aetiologies

Both Kanner (1943) and Asperger (1944) were struck by the extraordinary intellectual backgrounds of the parents of the children with ASD, and the behavioural peculiarities and related incipient autistic traits the parents seemed to possess. While Kanner drew conclusions on how autism occurred in the ‘upper-classes’, Asperger was convinced that autism “ran in families” and believed firmly in a genetic cause (Frith, 1991). Genetic research over the last two decades supports the significance of genetic factors in the cadence of ASD risk (Rutter, 2000; Zhao et al., 2007).

ASD is considered the most heritable of all neurodevelopmental disorders mainly because of the evidence found in the large difference in concordance rates between monozygotic and dizygotic twins (Veenstra-VanderWeele, Christian, & Cook, 2004). Twin studies demonstrate that monozygotic twins show up to 70% concordance rates (Bailey et al., 1995) and this rate only increases if broader diagnostic criteria are used, a rate that is much higher than that found among dizygotic twins (Steffenburg et al., 1989). Furthermore, having a sibling with an ASD diagnosis escalates the possibility of being on the spectrum 20-fold (Lauritsen, Pedersen, & Mortensen, 2005), suggesting the possibility that ASD can be inherited at least partially from pre-existing genetic variants of ASD among parents.

While it was once considered that the proportion of liability attributable to genetics is 90%, newer studies have shown that genetic factors were overestimated in earlier literature and environmental factors underestimated (Hallmayer et al., 2011). Nonetheless, efforts to identify the genetic mechanism of ASD is frustratingly elusive.
Unlike single-gene disorders, in which a mutation in one gene leads to a pathologic heritable phenotype, ASD is known to be a multiple gene disorder of uncertain mode of inheritance, with several interacting genes of moderate effect on different chromosomes (Sebat et al., 2007; Szatmari, 2009; Schellenberg et al., 2006), and results from genome-wide studies such as the International Molecular Genetic Study of Autism (IMGSAC;1998) confirm this.

Genetic-linkage studies have mapped candidate risk loci but have not yet isolated such loci with any certainty. However, susceptible loci on as many as 15 different genes of moderate effect have been implicated. Based on reported associations between biologic functions of genes and ASD phenotypes, several suspect candidates were studied for individuals with ASD (Buxbaum et al., 2001).

**Chromosome 15.** Duplications or deletions of genes of maternal origin on chromosome 15 on the long arm, 15q, on the regional interval of 11-13 were described as the most common chromosomal abnormalities among individuals with ASD (Cook et al., 1998; Schroer et al., 1998). Occasionally babies are born with either too many duplications of genes in this area, and other times portions of this region are deleted. Such aberrations could occur during cell division; some of which are inherited from parents, while other times they randomly arise anew (de novo) in the foetus. Deletions of genetic material in the region 15q11-13 are associated with Angelman’s Syndrome and Prader-Willi syndrome; and concurrently an increased risk of ASD is also present in people with these syndromes. Duplications of 15q11-13 are the reciprocal to the mechanism of deletions. Babies born with duplications is this region from genes of maternal origin appear to be typically diagnosed with ASD, suffer more severe cognitive
impairment and a severe risk for epilepsy (Schroer et al., 1998). As promising as such discoveries are, they are not conclusive owing to a high frequency of similar gene variants occurring in individuals who do not express an autistic phenotype, perhaps due to incomplete penetrance and/or insufficient interaction between mutated genes. Further studies with larger and more phenotypically homogeneous groups should provide more clues toward identifying ASD-related susceptibility genes (Buxbaum et al., 2001).

**Chromosome 7.** Suggestive evidence exists that the long arm of chromosome 7 (7q) may contain genes relevant to ASD (IMGSAC; 1998). Some of the candidate genes on the 7q that have generated interest are the RAY1 (Vincent et al., 2002), the WNT2, believed to be associated with reduced social interaction (Wassink et al., 2001), the RELN, with suggested associations to developmental brain alterations (Persico et al., 2001), the FOXP2, related to language impairment (Gauthier et al., 2003), the EN2, which plays a role in the development of the brainstem and the cerebellum (both regions are implicated in ASD) (Abrahams & Geschwind, 2008), and the IMMP2L, which has been associated with Tourette’s syndrome, which is further associated with ASD (Petek et al., 2001). However, there is extreme variability among individuals carrying the 7q chromosomal aberrations (Van der Aa et al., 2009) and researchers are forging forward to try and learn more about these susceptibility genes and what it means for ASD in terms of diagnosis and treatment planning (Folstein & Rosen-Sheidley, 2001).

**Genetic Syndromes**

Researchers have been interested and guided by this interest in the study of specific rare Mendelian variants of syndromic and non-syndromic disorders with known
genetic causes, in which a proportion of affected individuals demonstrate autistic features, with the hope that understanding these disorders will shed some light and provide leads into the complex etiology of ASD (Smalley et al., 1988). Two such syndromes are the Fragile X Syndrome (FXS) and Joubert Syndrome (JS).

FXS has a strong association with ASD, such that approximately 2-6% of males with ASD have FXS and ASD (Harris et al., 2008). FXS is caused by a mutation of the FMR1 gene on the X chromosome, which is vital for normal brain development. Individuals with a mutation of the FMR1 gene usually demonstrate intellectual deficiency, ranging from mild to severe. Males are significantly more affected than females with FXS, because they have only one X chromosome, while females are afforded protection by a functional FMR1 gene on their second X chromosome. Approximately 80% of males with FXS when aroused by environmental stimuli, exhibit ‘autistic-like’ behaviours which include hand-flapping, poor eye-contact and perseverative behaviours.

Similarly, features of ASD have been described in up to 40% of patients diagnosed with JS (Joubert Syndrome), making it a significant syndromic disorder related to ASD (Ozonoff, Williams, Gale, & Miller, 1999). JS is a rare genetic disorder that is characterized by the underdevelopment of the cerebellar vermis and a malformed brain-stem. Individuals with JS have been found to have mutations on the AHII1 gene (Abelson’s helper integration 1 gene) which resides on the long (q) arm of chromosome 6 at position 23.3. Two studies have suggested an involvement of this locus with ASD (McCauley et al., 2005; Philippe et al., 1999). Notably, the AHII1 gene has been associated with schizophrenia, suggesting a possible role for AHII1 locus in human
cognition and behavior (Ingason et al., 2007). Results confirm the association between autism and schizophrenia, in terms of overlapping symptoms (Sporn et al., 2004), and common genetic variants observed in both conditions (Walsh et al., 2008). Further study of the neuroanatomical and biological basis of the cognitive and behavioural deficits in JS, including comparison of individuals with and without ASD, will likely provide important indications as to the role of specific abnormalities in the CNS (central nervous system) and their relationship to ASD (Retuerto et al., 2008).

The wide range of presentations and the heterogenic nature of ASD severely challenge genetic study-replication. Replication may be more likely possible with the employment of delineated homogenous phenotypes of ASD. Such selectivity increases the likelihood that the etiology of ASD within these subsets is similar. Large-scale studies such as the Autism Genetic Resource Exchange (AGRE) have been collecting detailed information from multiplex families with a history of ASD. Using genome-wide association, common genetic factors are researched that manifest as particular phenotypes, in an attempt to isolate susceptibility genetic variants and loci. Ultimately, integrating findings from different studies looking at different phenotypes might likely provide a clearer understanding on what the commonalities and what the distinctions are among the different biological pathways involved in ASD.

**Mutational and Non-hereditary genetics**

Few, if any known genetic polymorphism shows a one to one relationship with ASD and geneticists allude to such a phenomenon as incomplete penetrance. With ASD, rising trends over the last two decades (Fombonne, 2009) appear not be just owing to
broadening of diagnostic criteria or heightened awareness (Hertz-Picciotto & Delwiche, 2009). This then would support the importance of environmental contributors to the rising trends, perhaps via a gene-environment interactional mechanism.

Gene-mapping studies have identified an abnormal number of CNVs of neuronal genes of patients with ASD (Szatmari et al., 2007), but limited research precludes drawing any certain conclusions (Geschwind, 2011). Advanced parental age is believed to be one of the factors contributing to such mutations, where ASD is more often diagnosed among offspring of older parents (Durkin et al., 2008). Age-related chromosomal changes due to accumulated bio-hazardous environmental exposures could have mutagenic effects on gametes or time-related increases in point mutations are implicated (Reichenberg et al., 2006).

On the other hand, the relationship between advancing parental age and ASD is also consistent with an increased utilization of assisted reproductive technology (ART) as natural fertility declines (Zachor & Ben-Itzchak, 2011), where apprehensions have been raised over the detrimental nature of the micro-manipulative techniques involved in some of these fertility treatments on embryogenesis (Saha et al., 2009). The concurrent increase in the rates of ASD and the increased utilization of ART has raised doubts as to whether these two simultaneously rising phenomena are related, and accordingly the health and development of children conceived after ART has been investigated in a number of studies, which have been systematically reviewed (Helmerhorst et al., 2004; Jackson et al., 2004). Epidemiological data of varying methodological rigor indicate that ART conceptions are at greater risks than natural conceptions for obstetric adversity and poorer perinatal and natal outcomes and concurrently, children with ASD have an increased risk
for obstetric adversity (Bolton et al., 1997). Literature points to the role of ART as a risk factor for ASD (Zachor & Itzchak, 2011), but the association between the two variables may be primarily explained by adverse natal and perinatal outcomes and multiple births.

1.3.4 Biochemistry

A wide array of neurotransmitter studies postulates that abnormalities in the serotonergic and dopaminergic systems may be contributing to autistic symptomology, the details of which are still not clear (Nakamura et al., 2010; Daly et al., 2014). Repeated findings of elevated serotonin or 5-hydroxytryptamine (5-HT) levels among subjects with ASD and their first degree relatives (Piven et al., 1991; Leboyer et al., 1999), as well as associations between severity of ASD symptoms to levels of 5-HT has led to the hypothesis that a dysfunctional serotonergic system may be a causal mechanism for ASD (Harrington et al., 2013).

More recently, genetic assays and PET (positron emission tomography) have supported the role of a dysfunctional dopaminergic system in ASD. Dopamine affects movement, attention, perception, and a range of social behaviours; each of these functions shows some impairment in ASD. PET scans demonstrated reduced prefrontal dopaminergic activity in the prefrontal cortex in children with autism \((N=14)\) when compared to controls, controlling for individual differences in IQ scores (Ernst & Zametkin, 1997). Furthermore, the role of a dysfunctional dopaminergic system has been confirmed indirectly through the monitoring of the consistent therapeutic benefit of drugs directed at antagonizing dopaminergic receptors in the reduction of levels of some of the most problematic behaviours associated with ASD, such as stereotypy and self-injurious
behaviours (Patzer & Volkmar, 1999), aggression, anxiety, depression and irritability (McDougle et al., 1998). Taken together, findings suggest a role for both serotonin and dopamine systems in ASD, although these findings remain ambiguous and inconclusive (Tassone et al., 2011).

Other research points to another neurotransmitter, gamma-aminobutyric acid (GABA) dysfunction to organize many developmental and clinical key issues in ASD (Dhossche et al., 2002). Firstly, neuropathological post-mortem studies of the brains of individuals with ASD have emphasized consistent abnormalities in the cerebellar system and the limbic system (Kemper & Bauman, 1993), where GABA receptors reside. Secondly, there is increasing evidence that GABA neuronal dysfunction is implicated in mood disorders (Sanacora et al., 1999), anxiety disorders (Goddard et al., 2001) and schizophrenia (Guidotti et al., 2000). These conditions share overlapping symptoms with ASD. A growing body of evidence implicates reelin, a glycoprotein critical to brain development, in the etiology of schizophrenia and ASD (Fatemi, 2001). Thirdly, studies have consistently found abnormalities among individuals with ASD on a specific region on chromosome 15, region 15q11-13 (Lauritsen et al., 2001) which harbours a set of three GABA subunit genes (Buxbaum et al., 2001). GABA is the major inhibitory neurotransmitter in the brain, and acts via the GABA-A receptors. Duplications in this area lead to the formation of an unstable and dysfunctional receptor that potentiates excessive cell-firing resulting in seizures. Furthermore, malfunctioning of any of the GABA receptor genes may impair early development of the brain and may hamper interneuronal communication (Freitag, 2010). This region is also involved in Prader-Willi syndrome (Dyckens, Lee, & Roof, 2011) and Angelmann syndrome (Peters et al., 2004),
which present comorbidly with ASD. It is possible that for some people with ASD, GABA dysfunction is present in certain brain regions, owing to abnormalities of the assembly of GABA subunits into the GABA receptor complex. Fourthly, there may be an association between the frequent occurrence of seizure disorders in ASD and GABA dysfunctionality (Petroff et al., 1996). The role of GABA in ASD is possible, but warrants further research.

Another hormone of interest in ASD that is thought to play a key role in social relationships is oxytocin. Rodent models suggest that mice that have had the oxytocin gene rendered dysfunctional through knock-out gene coding performed significantly poorer than their normal peers in social recognition of mice they were previously socialized with (Ferguson et al., 2000). Re-injecting oxytocin into receptor-rich regions of the brain such as the amygdala (Amaral et al., 2008) re-established social recognition in the knock-out mice.

Children with ASD (N=29) are reported to have lower levels of oxytocin in their blood compared to their age-matched TD peers (N=30) (Modahl et al., 1998). Artificially increasing oxytocin levels enhances the emotion recognition skills in individuals with ASD, and may also result in reduced repetitive behaviours (Bartz & Hollander, 2008). When oxytocin was administered as a nasal spray to young people with ASD (N=16), relative to placebo groups, they significantly improved on their performance on the ‘Reading the Mind in the Eyes’ task (Guastella et al., 2010), suggesting a promising avenue for future research.
1.3.5 The Immune System

Decades of research have linked a dysfunctional immune system to the pathophysiology of ASD (Korvatska et al., 2002; Krause et al., 2002). Most of these studies are cross-sectional and thus do not provide any information on whether the reported immune patterns are reflective of a “dysmatured” immune system that may regulate itself with age (Zimmerman, 1995).

Growing evidence of autoimmune phenomena in individuals with ASD could be additionally be representative of an immune system dysfunction. Striking research demonstrates that a subset of mothers of children with ASD have circulating antibodies that target the foetal brain (Enstrom, Van de Water, & Ashwood, 2009). Maternal antibodies are passed on to the foetus without any selective process and thus both beneficial antibodies and harmful autoantibodies have access to the foetus. Rodent models have demonstrated that offspring born to mice that had the antibody-production artificially induced demonstrated histological abnormalities in the brain and demonstrated cognitive impairments in adulthood. A primate model (Martin et al., 2008) and a murine model (Singer et al., 2009) have demonstrated that prenatal exposure to brain-directed autoantibodies from mothers of children with ASD cause unique stereotypic movements and behavioural idiosyncrasies in their offspring, which were not observed in offspring of mothers injected with autoantibodies from mothers of children without ASD. Collectively, these findings yield important insights into atypical brain development from an immunological perspective.
The MMR vaccine controversy. Another highly controversial topic that has gained popularity world-wide, and draws on the area of immune dysfunction, is the linkage between the MMR (measles, mumps and rubella) vaccine and autism. The first dose of the vaccine is administered usually during early infancy at 12-15 months of age. Coincidentally, this is the same period around which parents or family members start to notice some of the first signs of autism. Concerns over the MMR vaccine were augmented with the publication of a small study looking at bowel disease and autism among 12 children (Wakefield et al., 1998), in which a possible causal link was implied between the MMR vaccine and autism. Coincidental increases in the rates of ASD in the USA and UK only supported the implication. While no scientific evidence was presented for such an association, the article led to considerable publicity, following which the rates of MMR vaccination plummeted sharply and substantially in the UK and Ireland over the course of the next few years (McIntyre & Leask, 2008), which was followed by a significant increase in the incidence of measles and mumps, resulting in severe morbidity and mortality (Pepys, 2007).

Taylor et al. (1999) in the UK and Honda et al. (2005) in Japan on examining existing medical records demonstrated clear evidence vindicating the MMR vaccine of any causal link with ASD. The significance of their findings was that the MMR vaccination cannot explain the rise over time in the incidence of ASD, and that removal of MMR in countries where it is still being used cannot be anticipated to lead to a decrease in the incidence of ASD. Furthermore, after a review of research evidence in relation to the MMR-autism link by the Medical Research Council (MRC,1998) and the Centers for Disease Control and Prevention (CDC, 2000), no epidemiological data has
been found to support the hypothesis alleging to a link between the two (Chen, Landau, Sham, & Fombonne, 2004). The MMR-autism relationship has been ridiculed as the most damaging medical hoax of the last century and is likened to fraudulent science (Flaherty, 2011).

1.4 Conclusion

Over the last 40 years, the ASD conundrum has slowly beginning to yield its secrets and researchers, parents and other related professionals are cautiously optimistic and excited to be where they are at this stage in their understanding of this complex condition, especially given the opportunities afforded by newer technologies. Present epidemiological results attest to the fact that ASDs are not as rare as once believed, but has a higher incidence in the childhood population than Down’s syndrome, spina bifida, cancer and diabetes.

A rather interesting observation is that healthcare, educational and social services offer assistance to parents of children with ASD, but in transitioning into adulthood, many of these support-systems cease to continue and subsequently children with ASD who grow up to become adults face challenges that are different from those encountered earlier. Living with difficulties related to social/communication skills, sensory problems, repetitive and stereotypical behaviours and unusual preoccupation can lead to a myriad of challenging situations in the life of one on the spectrum, that are not experienced by the TD population. Such challenges are felt in many areas, one of which is the sexuality of the adult with ASD. While considerable research had focused on optimizing the quality of life of young adults with ASD (Singh et al., 2009), the area of sexuality is largely
neglected (Gougeon, 2010). This might be due to persistence of mistaken myths that individuals with ASD are not concerned with sexual intimacy (Gougeon, 2010). Among whatever scarce literature that is present, there are methodological limitations, including small sample sizes, reliance on caregivers’-reports, non-validated psychometric measures, and the confounding effects of ASD by including diverse populations with various intellectual impairments (Konstantareas & Lunsky, 1997). The next chapter highlights some of the findings from existing literature and is dedicated to the understanding of sexuality as it exists in the population with ASD.
Chapter 2. Sexuality and Gender-Identity in ASD
2.1 Sexuality in ASD

2.1.1 Historical perspectives of Sexuality and ASD

People with autism are sexual beings (Byers, Nichols, & Voyer, 2013). However, this is not what was always believed (Ousley & Mesibov, 1991), and as such sexuality is understudied in this population. Historically, the sexuality rights of individuals with intellectual impairments and developmental syndromes such as ASD were repudiated (Block, 2000). With the emergence of the inclusion movement in the 21st century (Wronka, 1998), equal fundamental rights were afforded to all people alike, creating social opportunities that were earlier denied to marginalized groups. But these cultural changes brought with them certain potential risks. Some inappropriate sexual behavior (Ray, Marks & Bray-Garretson, 2004), being sexually-abused and sometimes sexually-abusing another (Koller, 2000) present a paradoxical perception of such vulnerable populations as both being at risk and as a threat to others and the social order.

The intellectual impairments inherent to ASD are not physically obvious to others, as is the case with some other developmental syndromes, and thus people with ASD may be easily misunderstood for some of their behaviors. Errors in socio-sexual judgement (Stokes & Kaur, 2007) may prompt inappropriate sexual behaviors (Griffits, Quinsey, & Hingsburger, 1989) where the intent may be non-malicious, but may be construed as such. Adverse consequences to such social faux-pas could sometimes result in promiscuity, sexual-abuse, and date-rape (Attwood, 2007), or even sexual offence charges (Ray et al., 2004). Other negative mental health repercussions stemming from socio-sexual deficits could range from low self-esteem (Moore & Schultz, 1983), peer rejection (Dijker & Koomen, 2007), chronic loneliness and isolation (Muller, Schuler,
Yates, 2008) and in more severe cases long-standing depression, paranoia, and aggression (Deprey & Ozonoff, 2009).

2.1.2 Sexuality in ASD

A review of literature related to sexuality in ASD was undertaken in order to better understand sexual behaviors and attitudes as it is experienced in the ASD population, with a specific focus on sexual orientation and gender identity. A search of the databases PsycINFO, MEDLINE, Scopus, Science Direct and INFORMIT, using a few key word search terms “autis*” OR “autism spectrum disorder” OR “high-functioning autism” was paired with “sexuality” OR “same-sex attraction” OR “sexual-orientation” OR “LGBTQA” OR “homosex*” OR “gender dysphor*”. All abstracts were screened and empirical peer-reviewed literature related to sexuality were included. Studies on the screening of autism in particular populations such as juvenile offenders were excluded. Only English publications were included. Reference lists were scanned for additional relevant articles. Of the 21 papers that were retrieved, a significant number of papers looked at autism within the context of the larger family of intellectual deficiencies (ID), given the intimate relationship between ID and ASD (La Malfa et al., 2007). However, owing to the unique characteristics of ASD in that the deficits experienced are in the social and communicative domains with sensory-related issues, their sexual behaviours may be somewhat delineated in nature than that of someone with ID and without autism. A secondary search specifically relevant to ASD and sexuality yielded 15 studies that looked at sexual behaviors and attitudes toward sexuality, of which four studies specifically looked at autism within the context of gender-identity and sexual orientation. Salient findings from the 15 studies are listed in Table 2.1, while the
four studies on sexual orientation and gender-identity are discussed separately in some
detail. Additionally, seven case-reports were identified reporting a co-occurrence of
autism and GD, as listed in Table 2.2.
Table 2.1

Summary of Studies Examining Sexual Knowledge, Interest and Behaviors among Individuals with Autism

<table>
<thead>
<tr>
<th>Study</th>
<th>Sample Composition</th>
<th>Major Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown-Lavoie, Veicilli &amp; Weiss (2014)</td>
<td>Group comparisons were made between 117 controls and 95 individuals with ASD, ages 19-43 years.</td>
<td>Individuals with ASD obtained less of their sexual knowledge from social sources, more Sexual knowledge from non-social sources, had less perceived and actual knowledge and experienced more sexual victimisation than controls. The increased risk of individuals with ASD being subject to sexual victimisation was partially mediated by their sexual knowledge.</td>
</tr>
<tr>
<td>Byers, Nichols, Voyer, and Reilly, 2013</td>
<td>56 males and 85 females with HFA, ages 21-73 years</td>
<td>Individuals with lesser social and communicative-autism symptomatology reported greater dyadic sexual well-being, sexual arousability, sexual satisfaction, and fewer sexual problems and lesser anxiety. Males had lower sexual knowledge but better solitary sexual well-being compared to females.</td>
</tr>
<tr>
<td>Dewinter et al. (2014)</td>
<td>Group comparisons were made between 90 control males and 50 males with ASD, aged 15-18 years</td>
<td>Similar levels and frequency of sexual behaviors between groups. Males with ASD were more tolerant toward homosexuality compared to controls.</td>
</tr>
<tr>
<td>Gilmour et al. (2012)</td>
<td>Group comparisons were made between 82 individuals with HFA (17 males, 55 females) and 282 TD individuals</td>
<td>No significant differences were found in the breadth and strength of sexual behaviors and comprehension of sexual language between groups. Relative to TD persons, individuals with ASD scored significantly lower on measures of heterosexuality ($d=.70$), scored higher on measures of bisexuality ($d=.09$), on measures of homosexuality ($d=.6$) and reported higher asexuality ($d=.37$). While heterosexuality was overall lower in ASD individuals than TD individuals, female participants with ASD reported higher scores on a measures of heterosexuality ($d=.53$) than males with ASD, whereas male and female controls demonstrated identical strengths.</td>
</tr>
<tr>
<td>Study</td>
<td>Sample Composition</td>
<td>Major Findings</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Haracopos and Pedersen (1992)</td>
<td>Staff reports on 57 males and 24 females ages 16-40 years</td>
<td>68% of the sample masturbated. The frequency of masturbation positively correlated with developmental level of spoken language. 52% engaged in public masturbation, 42% displayed person-oriented sexual behaviors, with advances toward uninterested targets. 35% were bisexual in orientation, while 9% demonstrated homosexual interest. Wide range of deviant sexual patterns such as atypical object-use for sexual arousal, exhibitionism, fetishism and voyeurism were reported.</td>
</tr>
<tr>
<td>Hellemans et al. (2007)</td>
<td>24 institutionalized HFA males (Full Scale IQ above 70) ages 15-21 years</td>
<td>Sexual practices included masturbation, with reports of public masturbation and hypermasturbation (primarily due to difficulties in achieving orgasm) 58% of the sample demonstrated heterosexual orientations, 4% were homosexual, 13% bisexual and 25% were unclear as to their sexual orientation. There were 2 cases of paraphilia, one of whom demonstrated pedophilic and fetishistic interests. Certain autism-specific features were noted such as repetitive sexual behaviors, ritualistic use of objects with sexual connotations and sensory fascinations accompanied by sexual arousal.</td>
</tr>
<tr>
<td>Hellemans et al. (2010)</td>
<td>Group comparisons were made between two groups of institutionalized males with mild developmental delay (Full Scale IQ 51-80), one group with ASD (N= 20) and the other without ASD (N=19), aged 15-21.11 years.</td>
<td>‘Autistic’ features were reported in relation to the sexual behaviors of those in the group with ASD relative to the non-ASD group, such as stereotyped, obsessive and ritualistic sexual interests and sensory fascinations with sexual connotations. Those with ASD reported significantly more difficulties with their bodies undergoing pubertal changes. Two individuals with ASD had paraphilia. While not statistically significant, 40% of the group with ASD demonstrated either indefinite sexual orientations, homosexuality or bisexuality, compared to 10% of the control group.</td>
</tr>
<tr>
<td>Study</td>
<td>Sample Composition</td>
<td>Major Findings</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Kalyva (2010)</td>
<td>Teachers reported on 56 children with HFA (IQ &lt; 70) and 20 children with LFA (IQ &gt; 70) (ages 7–14 years)</td>
<td>Relative to children with LFA, children with HFA displayed more socially acceptable behavior ($\eta^2 = .36$), more privacy-seeking behavior ($\eta^2 = .39$), more social comprehension ($\eta^2 = .41$), and a greater concern for children with HFA ($\eta^2 = .18$), due to fears that the inability to practice the subtle rules of social interaction might enhance sexual problems.</td>
</tr>
<tr>
<td>Konstantareas and Lunskey (1997)</td>
<td>Group comparisons were made between 15 subjects with ASD (9 males, 6 females) and 16 subjects with ID (8 males, 8 females), aged between 16 to 46 years</td>
<td>Individuals with ASD had greater difficulty defining sexual terms when compared to those with ID and demonstrated more concrete and literal interpretations of drawings depicting sexually-relevant activities and a degree of perseveration in their definitions.</td>
</tr>
<tr>
<td>Mehzabin and Stokes (2011)</td>
<td>Group comparisons were made between 39 typically-developing (TD) and 21 HFA young adults (18–30 years)</td>
<td>When compared to TD individuals, individuals with HFA engaged in fewer social behaviors ($\eta^2 = 0.45$), fewer sexual experiences ($\eta^2 = 0.29$), and more concerns for the future ($\eta = 0.16$), and showed no significant difference in dysfunctional sexualized behaviors.</td>
</tr>
<tr>
<td>Ousley and Mesibov, 1991</td>
<td>Group comparisons were made between 21 subjects with HFA (11 males, 10 females, mean IQ 79.15, mean age 27.3 years) and 20 subjects with ID and no ASD (10 males, 10 females, mean IQ 55.75, mean age 27.8 years)</td>
<td>The group with ASD reported fewer sexual experiences than the control group. There was a significant correlation between IQ and sexual knowledge ($r = 0.92$).</td>
</tr>
<tr>
<td>Ruble and Dalrymple (1995)</td>
<td>100 parental reports on 68 males and 32 females with autism (diagnosed as per DSM-III-R criteria)</td>
<td>Reports suggested both normative and non-normative sexual behaviors. Some of the inappropriate behaviors mentioned were exhibitionism, unsolicited sexual contact, touching parents inappropriately, public masturbation, and displaying private pictures publicly. Despite parental beliefs, no correlation was found between verbal levels and display of inappropriate sexual behaviors, suggesting that someone with ASD and ID is just as likely as someone with ASD and no ID to display inappropriate sexual behaviors, emphasizing the need for individualized sex education.</td>
</tr>
<tr>
<td>Study</td>
<td>Sample Composition</td>
<td>Major Findings</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Stokes and Kaur (2005)</td>
<td>Group comparisons were made between 50 TD adolescents and 23 HFA adolescents</td>
<td>Parental reports indicated that compared to children with TD, children with ASD displayed more socially inappropriate behaviors (partial $\eta^2 = 0.48$), less awareness of privacy (partial $\eta^2 = 0.08$), received lesser sex-education (partial $\eta^2 = 0.27$) and parents had greater concerns about their children’s long-term outcomes ($\eta^2 = 0.42$).</td>
</tr>
<tr>
<td>Stokes, Newton, and Kaur (2007)</td>
<td>Group comparisons were made between parents reported on 25 subjects with ASD (ages 13-36 years) and 38 TD subjects (ages 13-30 years)</td>
<td>Parental reports suggested that relative to TD persons, those with ASD engaged in lesser social activity, demonstrated atypical and inappropriate social and romantic behaviors ($\phi=7.09$) such as stalking, longer pursuit of uninterested parties ($d=1.03$), displayed an excessive focus of attention on strangers ($\phi=6.09$), celebrities and ex-partners. Individuals with ASD were reported to have less access to friends and peers as sources of learning to acquire social and romantic skills and knowledge (partial $\eta^2 = .26$).</td>
</tr>
<tr>
<td>Van Bourgondien, Reichle, and Palmer (1997)</td>
<td>Staff reported on 72 males and 17 females, aged between 16 to 59 years, residing in group homes. Subjects presented with different levels of autism 26% HFA, 23% moderate range, 51% LFA</td>
<td>76% engaged in one or more sexual behaviors, with 68% reported to masturbate. 34% of the sample engaged in person-oriented sexual behaviors. 20% of this subsample preferred homosexual partners. A positive correlation was found between verbal abilities and capacity to reach orgasm on masturbation ($d = 1.07$). Persons who received sex education showed a preference for sexual exchanges with persons ($\phi=.23$) rather than solitary sexual activities ($\phi=.15$).</td>
</tr>
</tbody>
</table>
A brief description of the main findings is presented here. In earlier literature, when sexual behavior was noted among individuals with ASD, it was generally either shrouded in a problematic context that required management, or was perceived as a child-like liability in need of protection (Ousley & Mesibov, 1991), and was sometimes described as inappropriate and deviant (Hellemans & Deboutte, 2002). The most commonly reported sexual activity was masturbation, where some caregivers expressed concerns over public masturbation, deviant masturbation (the use of peculiar objects for sexual stimulation), and hypermasturbation (excessively preoccupied with masturbation; Van Bourgondien, Reichle, & Palmer, 1997; Haracopos & Pedersen, 1992; Hellemans et al., 2007). Other issues raised include rigidistic sexual rituals, pedophilia, paraphilia and unsolicited sexual contact (Sullivan & Caterino, 2008).

As studies began to focus on sex-education in ASD, any early notions viewing individuals with ASD as sexually-inexperienced or deviant were slowly debunked as newer literature provided opportunities for people with ASD to voice their own opinions rather than a predominant reliance on caregiver reports (Howlin, 2000; Hénault & Attwood, 2006; Mehzabin & Stokes, 2011; Byers, Nichols, & Voyer, 2013; Dewinter, Van Parys, Vermeiren, & van Nieuwenhuizen, 2016). The general consensus was that individuals with ASD desired and enjoyed sexual intimacy not unlike their neurotypical peers. Indeed, there were significant differences when it came to the quantity and quality of sexual knowledge and how this knowledge was obtained. Individuals with ASD reported less sexual knowledge and were more likely to learn about sex-related matters from non-social media like the internet and by trial and error experiences, while controls
depended more on parents, teachers and friends (Holmes & Himle, 2014; Mehzabin & Stokes, 2011). A larger number of individuals with ASD report sexual victimization, and this may be partly associated with having less sexual knowledge that is only compounded by the presence of ASD-core social deficits (Brown-Lovoie, Viecili, & Weiss, 2014). Ironically, parents and educators have generally been reluctant to provide comprehensive sexual education to their wards with ASD and often omitted information regarding courtship, birth-control, sexually-transmitted diseases and diversity of sexual behaviors (Ballan, 2012). Of interest, findings on sexual orientation suggest a higher prevalence of non-heterosexual orientations in ASD compared to the wider population (Gilmour et al., 2012; Hellemans et al. 2007, 2010). At the same time, some case-histories and empirical literature points to an association between GD and ASD. The next part of the literature review examines these associations with some depth.

2.2 Gender-identity, Sexual Orientation and ASD

The second part of the literature review examined studies and case-reports from which the major emerging themes were that non-heterosexual orientations such as lesbian, gay, bisexual, transgender, questioning and asexual (LGBTQA) orientations are over-represented among those with ASD (Hellemans et al., 2010; Gilmour, Schalomon, & Smith, 2012; Byers, Nichols, & Voyer, 2013) and a high co-occurrence of gender-dysphoria (GD) is present in ASD. (Bejerot & Eriksson, 2014).

The estimated prevalence of GD depending on birth sex is 0.25 to 2.5 per 100,000 (Landen, Walinder, & Lundstrom, 1996). Expressions of GD in children include a preference for cross-dressing (dressing up in clothes typically worn by the opposite sex as defined by the person’s cultural norms), for stereotypical cross-gender roles and make-
believe play, and a strong inclination for play-mates of the opposite sex. More importantly, prospective and retrospective studies have indicated that the most likely psychosexual outcome for children with GD was a high rate (60-100%) of homosexual or bisexual orientations in adulthood (Wallien & Cohen-Kattenis, 2008; Zucker, 2004).

The establishment of gender identity in children is a function of social development (Rees, Doyle, Holland & Root, 2008). Given the struggles of children with ASD in the social realm, could having an ASD increase the propensity toward GD? And given what is known about children with GD and non-heterosexual orientations in adulthood, would sexual diversity be more prevalent among some individuals with ASD in adulthood who present with a history of GD? A few case-histories (see Table 2.2) and some empirical literature lend some credence to these questions.
### Table 2.2

**Summary of Case-Histories presenting the comorbid presentation of ASD and GD**

<table>
<thead>
<tr>
<th>Author and Case</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Galluci et al. (2005)</td>
<td>Early developmental history remarkable for head-banging, rocking, socio-communicative impairments; preoccupation with soft fabrics, often actively seeking these out; artistically-talented; history of cross-dressing with women’s clothing; strong desire to have the body of a woman; has paraphilic tendencies to be sexually aroused by fantasies of himself as a woman (autogynephilia); expresses extreme distress with natal sex; pervasive preoccupation with physical appearance; dislikes having a penis and has confessed to wanting to use a “butcher-knife to whack it off”; strongly desires sexual re-assignment; obsessive need for order and predictability; passive death wish and paranoid thoughts.</td>
</tr>
<tr>
<td>Kraemer et al. (2005)</td>
<td>Emotionally non-reciprocating and unapproachable as a child; obstinate fascination with geometric patterns; preferred the company of male playmates, described as being tomboyish, enjoyed male-stereotypical play; insisted she was a boy had an aversion to her body and secondary sex characteristics; insisted she always felt like a boy and refused girl’s clothing.</td>
</tr>
<tr>
<td>Landen and Rasmusen, (1997)</td>
<td>The subject displayed echopraxia and echolalia; selective mutism; obsessive compulsions with hand-washing; claimed she was a boy; refused girl’s clothing or using the girl’s toilet; insisted on being addressed as ‘he’; treatment with clomipramine helped with OCD-related symptoms but GD persisted.</td>
</tr>
<tr>
<td>Mukaddes (2002)</td>
<td><em>10-year-old male</em>: subject demonstrated autistic behaviors such as restricted eye-contact, unresponsiveness to verbal stimuli, echolalia, perseveration and neologisms; developed attachment to feminine objects such as cosmetics at age 3 years; at age 6, started to cross-dress with mother’s dresses, pretend to wear high-heels, and express his disappointment with his gender; prayed to God to “make his penis disappear”; had fantasies about becoming a bride and being married to a man; complete disinterest in rough-tumble play typical of males; preferred the company of girls. <em>7 year old male</em>: subject presented with a history of delayed language; difficulties with social-affective development and eye-contact; stereotypical behaviors, toe-walking and a low frustration tolerance; at the age of 4-6 years started some make-believe play, such as ‘playing house’ and ‘playing mother-roles’; avoided rough-tumble male-oriented play and preferred the company of his mother and female classmates; persistently expressed his desire to grow up to be a woman like his mother and enjoyed making skirts with his mother’s scarves.</td>
</tr>
<tr>
<td>Author and Case</td>
<td>Findings</td>
</tr>
<tr>
<td>----------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Tateno, Tateno, and Saito (2008) 5-year-old male with AS and GD</td>
<td>The individual presented with preoccupation with colors and figures; difficulty developing peer relationships; avoided socializing; given to temper tantrums and strict adherence to own self-made rules; strong preference for female playmates; marked preoccupation with female activities; abhorrence to male stereotypical toys and play; cross-dressing; disliked his male body; insisted that he would grow up to be a woman; symptoms were present on follow-up for two years.</td>
</tr>
<tr>
<td>Perera, Gadambanathan, &amp; Weerasiri, (2003) 20-year old female with AS, GD and OCD</td>
<td>The case presented with socially-awkward behaviour; rejection of all peer-group activities; class-room disruptive behaviour; indiscriminate and frequent aggression; recurrent compulsion; parents distressed about her strange obsession with licking public floors; confession to irrational compulsive fears about parents dying; high achiever in school and artistically-talented; at age of 14 years started to experience gender-dysphoric symptoms; voiced deep resentment to her gender and insisted on being a male; physically violent to those who resisted her thinking insisted on sexual-reassignment surgery and hormonal treatments after menarche; patient was diagnosed with OCD and AS; medication with Clomipramine alleviated some of the OCD symptoms, with less overt GD symptoms.</td>
</tr>
<tr>
<td>Williams, Allard, and Sears (1996) 5-year-old male with ASD and GD</td>
<td>5-year-old male: Presentation included symptoms of hyperactivity, impulsivity, loneliness and moodiness; perseverative motor activities; echolalic and echopraxic patterns; female stereotypical play and strong rejection of male pursuits; interested in Barbie dolls, related paraphernalia and female cartoon characters; ripped the heads off the dolls with the purpose of playing with their hair; fascinated with bright objects; preoccupation with cross-dressing, fashioned long-hair from scarves.</td>
</tr>
<tr>
<td>3.7-year-old males with ASD and GD</td>
<td>3.7-year-old male: described as a loner; perseverative play such as opening and closing doors; running hand repeatedly through water; prone to temper tantrums; stubbornness; favorite toys are Minnie mouse doll and Barbie doll; mostly plays with dolls by shaking their hair; cross-dresses with mother's and sister's clothing and high-heeled shoes; bras and underwear; wraps shirts over head and pretends like it is long hair.</td>
</tr>
</tbody>
</table>
Aside from the solitary case-reports on the ASD-GD comorbid presentation, the literature search uncovered three empirical studies examining this co-occurrence among individuals primarily referred for gender-identity issues to gender clinics (de Vries et al., 2010; Jones et al., 2012; Pasterski, Gilligan, & Curtis, 2013).

Given that the association of GD with ASD had hitherto been documented via isolated case-reports, de Vries et al. (2010) sought to measure the incidence of ASD among children and adolescents with GD ($N=115$ boys, $89$ girls, $M=10.8$ years, $SD=3.58$) who were referred to a gender-identity clinic in Amsterdam for management of their gender-issues. Given that the prevalence estimates of GD in adults range from $1:10,000$ to $1:20,000$ in men and $1:30,000$ to $1:50,000$ in women (Zucker & Lawrence, 2009), while the prevalence estimates of ASD range from $0.6-2\%$ in the general population (Baird et al., 2006; Blumberg et al., 2013), the random co-occurrence of both would be extremely uncommon. de Vries et al. found that the incidence of ASD in the sample of children referred to the gender identity clinic was $7.8\%$, which was up to $3.9$ times more prevalent than has been reported in the general population, suggesting that this might not be as rare a co-occurrence as was once held. Interestingly, individuals with ASD frequently received a diagnosis of GD-NOS (Gender Dysphoria-Not Otherwise Specified), a diagnosis that was rendered when the cross-gender behaviour and interests were merely sub-threshold or more importantly, atypical. The authors hinted at ‘autistic-like’ traits driving the GD and recommended future assessments of the same.

It has also been suggested by other researchers that GD could present as sequelae in some female cases with ASD (Kraemer et al., 2005; Tateno et al., 2008). The Extreme Male Brain (EMB) theory of autism (Baron-Cohen, 2002) suggests that autism is
considered as an extreme variant of the normal male cognitive profile (Asperger, 1944). Psychometrically, on average the male brain is typified as driven toward ‘systemizing’; a tendency to analyze or construct systems with the purpose of wanting to control and maintain constancy. On the other hand, the female brain is typified as demonstrating a cognitive profile that lends itself significantly better toward empathizing; the drive to identify and understand the emotions of someone with the purpose of predicting their behavior. In this regard, it is suggested that GD may develop collaterally as part of this masculinized phenotype among female-to-male transsexual people who report with ‘autistic-type’ traits (Kraemer et al., 2005).

Against this backdrop of emerging theories of a male cognitive pattern underlying autism, Jones et al.’s (2012) studied the ASD-GD association by examining transsexual people or females with GD, for autistic traits on the Autism Spectrum Quotient (AQ), a psychometric measure that quantifies autistic traits (Baron-Cohen, Wheelwright, Skinner, Martin, & Clubley, 2001). As predicted, they found that females with GD (N=61) had a higher mean AQ score than typical females (N=98; d=1.00), than males with GD (N=198; d=0.83), and typical males (N=76; d=0.70), while no difference was found between males with GD and typical males on their AQ scores. Another interesting finding was that among the 198 males with GD, six individuals had a diagnosis of ASD. This rate is about 1.5 times of that found in the general population (Blumberg et al., 2013), and is in line with results from other studies testifying to an overrepresentation of ASDs among those with GD (de Vries et al., 2010; Robinow & Knudson, 2005). In sum, given that the development of GD is complex, Jones et al.’s (2012) study is a pivotal study in the field, having demonstrated that chromosomal females with GD have an elevated loading of
autistic traits, and while the association between GD and ASD in transsexual female people finds some support in the considerable overlap on the roles of the male cognitive profile in autism (Auyeung et al., 2009) and in female GD (Hines, 2006), matters are not quite as straightforward when it comes to transsexual male people. Interestingly, in a five-year follow-up period, de Vries et al., (2010) found only five persisting cases of GD among the 16 children who presented with GD and ASD, leading to the inference that perhaps co-morbidity of the two may be a childhood phenomenon that resolves over time (deVries et al., 2010). However, that autistic traits were present in a cohort of adult transsexual people suggests otherwise (Jones et al., 2012).

As self-report was relied on to ascertain transsexuality-status in previous studies, there may be concerns for accuracy. Consequently, Pasterski et al., (2013) sought to address this gap and examine for the persistence of GD from childhood into adulthood in a sample of adults who had a confirmed diagnosis of transsexualism (N=63 transsexual males, 28 transsexual females). Results of the study confirmed that the association between GD and ASD appeared to be genuine and continues into adulthood, an acknowledgement of which has implications for the evaluation, prognosis and appropriate clinical management of clients presenting with ASD who have GD (Landen & Rasmussen, 1997). However, contrary to findings from the Jones et al.’s (2012) study where only female transsexual people displayed more autistic traits than male transsexual people, the loading of autistic traits were similar among both male and female transsexual individuals.
2.3 Is there an association between Gender-Dysphoria, Sexual Orientation and ASD?

Literature has reliably demonstrated that positive interactional early experiences are critical to and highly dependent on the subsequent development of a fund of higher order social skills (Johnson & Felmeth, 1993), which in turn is pivotal to the development and expression of normal sexuality and the experience of gender identity (Robinow, 2009). Given that impaired social functioning is a hallmark feature of ASD, the achievement of personal sexual and gender identity can become complex when an inherent social impairment exists.

Adolescence is recognised as a critical period in the young person’s life, fraught with fundamental developmental tasks; such tasks playing a defining role in one’s personal and sexual identity (Graber et al., 1998). Sexual-hormones indiscriminately usher in neurophysiological changes among every adolescent (Backelijauw, Rose, & Lawson, 2004). While the pubescent individual with ASD may experience the expected normative physical metamorphoses at this stage, their socio-emotional development may not always correspondingly keep pace with their physical development (Sullivan & Caterino, 2008). This disparity presents room for certain disconcerting issues to arise and reviewed literature bears testament to this (Hellemans & Deboutte, 2002).

Furthermore, social activities typically peak during adolescence and the initiation and maintaining of romantic relationships, even at the best of times are not easy. Relative to their TD peers, young individuals with ASD report challenges in developing meaningful peer-relationships (Koning & Magill-Evans, 2001). Young people with ASD
may thus face an increased risk of peer rejection (Chamberlain, Kasari, & Rotheram-Fuller, 2007), and sometimes in a self-fulfilling prophecy may choose to avoid socializing, owing to an acute self-awareness of their ‘differentness’ (Carrington & Graham, 2001).

Drawing on some of the findings from the gender-studies and case-studies examined, some theoretical speculative frameworks are proposed to explain why minority sexual orientations and GD may be overrepresented among those with ASD. Two broad perspectives emerge from literature, and can be organized under two ontological postures, namely biological and psychological positions in the development of sexual orientation and gender-identity. It must be appreciated that both positions are not competing approaches, but rather different levels of analysis. The biological approach examines the possibility that altered levels of sex-hormones during prenatal development is associated with a non-heterosexual orientation and gender-nonconformity (Berenbaum & Bailey, 2002; McFadden, Loehlin, Lippa, Manning, & Rahman, 2005), while the psycho-social approach believes that minority sexual and gender identities may be overrepresented in the ASD population owing to certain environmental/experiential factors unique to this group.

2.3.1 Biological postulates

Hans Asperger wrote that “the autistic personality is an extreme variant of male intelligence” (1944), and this extreme pattern of the typical male profile of cognition and behavior has been psychometrically demonstrated among individuals with ASD (Baron-Cohen, 2002; Ingudomnukul, Baron-Cohen, Wheelwright, & Knickmeyer, 2007).
Extrapolating from this, females with ASD may be hypermasculinized in specific aspects of cognition and behaviour, and it may well be these hypermasculinized ‘autistic-traits’ readily permit an identification with the male gender, making assimilation into a typical female peer group difficult, and in some cases this may increase the probability of GD. This is consistent with neurobiological studies in autism and gender studies that found a striking number of similarities between some girls with ASD and girls with GD (Knickmeyer, Wheelwright, & Baron-Cohen, 2008; Green & Young, 2001) such as cross sex-typical play and preference for opposite-sex playmates, reduced empathy and social skills, higher AQ scores than controls, and a left-handedness pattern more typical of genetic males. Additionally, an elevated number of autistic traits would confer a rigidity and stubbornness on how both females with ASD and females with GD perceive their gender identity (Knickmeyer et al., 2006).

It is speculated that a common denominator between female ASD and female GD might be elevated fT levels (Hines, Brook, & Conway, 2004). Studies of fT in humans suggest that fT is inversely correlated with post-natal psychological and neural development, specifically social development, language development, and empathy, and positively associated with systemizing and a number of other autistic traits (Auyeung et al., 2009). Concurrently, the fT hypothesis is supported in animal models, where rodent-experiments show that fT plays a critical role in sexual dimorphism. Castrated males show feminized cognition and behaviours, while conversely females treated with fT show corresponding masculinization (Knickmeyer et al. 2005). Furthermore, a great deal of evidence testifies to the role of testosterone in masculinized behaviours (Berenbaum & Bailey, 2003), and increased rates of homosexual and bisexual orientations among
females with congenital adrenal hyperplasia, a congenital condition where testosterone levels are prenatally and postnataally elevated relative to unaffected females (Meyer-Bahlburg et al. 2008). Simultaneously, a large evidence base supports an association between childhood gender-nonconformity and sexual orientations in adulthood (Bailey & Zucker, 1995; Bem, 2000). Masculinized gender identities attributed to ‘autistic-type’ cognitions and behaviours may explain high rates of non-heterosexuality among some females with ASD.

While varied testosterone exposure presents a rather straightforward neuro-hormonal explanation for female non-heterosexuality (Kraemer et al., 2005), things are not very clear with male non-heterosexuality. Some studies have shown that high fT in males is linked to homosexuality (Jenkins, 2010), others have argued just the opposite (Ellis & Ames, 1987; Dorner et al., 1980), while still others posit that up to a certain point higher levels of fT in a male can be masculinizing, but beyond this any increased levels may be feminizing (McFadden et al., 2005). According to the fT hypothesis, a lower rate of homosexuality and a higher rate of heterosexuality would be expected among males with ASD, as a hypermasculinized brain would likely result in sexual behaviours gravitating towards gynophilia (sexual attraction to women). Such speculation was not supported by Gilmour, Schalomon and Smith (2012), when contrasting sexual behaviours between individuals with and without an ASD. Both male and female participants with ASD alike showed significantly lower levels of heterosexuality and higher levels of asexuality than controls. However, a portion of the participants recruited by Gilmour et al. were recruited from a personal ASD blog operated by the one of the authors, which may have led to some response-bias.
Whilst testosterone is the hormone that is commonly held as the sexual hormone responsible for sexual dimorphism, innovative research has implicated another hormone, the anti-Müllerian hormone (AMH) which works in concert with testosterone in guiding sexual development and gender identity (Rey et al., 1993). Additionally, AMH is believed to play a role in the rate of neural development, and thus has implications for autism. On analysing the levels of AMH among 82 boys with autism, it was found that the lower the level of AMH, the higher the number of autistic traits that were displayed (Pankhurst & McLennan, 2012). Another interesting and relevant finding of this study was that besides controlling the rate of neural development, AMH plays a role alongside testosterone in sexual differentiation, such that when AMH is missing among male mice, certain non-reproductive behaviors become partially feminized as evidenced in a lack of desire for territorial exploration, implying that without AMH, self-perception of gender identity may not be straightforward. It is speculated that a parallel pathway could contribute to male-to-female GD among human-beings as well, and concurrently, drawing on the AMH-autism link, we can then posit that perhaps lowered levels of AMH among males with autism may contribute to a feminized gender-identity.

2.3.2 Psychogenic postulates

**Misattribution of social difficulties to GD.** Children with ASD are often the target of bullying and taunting (Haq & Le Couteur, 2004). Owing to their social naïveté, individuals with ASD (Howlin, Mawhood, & Rutter, 2000) may attribute their awkwardness within their same-sex peer-groups to a gender-mismatch and decide that they may find more ‘luck’ with peers of the opposite-sex (Pasterski, Gilligan, & Curtis, 2012). One adolescent with ASD who was referred to a gender-identity clinic had no
history of cross-dressing or other gender-confused behaviour as a child, but yet persistently felt different from his peers, and became convinced that this feeling of alienation was possibly due to his not fitting into his gender-cohort and believed that his social problems would alleviate by taking estrogens (de Vries et al., 2010).

Need for sameness. It is empirically demonstrated that children aged two to four years generally prefer the company of their same-sex peers, but then later become more accommodating of both sexes (Rosenfield & Wasserman, 1993). It is also known that persons with ASD often become distressed over changes in the environment (Corbett et al., 2009), and accordingly demonstrate more perseverative responses on tasks that measure mental flexibility (Ozonoff & Jensen, 1999). Neuropsychological research has identified a pattern of cognitive abilities amongst individuals with ASD that appear to relate to deficits in Executive Functioning (EF), where the ability to maintain an appropriate problem-solving repertoire of component mental-processes to achieve a future goal appears impaired.

Accordingly, it is speculated that owing to inherent social anxieties and the ‘need-for-sameness’-type thinking and behaviors, some young individuals with ASD may continue to nurture any childhood same-sex friendships and may not progress as readily to opposite-sex friendships as their TD peers, who seek to broaden their social network as they grow older. Finding acceptance and safety with a same-sex childhood friend would be something dearly valued and treasured. While non-sexual in intent at the beginning, physical proximity during times of play could initiate physiological arousal (Bem, 2000), which over time has the potential to turn intimate and sexual in tone.
Exotic is Erotic. Other postulates have been made to suggest how various psychological states may arise from hormonal causes. Bem (2000) hypothesizes a theory that attempts to integrate GD in childhood with sexual orientation in later years by proposing that gender-nonconforming children tend to feel different from their same-sex peers, and as a result eroticize them. According to the theory, biological variables such as genes or prenatal hormones may predispose certain children toward certain sex-atypical activities, play and interests. It is hypothesized that these gender-nonconforming children may experience heightened, nonspecific physiological arousal in the presence of same-sex peers from whom they feel different or exotic. Regardless of the tone of the arousal, these transactions may be cognitively attributed to be sexual attraction to their same-sex peers and become erotic.

Correspondingly, human behaviour studies demonstrate that boys are generally shown to be more socially accepting than girls are of ‘tomboyish’ girls and conversely, girls are more tolerant of ‘shy and shunned’ boys (Zucker & Bradley, 2004). Accordingly, gender studies have found consistent reports of gender-nonconforming children experiencing rejection from same-sex peers and acceptance from opposite-sex peers (Wallien et al., 2010). Currently, there is no known study that has examined whether this may also be the case within an ASD population.

Individuals with ASD may generally not be too concerned with social norms and may not attribute the same regard to gender as a neurotypical individual might, but instead define it as a socio-rhetorical construct (Meyerding, 2003; Golubock, 2003). Furthermore, the sensory-processing differences (hypo- or hypersensitivity) many individuals with ASD experience may be functional in how one with ASD develops a
sense of sexual-self. For instance, some individuals with ASD may find shiny objects, trailing skirts, and gaudy jewellery fascinating, hypnotizing and soothing, and these interests in certain fabrics, textures or colours/patterns do not necessarily carry gender-connotations in the typical sense (Tateno et al., 2008; de Vries et al., 2010).

Categorising people into two groups on the conjecture of what lies underneath their clothing or according to mannerisms and certain cultural norms may not have much relevance to the person with ASD, who instead may choose to focus on specific details. This ‘ignoring the forest for the trees’ feature is consistent with the Weak Central Coherence Theory or WCC (Joliffe & Baron-Cohen, 1999), which is an information-processing style peculiar to those with ASD (Happé & Frith, 2006). Central coherence is a perceptual-conceptual ability that enables one to ‘see the bigger picture’ and extract the “gist” and gestalt in information-processing (Frith, 1989). WCC would yield a poor ability to process information holistically when such is called for, but rather to process stimuli in a fragmented style (Frith & Hill, 2003).

Thus, examining gender from an autistic perspective licenses a denaturalization of social norms and expectations (Brewer et al., 2015) and permits gender to be a fluid and multidimensional construct, whilst deeming gender-labels as not being very meaningful. Such gender-fluidity may likely ‘bleed’ into how one sexually-orients. Furthermore, it is likely that while neurotypical populations may typically pay more attention to the sex of their target of interest, or perhaps strive harder to suppress same-sex desires, individuals with ASD may not be as motivated to do so as they rarely engage in counter-factual reasoning (Sodian & Frith, 1993).
Despite the difficulties of orienting oneself around a stable sexual identity, the ‘sex-topic’ provides a point of identification for some individuals with ASD with LGBTQA orientations. On online forums such as ‘Asexual Visibility and Education Network (AVEN)’, ‘Transgender People on the Autistic Spectrum’ and ‘WrongPlanet.net’, individuals with ASD share experiences with their like-minded peers in ways that might be confirmatory, validating and supportive. Others confess that while gender-identification and sexual orientations may be confusing, they do not view sexual-ambiguity as necessarily negative and perhaps counterintuitively to many, find meaning and acceptance in this ambiguous space and from here go ahead to forge alternative and idiosyncratic sexual identities with similar others (Burke, 1984; Shiva, 2007; Miller, 2003).

For others with ASD, conscious gender performance and orientation towards a particular sex can become a coping strategy, and an attempt to find social acceptance, even though the ‘performer’ may feel disconnected to the ‘performance’ (Jack, 2012). Such orientations are varied according to the situation. Individuals on the spectrum who post on LGBTQA blogs and ASD forums identify with particular styles sometimes to connect to a particular sexual group, and other times to belong to a subculture (i.e.: Victorian, Gothic, Steampunk, and Vintage). Visitors to these sites are aware of one and other’s social challenges, thus creating a safe and non-judgemental space.

Still other individuals with ASD may develop GD as a psychological coping mechanism to address their cognitive dissonance about their minority sexual orientations (Parkes, Hall, & Wilson, 2009), as a result of internalized homophobic caregiver concerns (Ludlow, 1991; Konstantareas & Lunsky, 1997). Others find respite from their
GD in cross-dressing and use this as a coping mechanism in the absence of a fulfilling sexual relationship (Bowler & Collacott, 1993). Owing to the characteristic ASD-specific rigidity, enduring such gender-related incongruent feelings may be extremely distressful and may lead to significant levels of psychological distress. Temporarily aligning with one or the other gender and sexual orientation (trying-on and experimenting identities) may help some, while others may choose to remain neutral and uncommitted to a label and consider the whole gender/sex issue arbitrary (Lai et al., 2011; Mandy et al., 2012).

Furthermore, individuals with ASD may find more potential for relationships in the LGBTQA community where both populations tend to put less emphasis on conformity, and share a liberal attitude when it comes to age and cultural differences, and are more interested in carving out a meaningful intimate connection with another. This may partially explain some of the increased sexual diversity among those with ASD.

2.4 Conclusion

A substantial body of evidence indicates that individuals who align themselves with minority sexual orientations (non-heterosexual orientations) are at higher risk than heterosexual populations for risk-behaviours related to substance abuse, increased chances for HIV (human immunodeficiency virus) infection (Rotheram-Borus et al., 2001), high suicide rates (Meyer, 2003), and poor psychological adjustment (Loutzenheiser, 2010). At the same time, a robust body of evidence indicates that gender-nonconforming individuals are at higher risk than the general population for psychiatric comorbidity (Sandfort, Melendez, & Diaz, 2007; Hepp et al., 2005). It is also known that
individuals diagnosed with ASD face a developmental trajectory marked by considerable psychosocial difficulties (Mazefsky, Auswald, & Conner, 2010).

Although many individuals with ASD who are either gender-nonconforming or are non-heterosexual or both have defined themselves with a sense of pride in their neurodiversity and sexual diversity, they may experience the effects of being marginalized socially. Such discriminatory practices put these individuals at risk for psychopathology, given the centrality of peer-relations to well-being (Rubin, Bukowski, & Laursen, 2009). This population can thus be seen as a ‘minority within a minority’ and can quite easily slip the ‘research-radar’, in experiencing what is best conceptualised as a ‘layered stigma’, in having to experience the synchronous impact of living with the challenges of ASD and belonging to a gender and sexual minority (Meyer, 2003; Crocker, 1999).

While the aetiologies of ASD are relentlessly being studied, the intimate manner by which the specific impairments influence how an individual with ASD functions in the sexual realm is a relatively unploted domain (Ruble & Dalrymple, 1993). The increased prevalence of non-heterosexual orientations in ASD (Byers, Nichols, & Voyer, 2013) raises questions that are tinged with both an academic curiosity and a clinical need to be better informed so as to serve better. Do some of the highlighted neuropsychological theories that influence how one with ASD negotiates the social realm play a role in how the individual perceives gender and sexually-orients? Are there certain aspects to ASD that would allow for higher rates of gender-nonconformity and sexual diversity? Why is it that GD co-occurs with some individuals with ASD and not others? Persons with ASD often have poor social skills, find communication for its own sake demanding, are often
very fixated and cannot switch their attention easily, pay great attention to details, and
tend to lack what one might consider typical imagination. These traits have been noted
among those with gender-identity issues (Jones et al., 2010). Is the ASD-GD presentation
a particular clinical phenotype that points to a shared cause? The many unanswered
questions on sexuality in the ASD context necessitate a need for research. At this stage,
the paucity of research on the issue of sexual orientation and gender-identity, their
subsequent development and different expressions in an ASD population limits drawing
any confident conclusions and providing comprehensive support programs.
2.5. Research Questions for this Thesis

The prevalence rates of ASD are high and appear to be rising (Fombonne, 2005; Prior, 2003). If future research supports what little evidence there exists on the increased rates of minority sexual orientations and gender-identity issues among this population, gaining an expanded understanding of the unique experiences of this population is warranted. Furthermore, knowledge in this area will help in guiding both clinical judgement and inform the designing of specialized psycho-social sex educational programs, in an effort to ameliorate a developmental track that is often painfully difficult to navigate, and provide comprehensive support to the individual with ASD with the goal of reducing frustration and increasing social acceptance.

While there is epidemiological literature that examines the prevalence rates of ASD and that of sexual and gender identities in the general population, to this author’s knowledge, as of writing this, there are no studies to have pooled all three parameters and thoroughly investigated both gender identity and sexual orientation in a single international autism sample. Such a study will allow for group comparisons, as well as learn of any associations between the different constructs. This would increase chances for unravelling any features of ASD that may be driving GD and whether an individual’s GD is related to how they sexually-orient. It is hoped that this thesis will provide us with a better understanding of (a) the demographic profile of the sexual orientations and gender identities in ASD; (b) compare the rates of GD symptomology in ASD with that of the wider population; (c) identify any associations between sexual orientation, ASD and GD; (d) examine any differences in the mental health status between the ASD and TD populations based on their reported sexual orientation and gender-status; and
(e) explore how someone with ASD experiences their sexuality with a particular focus on their sexual orientation and their experiences related to their gender-identity.
Chapter 3. Sexual Orientation in Autism Spectrum Disorder: “I like Sex and I’m not Choosy!”
3.1 Introduction

In the United States and many other nations, civil rights for sexual minorities have become a hot-button political issue affecting prevailing sexual attitudes (Avery et al., 2007). Additionally, internet-use has expanded dramatically, providing people access to sexual material online (Cooper, Boies, Maheu, & Greenfield, 2000). Changes in sexual culture over the last two decades have affected current sexual attitudes and behaviors (Petersen & Hyde, 2011) as well as renewed interest in sexuality research, and this interest extends into the field of autism research as well. This study aims to contribute to this emerging research base with a specific interest in sexual orientation in ASD.

Social norms govern most aspects of our lives, with sexuality being one area where these norms or rules can be quite decisive and unforgiving (Laumann, Gagnon, Michael, & Michaels, 1994). A large part of our sexuality develops through the stream of our social interactions, together with a process of solitary discovery, as well as our sense of imagination and our emotional perception of ourselves and others (Tolman & Diamond, 2014). Social domains such as self-understanding, social interaction, communication, physical contact, empathy, and fantasy can be particularly difficult or limited for individuals with ASD, and this can have a profound effect upon sexual development and the initiation and maintenance of relationships (Attwood, 1998; Henault, 2005). These deficiencies may result in rigid, stereotypical or even ritualized mannerisms that could impede the full experience and richness of life. Despite these difficulties in relationship skills experienced by people with ASD and some fundamental myths about a lack of sexual interest among individuals with intellectual deficits (Milligan & Neufeldt, 2001), many adults on the spectrum are able to experience
romantic and sexual relationships (Byers & Nichols 2014; Stokes, Newton & Kaur, 2007).

Contrary to pervasive societal perceptions on problematic sexual behaviors among individuals with ASD (Hénault, 2005; Koller, 2000), there is literature that supports healthy sexual functioning and sexual behaviors not unlike that seen in the TD population (Byers, Nichols, & Voyer, 2013). However, inappropriate expressions of sexuality attributed to a deficiency in sexual knowledge have been reported (Hellemans et al. 2007; Van Bourgondien, Reichle & Palmer, 1997; Stokes et al., 2007). Furthermore, higher rates of non-heterosexuality (Byers et al, 2013; Gilmour et al., 2011; Hellemans et al. 2010) and gender-ambivalent attitudes (Bejerot & Eriksson, 2014) have been reported among individuals with ASD.

Among the few earlier studies that assessed sexual behaviors among individuals with autism residing in group homes, caregiver reports indicated a high prevalence of homosexual, bisexual, and undetermined orientations, with between 20-40% of residents reporting non-heterosexual orientations (Hellemans et al., 2007, 2010; Van Bourgondien, Reichle, & Palmer, 1997). However, some participant characteristics limit the generalizability of these findings; subjects were institutionalized males with varying levels of cognitive-impairment, who entered care-facilities at an early age, and this could have interfered with socio-sexual development and access to members of the opposite-sex. Furthermore, many of the subjects were still young, and may still have been exploring their sexuality, and not have developed stable sexual orientations. Additionally, a lack of a neurotypical control group precluded comparisons on population norms in this age group.
Whilst most reviewed studies relied on parental reports, a more recent study (Gilmour, Schalomon, & Smith, 2012) relied on self-report data using the Sell Scale of Sexual Orientation (Gonsiorek, Sell & Weinrich, 1995) and contrasted sexual behaviors between 82 individuals with ASD (55 females and 17 males) and 282 typically-developing (TD) individuals (180 females and 102 males). Overall, individuals with ASD reported higher rates of asexuality, bisexuality, and homosexuality, and lower rates of heterosexuality when compared to controls. Comparisons within the ASD group suggested that females with ASD were less heterosexual when compared to males with ASD. However, a portion of the participants recruited by Gilmour et al. were recruited from a personal ASD blog operated by the one of the authors, which may have led to some response-bias, and low ASD-male sample sizes may have masked any small variations in sexual orientations across diagnostic groups. Another study interviewed 28 men with ASD and similarly found an increased prevalence of homosexuality (Aston, 2003). In a case-control study comprising Swedish participants (50 adults with ASD and 53 controls), females with ASD reported higher rates of homosexuality and bisexuality (58.3%) when compared to control females (16%), while no differences were found among males with and without an ASD (Bejerot & Eriksson, 2014). The researchers agreed that male controls were less gender-typical and that this might have contributed to some of the non-significant findings across male groups. However, a purely Swedish sample and a non-validated sexual orientation measure might restrict generalizability of the findings. Notwithstanding limitations, taken together, findings from these studies suggest an elevated rate of non-heterosexuality among individuals with ASD relative to TD individuals, and this effect may be more pronounced among females with ASD.
The Extreme Male Brain (EMB) theory of autism (Baron-Cohen, 2002) might partly explain the increased non-heterosexuality rates among females with ASD. According to the EMB theory, individuals with ASD have a hypermasculinized cognition, and elevated fetal testosterone (fT) exposure is implicated as the biological mechanism related to this neural masculinization (Auyeung et al., 2009). It is suggested that fT excess in females may more readily permit gynophilia or sexual attraction to females (Meyer-Bahlburg, Dolezal, Baker, & New, 2008). Interestingly, some literature suggests that homosexuality in both females and males might be related to increases in fT levels (Jenkins, 2010), but reports are inconsistent when it comes to male homosexuality and its association with fT (Dorner et al., 1980), when compared to the link between female homosexuality and fT (Hines, Brook, & Conway, 2004; Williams et al., 2000; Meyer-Bahlburg et al., 2008).

Sexual orientation is a complex multidimensional construct. The three main domains of sexual orientation, namely an individual’s sexual attractions, sexual contacts and sexual identity could be distinct from one another and may not necessarily and consistently be predictive of one another owing to influences from different sociocultural factors (Pathela et al., 2006). No study has to date investigated all three domains in a population of individuals with an ASD and this warrants empirical attention.

The aim of the current study was to compare sexual orientations between individuals with and without an ASD in an international sample using validated measures, so as to address some of the limitations raised earlier. Males and females differ on their sexual attitudes and behaviors (Petersen & Hyde 2011) and reviewed literature points to increased sexual diversity among females in the ASD population. To better
understand group differences by birth-sex, comparisons related to sexuality would be best studied separately. Consequently, it was hypothesized that when compared to male and female controls, males and females with ASD would report lower rates of heterosexuality and higher rates of homosexuality, bisexuality and asexuality across all three domains of sexual orientation, namely sexual attractions, sexual contacts and sexual identity, respectively.

3.2 Method

3.2.1 Participants

A total of 571 individuals participated in the study. Of these, 261 were TD and 310 self-reported having a diagnosis of ASD. The Autism-Spectrum Quotient (AQ; Baron-Cohen et al., 2001) was one of the standardized tests included in the survey to screen for ASD. Scores on the AQ test differed significantly between the two groups ($t(460.59) = 21.01, p < 0.001, d = 1.79$), confirming that participants in the group with ASD were exhibiting significantly more traits characteristic of autism than participants in the control group. The authors of the AQ stated that individuals with a clinical diagnosis of ASD tend to score at or above 32 on the AQ. The mean AQ score of the ASD group was above this cut-off score ($M = 34.98, SD = 7.29$), when compared to the mean AQ scores among controls ($M = 19.10, SD = 10.19$).

The TD group consisted of 103 males ($M = 35.91$ years, $SD = 12.26$) and 158 females ($M = 32.90$ years, $SD = 12.17$), and the group with ASD consisted of 90 males ($M = 33.78$ years, $SD = 12.45$) and 219 females ($M = 31.65$ years, $SD = 11.70$) and one intersexed individual, who was aged 39 years. When examining the ages of the
participants, no significant differences for age were found between the group with ASD 
\(M_{age}=32.29, SD=11.93\) and the TD group \(M_{age}=33.97, SD=12.25\). The sample 
comprised of individuals from various ethnic backgrounds (see Table 3.1). Additionally, 
the sample was largely highly educated (53.2% had some University qualification or a 
Bachelor’s degree, and 14.4% had a Master’s or Doctoral degree; see Table 3.1). There 
were no significant differences between the individuals with and without an ASD on their 
levels of education \(\chi^2(8)= 10.51, p= \text{ns}\).

Table 3.1

Demographic characteristics of the study sample

<table>
<thead>
<tr>
<th></th>
<th>ASD (N= 310)</th>
<th>TD (N= 261)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Race/Ethnicity %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>81.6</td>
<td>71.4</td>
</tr>
<tr>
<td>African-American</td>
<td>0.6</td>
<td>1.1</td>
</tr>
<tr>
<td>Hispanic</td>
<td>1.0</td>
<td>2.2</td>
</tr>
<tr>
<td>Latino</td>
<td>0.3</td>
<td>0.5</td>
</tr>
<tr>
<td>Middle-Eastern</td>
<td>0.0</td>
<td>3.8</td>
</tr>
<tr>
<td>Asian</td>
<td>1.9</td>
<td>8.1</td>
</tr>
<tr>
<td>Pacific Islander</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Indigenous or Australian Aboriginal</td>
<td>0.3</td>
<td>0.0</td>
</tr>
<tr>
<td>Multiracial</td>
<td>8.1</td>
<td>7.0</td>
</tr>
<tr>
<td>Other/Rather not say</td>
<td>6.2</td>
<td>6.0</td>
</tr>
<tr>
<td>Education level %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary school</td>
<td>2.7</td>
<td>1.3</td>
</tr>
<tr>
<td>High school</td>
<td>17.7</td>
<td>24.2</td>
</tr>
<tr>
<td>Trade/Vocational school</td>
<td>7.4</td>
<td>5.8</td>
</tr>
<tr>
<td>Some University</td>
<td>29.7</td>
<td>25.5</td>
</tr>
<tr>
<td>Bachelor’s degree</td>
<td>23.2</td>
<td>25.8</td>
</tr>
<tr>
<td>Master’s degree</td>
<td>10.3</td>
<td>11.9</td>
</tr>
<tr>
<td>Doctoral degree</td>
<td>3.5</td>
<td>2.9</td>
</tr>
<tr>
<td>Other/Not sure</td>
<td>5.5</td>
<td>2.6</td>
</tr>
</tbody>
</table>
3.2.2 Procedure and measures

Upon receiving ethical approval for the research from Deakin University Human Research Ethics Committee (DUHREC 2014-008), national and international autism organizations were contacted, including autism forums. TD participants were recruited by word of mouth and through social media such as Facebook. The study was solely conducted in electronic format.

After reading the terms and conditions in the Plain Language Statement (see Appendix A) and consenting to participation in the survey, participants first completed a series of demographic questions related to their age, country of residence, race, and level of education, birth-sex, diagnostic status, comorbid medical/psychiatric conditions, and cohabitation status. This was followed by administration of the Sell Scale of Sexual Orientation (Gonsiorek, Sell, & Weinrich, 1995; see Appendix D).

**Sell Scale of Sexual Orientation.** The Sell Scale of Sexual Orientation (Gonsiorek et al., 1995) is a comprehensive measure of sexual orientation. It is a well-validated instrument which demonstrates construct validity in its strong correlation with the Kinsey scale of sexual orientation ($r = 0.85$), while test-retest reliability is demonstrated in correlations ranging upward from 0.93.

The Sell Scale firstly ascertains an individual’s biological sex, and then goes on to assess the person’s Sexual Attractions, Sexual Contacts, and Sexual Identity, in relation to men and to women, separately. On every domain, there are three corresponding questions for same-sex attraction (homosexuality) and opposite-sex attraction (heterosexuality): 1. *number of different persons attracted to*; 2. *frequency of attraction to*
a person; 3. intensity of attraction to a person. Two questions assess the number of and the frequency of homosexual and heterosexual contacts. One question assesses homosexual identity and heterosexual identity.

**Summarizing scores on the Sell scale.** Unmodified, the six pairs of questions provide a profile of an individual’s homosexual and heterosexual orientations; three for sexual attraction, two for sexual contacts, one for sexual identity. Sell (1996, p. 305), the author of the sexual orientation scale stated that the three responses related to sexual attraction and the two related to sexual contact, could be summarized into a single score each. This is accomplished by taking the highest score from each of the domains. While heterosexual and homosexuality are regarded as categorical, Sell states that there are degrees of sexuality within each respective category and different response-options are included to measure this degree of hetero- or homosexuality. The degree of a person’s sexuality is reflected in the coding of the responses to each item, see Table 3.2.
Table 3.2

*Codes assigned to responses on the Sell Scale for statistical analysis*

<table>
<thead>
<tr>
<th>Extent of Event</th>
<th>Assigned code denoting degree of sexuality</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sexual Attraction</strong></td>
<td></td>
</tr>
<tr>
<td>1. <em>During the past year, how many different [men/women] were you sexually attracted to?</em></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>No sexual attraction</td>
</tr>
<tr>
<td>1 to 5 persons</td>
<td>Moderate sexual attraction</td>
</tr>
<tr>
<td>More than 6 persons</td>
<td>Extreme sexual attraction</td>
</tr>
<tr>
<td>2. <em>During the past year, on average, how often were you sexually attracted to a [man/woman]?</em></td>
<td></td>
</tr>
<tr>
<td>Never to less than one time per month</td>
<td>No sexual attraction</td>
</tr>
<tr>
<td>1-3 times per month to once weekly</td>
<td>Moderate sexual attraction</td>
</tr>
<tr>
<td>More than 4 times per week to daily</td>
<td>Extreme sexual attraction</td>
</tr>
<tr>
<td>3. <em>During the past year, the most I was sexually attracted to a [man/woman] was:</em></td>
<td></td>
</tr>
<tr>
<td>Not at all - slightly</td>
<td>No sexual attraction</td>
</tr>
<tr>
<td>Mildly - Moderately</td>
<td>Moderate sexual attraction</td>
</tr>
<tr>
<td>Significantly - Extremely</td>
<td>Extreme sexual attraction</td>
</tr>
<tr>
<td><strong>Sexual Contact</strong></td>
<td></td>
</tr>
<tr>
<td>1. <em>During the past year, how many different [men/women] did you have sexual contact with?</em></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>No sexual contact</td>
</tr>
<tr>
<td>1 to 5 persons</td>
<td>Moderate sexual contact</td>
</tr>
<tr>
<td>More than 6 persons</td>
<td>Extreme sexual contact</td>
</tr>
<tr>
<td>2. <em>During the past year, on average, how often did you have sexual contact with a [man/woman]?</em></td>
<td></td>
</tr>
<tr>
<td>Never to less than once a month</td>
<td>No sexual contact</td>
</tr>
<tr>
<td>1-3 times per month to once weekly</td>
<td>Moderate sexual contact</td>
</tr>
<tr>
<td>More than 4 times per week to daily</td>
<td>Extreme sexual contact</td>
</tr>
</tbody>
</table>
The combination of the Homosexual and the Heterosexual summaries provided the Bisexuality and Asexuality status of a person. If an individual reported sexual attraction or sexual contact to both sexes, rather than to only one sex or neither, then they were categorized into the bisexual category. Additionally, asexuality was coded as a binary variable and an individual was assigned to the asexual category if they reported no sexual attraction and no sexual contact. Both bisexuality and asexuality were coded as binary variables, due to deficient number of cases per cell that would violate assumptions of the statistical analysis used.

After the Sell Scale, a singular question was included, ‘I consider my sexual orientation identity as’ followed by the following options; lesbian, gay, bisexual, transgender, questioning, asexual, pansexual, intersexual, heterosexual and other. Respondents who opted for ‘other’ were provided with a free-choice format option. The survey took approximately 20 minutes to complete.

3.3 Results

3.3.1 Data screening

Data were screened for missing values, outliers, and normality. Of the 571 participants, one case indicated their birth-sex as intersex. It was decided that this case be excluded from analyses that examined sexuality by birth-sex group. Missing data on the relevant variables was less than 5%, and cases with missing data were excluded from analyses employing pairwise deletion where necessary. No univariate or multivariate outliers were found. Multinomial logistic regression (MLR) analyses were conducted to compare responses between individuals with and without an ASD on their Sexual
attractions, Sexual Contacts and Sexual Identity from the Sell Scale of Sexual Orientation. The Dependent Variables (DVs) were the different questions on the Sell Scale and the levels on each DV were the different response-options to each item. The Independent Variable (IV) was diagnosis (ASD or TD).

3.3.2 Demographic trends

A chi-square test of independence was conducted to investigate the relationship between diagnosis and sexual orientation as reported on the single-item question asking participants to state their sexual orientation. Responses to the question ‘I consider my sexual orientation identity as’ were analyzed. Results suggested that self-reported sexual orientation was contingent on diagnosis (N = 570, \(\chi^2(9) = 104.05, p < .001, \phi = 0.43\)). In the group with ASD, 69.7% of the sample reported being non-heterosexual, while in the TD group, 30.3% reported being non-heterosexual.

Individuals with ASD reported a wider range of sexual orientations than controls (see Figure 3.1 and Table 3.3). Under ‘other sexual orientation’, the most frequent responses were ‘demisexual’, ‘gray asexual’, ‘celibate’ and ‘queer’, all of which are variant terms that come under the broader ‘asexual’ umbrella term (Richards & Barker, 2013).
Table 3.3

<table>
<thead>
<tr>
<th>Sexual Orientation</th>
<th>ASD (N=309)</th>
<th>TD (N=261)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (N=90)</td>
<td>F (N=219)</td>
</tr>
<tr>
<td>Lesbian</td>
<td>3.3</td>
<td>9.1</td>
</tr>
<tr>
<td>Gay</td>
<td>11.1</td>
<td>0.5</td>
</tr>
<tr>
<td>Bisexual</td>
<td>8.9</td>
<td>14.6</td>
</tr>
<tr>
<td>Transgender</td>
<td>2.2</td>
<td>0.9</td>
</tr>
<tr>
<td>Questioning</td>
<td>3.3</td>
<td>4.6</td>
</tr>
<tr>
<td>Asexual</td>
<td>8.9</td>
<td>23.3</td>
</tr>
<tr>
<td>Pansexual</td>
<td>4.4</td>
<td>8.2</td>
</tr>
<tr>
<td>Heterosexual</td>
<td>46.7</td>
<td>23.7</td>
</tr>
<tr>
<td>Other</td>
<td>11.1</td>
<td>15.1</td>
</tr>
</tbody>
</table>

Note: The individual with ASD who reported being Intersex was excluded from this analysis.

A chi-square test of independence was performed to examine the relationship between sexual orientation and birth-sex in the ASD group. The relationship between these variables was significant ($\chi^2_{(9)} = 45.85$, $p < .001$, $\phi = 0.39$). Females with ASD were more likely to report a larger range of sexual orientations than were males with ASD (see Table 3.3).
3.3.3 Male Sexuality

3.3.3.1 Heterosexuality.

Attraction. MLR analyses were conducted among males in the sample to assess whether having a diagnosis of ASD predicts sexual attraction to a woman. Heterosexual attraction was assessed by three items, number, frequency and intensity of heterosexual attractions. Each item had three response options as shown in Table 3.2; no heterosexual attraction (reference category), moderate heterosexual attraction, and extreme heterosexual attraction.

An analysis of the number of heterosexual attractions indicated that males with and without an ASD responded differently, \( R^2_{LL} = 0.36 \), Hosmer & Lemeshow, 2013; \( \chi^2(2) = 10.52, \ p = .005 \). Relative to their TD peers, males with ASD were 0.22 times less likely to be attracted to one to five women (moderate heterosexuality; \( p = .002 \)) and 0.28 times less likely to be attracted to more than six women (extreme heterosexuality; \( p = .009 \)) than not be attracted to a woman. Additionally, males with ASD differed from TD males on frequency of heterosexual attractions, \( R^2_{LL} = 0.54 \), \( \chi^2(2) = 23.32, \ p < .001 \). Males with ASD were 0.17 times less likely than TD males to be attracted to women one to three times per month to once weekly (moderate heterosexuality; \( p < .001 \)) than not be attracted to a woman. Moreover, males with and without an ASD differed on the intensity of heterosexual attractions, \( R^2_{LL} = 0.26 \), \( \chi^2(2) = 6.18, \ p = .04 \). Males with an ASD were
0.30 times less likely to report mild to moderate intensity of heterosexual attraction than no heterosexual attraction at all (moderate heterosexuality; \( p = .02 \); see Table 3.4).

The responses to the number, frequency and intensity of sexual attractions were reduced to a single score based on the most extreme score. Relative to TD males, males with ASD were extremely less heterosexual in the number of attractions, moderately less heterosexual in the frequency of attractions, and moderately less heterosexual in the intensity of attractions. Thus the highest score in the domain of heterosexual attractions suggested that males with ASD were extremely less heterosexual compared to TD males.

**Contact.** An analysis of the count of heterosexual contacts suggested differences between males with and without an ASD, \( R^2_{2LL} = .70, \chi^2(2) = 37.69, p < .001 \). When compared to TD males, males with an ASD were 0.15 times less likely to have sexual contact with one to five women (moderate heterosexuality; \( p < .001 \)) and 0.06 times less likely to have sexual contact with more than six women (extreme heterosexuality; \( p = 0.001 \)) than to not have any sexual contact with a woman. Furthermore, the two groups differed on the frequency of heterosexual contact \( R^2_{2LL} = .71, \chi^2(2) = 45.68, p < .001 \).

Relative to TD males, the odds of males with an ASD having sexual contact with a woman one to three times a week to once weekly (moderate heterosexuality) was 0.25 times lower than having no sexual contact with a woman \( (p < 0.001) \), and that of having sexual contact with a woman more than four times a week to daily (extreme heterosexuality) was 0.07 times lower than having no heterosexual contact with a woman \( (p < 0.001) \). Summarizing across the two items, results suggested when it came to heterosexual contacts, males with an ASD were extremely less heterosexual compared to TD males (see Table 3.4).
Identity. Independent samples t-tests were undertaken to examine differences on the strength with which males with and without an ASD identified with a heterosexual identity, on a scale of zero to six. No significant differences were found between males with an ASD (\(M = 3.61, SD = 2.20\)) and TD males (\(M = 3.55, SD = 2.56\)) on strength of identification with a heterosexual identity, \(t_{(190.90)} = 0.17, p = ns\), Cohen’s \(d = 0.05\).

3.3.3.2 Homosexuality.

Attraction. A MLR analysis was undertaken to examine whether males with and without a diagnosis of ASD differed in their homosexual attractions. The two groups differed on number of homosexual attractions \(R^2_{LL} = 0.42, \chi^2_{(2)} = 11.91, p = .003\). Compared to TD males, males with ASD were 2.93 times more likely to be attracted to one to five men (moderate homosexuality; \(p = .009\)) and 4.17 times more likely to be attracted to more than six men (extreme homosexuality; \(p = .02\)) than not to be attracted to any man. Group differences were demonstrated in response to frequency of homosexual attractions \(R^2_{LL} = 0.56, \chi^2_{(2)} = 16.12, p < .001\). Males with an ASD were 11.29 times more likely than TD males to be attracted to a man more than four times a week to daily (extreme homosexuality; \(p = .002\)) than not to experience any attraction to a man. Furthermore, males with and without ASD differed in their intensity of homosexual attractions, \(R^2_{LL} = 0.44, \chi^2_{(2)} = 10.53, p = .006\). Specifically, when compared to TD males, males with an ASD were 3.24 times more likely to report significant to extreme intensity of attraction to a man (extreme homosexuality; \(p = .003\)) than no attraction to a man (see Table 3.4). Taking the highest score across the three items, results suggested that males with an ASD were extremely homosexual when compared to TD males in their sexual attractions.
**Contact.** Responses assessing count of homosexual contact indicated no differences in number of homosexual contacts between individuals with and without an ASD, \( R^2_{2LL} = 0.25, \chi^2(2) = 3.18, p = \text{ns} \). In responding to frequency of homosexual contact, males with ASD reported more frequent homosexual contact than control males, \( \chi^2(1) = 3.98, p = .04, \varphi = 0.14 \); see Table 3.4). Summarizing across the two items, males with an ASD were more likely to have homosexual\(^1\) contact when compared to TD males.

**Identity.** Independent samples \( t \)-tests were undertaken to examine differences on the strength with which males with and without an ASD identified with a homosexual identity on a scale of zero to six. Males with an ASD identified more strongly with a homosexual identity \( (M = 1.39, SD = 1.94) \) than TD males did \( (M = 0.72, SD = 1.48) \); \( t_{(166.07)} = 2.90, p = .004 \), Cohen’s \( d = 0.45 \).

\(^1\) Homosexual contact was coded as a binary variable, as the number of participants fell below the minimum number of cases per cell, violating an assumption of the MLR analysis. A chi-square analysis was undertaken instead of a MLR for this particular variable.
Table 3.4  
Multivariate Logistic Regression comparing Homosexuality and Heterosexuality between males with and without an ASD

<table>
<thead>
<tr>
<th>DV</th>
<th>Homosexuality</th>
<th></th>
<th></th>
<th>Heterosexuality</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B(SE)</td>
<td>OR</td>
<td>CI</td>
<td>B(SE)</td>
<td>OR</td>
<td>CI</td>
</tr>
<tr>
<td><strong>Sexual Attraction</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of persons sexually attracted to versus No attraction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate Attraction</td>
<td>1.07(0.41)*</td>
<td>2.93</td>
<td>1.31-6.53</td>
<td>-1.5(0.50)**</td>
<td>0.22</td>
<td>0.08-0.59</td>
</tr>
<tr>
<td>Extreme Attraction</td>
<td>1.22(0.56)*</td>
<td>3.38</td>
<td>1.11-10.22</td>
<td>-1.28(0.49)**</td>
<td>0.28</td>
<td>0.11-0.72</td>
</tr>
<tr>
<td>Frequency of attraction versus No attraction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate Attraction</td>
<td>0.33(0.60)</td>
<td>1.34</td>
<td>0.39-3.76</td>
<td>-1.76(0.44)***</td>
<td>0.17</td>
<td>0.07-0.40</td>
</tr>
<tr>
<td>Extreme Attraction</td>
<td>2.42(0.77)*</td>
<td>11.29</td>
<td>2.52-50.74</td>
<td>-0.07(0.34)</td>
<td>0.92</td>
<td>0.47-1.82</td>
</tr>
<tr>
<td>Intensity of attraction versus No attraction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate Attraction</td>
<td>1.09(0.88)</td>
<td>2.97</td>
<td>0.53-16.70</td>
<td>-1.20(0.55)*</td>
<td>0.30</td>
<td>0.10-0.89</td>
</tr>
<tr>
<td>Extreme Attraction</td>
<td>1.17(0.40)*</td>
<td>3.24</td>
<td>1.48-7.08</td>
<td>-0.52(0.32)</td>
<td>0.59</td>
<td>0.31-1.12</td>
</tr>
<tr>
<td><strong>Sexual Contact</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of persons sexually contacted versus No contact</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate Contact</td>
<td>0.67(0.51)</td>
<td>1.96</td>
<td>0.72-5.3</td>
<td>-1.89(0.35)***</td>
<td>0.15</td>
<td>0.07-0.30</td>
</tr>
<tr>
<td>Extreme Contact</td>
<td>1.32(1.16)</td>
<td>3.75</td>
<td>0.38-36.78</td>
<td>-2.89(0.82)***</td>
<td>0.06</td>
<td>0.01-0.28</td>
</tr>
<tr>
<td>Frequency of contact versus No contact</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate Contact</td>
<td>$\chi^2 (1) = 3.98, p&lt;0.05$, $\phi=0.14$</td>
<td>-1.38(0.39)***</td>
<td>0.24</td>
<td>0.11-0.54</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extreme Contact</td>
<td>(categories collapsed due to insufficient numbers in individual cells)</td>
<td>-2.61(0.43)***</td>
<td>0.07</td>
<td>0.03-0.17</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$p<.05$  $p<.01$  $p<.001$  ***
3.3.3.3 Bisexuality.

Chi-square analyses were conducted to assess for whether relative to controls, males with an ASD were more likely to be bisexually oriented. Bisexual attractions rates were compared between the two groups. No significant differences were found on number of bisexual attractions ($\chi^2(1) = 3.59, p = .06$) and frequency of bisexual attractions, ($\chi^2(1) = 2.58, p = .08$). However, males with an ASD reported a higher intensity of bisexual attractions relative to their TD peers, ($\chi^2(1) = 12.33, p < .001$). Using the highest score in the domain of bisexual attractions, results suggested that males with an ASD were more likely to be bisexual than control males, in their sexual attractions. Bisexual contact rates were compared between males with and without an ASD. No significant group differences were found on the number of bisexual contacts, ($\chi^2(1) = 0.18, p = ns$) and frequency of bisexual contacts, ($\chi^2(1) = 2.54, p = ns$). When interactions between the homosexual and heterosexual identity-scales were examined, relative to TD males, males with ASD identified more strongly with a bisexual identity ($\chi^2(1) = 5.50, p = .01, \phi = 0.17$).

3.3.3.4 Asexuality.

Chi-square analyses were conducted to assess for whether a diagnosis of ASD was related to asexuality. Relative to controls, males with ASD reported increased asexuality on number of sexual attractions, ($\chi^2(1) = 6.89, p = .008$) and frequency of sexual attractions, ($\chi^2(1) = 5.31 p = .02$). However, no group differences were found on the intensity of sexual attractions, ($\chi^2(1) = 0.18, p = ns$). Males with an ASD identified more strongly with an asexual identity ($\chi^2(1) = 8.74, p = .003, \phi = 0.22$) than TD males.
Summarizing across the three items, males with an ASD were more likely to be asexual than control males.

3.3.4 Female Sexuality

3.3.4.1 Heterosexuality.

Attraction. Significant differences were found between females with and without an ASD on number of heterosexual attractions, $(R^2_{LL} = 0.52, \chi^2(2) = 22.71, p < .001)$. Relative to their TD peers, females with an ASD were 0.30 times less likely to be attracted to one to five men (moderate heterosexuality; $p < .001$) and 0.37 times less likely to be attracted to more than six men (extreme heterosexuality; $p = .006$) than to not be attracted to any man. Group differences were found on frequency of heterosexual attractions, $(R^2_{LL} = 0.33, \chi^2(2) = 7.16, p = .03)$. Females with ASD were 0.55 times less likely to be attracted to a man four times a week to daily (extreme heterosexuality; $p = .01$) than to not be attracted to any man. Moreover, females with and without a diagnosis of ASD differed on intensity of heterosexual attractions, $(R^2_{LL} = 0.55, \chi^2(2) = 24.48, p < .001)$. Relative to controls, females with an ASD were 0.34 times less likely to report mild to moderate intensity of attraction to a man (moderate heterosexuality; $p = .006$) and 0.33 times less likely to report significant to extreme intensity of attraction to a man (extreme heterosexuality; $p < .001$) than to report no attraction to a man. Taking the highest score in the domain of heterosexual attractions indicated that females with ASD reported extremely low heterosexuality than TD females (see Table 3.5).

Contact. An analysis of the count of heterosexual contacts indicated lower heterosexuality among females with ASD than controls, $(R^2_{LL} = .57, \chi^2(2) = 22.80,$
When compared to TD females, females with ASD were 0.37 times less likely to have sexual contact with one to five men (moderate heterosexuality; $p < 0.001$) and 0.16 times less likely to have sexual contact with more than six men (extreme heterosexuality; $p = 0.03$) than to have no sexual contact with a man. Furthermore, responses to frequency of heterosexual contact indicated that females with ASD and TD females significantly differed on how often they had heterosexual contact, ($R^2_{2LL} = 0.66$, $\chi^2(2) = 41.65$, $p< 0.001$). Compared to TD females, the odds of females with ASD having sexual contact with a man one to three times a month to once weekly (moderate heterosexuality) was 0.45 times lower ($p = 0.002$) and having sexual contact with a man more than four times per week to daily (extreme heterosexuality) was 0.16 times lower ($p< 0.001$) than having no sexual contact with a man. The highest score in the heterosexual contact domain suggested that females with an ASD were extremely less heterosexual when compared to TD females (see Table 3.5).

Identity. Independent samples $t$-test compared the strength with which female respondents identified with a heterosexual identity based on membership to diagnostic group, on a scale of zero to six. Females with an ASD did not identify as strongly with a heterosexual identity ($M = 2.78$, $SD = 2.23$) as TD females did ($M = 4.10$, $SD = 2.04$), $t(374)= 5.90$, $p< 0.001$, $d = 0.61$.

3.3.4.2 Homosexuality.

Attraction. No significant differences were found between females with ASD and TD females on number of homosexual attractions in the overall model, ($R^2_{2LL} = 0.21$, $\chi^2(2) = 5.41$, $p = 0.07$). However, comparisons on the different levels of this DV revealed
that females with ASD were 1.73 times more likely than TD females to belong to the group that was attracted to one to five different women (moderate homosexuality; \(p = .02\)) than to belong to the group that was not attracted to any woman over the past year. The groups also differed on frequency of homosexual attractions, \(R^2_{2LL} = 0.28, \chi^2(2) = 7.50, p = .02\). Females with ASD were 2.35 times more likely to belong to the group that was attracted to women one to three times per month to once weekly (moderate homosexuality; \(p = .01\)) than to belong to the group that was not attracted to any women. Moreover, both groups differed on intensity of homosexual attractions, \(R^2_{2LL} = 0.34, \chi^2(2) = 9.81, p = .007\). Females with an ASD were 2.06 times more likely than TD females to report experiencing a significant to extreme intensity of sexual attraction to a woman (extreme homosexuality; \(p = .004\)) than to experience no sexual attraction at all. The highest score in the domain of homosexual attractions indicated that females with an ASD were extremely homosexual compared to TD females (see Table 3.5).

**Contact.** Responses to number of homosexual contacts indicated no differences between female groups with and without ASD in the overall model, \(R^2_{2LL} = 0.25, \chi^2(2) = 3.78, p = \text{ns}\). Comparisons on the individual response options showed that relative to their TD peers, females with an ASD were 1.87 times more likely to have sexual contact with one to five women (moderate homosexuality; \(p = .06\)) than have no homosexual contact at all. This effect however fell short of significance. In responding to frequency of homosexual contact, no significant differences were noted between the ASD and TD female groups in the overall model, \(R^2_{2LL} = 0.21, \chi^2(2) = 3.45, p = \text{ns}, \text{see Table 3.5}\).
**Identity.** Independent samples \( t \)-test compared the strength with which female respondents identified with a homosexual identity based on membership to diagnostic group. Females with ASD reported identifying more strongly with a homosexual identity \((M= 2.14, SD= 2.23)\) than TD females did, \((M= 1.55, SD= 1.81, t(374)= 2.83, p = .005, d = 0.32)\).

3.3.4.3 Bisexuality.

Chi-square analyses were conducted to assess for whether females with and without an ASD differed in their bisexuality attractions. No significant differences were found in number of bisexuality attractions, \((\chi^2(1)= 0.52, p = ns)\) and the intensity of these bisexual attractions \((\chi^2(1)= 1.07, p = ns)\). However, females with an ASD reported an increased frequency of bisexual attractions than TD females did \((\chi^2(1)= 4.47, p = .02, \phi = 0.11)\). The highest score in the domain of bisexual attractions suggested that females with ASD were more likely to be bisexual than TD females. Comparisons on bisexuality contact rates between the two female groups did not demonstrate any significant differences on the number of bisexual contacts over the past year, \((\chi^2(1)= 0.40, p = ns)\) and the frequency of bisexual contacts, \((\chi^2(1)= 2.50, p = ns)\). Additionally, when interactions between the scales were examined on how strongly one identified with a bisexuality identity, compared to controls, females with an ASD were significantly more likely to identify with a bisexual identity \((\chi^2(1)= 4.00, p = .03, \phi = 0.11)\).

3.3.4.4 Asexuality.

Chi-square analyses were conducted to assess for whether a diagnosis of ASD was related to asexuality. Compared to controls, females with an ASD were more likely
to be asexual in relation to *number of sexual attractions* ($\chi^2(1) = 10.52, p = .001, \varphi = 0.17$), *frequency of sexual attractions* ($\chi^2(1) = 6.92, p = .006, \varphi = 0.13$) and *intensity of sexual attractions* ($\chi^2(1) = 7.31, p = .005, \varphi = 0.14$). Moreover, females with an ASD identified strongly with an asexual identity than TD females did ($\chi^2(1) = 8.91, p = .002, \varphi = 0.15$).
Table 3.5.

Multivariate Regression Analyses comparing Homosexuality and Heterosexuality of Females with an ASD versus Control Females

<table>
<thead>
<tr>
<th>DV</th>
<th>Homosexuality</th>
<th></th>
<th></th>
<th>Heterosexuality</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>B(SE)</td>
<td>OR</td>
<td>CI</td>
<td>B(SE)</td>
<td>OR</td>
</tr>
<tr>
<td>Sexual Attraction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of persons sexually attracted to versus No attraction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate Attraction</td>
<td>0.55 (0.24)*</td>
<td>1.73</td>
<td>1.07-2.79</td>
<td>-1.19 (0.26)***</td>
<td>0.30</td>
<td>0.18-0.51</td>
</tr>
<tr>
<td>Extreme Attraction</td>
<td>0.33 (0.30)</td>
<td>1.39</td>
<td>0.77-2.51</td>
<td>-0.98 (0.36)***</td>
<td>0.37</td>
<td>0.19-0.75</td>
</tr>
<tr>
<td>Frequency of attraction versus No attraction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 to 4 times a month</td>
<td>0.85 (0.33)*</td>
<td>2.35</td>
<td>1.22-4.09</td>
<td>-0.50 (0.27)</td>
<td>0.60</td>
<td>0.36-1.02</td>
</tr>
<tr>
<td>More than 4 times a month</td>
<td>0.33 (0.31)</td>
<td>1.39</td>
<td>0.76-2.55</td>
<td>-0.60 (0.25)*</td>
<td>0.55</td>
<td>0.34-0.89</td>
</tr>
<tr>
<td>Intensity of attraction versus No attraction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate Attraction</td>
<td>0.72 (0.47)</td>
<td>2.06</td>
<td>0.82-5.18</td>
<td>-1.09 (0.39)**</td>
<td>0.34</td>
<td>0.15-0.73</td>
</tr>
<tr>
<td>Extreme Attraction</td>
<td>0.71 (0.25)**</td>
<td>2.03</td>
<td>1.25-3.23</td>
<td>-1.10 (0.23)***</td>
<td>0.33</td>
<td>0.21-0.53</td>
</tr>
<tr>
<td>Sexual Contact</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of persons sexually contacted versus No contact</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate contact</td>
<td>0.63 (0.34)</td>
<td>1.87</td>
<td>0.97-3.62</td>
<td>-0.98 (0.22)***</td>
<td>0.37</td>
<td>0.24-0.58</td>
</tr>
<tr>
<td>Extreme contact</td>
<td>-0.26 (1.01)</td>
<td>0.77</td>
<td>0.11-5.54</td>
<td>-1.84 (0.85)*</td>
<td>0.16</td>
<td>0.03-0.85</td>
</tr>
<tr>
<td>Frequency of contact versus No contact</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate contact</td>
<td>0.43 (0.37)</td>
<td>1.54</td>
<td>0.74-3.19</td>
<td>-0.79 (0.25)**</td>
<td>0.45</td>
<td>0.28-0.74</td>
</tr>
<tr>
<td>Extreme contact</td>
<td>0.84 (0.59)</td>
<td>2.31</td>
<td>0.73-7.32</td>
<td>-1.85 (0.30)***</td>
<td>0.16</td>
<td>0.07-0.28</td>
</tr>
</tbody>
</table>

*p < 0.05, **p < 0.01, ***p < 0.001
Figure 3.2. Heterosexuality and Homosexuality among males and females with ASD compared to sex-matched controls. The odds of an event occurring in controls were set at 1:1. Odds >1 indicate increased odds of event among individuals with ASD compared to controls. Odds <1 indicate decreased odds of event among individuals with ASD compared to controls.

3.4 Additional Analysis

A visual inspection of the data revealed that sexual identity labels (responses to the question ‘I consider my sexual identity as’) did not always correspond with a participant’s sexual attractions and contacts. This is not uncommon, given that sexual identities are subject to sociocultural influences, and are not always a reflection of the individual’s sexual fantasies and behaviors. This would be true for both individuals with and without an ASD. Moreover, a general disregard for social norms in ASD (Izuma, Matsumoto, Camerer, & Adolphs, 2011) and choosing sexual partners for personality-characteristics rather than birth-sex (Lai et al., 2011; Mandy et al., 2012) might increase the discordance between sexual attraction, contact and identity domains in ASD relative
to non-ASD individuals. However, Gilmour et al. (2012) stated that individuals with
ASD chose sexual partners that matched their sexual identity. Thus, the level of
agreement between sexual identity-labels and sexual attractions and contacts were
compared between TD individuals and individuals with ASD. To verify the extent to
which sexual identity labels reported by participants corresponded with their sexual
attractions and contacts, chi-square analyses were undertaken separately for each
diagnostic group for males and females, where the number of cases per cell satisfied
statistical assumptions. Otherwise, raw numbers were used to make comparisons. Only
heterosexual, homosexual and asexual identities were examined, as individuals with these
sexual identities orient toward one or the other sex or neither. Bisexuality, pansexuality,
questioning and ‘other’ orientations were not assessed, as the target of sexual affections
among these orientations are less focused.
Table 3.6.

Percentage of individuals within each sexual identity-label who reported sexual attractions to and sexual contacts with males or females: An assessment of the level of agreement between sexual identity and sexual attractions and contacts.

<table>
<thead>
<tr>
<th></th>
<th>Males%</th>
<th></th>
<th>Females%</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Attraction to</td>
<td>Contact with</td>
<td>Attraction to</td>
<td>Contact with</td>
</tr>
<tr>
<td></td>
<td>males</td>
<td>males</td>
<td>females</td>
<td>females</td>
</tr>
<tr>
<td>TD Heterosexual</td>
<td>1.2</td>
<td>0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>ASD Heterosexual</td>
<td>7.1</td>
<td>4.8</td>
<td>95.2</td>
<td>57.1</td>
</tr>
<tr>
<td>TD Homosexual</td>
<td>100.0</td>
<td>25.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>ASD Homosexual</td>
<td>84.6</td>
<td>38.5</td>
<td>53.8</td>
<td>30.8</td>
</tr>
<tr>
<td>TD Asexual</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>ASD Asexual</td>
<td>18.8</td>
<td>0.0</td>
<td>43.8</td>
<td>25.0</td>
</tr>
</tbody>
</table>

3.4.1 Heterosexuality Identity versus Attractions and Contacts

A chi-square analysis demonstrated that there was a stronger association between an individual’s heterosexual identity and the nature of their sexual attractions and contacts in the TD group than the group with ASD, and this was evident among both TD males ($\chi^2(1) = 26.44, p < .001, \phi = 0.51$) and TD females ($\chi^2(1) = 25.96, p < .001, \phi = 0.41$). There was however lesser agreement between a heterosexual identity, attraction and contact among males with ASD ($\chi^2(1) = 10.26, p < .05, \phi = 0.34$) and females with ASD ($\chi^2(1) = 26.42, p < .001, \phi = 0.34$), relative to their sex-matched controls, where both males and females with an ASD reported less opposite-sex focused attractions, and males reported less opposite-sex focused contact, despite a heterosexual identity. Overall, females reported more diversity in their sexual attractions compared to males, (see Table 3.6 and Figures 3.3 and 3.4).
3.4.2 Homosexuality Identity versus attraction and contact

Chi-square analyses could not be undertaken to assess the level of agreement between a homosexual identity and sexual attractions and contacts, due to deficient numbers in cells, which would violate an assumption of the chi-square analysis. However, an inspection of raw data indicated that TD males and females reported more agreement between their homosexual identity and the nature of their sexual attractions.
and contacts, when compared to males and females with ASD, who were more diverse in their attractions and contacts, (see Table 3.6 and Figures 3.5 and 3.6).

![Figure 3.5 Homosexual Identity and Attraction](image)

![Figure 3.6 Homosexual Identity and Contact](image)

### 3.4.3 Asexuality Identity versus Attraction and Contact

An inspection of proportions of individuals who identified with an asexual identity and their sexual attractions and behaviors demonstrated that TD individuals who reported an asexual identity correspondingly reported an absence of sexual attraction and contact. Individuals in the group with ASD however reported sexual attractions and contacts in a manner that did not correspond with their asexual identity, (see Table 3.6 and Figures 3.7 and 3.8).
3.5 Discussion

The aim of the current study was to compare sexual orientations between individuals with and without an ASD. It was hypothesized that there would be lower rates of heterosexuality and higher rates of homosexuality, bisexuality and asexuality across the three domains of sexual orientation, namely sexual attractions, sexual contacts and sexual identity among males and females with an ASD relative to control males and females, respectively. In sexual attractions, males and females with an ASD reported extremely low heterosexuality, extremely high homosexuality, increased bisexuality and increased asexuality relative to their control peers. However, in sexual contacts, while both males and females reported extremely low heterosexuality, it was only males with an ASD that reported higher homosexual contact. No differences were found on bisexuality contacts for both sexes. In sexual identity, relative to sex-matched peers, males and females with an ASD were stronger in their identification with homosexual,
bisexual and asexual identities. However, only females with an ASD reported lesser identification with heterosexuality relative to female controls, while males with an ASD did not differ from their TD peers on the strength with which they identified with a heterosexual identity. Thus, the hypotheses were partially supported.

The current study provided a sexual profile of individuals related to their sexual attractions, contact behaviors and sexual identity (see Figure 3.2). Findings suggested that when compared to their sex-matched peers, males and females with an ASD were less heterosexual but more homosexual in their sexual attractions, and these differences were at the extreme range as measured by the Sell Scale. Sexual behaviors are often the outcome of sexual attractions and therefore are a valuable index of one’s sexuality. Low heterosexual attraction rates in males and females with an ASD corresponded with low heterosexual contact rates. However, high homosexual attraction rates among individuals with ASD were matched by correspondingly high homosexual contact rates only among males but not females. While homosexual contact rates were higher among females with an ASD compared to controls, these differences did not quite reach statistical significance. Existing census data on female non-heterosexuality states this rate to be approximately 2.4% (Coffman, Coffman, & Ericson, 2013). However, 37.8% of the female control sample from the current study, reported a non-heterosexual orientation. Perhaps, the composition of the female control sample may have reduced the chances of finding a significant effect.

Only females with an ASD reported identifying strongly with a homosexual identity and weakly with a heterosexual identity in a manner that corresponded to their increased homosexual attractions and contacts versus their decreased heterosexual
attractions and contacts. The strength with which males with an ASD identified with a heterosexual identity was comparable to their TD peers, despite the extremely low heterosexual attraction and contact rates among males with ASD. Discordance between sexual identity when compared to sexual attractions and behaviors is not uncommon and susceptible to socio-cultural influences (Pathela et al., 2006). Men are less likely than women to incorporate their sexual experiences into their perceived sexual identities, and more inclined to be less flexible around their sexual identity label based on any fluctuant sexual experiences (Diamond, 2003; McClintock, 2015). Also, society is more tolerant of female homosexuality than it is of male homosexuality (Herek, 2004) and consequently females might be more straightforward when reporting their sexual identities, while males may have internalized some of the more prevalent homophobic attitudes. Correspondingly, females reported greater diversity than males did on the single-item question that asked respondents to state their sexual identity (see Table 3.3).

Furthermore, overall sexual identities corresponded to a larger extent with their sexual attractions and contacts among TD individuals than among individuals with an ASD, whose sexual attractions and contacts were less focussed and more diverse, while being less aligned with their sexual identity-label. The disparity between a sexual identity, sexual attraction and sexual contact was most obvious among individuals with an ASD who reported an asexual identity (see Figures 3.3 to 3.8). This diversity was more pronounced overall among females than males, and supports increased plasticity of female compared to male sexuality (Baumeister & Stillman, 2006; McClintock, 2015). Among TD males and females who identified with a heterosexual identity, a proportion of individuals reported homosexual attractions but no homosexual contact. It is not
uncommon for heterosexual individuals to ‘choose the straight label’ and appease a ‘hetero-conformist’ society that discourages alternative sexualities (Adams, Wright, & Lohr, 1996), while this reasoning may not apply to individuals with ASD, who are more likely to disregard social norms (Izuma et al., 2011) and act on their sexual desires. However, the disparity between sexual labels and sexual desires and behaviors overall among individuals with ASD raises interesting questions about why certain sexual identity-labels are chosen and whether social factors supersede biological factors in sexual orientation in ASD. A qualitative study investigating attitudes toward sexual orientation would prove useful in understanding some of the sexual diversity noted in this study.

While no study has comprehensively assessed for the different domains of sexual orientation among individuals in the ASD population relative to the wider population, previous literature has reported overall higher rates of homosexuality among females with ASD (Gilmour, Schalomon, & Smith, 2012; Bejerot et al., 2014), but no differences among their male groups with and without a diagnosis of ASD. Both studies utilized small sample-sizes of males with ASD comprising 17 and 28 males respectively (Gilmour et al., 2012; Bejerot et al., 2014). Moreover, Bejerot et al. conceded that their male controls were less gender-typical than the general population, where 25% reported ‘being a sissy in childhood’. These reasons may have contributed to the non-significant findings across male groups in previous literature.

Still, one previous study found that males with ASD had a high prevalence rate of homosexual attractions, when compared to controls (Hellemans et al., 2007; 2010). However, the sample comprised of adolescent institutionalized males, who were possibly
developing their sexuality and had limited opportunities for interacting with the opposite-sex. This raises an important point of discussion. Sexual attractions develop as a function of socialization, familiarity and experience. Individuals with ASD typically have deficiencies in their social interactions and communication (Howlin et al., 2000; Mehzabin & Stokes, 2011; Stokes & Kaur, 2005). Relationships, even at the best of times are not easy, and some of the related challenges may be magnified among individuals with ASD seeking to initiate and maintain a romantic relationship (Howlin, 2000; Koning & Magill-Evans, 2001; Stokes, Newton, & Kaur, 2007). Meeting individuals of the opposite sex would require a level of social aptitude and might be demanding for someone with ASD. Additionally, certain socio-sexual stereotypical expectations might add to these challenges. Men are generally required to initiate a romantic relationship (Byers, 1996). This might be particularly difficult if the male individual has had negative social experiences or low self-esteem, and such incidences are not uncommon in ASD (Attwood, 2006). Women generally take longer than men to develop sexual desire (Baumeister, Catanese, & Vohs, 2001), where when men sometimes place more importance on visual stimuli, women may be more sensitive to other criteria such as relational aspects (Ellis & Symons, 1990; Wiederman & Allgeier, 1992). Perhaps some females with ASD experience difficulty developing a relationship with the opposite-sex and consequently experiencing a certain level of sexual desire. This might explain the increased homosexuality trends noted in the current study.

Alternatively, there may be fewer challenges meeting members of the same-sex, which would facilitate same-sex attraction more readily, and the direction of the results concur with this. Given that venturing out and socializing with members of the opposite
sex requires confidence and initiative, perhaps some individuals with ASD may continue to nurture any existing same-sex friendships and not endeavor as readily as their TD peers to broaden their social network. Increased homosexuality trends in the group with ASD may be at least partly attributed to easier access to same-sex individuals, which in turn may encourage same-sex sexual contact, within what may be perceived as a less-rejecting and more affirming social environment. On the other hand, some individuals with ASD may abstain from any sexual activity. The current study found higher scores on measures of asexuality among individuals with an ASD. There may be several reasons for this. ASD-specific features such as decreased need for sexual intimacy due to lowered libidos and sexual arousability (Bejerot et al., 2014), sensory issues, such as hypersensitivity and tactile defensiveness (Leekam & Moore, 2001; Kern et al. 2006; Tomchek & Dunn 2007), social anxieties (Kuusikko et al., 2008), decreased socio-sexual opportunities or unavailability of partners, may lead to choices to remain celibate. The study also added to our understanding of asexuality in ASD; individuals who identify with asexuality may not necessarily have a lack of sexual desire, but may experience romantic attraction to others with decreased or no desire for sexual contact. Accordingly, there were labels that reflected these ‘degrees’ of asexuality, such as homo- or heteroromantic, sapiosexual or demisexual orientations.

When the development of sexual orientation is considered, researchers often look to the critical period of adolescence, when one’s physiology, psychological functioning and social climate are in flux (Savin-Williams, 1988). It is not uncommon for adolescents to engage in homosexual behavior more often than would other age groups. For many teenagers, these experiences are simply part of the process of understanding their
emerging sexuality, and viewed as a pathway to developing a heterosexual orientation (Savin-Williams, 1990). However, cognitive-inflexibility is an inherent characteristic of ASD. Perhaps some individuals with ASD continue to engage in homosexual behaviors that are initiated during adolescence into adulthood. Sexual studies in ASD report on hyper-masturbation and ritualistic sexual practices as being part of a rigid regime (Haracopoulos & Pedersen, 1992) and such reasoning might be extended to sexual preferences as well.

Furthermore, a heightened sexual drive during adolescence may more readily permit same-sex friendships to take on an intimate and sexual nature, and this has been investigated as one probable contributing factor to the development of a homosexual orientation (Jenkins, 2010). When an individual reaches puberty at an earlier age than their peers, access to heterosexual contacts may be restricted. Such early “bloomers” are surrounded by same-sex stimuli, with which they may engage in sexual exploration, and consequently may associate sexual pleasure with homosexual experience. In addition to the sexual connection, friendship ties with these same-sex peers may act as a reinforcing factor for these relationships and create an emotional preference for homosexual relationships. Signs of precocious puberty have been reported among those with ASD (Tordjman & Ferrari, 1992; Ingudomnukul et al., 2007), and this could be one pathway that could lead to increased homosexuality, and indeed bisexuality, as experiences and opportunities expand among ASD individuals.

Certain biological factors might be involved as well in the increased non-heterosexuality in ASD. Robust studies have associated autistic traits with elevated levels of fetal testosterone (fT) (Auyeung et al., 2009; Baron-Cohen, Knickmeyer, &
Belmonte, 2005; Chapman et al., 2006). Neurohormonal theories of sexual orientation also emphasize the sexually-dimorphic organizational role of fT on the developing brain (Auyeung et al., 2009; Gooren, 2006; Knickmeyer et al. 2005). fT is a masculinizing hormone, and elevated levels of fT among males would typically be expected to hypermasculinize the individual and contribute toward a pronounced heterosexuality, contrary to findings in the current study that point to decreased heterosexuality and increased homosexuality in fantasy and behavior. Direct studies investigating the effects of early testosterone on human sexual orientation is difficult, and this has led to the search for proxies of human sex hormones levels on sexual orientation. Recent suggestions by some scientists that the ratio of the length of the 2nd to 4th digits (2D:4D) is related to fT levels (Honekopp et al., 2007; Zheng, Zhengu; Cohn, & Martin, 2011) has prompted the investigation of finger-length ratios in relation to sexual orientation. With regard to males, these studies have yielded discrepant and inconclusive outcomes. Two studies (Rahman & Wilson, 2003; Robinson & Manning, 2000) demonstrated more male-typical finger patterns among male homosexual populations compared to heterosexual males, and from this it was inferred that male homosexuals have higher levels of fT than heterosexual males. However, other studies (Voracek, Manning, & Ponocny, 2005; Williams et al., 2000) reported no significant difference in 2D:4D ratios between homosexual and heterosexual males, while two subsequent studies found that homosexual males reported higher 2D:4D ratios than their heterosexual counterparts (Lippa, 2003; McFadden & Shubel, 2002). At this stage, the evidence linking elevated testosterone to male homosexuality is unclear and requires further research.
Newer literature has found a relationship between another sexually-dimorphic sex hormone, the anti-Müllerian hormone (AMH) and ASD, where lower levels of AMH have been associated with increased ASD symptoms in males (Pankhurst & McLennan, 2012). AMH is believed to play a role in the masculinization of the male foetus (Behringer, Finegold, & Cate, 1994). Whether low levels of AMH has any association with male homosexuality in ASD is unknown and requires investigation.

Similarly, higher homosexuality and bisexuality rates among females with ASD have been linked to elevated fT levels (Ingudomnukul et al., 2007). Females with a genetic condition, congenital adrenal hyperplasia (CAH) have elevated levels of fT and a higher number of autistic traits relative to a non-clinical female population (Knickmeyer et al., 2006; Meyer-Bahlburg et al., 2008). Testosterone is an important determinant of male gender role behavior, gender identity and sexual orientation and accordingly females with CAH report a preference for male-typical activity, masculinized gendered behaviors, and increased homosexuality and bisexuality (Hines, 2006). Perhaps similar pathways may be contributing to increased homosexuality and bisexuality among some females with ASD (Ingudomnukul, et al., 2007).

3.5.1 Conclusion and Limitations

The study was not without its limitations. The study relied on self-report. However, given that this study was exploratory and hoped to interest a large international sample, this was achieved at the cost mentioned. Most ASD studies demonstrate the usual male bias and report fewer female participants. The current study found the opposite to be true. This might be due to the online format of the study, where females are more
likely than males to rely on the internet for interaction and self-help (Addis & Mahalik, 2003; Santor et al, 2007). Moreover, given this was a study looking into sexual orientation, participants who volunteered may have had a pre-existing interest in sexuality, and thus results need to be interpreted with this in mind. However, this concern can be somewhat mitigated as the study was published on a large number of reputed autism websites to raise awareness in an area that is novel and several respondents reported their readiness and satisfaction in being able to help. A large number of control participants reported a non-heterosexual orientation (30.3%), which was much higher than figures quoted in existing sexual demographic data (Gates, 2011). This in fact would make the findings in this study even more remarkable and group differences on sexual orientations may have been notably underestimated.

Aside from our limitations, the study yielded some important findings. The results support the impression that sexual attractions and behaviors of individuals on the autism spectrum are as diverse as the spectrum itself. What became clear was that individuals on the spectrum are sexual beings and that non-heterosexuality is more prevalent. These findings debunk any contrary myths that cast individuals with ASD as asexual (Koller, 2000; Shakespeare, 1996). While asexuality is definitely a component of the sexual spectrum in ASD, it does not constitute the whole picture. The fT hypothesis offers one plausible reason for female non-heterosexuality, but it struggles to explain male non-heterosexuality. On the other hand, social influences parsimoniously explain non-heterosexuality in both sexes. Hence, it would appear to be the better explanation at present.
Given what is known about increased non-heterosexuality among gender-variant populations (Bailey & Zucker, 1995; Rieger, Linsenmeier, Gygax, & Bailey, 2008), and the predilection for a general disregard for social norms and gender-fluid attitudes in ASD (Bejerot et al., 2014; Strang et al., 2014), investigating the relationships between gender-identity and sexual orientation in ASD should be useful in better understanding sexuality in this population. Clinicians and researchers should be attuned to the different expressions of sexuality in ASD. Individuals from sexual minorities have unique mental and physical healthcare needs when compared to heterosexual populations (Mayer et al., 2008). Medical care providers, public health workers and social services who interact with individuals with ASD should receive specialized training to meet the clinical concerns of this population and provide inclusive tailored support to the individual with ASD.
Chapter 4. Gender Identity and Autism: “Gender is not on my Agenda!”
4.1 Introduction

The terms ‘sex’ and ‘gender’ are sometimes treated as synonymous with each other, but have distinct and separate meanings. Sex refers to biological and physiological characteristics that define men and women, while gender is not inherently or exclusively associated to one’s physical anatomy. It is a psychological identification of oneself as a man, a woman, both, neither or otherwise.

Gender permeates human interactions in such basic ways that its impact may not always be directly obvious. Most youngsters are cognizant of their gender between the ages 18 months and 3 years, and by the beginning of school years, most children will have achieved a sense of their gender-identity and a certain degree of gender constancy, at which time children begin to realize that gender is a permanent state that cannot be altered by a change of clothing or activity (Paikoff & Brooks-Gunn, 1994). By the age of four years, children typically outline preferences for same-sex companions, gendered-activities and sex-typed play (Rosenfield & Wasserman, 1993).

Gender-identity can be the same or different from one’s birth-assigned sex. Generally, an individual’s gender-identity correlates with the gender roles that a given society considers appropriate for males and females. Occasionally, for some individuals this is not the case. Gender-Dysphoria (GD) is a clinical condition where the individual experiences a persistent sense of discontentment over the incongruence between their assigned gender and their birth-sex, leading to significant distress to the person, an impairment of social or occupational functioning, and a desire to live a cross-gender life ([DSM-5], American Psychiatric Association, 2013). It is estimated that between 0.005%
and 0.014% of natal males and 0.002% to 0.003% of natal females would be diagnosed with GD, based on current diagnostic criteria (Zucker & Lawrence, 2009). Expressions of GD include a preference for cross-dressing (dressing up in clothes typically worn by the opposite sex as defined by the person’s cultural norms), cross-gender roles and additionally in children, make-believe play and a strong inclination for play-mates of the opposite sex. Importantly, a handful of case-studies (Landen & Rasmusen, 1997; Tateno, Tateno & Saito, 2000; Mukaddes, 2002; Galluci et al., 2005; Kraemer et al., 2005, see Table 2.2 for a summary of each study’s findings) and empirical reports verify an association between ASD and GD (DeVries et al., 2010; Jones et al., 2011; Pasterski et al., 2013).

Researchers from the Netherlands (DeVries et al., 2010) found a higher incidence of ASD (7.8%) in a sample of children referred to a gender-identity clinic for management of their GD ($N = 204$, $M_{\text{age}} = 10.8$ years, $SD = 3.58$). This rate is higher than the prevalence rate of ASD in the general population which ranges from 0.6-2% (Fombonne, 2005; Blumberg et al., 2013). DeVries et al. recognized the substantial variance concerning GD symptoms displayed by individuals with ASD, where a diagnosis of Gender Dysphoria-Not Otherwise Specified (GD-NOS) was frequently issued. GD-NOS is given when the cross-gender behavior and interests were merely subthreshold or atypical or unrealistic. For example, some gender-dysphoric males in the sample reported feminine interests related to textural features that could be understood as a preference for specific sensory input typical of ASD. Others, in the absence of any childhood history of cross-gendered behavior, attributed their social problems in school to GD. Some demonstrated cross-gendered behavior, which appeared to be related to
transvestic fetishism or sexual arousal when handling or wearing female clothing, rather than clinical GD. Such non-normative sexual interests and behaviors in ASD have been evidenced in previous literature as well (Hellemans et al., 2007), and it has been suggested these behaviors may be playing a part in the development of GD or mimicking GD-like symptoms.

Another group of researchers (Jones et al., 2011) examined the co-occurrence between GD and ASD by comparing scores on a psychometric measure of autistic traits, the Autism Spectrum Quotient (AQ; Baron Cohen et al., 2001) among adults with GD. Jones et al. found that when compared to control females ($N = 98$), females with GD or transmen (female-to-male transsexual people; $N=61$) reported a higher mean AQ, but males with GD or transwomen (male-to-female transsexual people; $N=198$) did not differ from control males ($N=76$). Jones et al. drew upon Baron-Cohen’s (2002) Extreme Male Brain (EMB) theory of autism to explain the increased number of autistic traits among their female-to-male transsexual subjects. EMB theory posits that females with ASD are hyper-masculinized in specific aspects of their cognition and behavior, related to elevated levels of fetal testosterone (fT; Aeyeung et al., 2009). At the same time, a positive correlation has been demonstrated in neurobiological literature between fT and autistic traits. It is suggested that some females with ASD may more readily identify with the male gender and may face challenges in assimilating into a typical female peer group, which in a minority of cases may lead to the development of a GD. Additionally, there are a striking number of similarities between some girls with ASD and girls with GD (Knickmeyer et al., 2008; Green & Young, 2001) such as cross-sex typical play, reduced empathy and social skills, and handedness patterns. Furthermore, higher prevalence rates
of homosexuality and bisexuality have been reported among and females with GD (Drummond, Bradley, Peterson-Badali, & Zucker, 2008) as well as among females with ASD, both in Study 1 of this dissertation and in previous literature (Bejerot et al., 2014; George & Stokes, 2016; Gilmour et al., 2012), where neural masculinization in some females might contribute toward gynophilia or attraction to other females. It is speculated that the common denominator between female ASD and female GD might be an excess of fT (Hines, Brook, & Conway, 2004).

Another study that assessed for AQ traits in a clinical population diagnosed with GD also found evidence of the ASD-GD association in their sample, where 7.1% of the females with GD (N = 28) and 4.8% of males with GD (N = 63) met diagnostic criteria based on their AQ scores (Pasterski et al., 2013). This finding was different from the findings of the Jones et al. (2011) study where only females with GD reported higher AQ scores than controls. The authors noted that individuals with GD who met the clinical cut-off for ASD, reported an onset of GD after puberty. On the contrary, Pasterski, Golombok and Hines (2011) report that gender-dysphoric ideation is often expressed in early-to-middle childhood when gender-segregation or the general tendency for children to prefer interactions with their same-sex, is at its peak. Literature also points to the role of social naivété in unsuccessful relationships among individuals with ASD (Howlin, Mawhood, & Rutter, 2000). Pasterski et al (2013) speculated that this might falsely lead some individuals to attribute their social challenges to their gender and believe that they would fit in better with the opposite gender. Other authors similarly suggest that certain behavioral and psychological characteristics of autism might mimic GD-like symptoms or even lead to the development of a clinical GD (DeVries et al., 2010; Jones et al., 2011).
While some research has assessed for ASD among clinical populations treated for GD, newer research by Strang et al. (2014) measured gender variance, defined as the desire to be the opposite gender, in a population of children with ASD \((N = 147)\). On analyzing parental responses to the item “Wishes to be the opposite sex” on the Child Behavior Check List (CBCL), it was noted that gender variance was 7.59 times more common in the ASD group than among non-ASD participants. However, the study assessed for gender variance in children only. Gender variance in children has been known to often decline when they reach puberty, thus limiting generalizability to adult populations. Prospective studies on GD inform us that GD symptoms sometimes resolve as the individual grows older through the adoption of a sexual orientation that is congruent with their experienced gender-identity (Bailey & Zucker, 1995; Rieger, Linsenmeier, Gygax, & Bailey, 2008). Concurrently, higher rates of minority sexual orientations are reported among individuals with GD (Wallen & Cohen-Kettenis, 2008; Drummond, Bradley, Peterson-Badali, & Zucker, 2008).

Bejerot and Eriksson (2014) similarly found a gender-atypical pattern in their sample of 50 adults with ASD when compared to 53 typically-developing individuals in a Swedish population. Males were less masculine and females were less feminine compared to controls, when tested on the Bem Sex Role Inventory (Bem, 1974), which measures stereotypical masculine and feminine traits. It was also found that participants with GD scored higher on the AQ compared to controls. Another study by the same group of researchers found a negative correlation between AQ traits and body gender coherence \((d=1.03)\). Body gender coherence was estimated by assessing digital photographs and voice samples of the participants for gender-typicality (Bejerot,
Erikkson, Bonde, Carlström, & Humble, 2012). However, the use of a non-validated instrument to measure gender-identity in a purely Swedish sample limits the generalizability of the study-findings.

The comorbidity of ASD and GD is worth noting as the prevalence of both conditions is reasonably low. Aside from a few case-reports that have indicated an association between ASD and GD, and empirical studies that pointed to an increased number of autistic traits among clinical GD populations, the scant evidence-base that specifically assessed for gender-dysphoric expressions in ASD yielded findings limited by sample restrictions and methodology. Thus, there is a need for a larger study with a broader sampling methodology to explore the ASD-GD association with validated psychometric measures. Previously cited literature indicates that individuals with GD have an elevated number of autistic traits (Jones et al., 2012; Pasterski et al., 2013). The current study investigated this in the reverse direction and consequently predicted that a) individuals with ASD would demonstrate higher levels of gender-dysphoric traits (GDT) compared to TD individuals. The present study investigated the levels of GDT rather than an assessment of clinical diagnoses of GD, based on observations of a number of GD-NOS diagnoses among individuals with an ASD in DeVries et al.’s (2010) study. One study found sex-specific differences in the association between ASD and GD (Jones et al., 2011) while another did not (Pasterski et al., 2013). The current study chose to further investigate this by analyzing rates of GDT separately between males and females by diagnosis. Based on the EMB theory, it was hypothesized that b) females with ASD would report higher levels of GDT than males with ASD.
4.2 Method

4.2.1 Participants

This study was granted ethics approval, as was provided for the first study (DUHREC 2014-008). The present study utilized the same cohort as Study I, comparing 261 controls (103 males and 158 females) with 310 individuals with a diagnosis of ASD (90 males, 219 females and 1 individual who was intersex). This case was excluded from relevant analyses that examined sexuality by birth-sex group. A more detailed description of the participants is provided in section 3.2.1 and in Table 3.1.

Participants first completed a series of demographic questions related to their age, country of residence, race, and level of education, birth-sex, diagnostic status, comorbid medical/psychiatric conditions, cohabitation status, gender-identity, hormone-replacement related to gender-identity, and importance of partner-gender in a romantic or sexual relationship. This was followed by administration of the different psychometric measures, presented here in the order they appeared in the survey.

4.2.2 Materials

4.2.2.1 Autism Spectrum Quotient (AQ)

This was followed by administration of the AQ (Baron-Cohen, Wheelwright, Skinner, Martin, & Clubley, 2001; see Appendix C). The AQ is a screening tool which provides a continuous, quantitative measure of autistic traits. The questionnaire comprises 50 items, each of which is in a forced-choice format. Each question allows the respondent to indicate “definitely agree”, “slightly agree”, “slightly disagree”, and
“definitely disagree”. Approximately half the questions are worded to prompt an "agree" response from TD individuals, and half to prompt a "disagree" response. The items cover five different domains associated with ASD: social skills; communication skills; imagination; attention to detail; and cognitive-inflexibility. Evidence for convergent validity is demonstrated through the strong positive correlation of the AQ with the Social Responsiveness Scale ($r = 0.64$; Constantino & Gruber, 2005), which is another continuous quantitative measure of ASD symptoms. Test-retest reliability of the AQ has been reported as being substantial ($r=.95$; Broadbent, Galic, & Stokes, 2013).

4.2.2.2 Gender-Identity/Gender-Dysphoria Questionnaire for Adolescents and Adults (GIDYQ-AA)

The GIDYQ-AA (Deogracias et al., 2007) is a standardized 27-item instrument, which assesses cross-gender behavior and different aspects of GD among adolescents and adults, with the past 12 months as the time frame. Questions have parallel male and female versions, and participants were administered the version according to their reported birth-sex (see Appendices E and F). The questionnaire includes 13 items that assess subjective aspects, such as "Are you satisfied with being a man/woman?", nine items that investigate social aspects, such as "Have you ever presented yourself as a man/woman at social gatherings?" three items that measure somatic aspects, "Have you taken hormone treatments to change your gendered-appearance?" and two items for socio-legal aspects, such as "Have you bothered with having to identify as male/female on official forms such as your driver’s license or your passport?". The response options are coded along a five-point scale as 1(always), 2 (often), 3(sometimes), 4(rarely), or 5(never). A cut-off mean score of 3.00 is recommended by the authors to discriminate
between individuals with and without GD, which has a sensitivity of 90.4% for clients with GD and a specificity of 99.7% for controls (Deogracias et al., 2007).

The present study sought to examine friendship patterns in childhood among individuals with ASD to investigate for any potential relationships between one’s gender-identity and recalled friendship experiences with peers of the same and opposite sex. Sociometric research suggests that gender-dysphoric children tend to experience poorer relationships with their same-sex peers and better relationships with the opposite-sex (Wallien et al., 2010). Whether this finding can be extended to the ASD population is unknown. Two instruments were used to find out more about socialization-experiences of an individual with ASD and their peers during childhood, described below.

4.2.2.3 Loneliness and Social Dissatisfaction Questionnaire (LSDQ)

The LSDQ is a self-report measure of a person’s loneliness and dissatisfaction with peer relationships (Cassidy & Asher, 1992). The measure was originally designed for children, with filler questions addressing the child’s hobbies, aimed at relaxing the child. For the purposes of this study, the eight filler questions were omitted, leaving 16 items to the questionnaire. The response options were ‘Not true at all’, ‘hardly ever true’, ‘sometimes true’, ‘mostly true’ and ‘always true’. Given the linearity of the options, these were presented in a visual analogue format to make it more user-friendly. Two identical versions of the same questionnaire were presented to assess for loneliness among same-sex and opposite-sex peers (see Appendices G and H). The visual scale was linearly divided to reflect the five original response-options. The final score for each participant was obtained by summing up responses across all items. Higher scores indicated greater
loneliness and social dissatisfaction. The authors of the scale reported satisfactory internal consistency (Cronbach’s $\alpha = .79$) while the validity was supported by correlations with peer status derived teacher’s report of the child’s social behavior of peer relationships ($r = 0.85$). That is, the students who were identified as being lonely by their teachers were satisfactorily identified by the LSDQ as well.

4.2.2.4 Friendship Quality Questionnaire (FQQ)

The FQQ is a 40-item questionnaire designed to assess children’s perceptions of various qualitative aspects of their very best friendship (Parker & Asher, 1993). The questionnaire was used in the current study to measure retrospective accounts of an individual’s perception of various qualitative aspects of a friendship they shared with someone of the same and opposite biological sex as themselves. Respondents were asked to enter the name of a friend in a blank space. The questions were completed with reference to this friend, so as to avoid completing the questionnaire on the basis of any internal representation of an idealized or stereotypic friendship. Participants were asked to rate themselves on a 4-point scale ranging from 1(definitely agree) to 4(definitely disagree). Two identical versions of the same questionnaire were presented to assess same-sex and opposite-sex friendships (see Appendices I and F). A total score friendship quality score for each participant was computed by summing up responses across all items. Higher scores indicated higher friendship quality. Validity of the measure was determined through sociometric ratings among school children. The FQQ was group-administered in class as a paper-based instrument. A ‘roster and rating’ procedure was used to categorize children into low-accepted, average-accepted and high-accepted
groups. Low-accepted children reported poorer quality friendships on all the scales of the FQQ compared to average and high-accepted children.

4.3 Results

4.3.1 Data Screening

Data were screened for missing values, outliers, and normality. On the FQQ, 21% of the data was missing, while 9.3% was missing on the LSDQ. These cases were excluded from the analysis by pairwise deletion. Independent samples t-tests were conducted to analyze GD scores and AQ scores between groups with and without an ASD. Assessments of normality revealed significant skew and kurtosis on the AQ and GD scales within groups. Examination of histograms revealed that violations were due to a high level of autistic traits and GD symptoms among transgender people in each group. Based on reviewed literature, this non-normality was not unexpected (Jones et al., 2011; Pasterski et al., 2013). Sample sizes within each group were greater than 200 cases. Tabachnik and Fidell (2001) advise that non-normality is not an issue of concern under such conditions. Data was thus retained in the analysis untransformed. Where violations of variance were detected, as indicated by Levene’s homogeneity test, degrees of freedom were accordingly adjusted. Analyses of variance (ANOVAs) were conducted to analyze socializing patterns between groups based on GDT-status.

4.3.2 Demographic trends

Participant scores on the AQ test differed significantly ($t_{460.57}= 21.01, p < 0.001, d=1.96$). An independent samples t-test showed that participants in the ASD group reported significantly more traits characteristic of autism ($M = 34.98, SD = 7.29$) than the
control group-participants ($M = 19.11, SD = 10.20$). Different cut-off scores of 32, 30, 29, 26 and 22, have been recommended to screen individuals with a diagnosis of ASD, respectively (Baron-Cohen et al., 2001; Au yeung et al., 2008; Austin, 2005; Lepage et al., 2009; Broadbent, Galic, & Stokes, 2013; Woodbury-Smith et al., 2005). All participants with a diagnosis of ASD fell above the most stringent of the recommended cut-offs, increasing confidence in diagnostic-status reports.

Comparisons were undertaken between individuals in the ASD and TD groups on various demographic variables. A chi-square test was conducted to examine the relationship between diagnosis and gender-identity reported by participants. Results indicated that gender-identity was contingent on diagnosis ($\chi^2(6) = 34.06, p < 0.001, \phi = .25$). Individuals with ASD reported a more diverse range of gender-identities. Table 4.1 and Figure 4.1 show the percentages of the different gender-identities reported by males and females in the study. Gender diversity was overall greater among females than males.
Table 4.1

*Gender-Identities reported by individuals in the ASD and TD groups by birth-sex*

<table>
<thead>
<tr>
<th>Gender-Identity</th>
<th>ASD</th>
<th></th>
<th></th>
<th></th>
<th>TD</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Man</td>
<td>77.8</td>
<td>2.3</td>
<td>93.1</td>
<td>1.3</td>
<td>7.8</td>
<td>2.3</td>
<td>3.9</td>
<td>0.6</td>
</tr>
<tr>
<td>Transgender</td>
<td>7.8</td>
<td>67.1</td>
<td>0.0</td>
<td>87.3</td>
<td>2.2</td>
<td>3.3</td>
<td>1.0</td>
<td>3.8</td>
</tr>
<tr>
<td>Bigendered</td>
<td>1.1</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>1.1</td>
<td>12.0</td>
<td>0.0</td>
<td>5.1</td>
</tr>
<tr>
<td>Crossdresser</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3.3</td>
<td>13.4</td>
<td>2.0</td>
<td>1.9</td>
</tr>
</tbody>
</table>

*Figure 4.1 Gender Identity by relative proportion reported by respondents by diagnosis and birth-sex*

The results of other comparisons on demographic variables between individuals in the ASD and TD groups are presented in Table 4.2 and shows number of individuals within each category for the two birth-sexes separately. A chi-square test of contingency
indicated that individuals with ASD were more likely to utilize Hormone Replacement Therapy (HRT) related to their gender-identity than controls, \( (\chi^2(1) = 6.99, p = 0.006, \varphi = .11) \). Furthermore, when compared to controls, individuals from the ASD group were less likely to report cohabitation, \( (\chi^2(1) = 49.81, p < 0.001, \varphi = .29) \) and the gender of their romantic/sexual partner as an important factor to their decision-making, \( (\chi^2(1) = 57.83, p < 0.001, \varphi = .32) \). Two females reported having a diagnosis of congenital adrenal hyperplasia (CAH), one with and one without ASD. The ASD female reported an asexual orientation, while the TD female reported being pansexual. Both described their gender-identity as a man.

Table 4.2

<table>
<thead>
<tr>
<th>Variable</th>
<th>ASD</th>
<th>TD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male (N=90)</td>
<td>Female (N=219)</td>
</tr>
<tr>
<td>HRT</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>Cohabitation</td>
<td>63</td>
<td>153</td>
</tr>
<tr>
<td>Partner-gender unimportant</td>
<td>32</td>
<td>127</td>
</tr>
</tbody>
</table>

Note: The individual who reported birth sex as intersex was excluded from this analysis

4.4 Hypothesis testing

An independent-samples \( t \)-test was conducted to compare gender-dysphoria (GD) scores between groups with and without an ASD. Comparisons were made on the total GD score and the different subscales of the GD measure. Levene’s test for equality of variances indicated unequal group variances for each of the variables tested. The adjusted
degrees of freedom test were used to address this violated assumption. The two groups significantly different from each other on all scales (see Table 4.3). Results indicated that individuals with ASD reported higher GD scores than TD individuals.

Table 4.3

<table>
<thead>
<tr>
<th></th>
<th>TD (N= 261)</th>
<th>ASD (N= 310)</th>
<th>t-test (df=558.39)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>GD Total</td>
<td>10.00</td>
<td>16.48</td>
<td>24.11</td>
</tr>
<tr>
<td>GD Subjective</td>
<td>6.02</td>
<td>10.08</td>
<td>12.65</td>
</tr>
<tr>
<td>GD Somatic</td>
<td>0.77</td>
<td>2.20</td>
<td>2.00</td>
</tr>
<tr>
<td>GD Social</td>
<td>3.57</td>
<td>5.03</td>
<td>8.25</td>
</tr>
<tr>
<td>GD Socio-legal</td>
<td>0.34</td>
<td>0.98</td>
<td>1.05</td>
</tr>
</tbody>
</table>

*** p < 0.001

In order to test the hypothesis that females with ASD would report higher GD scores than males with ASD, separate comparisons were undertaken between the two birth-sexes within their diagnostic group. TD males and females did not differ on total GD scores and on individual subscales of the GIDYQ-AA (see Table 4.4). Within the group with an ASD, females did not differ from males on their total GD scores. On individual GD subscales, relative to their male peers, females with an ASD demonstrated significantly higher scores on the GD-subjective scale only (see Table 4.4).
Table 4.4

Independent Group t-test results between males and females with and without an ASD on Gender-Dysphoria scores

<table>
<thead>
<tr>
<th></th>
<th>ASD</th>
<th></th>
<th>TD</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male (N=90)</td>
<td>Female (N=219)</td>
<td></td>
<td>Male (N=103)</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>GD Total</td>
<td>21.68</td>
<td>25.71</td>
<td>25.77</td>
<td>21.64</td>
</tr>
<tr>
<td>GD Subjective</td>
<td>10.34</td>
<td>13.15</td>
<td>13.87</td>
<td>12.03</td>
</tr>
<tr>
<td>GD Somatic</td>
<td>2.24</td>
<td>4.17</td>
<td>2.02</td>
<td>3.03</td>
</tr>
<tr>
<td>GD Social</td>
<td>7.38</td>
<td>7.68</td>
<td>8.65</td>
<td>6.60</td>
</tr>
<tr>
<td>GD Socio-legal</td>
<td>0.97</td>
<td>1.87</td>
<td>1.07</td>
<td>1.66</td>
</tr>
</tbody>
</table>

*p < 0.05

4.5 Additional tests

4.5.1 Autistic traits, Gender-dysphoria and Sexual Orientation.

Given that literature suggests a high prevalence rate of non-heterosexual orientations among those with GD (Wallien & Cohen-Kettenis, 2008; Drummond, et al., 2008), the current study investigated the association between Sexual Orientation and levels of gender-dysphoric traits (GDT). Sexual Orientation was coded as a dichotomous variable with two categories; heterosexual and non-heterosexual orientations. The non-heterosexual orientation category included all non-heterosexual response options (lesbian, gay, bisexual, transgender, questioning, asexual, pansexual, intersexual, other). An independent sample t-test was undertaken to examine whether the group of individuals with non-heterosexual orientations would have higher number of GDT than individuals in the heterosexual group. Levene’s test of homogeneity of variance was violated and degrees of freedom were adjusted accordingly. Results indicated a significantly higher mean of GDT in the non-heterosexual group (M=27.13, SE=1.39) than in the heterosexual group (M=7.76, SE =0.75; t(446.81)=12.21, p<0.001, d=1.02).
A one-way ANOVA was undertaken to investigate how levels of GDT differed between different sexual orientations. A new variable for sexual orientation was computed, as some of the categories had very few participants. The new variable had five categories; homosexuality (gay and lesbian), bisexuality, heterosexuality, asexuality, and other (transgender, questioning, pansexual, intersexual, other). Groups differed significantly on GDT levels, \( F(4, 566) = 47.54, p < 0.001 \). A Tukey post-hoc test revealed that the levels of GDT were significantly lower among individuals in the heterosexual group (\( M = 7.43, SD = 11.61 \)) when compared to individuals in the homosexual (\( M = 24.36, SD = 23.72 \)), bisexual, (\( M = 21.38, SD = 21.25 \)) asexual, (\( M = 22.55, SD = 21.20 \)) and other (\( M = 34.06, SD = 25.69 \)) sexual orientation groups (see Figure 4.2).

![Figure 4.2 Levels of GDT by Sexual Orientation (in descending order of GDT).](image)

A Pearson correlation of the relationship between autistic traits (as measured on the AQ) and GDT was obtained. There was a modest positive correlation between the two variables, \( r = .37, p < .001 \). Increases in AQ scores were significantly correlated with
increases in GDT (see Figure 4.3). Correlations between different subscales of the AQ with GDT were also undertaken to assess for any differences in relationships between autistic traits and GDT across the different domains of the AQ. There were positive correlations between GDT and the different subscales of the AQ; Communication ($r = .36, N=571, p< .001$), Social ($r = .35, N=571, p< .001$), Cognitive-Inflexibility ($r = .34, N=571, p< .001$), Imagination ($r = .17, N=571, p< .001$), and Detail ($r = .20, N=571, p< .001$). The correlation between GDT with AQ Communication subscale was stronger than the correlation with AQ Imagination as indicated by Fisher’s Z test ($z = 3.50, p<0.001$) and AQ Detail ($z = 2.97, p<0.01$). Additionally, the correlation between GDT with AQ Social subscale was stronger than the correlation with AQ Imagination ($z = 3.23, p<0.001$) and AQ Detail ($z = 2.70, p<0.01$). The relationship between AQ and GDT was also assessed separately by birth-sex. Results indicated that the relationship between AQ and GDT was significant among males ($r = .27, N=193, p< .001$) and females ($r = .40, N= 377, p < .001$) and that the relationship was stronger among females than males, ($z = 1.65, p<0.05$).
4.5.2. Gender-Dysphoria and Transgenderism rates

Deogracias et al. (2007) found that a cut-off mean score of 3.00 on the GIDYQ-AA could distinguish between individuals with and without a diagnosis of GD. A mean score is computed by taking the total score and dividing this by the number of items on the GIDYQ-AA. There were seven individuals with a mean score of 3.00 and above. Of these, six individuals had a diagnosis of ASD, comprising five females and one male. The non-ASD individual was a female. All seven individuals had AQ scores well over 32, and reported non-conforming gender-identities\(^2\). Accordingly, the rate of GD that would otherwise have led to a clinical diagnosis in the ASD sample was 1.9%. This is approximately 135 times more than that found in the wider population given existing rates of GD estimated at 0.005% to 0.014% among males and 0.002% to 0.003% among females (Zucker & Lawrence, 2009). Individuals with an ASD were more likely than controls to report non-conforming gender-identities. Of these, twelve individuals with ASD reported transgenderism (7 genetic males and 5 genetic females) as well as five controls (4 genetic males and 1 genetic female). The rate of transgenderism in the ASD sample was 3.9% which was approximately 20 to 40 times higher than existing prevalence estimates (1:1000 to 1:2000, Olyslager & Conway, 2007).

\(^2\) A non-conforming gender-identity refers to a gender-identity that may not be the same as the gender-role assigned to one’s birth-sex.
4.5.3. Do Gender-dysphoric traits mediate how an individual with ASD sexually-orients?

The current study found that levels of GDT were related both to sexual orientation and to AQ traits. Empirical evidence points to a higher rate of non-heterosexuality in the ASD population compared to prevalence rates in the wider population (George & Stokes, 2016; Gilmour et al., 2012). It was thus speculated that GDT may mediate between an individual’s autistic symptomatology and their sexual orientation. A mediation analysis was undertaken to assess the relation between autistic traits and sexual orientation, where GDT was assessed as a mediator. There was a significant direct effect between AQ traits and Sexual Orientation ($b=0.079$, SE=.009, 95% CI [0.062-0.096]). Thereafter, the mediation effect was explored. AQ traits was significantly related to the mediator, GDT ($b=0.66$, SE=.071, 95% CI [0.524-0.803]), while the mediator was significantly related to the dependent variable, Sexual Orientation ($b=0.05$, SE=.007, 95% CI [0.036-0.063]). The indirect effect of the mediator was significant ($b=0.03$, SE=.006, 95% CI [0.024-0.047]; Goodman’s $Z=5.68$, $p<0.001$). GDT partially mediates the relationship of AQ traits to Sexual Orientation (see Figure 4.4).
Figure 4.4 Model of AQ traits as a predictor of sexual orientation (heterosexual or non-heterosexual) mediated by GDT. The confidence interval for the indirect effect is a bootstrapped CI based on 1000 samples.

4.5.4 Socializing patterns and gender-identity

Young children generally socialize with peers of their own-sex more than they do with the opposite-sex (Rosenfield & Wasserman, 1993). Children with GDT, however usually enjoy and engage in certain sex-atypical activities, play and interests and prefer the company of the opposite-sex (Hines, Kaufman, & Francine, 1994; Wallien et al., 2008). These discrepancies in pastimes and hobbies might make children with GDT feel different from their same-sex peers and more like their opposite-sex peers (Bem, 2000), and this might impact on the quality of social interactions. This has never been tested in an ASD population. Consequently, it was hypothesized that when compared to their peers without GDT, individuals with GDT individuals would retrospectively recall poorer
friendship quality with same-sex peers than with opposite-sex peers. This analysis was only conducted on individuals with an ASD, as this was the primary focus of the thesis.

A Mixed-design ANOVA was conducted to investigate if individuals with ASD rated their friendship quality with same and opposite-sex peers differently based on their gender-dysphoric status\(^3\) (GDT). The within-subject factor was the Friendship-quality (same-sex versus opposite-sex friendship). The between-subjects factor was GDT-status (No-GDT versus GDT). Individuals were categorized based on whether they reported any symptoms on the GIDYQ-AA or not. The within-subjects interaction between GDT-status and Friendship-quality was not significant, suggesting that the quality of friendships with the same and opposite sex were not differently rated based on whether the respondent had GDT or did not ($\eta^2=0.004$). There was however a main effect for the between-subjects factor, GDT-status ($F_{(1,241)}=5.72, p=.02, \eta^2=0.15$). Individuals with GDT ($M=52.13, SE=1.47$) reported poorer friendship quality overall than their No-GDT peers ($M=59.68, SE=2.79$).

It was also expected that when compared to their No-GDT peers, individuals with GDT would retrospectively recall higher levels of loneliness and social dissatisfaction with same-sex peers than with opposite-sex peers. This analysis only included individuals with an ASD. A Mixed-design ANOVA was conducted to investigate the effect of GDT-status on levels of loneliness and social dissatisfaction. The within-subject factor was Loneliness-type (‘loneliness among males’ and ‘loneliness among females’). The between-subjects factor was GDT-status (No-GDT versus GDT). The analyses were

\(^{3}\) Gender-dysphoric status (No-GDT versus GDT) referred to whether or not an individual expressed gender-dysphoric traits or not. No-GDT (never or rarely experienced gender-dysphoric feelings) versus GDT (sometimes or always experienced gender-dysphoric feelings).
undertaken separately for male and female respondents, as participants received two set of questionnaires investigating loneliness experienced among same-sex and opposite-sex peers.

Among males with ASD, the interaction between GDT-status and Loneliness-type was significant. This suggests that how lonely a male participant felt in the company of same and opposite-sex peers was different based on whether the participant had GDT or not ($\Lambda_{\text{Pillai}}=0.13$, $F(1,65) = 9.71$, $p=.003$, $\eta^2=0.13$). A Simple Main Effects analysis indicated that males with GDT reported higher loneliness and social dissatisfaction in the company of their own sex ($M=42.80$, $SE=2.21$) when compared to males without GDT ($M=27.41$, $SE=3.15$; $t(65)=4.00$, $p<.001$, $d=1.01$). However, males with GDT ($M=37.20$, $SE=2.23$) and without GDT ($M=34.91$, $SE=3.20$) did not report differences in their loneliness and social dissatisfaction levels with the opposite-sex, ($t(65)=0.59$, $p=\text{ns}$). The main effect for Loneliness-type was not significant ($\Lambda_{\text{Pillai}}=0.003$, $F(1,65)=0.20$, $p=\text{ns}$), suggesting that male participants did not differently rate how lonely they felt with the same-sex ($M=35.10$, $SE=1.92$) versus the opposite-sex ($M=36.05$, $SE=1.95$). There was also a main effect for the between-subjects factor, Gender-dysphoric status, ($F(1,65)=7.37$, $p=.008$, $\eta^2=0.10$). Results indicated that males with GDT felt lonelier when socially-interacting with others, regardless of sex of peer ($M=40.00$, $SE=1.87$) when compared to males without GDT ($M=31.16$, $SE=2.76$).

Among females with ASD, the interaction between GDT-status and Loneliness-type was not significant. The loneliness experienced among female participants when recalling social experiences with same and opposite-sex peers was not different for groups with
and without GDT ($\Lambda_{Pillai}=.02, F_{(1,212)}= 3.68, p=.056, \eta^2=0.02$). The main effect for Loneliness-type however, was significant ($\Lambda_{Pillai}= 0.03, F_{(1,212)}= 7.3, p=.007, \eta^2=0.03$). Regardless of whether they had GDT or not, females with ASD felt lonelier in the company of other females ($M= 43.04, SE= 1.23$) than in the company of males ($M= 7.86, SE= 1.73$). There was no significant main effect for the between-subjects factor, GDT-status ($F_{(1,212)}= 3.35, p=.07, \eta^2=0.02$). This suggests that whether a female participant had GDT or not, did not play a role in their loneliness and social dissatisfaction levels in social interactions. Figure 4.5 depicts the friendship and loneliness ratings among same and opposite-sex peers based on GDT-status for males and females.

*Figure 4.5 Comparisons of Friendship and Loneliness ratings based on Gender-dysphoric status among individuals with an ASD (Higher scores represent better friendship quality and more loneliness).*
4.6 Discussion

The aim of the current study was to explore the association between autistic traits and gender-dysphoric traits in a sample of individuals with ASD and compare this to TD individuals. It was hypothesized that individuals with ASD would demonstrate a higher number of gender-dysphoric symptoms than TD individuals, and that females with ASD would report greater rates of gender-dysphoric symptoms than males with ASD. The results of the present study were partially supported. Individuals with an ASD reported a higher number of gender-dysphoric symptoms than controls on the all subscales of the GIDYQ-AA. However, comparison by birth-sex within the ASD group demonstrated that females differed from males only on one GD subscale – the subjective scale.

The finding that individuals with ASD scored significantly higher on symptoms of GD is consistent with literature pointing to increased gender-variance among individuals with ASD (George & Stokes, 2016; Bejerot et al., 2014; Strang et al., 2014) and supports the relationship between ASD and GD. Reasons for the ASD-GD comorbidity has been a topic of emerging interest and several speculations attempt to account for this association. Previous literature has relied on the neurobiological basis of ASD to explain increased GDT in ASD. Baron-Cohen (2002) proposes that ASD is an overdevelopment of certain male-typical traits such as logical thinking, low emotionality and high level of perseverance. Fetal testosterone or fT is the biological mechanism implicated in this hyper-masculinization (Knickmeyer et al., 2006) and consistently, elevated levels of fT positively correlate with autistic traits and with masculinized neural development (Auyeung et al., 2009).
Human and non-human primate research show that fT levels influence human sexual behavior (Hines, Brook, & Conway, 2004). Rare congenital conditions such as found among women with congenital adrenal hyperplasia (CAH) afford opportunities to understand the effects of altered levels of fT on sexual development. Girls with CAH have an enzyme-deficiency driven overproduction of fT and show an increased number of autistic traits as measured on the AQ (Knickmeyer et al., 2006), increased male-typical play behaviors and masculinized gender-identities (Hines et al., 2004; Pasterski et al., 2005), and an increased prevalence of homosexual and bisexual orientations (Meyer-Bahlburg et al. 2008). The predisposing roles of elevated levels of fT in ASD and in male gender-identity development (Gooren, 2006) points to one possible pathway for the ASD-GD comorbid presentation in some females. Male-typical thinking and behavior may lead some females with ASD to interpret themselves as masculine relative to non-ASD females, and this could in some cases pave the way to the development of GD.

However, the same reasoning does not straightforwardly explain the increased prevalence of GD among males with ASD. Higher levels of fT would support the expression of a pronounced male gender-identity (Dessens, Slijper, & Drop, 2005). Amniotic measurements of testosterone confirm its role in the development of male-typical behavior (Auyeung et al., 2002). Given the association between elevated levels of fT in ASD, why then would males with ASD demonstrate higher GDT, when the converse would be expected, or at the least, similar rates GDT between ASD and TD males? Conclusions related to prenatal hormones and their effect on gender-identity are often drawn from sexual orientation studies that typically suggest that male homosexuality is related to gender non-conformity (Bailey et al., 1995; Lippa, 2003;
Rieger et al., 2008) and do not clearly explain the association between androgen-exposure and gender-conforming male homosexual people. Gender non-conformity among homosexual individuals has been hypothesized to be an outcome of atypical neural development as a consequence of altered prenatal hormone environments (Blanchard et al., 2006; Lalumière, Blanchard, & Zucker, 2000; Rahman & Wilson, 2003). Manning (2002) noted that some research argued that increased prenatal testosterone could lead to homosexuality (Geschwind & Galaburda, 1985), while others argued the opposite (Ellis & Ames, 1987). Put together, neuro-hormonal pathways leading to higher prevalence rates of male GD in ASD is not as clear, though potentially this is a pathway for female GD in ASD, yet this needs to be established. Nonetheless, this may be instructive to our understanding for a subset of ASD males who may develop GD as a result of an altered interaction between the developing brain and sex hormones.

To limit a construct as complex as gender-identity to biological factors would be overly reductionistic. An individual’s gender-identity is most likely an interaction of their biological and psychological make-up (Bradley & Zucker, 1997) and certain ASD-specific psychological features may increase the risk for development of gender-dysphoric expressions. Consistently, the current study found a positive correlation between autistic traits and gender-dysphoric symptoms. Previous literature has also found a high number of autistic traits among GD referrals (de Vries et al., 2010; Jones et al., 2011; Pasterski et al., 2012; Vanderlaan et al., 2014).

The present study found significant and clinically important correlations between various subscales of the AQ and the GIDYQ-AA. For instance, the GIDYQ-AA was significantly correlated to AQ communication skills and to AQ social skills, and these
correlations were significantly larger than other domains measured by the AQ, suggesting that deficits in communication and in social skills may impact on levels of gender-dysphoric traits. This is not surprising, given that gender is possibly one of the most intensively-socialized constructs with many ‘rules’ that are not explicit. While gendered norms are typically intuitively understood and followed by most individuals, the challenges associated with negotiating these norms involving fine judgements, understanding abstractions, and balancing multiple considerations related to gender and sexual innuendo, might be exaggerated in the presence of ASD-related socio-communicative deficits (Abelson, 1981). Furthermore, the correlation between scores on the AQ and the GIDYQ-AA were higher among females than males with an ASD, and relative to their male peers, females with an ASD reported higher scores on the GD-subjective subscale. Compared to men, women are generally believed to be more socially precocious and empathetic (Lutchmaya & Baron-Cohen, 2002), and possess stronger verbal and communicative prowess. These are domains that are saliently affected in ASD and this might explain why females with ASD may experience gender-dysphoric symptoms to a greater extent than their male peers.

Another feature that may play a role in the ASD-GD association is the frequent presence of intense obsessive-compulsive behaviors in ASD. Pharmacological studies have created a compelling argument for the association between ASD and obsessive compulsive disorder (OCD: Hollander & Pallanti, 2001; McCauley et al., 2004). Cognitive inflexibility is characteristic of OCD (Meiran, Diamond, Toder, & Nemets, 2010). Findings from the current study showed a significant correlation between the cognitive-inflexibility subscale on the AQ with the GIDYQ-AA. It is likely that GD
might develop as a sequela to ASD, where a person’s preoccupation with cross-gender activities and objects may not be related to confusion over one’s gender-identity, but may just be part of the pervasive obsessions and distress with cross-gender roles. Accordingly, several researchers view inflexible thinking and restricted interests seen in clients with GD as possible manifestations of the cognitive inflexibility inherent to ASD. (Galluci et al; 2005; Landén & Rasmussen, 1997; Perera & Gadambanathan, 2003; VanderLaan et al., 2014).

The current study investigated the relationship between autistic traits, GDT and sexual orientation. A mediation analysis supported GDT as a mediator between autistic traits and sexual orientation. It is speculated that one of the pathways by which a person’s autistic symptoms influence their sexual orientation appears to be contained in GDT, suggesting that there may be a biological or socialization mechanism underlying this. Thus, it is possible that for some individuals with ASD, their sexual orientation develops from their gender-dysphoric feelings, which in turn, seems to be associated with the strength of their autistic symptomology. Bem (2000) tries to relate GDT and sexual orientation by way of the ‘exotic is erotic’ theory. The central premise behind this theory is that individuals are erotically-aroused by those that are perceived as different or exotic from themselves. Gender-dysphoric children usually experience cross-gender identification and feelings of belonging to the opposite-sex, while feeling different from their own-sex peers. (Wallien et al., 2010). Bem (2000) proposes that gender-dysphoric children may experience heightened, nonspecific physiological arousal in the presence of same-sex peers from whom they feel different (exotic) and that this physiological arousal might in later years translate to sexual arousal toward their same-sex peers (erotic).
According to Bem’s reasoning, GDT in childhood might be one factor that predicts homosexuality in later years. While the current study did not assess GDT in childhood, there are measures of GDT in adulthood. A comparison of GDT rates among different sexual orientations demonstrated that GDT levels were significantly higher among individuals in the homosexual group than in the heterosexual group. Perhaps for some individuals in the sample, GDT contributed toward the development of same-sex attraction, and other non-heterosexual orientations.

The present study found that GDT-status did not play a significant role in sex-specific friendships, but did play a role in the overall quality of friendships in ASD. Individuals with GDT overall reported poorer friendship quality relative to those without GDT. Because gender-dysphoric children engage in gender-atypical or even solitary play, they are often victimized by peers, occupy a socially-deviant position, experience poor peer-relations (Mazefsky, Conner & Oswald, 2010) and report higher rates of psychiatric and emotional symptoms (Roberts et al., 2013). Together, these reasons might explain the relatively lowered friendship quality reported in the current study among individuals with ASD who have GDT compared to those who do not have GDT.

The current study also examined the influence of GDT on loneliness when socializing with same and opposite-sex peers in the sample with ASD. Results showed that GDT influenced the recall of social experiences differently for males and females with an ASD. Males with GDT recalled feeling lonelier than males without GDT, regardless of whether they were in the company of boys or girls. When separately comparing social experiences of males with and without GDT in the company of boys and of girls, males with GDT felt lonelier when interacting with boys, but did not report any differences
from males without GDT when in the company of girls. However, when looking at female retrospective reports on loneliness, GDT did not affect loneliness-outcomes. Instead, females, regardless of whether or not they had GDT, felt lonelier in the company of their own-sex than with the opposite-sex. Thus, sociometric research that points to better friendships with opposite-sex peers among children with GDT (Wallien et al., 2010), was not supported in the current study in retrospective accounts of individuals with ASD who had GDT. What was evident though was that both males and females with GDT had overall lower friendship quality, and that males with GDT felt lonelier in the company of their own-sex, while females with ASD, regardless of GDT, felt lonelier in the company of their own-sex.

Cultural factors might be contributing to these trends. Both males and females experience pressures related their gender-identity, but the quality of pressures may vary. Males who adopt feminine behavior are more negatively regarded and harshly treated than females who display a lack of feminine behavior (Herek & Glunt, 1993). This might explain why males with GDT are less tolerated by their own sex and experience more loneliness and isolation. Females recalled feeling lonelier in the company of other females might lead them to seek out male companionship. This may be one risk factor for increased vulnerability of females with ASD to sexual victimization by men, and this is concerning, given that Brown-Lavoie, Viecili, and Weiss (2014) report that individuals with ASD were between two to three times more likely than non-ASD individuals to experience sexual victimization.

Other interesting differences between male and female groups with ASD was the higher rates of transgenderism, cross-dressing and hormone-replacement therapy among
males than females. Despite higher rates of GDT among females, it was the males that acted on these feelings in a remedial sense. These trends may be reflective of the gender-polarizing cultural climate of the times, where it is more acceptable and easier for women to take on masculine traits, clothing and activities and live as a male would than vice versa. Perhaps there are acceptable gender stereotypes for women with GDT (‘butch’ lesbians) than gender stereotypes for men with GDT. Some women with GDT may thus choose to remain as they are, with the trappings of masculinity rather than to resort to HRT or surgery.

4.6.1 Conclusion and Limitations

Results of the current study must be interpreted in light of both its strengths and limitations. Firstly, participants self-reported that they had a clinical diagnosis of ASD. However, mean AQ scores of individuals with a diagnosis of ASD fell considerably above the most stringent recommended cut-off on the AQ, and as such it is likely that individuals with a diagnosis of ASD fell on the spectrum. Furthermore, participant recruitment took place through a network of reputed autism organizations worldwide and online autism communities, making it likely that the current study sample was more diverse in composition than clinically-referred samples. Secondly, the sample had a large representation of females, which is not common in studies of ASD. This might be due to the online format of the study, where females are more likely than males to rely on the internet for interaction and self-help (Addis & Mahalik, 2003; Santor et al, 2007). As such, the study provided an opportunity to study females with an ASD. Thirdly, there may have been reporting bias on retrospective measures measuring socializing patterns, as participants would have to rely on childhood memories to answer.
Aside from the limitations, the study yielded some important findings. It supports the previous literature and assertions that individuals with ASD are more diverse in their gender identities than the wider population. Moreover, individuals with ASD experience more gender-dysphoric traits than the wider population and this is more pronounced among females with ASD. These differences appear to be an outcome of sociocultural gendered norms, which highlight any deficits in social functioning in ASD more conspicuously among females than males. Paradoxically, the same sociocultural system that penalizes social deficits among females with an ASD more harshly than it does males, provides some respite to gender non-conforming females more than it does to gender non-conforming males, due to society’s increased tolerance toward female but not male gender-deviations (Kite & Whitley, 1996).

Biological explanations for the increased prevalence of GD in ASD presents a stronger case for female GD than it does male GD. However, social reasons provide an explanation for GD in both sexes adequately and might be the better explanation at this stage. Tensions between an ‘ASD personality’ with a ‘neurotypical personality’ could be misguided by attributed to gender-identity as being the reason for discord across different contexts. It is however equally tenable that in some cases, feelings of GD could progress to a clinical GD. The levels of complexity in terms of clinical management among clients with ASD presenting with symptoms of GD would be higher, as the convergence of ASD-related impairments and gender-related issues would afford unique challenges for disentangling the relative contributions of each factor and for developing effective interventions. The current study also found that individuals with ASD demonstrated gender-fluid attitudes in endorsing a large number of non-conforming gender identities.
and nonchalance toward the gender of their romantic or sexual partner. It is known that individuals with ASD overall are less concerned with social rules and may not always adhere to social etiquette (Attwood, 1998). Perhaps examining gender from the perspective of someone with ASD licenses a denaturalization of gendered norms and expectations.

In a society where gender has been decisively defined, individuals who exist outside its norms become likely targets of disapproval (Meyer, 2003). There is evidence of increased psychiatric comorbidity in populations with GDT (Hepp, Kraemer, Schnyder, Miller, & Delsignor, 2003) as well as among individuals with ASD (Ghaziuddin, Ghaziuddin, & Greden, 2002). Possibly individuals with an ASD who also have GDT bear a significant burden of distress. Investigation into the mental health outcomes of individuals who belong to sexual and gender minorities within the ASD population should be informative. Designing specialized psycho-sexual programs targeting any gender-related confusion tailored to each birth-sex, so as to provide comprehensive support to the individual with ASD with the goal of reducing frustration and increasing acceptance, is recommended.
Chapter 5. Mental Health Among Sexual and Gender Minorities in ASD: ‘Stealth Mental Health’.
5.1 Introduction

Autism is a lifelong neurodevelopmental condition that affects, among other things, the way an individual relates to their environment and their interaction with other people. While there are certainly individuals on the autism spectrum who are in meaningful relationships and lead fulfilling lives, research tells us that the quality of life among individuals with ASD is lower when compared to their non-ASD peers (van Heijst & Geurts, 2014; Billstedt et al., 2005). It is likely that individuals with ASD face a range of difficulties owing to varying degrees of deficits related to impairments in social communication, social comprehension and imagination. An adverse impact on the quality of life is not unexpected in reaction to some of the troubles related to socializing, relationship-issues and sometimes, simply trouble adapting to a neurotypical world. Accordingly, accumulating evidence from clinical practice and epidemiological research confirms that the rates of psychiatric comorbidity are higher among individuals with ASD than in the general population (Bolton et al., 1998; Mannion, Leader, & Healy, 2013; Piven & Palmer, 1999). The prevalence of mood disorders in ASD is reported to be between 53 and 70% (Lugnegård, Hallerbäck, & Gillberg, 2011; Hofvander et al., 2009) compared to much lower prevalence rates in the general population, ranging from between 5 to 17% (Bijl et al., 1998; Jacobi et al., 2004). Similarly, when comparing the prevalence rates of anxiety in ASD which is between 50 and 56% (Hofvander et al., 2009; Lugnegard et al., 2011), these rates are much higher compared to reports in the general population, which range between 3 and 12% (Bijl, et al., 1998; Jacobi et al., 2004).
At the same time, empirical evidence states that sexual minorities (Cochran, 2001; Herrell et al., 1999; Sandfort, de Graaf, Bijl, & Schnabel, 2001) and gender minorities (Hepp, Kramer, Schnyder, Miller, & Delsignore, 2005; Toomey et al., 2010) suffer from a greater burden of depressive and anxiety disorders and report poorer life-satisfaction (Powdthavee & Wooden, 2015; Davey et al, 2014), when compared to heteronormative populations. Different surveys (Clements-Nolle et al., 2006; Haas, Rodgers, & Herman, 2014; Kenagy, 2005; Maguen & Shipherd, 2010) on the prevalence of suicide attempts among gender non-conforming populations in the United States and other countries suggest the lifetime rate of suicide attempts is 41%, which is considerably higher than the 4.6% rate reported in the wider population, and is also higher than the prevalence rates of attempted suicide among sexual minorities which ranges between 10 to 20% (Haas et al., 2014). External or experienced stigma, internalized stigma (hiding minority status for fear of harm and living in stealth), discrimination, seclusion and exclusion have been named as the key causal factors that play a causative role in creating a stressful social environment that marginalizes such minority groups (Meyer, 2003).

The first study of this dissertation demonstrated that individuals with an ASD reported higher rates of non-heterosexuality (i.e.: homosexuality, bisexuality, pansexuality, asexuality and undetermined sexual orientations) than their TD peers. The second study found that individuals with an ASD experience increased levels of discontentment with their gender-role and reported a significantly higher number of gender-dysphoric traits (GDT) when compared to a non-ASD population. Given increased mental health adversity in the ASD population, and similar outcomes among sexual and gender minorities, concerns may be amplified for those individuals who have
a diagnosis of ASD as well as belong to a sexual or a gender minority. A conceptual model is presented in Figure 5.1 displaying one minority group within another minority group, and how stressors of one group could add to that of another group. Difficulties negotiating ASD-related challenges, along with any difficulties experienced due to belonging to a sexual or gender minority might be additive and increase the burden of distress, when compared to individuals with ASD who are heterosexual and do not experience discontentment with their assigned gender-roles.

Figure 5.1 Conceptual model of a ‘minority within a minority’

There exists considerable support for the poor psychiatric health of individuals with a non-heterosexual orientation (Meyer, 2003) and GDT (Toomey et al., 2010) relative to their heterosexual peers and those without GDT, respectively. However, there is a lack of research investigating the mental health of individuals who are both diagnosed with an ASD and who belong to a sexual or gender minority. This study aims to address this gap through the use of validated psychometric measures in an international...
sample of individuals with ASD. The second study of this dissertation demonstrated the relationship between autistic traits, GDT and sexual orientation. Not every individual who is non-heterosexual reports GDT and conversely not every individual who reports GDT is non-heterosexual. Life experiences may vary as a function of membership to a non-heterosexual orientation or a GDT condition. On this basis, those with ASD and a non-heterosexual orientation and those with ASD and GDT were separately evaluated for mental health outcomes. Mental health was evaluated for each participant based upon their rates of depression, anxiety, stress and subjective well-being. This study aimed to assess whether (a) having a non-heterosexual orientation reduced the mental health of someone with an ASD and (b) whether having GDT reduced the mental health of someone with an ASD. Accordingly, it was hypothesized that individuals with an ASD would have higher rates of depression, anxiety and stress and lower levels of subjective-wellbeing than those without an ASD, and therefore, reduced mental health. Furthermore, it was hypothesized that individuals with a non-heterosexual orientation would have higher rates of depression, anxiety and stress and lower levels of subjective-wellbeing than individuals with a heterosexual orientation, and therefore, reduced mental health. Lastly, it was hypothesized that individuals with GDT would have higher rates of depression, anxiety and stress and lower levels of subjective-wellbeing than individuals without GDT, and therefore, reduced mental health. To assess whether these effects added to each other, a profile analysis was used.
5.2 Method

5.2.1 Participants

The same cohort of participants from Study I and II of this dissertation were used in the current study. There were a total of 571 participants in the study, of which 261 were TD (103 males and 158 females) and 310 had a diagnosis of ASD (90 males and 219 females, 1 intersex individual). A more detailed description of the participants can be found in section 3.2.1 and Table 3.1.

5.2.2 Demographic trends

Chi-square tests were conducted to examine cohabitation rates among different minority groups. Individuals with an ASD were less likely to report cohabiting with a romantic/sexual partner than were TD individuals, \( \chi^2(571) = 49.81, p < 0.001, \phi = .29 \). Relative to their heterosexual peers, non-heterosexual individuals were less likely to report cohabiting with a romantic or sexual partner, \( \chi^2(571) = 45.81, p < 0.001, \phi = .28 \). Relative to individuals without GDT, individuals with GDT were less likely to report cohabiting with a romantic/sexual partner, \( \chi^2(571) = 44.16, p < 0.001, \phi = .28 \).

Chi-square tests were also conducted to assess for group differences on presence of a comorbid psychiatric diagnosis. Individuals with an ASD were more likely to report a comorbid psychiatric diagnosis than were TD individuals, \( \chi^2(571) = 76.59, p < 0.001, \phi = .37 \). Relative to their heterosexual peers, non-heterosexual individuals were more likely to have a comorbid psychiatric diagnosis, \( \chi^2(571) = 67.42, p < 0.001, \phi = .34 \). Relative to individuals without GDT, individuals with GDT were more likely to report a comorbid psychiatric diagnosis, \( \chi^2(571) = 63.72, p < 0.001, \phi = .34 \), see Figure 5.2.
Comparison of comorbid psychiatric diagnoses between minority groups (in yellow) versus control groups (in blue). Psychiatric diagnoses included depression, bipolar manic depression, stress, anxiety, post-traumatic stress disorder, and generalized anxiety disorder.

5.2.3 Procedure and measures

Upon receiving ethical approval for the research from Deakin University Human Research Ethics Committee (DUHREC 2014-008), national and international autism organizations were contacted, including autism forums. TD participants were recruited by word of mouth and through social media such as Facebook. The study was solely conducted in electronic format.

Participants first completed a series of demographic questions related to their age, country of residence, race, and level of education, birth-sex, gender-identity, diagnostic status, comorbid medical/psychiatric conditions, and cohabitation status. This was
followed by administration of the different psychometric measures. The focus of the current study was on mental health. The psychometric measures related to this are discussed below.

5.2.3.1 Depression, Anxiety, and Stress Scale-21 (DASS-21)

The DASS-21 is a short form of Lovibond and Lovibond’s (1995) 42-item self-report measure of depression, anxiety and stress (see Appendix K). The DASS-21 has a number of advantages over the full-length version, in being shorter, without sacrificing on reliability and having a cleaner latent structure (Henry & Crawford, 2005). There are four response options; ‘Did not apply to me at all’, ‘Applied to me to some degree, or some of the time’, ‘Applied to me to a considerable degree, or a good part of the time’, and ‘Applied to me very much, or most of the time’. The final score for each participant was obtained by summing up responses across all items. Higher scores on each of the three scales indicate greater severity of the distress. Because the DASS-21 is a shortened version of the DASS, the final score was doubled. The DASS had excellent psychometric properties with reported internal reliabilities of .91, .84, and .90 for depression, anxiety and stress, respectively (Lovibond & Lovibond, 1995). In this study, strong Cronbach alphas of .92, .87, and .89 were obtained for depression, anxiety and stress respectively. It also has excellent convergent validity with other scales designed to measure depression (Beck Depression Inventory: $r=.74$) and anxiety (Beck Anxiety Inventory: $r=.81$; Lovibond & Lovibond, 1995).
5.2.3.2 Personal Wellbeing Index (PWI)

The personal wellbeing of participants was assessed using the eight items of the Personal Wellbeing Index scale (Davern, Cummins, & Stokes, 2007; see Appendix B). Items were rated on a scale ranging from 0 (Not Satisfied At All) to 10 ( Completely Satisfied). The PWI contains seven items measuring satisfaction corresponding to a quality of life domain as: standard of living, personal health, achieving in life, personal relationships, safety, community-connectedness, and future security. These seven items are theoretically represented by the first global question: “How satisfied are you with your life as a whole?” The seven domains are summed up to yield an average score which represents ‘Subjective Wellbeing’. The first global item is not added to the other domains. For the purposes of this study, an individual’s PWI score was scored following Davern, Cummins and Stokes (2007), and then was recoded using the formula:

\[
Score = C - \frac{cx}{100}
\]  

Where \( C \) is the constant required to convert participant scores to the same metric as the DASS, and the negation reverses the direction of the scores. This is a simple linear transformation of the data for the purposes of the analysis only. By placing the PWI into the same metric as the DASS for the analysis, the PWI scores did not cross the DASS scores simply due to differences in their underlying metrics, which would have given rise to a spurious interaction between measures of mental health (e.g.: DASS & PWI) in the profile analysis. (Note for all tables raw PWI scores are reported; though for figures transformed PWI data are presented.) \( C \) was set to 42.
After transformation, higher scores on the PWI represented lower personal well-being. This enabled the PWI and the DASS scales to be interpreted in a linear manner, where higher scores on all scales represented greater mental distress. The PWI scale has sound psychometric properties. Cronbach’s alpha is reported to be between 0.70 and 0.85 in Australia and overseas. Inter-domain correlations are moderate at around 0.30 to 0.55 and item-total correlations are at least 0.50. The index has also demonstrated good test-retest reliability across a 1 to 2-week interval with an intra-class correlation coefficient of 0.84 (Lau, Cummins, & McPherson, 2005). Construct validity has been reported by Thomas (2008) through a correlation of .78 with the Satisfaction with Life scale (Diener, Emmons, Larsen, & Griffin, 1985).

5.2.4 Data Screening

Data were screened for missing values, outliers, and normality. Missing data on the variables of interest for the current study was less than 5%, and cases with missing data were excluded from analyses employing pairwise deletion where necessary. No univariate or multivariate outliers were found. Doubly-multivariate profile analyses were conducted to analyze Depression, Anxiety, Stress and PWI scores between groups based on diagnosis (ASD, TD), sexual orientation (Heterosexual or Non-Heterosexual), and presence of GDT (individuals with GDT or without GDT). One of the assumptions of the analysis is normality of data. Assessments of normality revealed significant skew in the Depression scale (z = 5.63), the Anxiety scale (z = 4.20), and the Stress scale (z = 3.27). No issues were found with kurtosis. With large sample sizes as with the current study, Tabachnik and Fidell, (2001) advise that non-normality is not of concern, as the z-score is artificially inflated by the sample size. Further, the doubly-multivariate analysis is an
analysis of variance (ANOVA) and ANOVA as a technique is considered robust to mild violations of normality (Keppel, 1991). In all instances, skew was mild (Tabachnik & Fidell, 2007). Thus, data was retained in the analysis untransformed.

5.3 Results

Multivariate profile analyses were undertaken to assess for the effects of Diagnostic-Status, Sexual Orientation, and GDT-condition on Mental Health. Diagnostic-Status included two levels (TD, ASD), Sexual Orientation included two levels (Heterosexual, Non-Heterosexual) and GDT-condition comprised two levels (No-GDT and GDT). The dependent variable was Mental Health Profile with four indicators of mental health (Depression, Anxiety, Stress and Subjective Well-being). Comparisons based on Diagnostic-Status (ASD or TD) indicated that individuals with an ASD reported poorer mental health than their peers without an ASD (see Table 5.1). Comparisons based on Sexual Orientation (Non-Heterosexual or Heterosexual) revealed that individuals who were non-heterosexual reported poorer mental health than their heterosexual peers (see Table 5.1). Lastly, comparisons based on GDT-condition⁴ (No-GDT and GDT) revealed that individuals who had GDT reported poorer mental health than individuals without GDT (see Table 5.1).

---

⁴ Gender-dysphoric condition (GDT-condition) is a binary variable with two categories; individuals with GDT or gender-dysphoric traits and individuals without gender-dysphoric traits
Table 5.1

Mental Health scores by group membership

<table>
<thead>
<tr>
<th>Group</th>
<th>Depression</th>
<th>Anxiety</th>
<th>Stress</th>
<th>PWI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Diagnosis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASD</td>
<td>19.14</td>
<td>11.82</td>
<td>15.23</td>
<td>10.67</td>
</tr>
<tr>
<td>TD</td>
<td>10.84</td>
<td>10.37</td>
<td>7.62</td>
<td>7.95</td>
</tr>
<tr>
<td>Sexual Orientation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Heterosexual</td>
<td>18.97</td>
<td>11.75</td>
<td>15.26</td>
<td>10.41</td>
</tr>
<tr>
<td>Heterosexual</td>
<td>11.48</td>
<td>10.86</td>
<td>8.04</td>
<td>8.66</td>
</tr>
<tr>
<td>GDT-condition</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDT group</td>
<td>20.02</td>
<td>11.34</td>
<td>15.26</td>
<td>10.36</td>
</tr>
<tr>
<td>No-GDT group</td>
<td>9.00</td>
<td>9.51</td>
<td>6.97</td>
<td>7.87</td>
</tr>
</tbody>
</table>

Group-comparisons across each of the four mental health indicators were significant at $p < 0.001$

5.3.1 Profile Analysis of Diagnosis, Sexual Orientation and GDT-condition on Mental Health

A multivariate profile analysis was undertaken to assess for the effects of all three independent variables together, Diagnostic-Status, Sexual Orientation, and GDT-condition on Mental Health. Diagnostic-Status included two levels (TD, ASD), Sexual Orientation included two levels (Heterosexual, Non-Heterosexual) and GDT-condition comprised two levels (No-GDT and GDT). The dependent variable was Mental Health Profile with four indicators of mental health (Depression, Anxiety, Stress and Subjective Well-being).

Mauchly’s test of sphericity indicated that the assumption of sphericity had been violated, ($\chi^2_{(5)} = 113.86, p < 0.001$). The Huynh-Feldt estimate is recommended when estimates of sphericity are greater than .75 (Barcikowski & Robey, 1984; Girden, 1992;
Huynh & Feldt, 1976). As the sphericity estimate was greater than this cut-off ($\epsilon = 0.89$), the degrees of freedom were corrected using Huynh-Feldt estimate of sphericity.

An examination of the *Within-Subjects Effects* indicated that the four-way interaction between Diagnosis, Sexual Orientation, GDT-condition and Mental Health was not significant, ($F(2.69, 1478.30)=0.50$, $p=ns$). This result suggested that the Mental Health profiles for individuals with and without an ASD in the Heterosexual and Non-Heterosexual groups were not different based on whether or not they had GDT.

However, the *Between-Subjects Effects* were significant for Diagnosis, ($F(1,550)=28.93$, $p<0.001$, $\eta^2=.05$), Sexual Orientation, ($F(1, 550)=11.18$, $p<0.001$, $\eta^2=.02$), and GDT-condition, ($F(1, 550)=43.44$, $p<0.001$, $\eta^2=.07$). Lower order interaction effects were not significant. As 14% of the variance in mental health was explained by the between-group main effects of Diagnosis, Sexual Orientation, and GDT-condition, while the between-group and within-group interaction effects did not explain any variance in mental health, this suggests parallelism of these effects. That is, individuals with an ASD had poorer mental health than TD individuals, while individuals who were non-heterosexual had poorer mental health than heterosexual individuals, and individuals with GDT had poorer mental health than individuals without GDT (see Table 5.1). Thus, as minority-status increases, mental health worsens (see Figure 5.3).

Given that the fourth-order interaction was not significant, two separate three-way analyses were undertaken to assess for additive effects of Sexual orientation on Diagnosis in Mental Health, and GDT-condition on Diagnosis in Mental Health.
Figure 5.3 Mental Health Profile by Group Membership. Groups with and without ASD groups are baseline reference groups. Membership to more than one minority group increases mental health symptoms. Increasing length of bars demonstrates increased mental health burden.

5.3.2 Profile Analysis of Diagnosis and Sexual Orientation on Mental Health

A multivariate profile analysis was undertaken to assess for the effect of Diagnostic-Status and Sexual Orientation on Mental Health. Diagnostic-Status included two levels (TD, ASD) and Sexual Orientation included two levels (Heterosexual, Non-Heterosexual). The dependent variable was Mental Health Profile with four indicators of mental health (Depression, Anxiety, Stress and Subjective Well-being). Mauchly’s test of sphericity indicated that the assumption of sphericity had been violated, \( \chi^2(5) = 116.43, p<0.001 \). The degrees of freedom were corrected using Huynh-Feldt estimate of sphericity.
An examination of the *Within-Subjects Effects* indicated that the three-way interaction between Diagnosis, Sexual Orientation and Mental Health was not significant (see Table 5.2). This result suggests that the Mental Health Profiles of individuals with and without an ASD was not different for individuals in the heterosexual and non-heterosexual groups. Furthermore, the two-way interaction between Diagnosis and Mental Health Profile was not significant (see Table 5.2). This effect suggests that the profile of ratings across Depression, Stress, Anxiety and Subjective Well-being was not different for individuals with and without an ASD. Additionally, the two-way interaction effect between Sexual Orientation and Mental Health Profile was not significant (see Table 5.2), suggesting that ratings across Depression, Stress, Anxiety and Subjective Well-being were not different for individuals in the heterosexual and non-heterosexual groups (see Table 5.2).

**Table 5.2**  
*Multivariate profile analysis examining effects of Diagnosis and Sexual Orientation on Mental Health*

<table>
<thead>
<tr>
<th>Within-Subject Interaction Effects</th>
<th>F</th>
<th>Eta-Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>df=(2.65, 1484.26)</td>
<td></td>
</tr>
<tr>
<td>Mental Health x Diagnosis</td>
<td>0.74</td>
<td>0.001</td>
</tr>
<tr>
<td>Mental Health x Sexual Orientation</td>
<td>0.49</td>
<td>0.001</td>
</tr>
<tr>
<td>Mental Health x Diagnosis x Sexual-Orientation</td>
<td>1.87</td>
<td>0.003</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Between-Subject Effects</th>
<th>df=(1, 550)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosis</td>
<td>78.73***</td>
<td>0.124</td>
</tr>
<tr>
<td>Sexual Orientation</td>
<td>55.14***</td>
<td>0.091</td>
</tr>
<tr>
<td>Diagnosis x Sexual Orientation</td>
<td>21.02***</td>
<td>0.037</td>
</tr>
</tbody>
</table>

***p < .001
An examination of the *Between-Subjects Effects* revealed that the interaction between Diagnosis and Sexual Orientation was significant, indicating that the Mental Health Profiles of individuals with and without an ASD was different at different levels of Sexual Orientation. This interaction between diagnosis and sexual orientation accounted for 3.7% of the variance in mental health (see Table 5.2). An examination of the simple effects (see Table 5.3) revealed differences by Sexual Orientation group (heterosexual versus non-heterosexual) on rates of Depression, Stress, Anxiety and Subjective Well-being were present for TD individuals but not those with a diagnosis of ASD. However, those with a diagnosis of ASD did report a difference in anxiety by Sexual Orientation group. The simple effect for diagnosis within each Sexual Orientation group revealed that within the TD group, relative to their heterosexual peers, individuals who were non-heterosexual reported higher levels of Depression, Anxiety and Stress and lower levels of Subjective Well-being. However, in the group with ASD, relative to their heterosexual peers, individuals who were non-heterosexual reported higher rates of Anxiety only, but did not differ from their heterosexual peers on levels of Depression, Stress or Subjective Well-being. Between-subject effects revealed a significant main effect for Diagnosis, accounting for 12.4% of the variance in mental health, as well as a significant main effect for sexual orientation, accounting for 9.1% of variance, as indicated by effect sizes (see Table 5.2).
Table 5.3

*Simple Effects comparing Mental Health for Diagnostic groups by Sexual Orientation*

<table>
<thead>
<tr>
<th></th>
<th>Non-Heterosexual</th>
<th>Heterosexual</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Depression</td>
<td>19.58</td>
<td>12.20</td>
</tr>
<tr>
<td>Anxiety</td>
<td>16.20</td>
<td>10.85</td>
</tr>
<tr>
<td>Stress</td>
<td>22.86</td>
<td>10.39</td>
</tr>
<tr>
<td>PWI</td>
<td>48.56</td>
<td>19.81</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Non-Heterosexual</th>
<th>Heterosexual</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Depression</td>
<td>17.32</td>
<td>10.32</td>
</tr>
<tr>
<td>Anxiety</td>
<td>12.72</td>
<td>8.67</td>
</tr>
<tr>
<td>Stress</td>
<td>19.40</td>
<td>9.52</td>
</tr>
<tr>
<td>PWI</td>
<td>54.04</td>
<td>20.69</td>
</tr>
</tbody>
</table>

**p < .01, ***p < .001

Considering the between-group variance from the main effects of Diagnosis (12.4%) and Sexual Orientation (9.1%), the variance in mental health is explained by both these effects is 21.5%, compared to the variance explained by the interaction effect, which is 3.7%. The variance explained by main-effects was 5.8 times the size of the interaction effect. Given, that a larger part of the variance in mental health was explained by the between-group main effects for Diagnosis and Sexual Orientation, in addition to an absence of within-group effects, this suggests parallelism of effects. Examination of plots (see Figures 5.4 & 5.5) confirmed the lack of interaction in the profile of results. Individuals with ASD had poorer mental health than those without ASD (Figure 5.4), and individuals who were non-heterosexual reported poorer mental health than individuals who were heterosexual (Figure 5.5).
**Figure 5.4** Mental health profiles of individuals based on diagnostic-status.

**Figure 5.5** Mental health profiles of individuals based on sexual orientation.
5.3.3 Profile Analysis of Diagnosis and GDT-condition on Mental Health

Another multivariate profile analysis was undertaken to assess for the effect of Diagnostic-Status and GDT-condition on mental health. Diagnostic-Status included two levels (TD, ASD) and GDT-condition included two levels (No-GDT, GDT). The dependent variable was Mental Health Profile with four indicators of mental health (Depression, Anxiety, Stress and Subjective Well-being). Mauchly’s test of sphericity indicated that the assumption of sphericity had been violated, \( \chi^2(5) = 112.93, p < 0.001 \). The degrees of freedom were corrected using Huynh-Feldt estimate of sphericity.

On examination of the Within-Subject Effects, the three-way interaction between Diagnosis, GDT-condition and Mental Health Profile was not significant (see Table 5.4). This suggests that individuals with and without an ASD did not rate their mental health differently based on whether they had GDT or not. The two-way interaction between Diagnosis and Mental Health Profile was also not significant (see Table 5.4), suggesting that the mental health profile ratings across the four indicators did not differ for both groups with and without an ASD. The two-way interaction between GDT-condition and Mental Health Profile was however significant, suggesting that the profile of ratings across Depression, Stress, Anxiety and Subjective Well-being was different for the No-GDT and GDT groups. This interaction accounted for 0.8% of the variance in mental health. The group with GDT reported poorer mental health on all four indicators of mental health when compared to the group without GDT. These means and standard deviations are presented in Table 5.1 (see also Figure 5.6). However, though slight, the difference between groups was more pronounced in depression ratings when compared to ratings on anxiety, stress and subjective well-being.
An examination of the *Between-Group Effects* revealed that the interaction between Diagnosis and Gender-Status was significant (see Table 5.4). The interaction accounted for 2.4% of the variance in mental health. This suggests that the Mental Health Profiles of individuals with and without an ASD was different for different levels of Gender-Status.

Simple effects Table 5.5 shows that the differences reported by groups with and without GDT on rates of Depression, Anxiety, Stress and Subjective Well-being were greater in the TD group than in the group with ASD, as demonstrated by larger effect sizes in the TD group. There was also a significant effect for Diagnosis, which accounted for 10.5% of the variance in mental health (see Table 5.4). Individuals with an ASD reported poorer mental health than their non-ASD peers, as shown in the means and standard deviations (see Table 5.1). There was also a significant between-group main effect for GDT-condition, which accounted for 15.1% of the variance in mental health (see Table 5.4). Individuals in the group with GDT reported poorer mental health than their peers without GDT, as noted in the means and standard deviations in Table 5.1.

Table 5.4

*Multivariate analysis examining effects of Diagnosis and GDT-condition on Mental Health*

<table>
<thead>
<tr>
<th></th>
<th>F</th>
<th>Eta-Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within-Subject Effects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mental Health</td>
<td>96.64***</td>
<td>0.148</td>
</tr>
<tr>
<td>Mental Health x Diagnosis</td>
<td></td>
<td>0.001</td>
</tr>
<tr>
<td>Mental Health x GDT-condition</td>
<td>4.66**</td>
<td>0.008</td>
</tr>
<tr>
<td>Mental Health x Diagnosis x GDT-condition</td>
<td>1.55</td>
<td>0.003</td>
</tr>
<tr>
<td>Between-Subject Effects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagnosis</td>
<td>64.97***</td>
<td>0.105</td>
</tr>
<tr>
<td>GDT-condition</td>
<td>98.68***</td>
<td>0.151</td>
</tr>
<tr>
<td>Diagnosis x GDT-condition</td>
<td>13.77***</td>
<td>0.024</td>
</tr>
</tbody>
</table>

Within-Subject Interaction Effects $df(2.65, 1484.26)$

Between-Subject Effects $df(1, 55)$

**$p < .01$, ***$p < .001$
Table 5.5

Simple Effects comparing Mental Health for Diagnostic groups by GDT-condition

<table>
<thead>
<tr>
<th></th>
<th>GDT group</th>
<th>No-GDT group</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Depression</td>
<td>20.33</td>
<td>11.45</td>
<td>15.16</td>
</tr>
<tr>
<td>Anxiety</td>
<td>16.09</td>
<td>10.41</td>
<td>12.34</td>
</tr>
<tr>
<td>Stress</td>
<td>23.38</td>
<td>9.48</td>
<td>19.37</td>
</tr>
<tr>
<td>PWI</td>
<td>47.33</td>
<td>19.62</td>
<td>58.98</td>
</tr>
<tr>
<td>TD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td>19.19</td>
<td>11.06</td>
<td>6.47</td>
</tr>
<tr>
<td>Anxiety</td>
<td>13.08</td>
<td>9.97</td>
<td>4.76</td>
</tr>
<tr>
<td>Stress</td>
<td>19.68</td>
<td>9.91</td>
<td>10.81</td>
</tr>
<tr>
<td>PWI</td>
<td>55.33</td>
<td>20.55</td>
<td>77.00</td>
</tr>
</tbody>
</table>

**p < .01, ***p < .001

The Between-Subject interaction accounted for 2.4% of the variance in mental health. The within-group interaction accounted for 0.8% of the variance. When comparing between-group variance of 25.6% against the within-group variance of 0.8%, the between-group variance was 32 times the size of the within-group variance. Given, that a larger part of the variance in mental health was contributed to by the between-group effects for Diagnosis and GDT-condition, in contrast to a small within-group interaction, this indicates parallelism of these effects. This conclusion is further supported by examination of the data. That is, individuals with ASD reported poorer mental health than those without ASD (see Figure 3), and individuals with GDT reported poorer mental health than individuals without GDT (see Figure 5.6). Importantly, relative to their non-ASD peers, individuals with ASD reported poorer mental health and having GDT worsens mental health.
5.4 Discussion

The aim of the current study was to investigate the mental health of individuals with an ASD who belong to sexual and gender minorities. As hypothesized, individuals with ASD reported poorer mental health than non-ASD individuals. Furthermore, individuals with a non-heterosexual orientation reported poorer mental health than their heterosexual peers. Lastly, individuals with GDT (gender-dysphoric traits) reported poorer mental health than their non-GDT peers. The profile analysis examining Diagnosis and Sexual Orientation demonstrated statistical parallelism, as did the effects of Diagnosis and GDT-condition, implying additive effects of sexual orientation and GDT on diagnosis.
While no existing study to date has examined the mental health of individuals with ASD who belong to sexual and gender minorities in a single study, there are studies that separately inform us of increased psychiatric comorbidity among individuals with ASD (Mannion, Leader, & Healy, 2013; Piven & Palmer, 1999), gender minorities (Hepp, Kramer, Schnyder, Miller, & Delsignore, 2005; Toomey et al., 2010) and sexual minorities (Sandfort, de Graaf, Bijl, & Schnabel, 2001).

A combination of factors may contribute to the increased prevalence of psychological distress among individuals with ASD. Some of these factors include deficits in interpersonal social interaction, negative social experiences with rejection and bullying (Cappadocia et al., 2012; Bejerot & Humble, 2013), challenges with perspective-taking, sensory difficulties (APA, 2013), a history of physical abuse (Mandell, Walrath, Manteuffel, Sgro, & Pinto-Martin, 2005), as well as biological predispositions, as evidenced in increased familial rates of affective disorders among individuals with ASD and first-degree relatives (Bolton, Pickles, Murphy, & Rutter, 1998; Piven & Palmer, 1999). Individuals on the high-functioning end of autism may be particularly vulnerable to psychological distress due to a deeper insight into their social challenges (Settipani, Puleo, Conner, & Kendall, 2012; Strang et al., 2012). The current sample would appear to have included many high functioning individuals as 69% had attained some college education (see Table 3.1 for educational details of participants). The cognitive capacity to recognize any social deficits that may interfere with their day-to-day psychosocial functioning might increase vulnerability to stress, provoke anxiety and indeed, a feeling of helplessness and depression. Elevated scores on the depression,
anxiety and stress scales reported by individuals with ASD in the current study support this contention.

Additionally, individuals with an ASD reported lower subjective well-being when compared to their non-ASD peers. Scores on the PWI fell below the ‘set-point’ for subjective well-being, which is held at on average to 75 points on a scale of 1 to 100 for Caucasian populations (Cummins, 2013). The range around the set-point for subjective well-being is very small and it is believed that a homeostatic mechanism defends this range protectively so as to maintain an individual’s subjective well-being. When the level falls below this range, it is termed as ‘homeostatic defeat’ (Cummins, 2013), and this occurs when challenges become too much for the homeostatic system to deal with. The sample with ASD in the current study comprised mainly of Caucasian individuals (as presented in Table 3.1). The mean PWI score for the ASD sample in the current study was approximately 50 points and fell below the set-point for subjective well-being (see Table 5.1). Given this score, it is likely that the chronic nature of the challenges of living with ASD increases the probability of homeostatic defeat. Furthermore, individuals within the group with ASD were more likely than their TD peers to report having a comorbid psychiatric diagnosis. The most frequently reported conditions were depression, social anxiety, generalized anxiety disorder (GAD) and obsessive compulsive disorder (OCD). Lower subjective well-being has been linked to depression, anxiety and stress (Burns, Anstey, & Windsor, 2011; Gargiulo & Stokes, 2008).

Moreover, individuals with an ASD were less likely to report cohabiting with a romantic or sexual partner. Lowered rates of cohabitation among individuals with an ASD have been reported elsewhere (Holtmann, Bolte, & Poustka, 2007; Hofvander et al.,
Research attests to the positive effect of cohabitation on life satisfaction, possibly as a function of the social support that living with someone provides (Zimmerman & Easterlin, 2006). Individuals who are in a cohabiting relationship, on average, have better mental health and report lower rates of depression (Brown, 2000; Horwitz & White, 1998), more life satisfaction and improved psychological wellbeing (Williams, Frech, & Carlson, 2010). The decreased rates of cohabitation among individuals with an ASD compared to TD individuals might be one contributing factor to the lowered mental health found in the current study.

At the same time, empirical literature testifies to higher levels of mental distress among individuals with gender-dysphoric traits (GDT) (Hepp, Kramer, Schnyder, Miller, & Delsignore, 2005) and individuals with a non-heterosexual orientation (Sandfort, de Graaf, Bijl, & Schnabel, 2001). The increased rates of mental health problems in these minority populations are usually understood as a consequence of the stigma and marginalization attached to living outside of sociocultural norms (Meyer, 2003). This stigma can lead to what Meyer (2003) refers to as ‘minority stress’. This stress could come from external adverse events, which among other forms of victimization could include verbal abuse, acts of violence, sexual assault by a known or unknown person, reduced opportunities for employment and medical care, and harassment from persons in positions of authority (Sandfort, Melendez, & Diaz, 2007). Minority stress levels are further perpetuated by internal stresses, such as the anticipation of adverse events, the vigilance this anticipation requires, the internalization of negative social attitudes (Herek, Gillis, & Cogan, 2015), efforts to conceal one’s sexuality and gender-identity position, and pressure to conform to societal expectations. Such stressors may lead to low self-
esteem, stress, anxiety, increased rates of depression (Sandfort, de Graaf, Bijl, & Schanble, 2001). Consistently, individuals with a non-heterosexual orientation in the current study reported higher rates of depression, anxiety, stress and lower subjective well-being in comparison to their heterosexual peers.

With gender non-conformity, deviations from gender-rules are generally less concealable than a non-heterosexual orientation, and given the strict norms guarding gender conformity, a lack of adherence to these sociocultural values makes gender-atypical individuals particularly salient targets for discrimination and other confrontational social experiences, which can range anywhere from derogatory and penalizing verbal assaults to varying forms of physical and sexual violence (Grossman & D’Augelli, 2006). Gendered norms are generally inculcated into the social fibre of a person as early as pre-school years, where gender-typical play-styles and social interactions are noticeable in school settings. Early victimization and ostracization by peers of one’s own gender group during early developmental stages when gender segregation is at its peak, can increase the likelihood of experiencing significant affective, cognitive and behavioural consequences for gender non-conforming individuals in adulthood (Zucker, 2005). Study 2 of this dissertation examined retrospective accounts of socializing experiences among individuals with ASD. Results demonstrated that individuals with GDT reported experiencing more loneliness and social dissatisfaction when in the company of their own-sex versus the opposite-sex peers relative to their peers without GDT. Adverse psychosocial developmental trajectories could increase risk for later life issues in mental health, and the trends in the current study support this contention.
Furthermore, cohabitation rates were lower among individuals with GDT and individuals with a non-heterosexual orientation compared to individuals without GDT and individuals with a heterosexual orientation, respectively. Living with a romantic or sexual partner provides a source of companionship, intimacy and social support (Waite & Gallagher, 2000). Without the buffering effects of these support-systems against stigmatization, these minority groups might be more vulnerable to increased risk for poorer mental health, and the current study findings concur with this. While the overall profile of mental health across the four indicators of mental health was poorer in the group with GDT versus the No-GDT group, the levels with which the rates of depression were higher in the GDT group was more pronounced. Caroll, Gilroy and Ryan (2002) report that due to the extreme discrimination that gender-variant populations undergo and resulting low self-esteem, feelings of depression may be especially intense for this group.

Additionally, subjective well-being scores fell below the homeostatic set-point, at approximately 50 points, suggesting homeostatic failure among the cohorts that were non-heterosexual and had GDT. The chronic nature of stressors perpetuated from younger ages through the course of the life-span might burden the homeostatic system to approach failure in maintenance mechanisms. Low subjective well-being is associated with affective disorders (Burns, Anstey & Windsor, 2011) and individuals in the group with GDT and the group with non-heterosexual orientations reported higher rates of psychiatric comorbidities with depression and GAD being the most frequently reported conditions.

It is clear that the three minority groups of interest in the current study (group with ASD; group with GDT; and non-heterosexual group) reported poorer mental health
outcomes than their respective control groups. Membership to more than one minority group would possibly incur higher levels of stress as a consequence of additivity of minority group-specific stressors from different conditions. Individuals with a diagnosis of ASD who have GDT or are non-heterosexual or both may be experiencing both the psychosocial stressors that form part of negotiating a neurotypical world in addition to stressors that come from belonging to a gender or sexual minority. This cohort of individuals can be conceptualized as a ‘minority within a minority’ and the mental distress experienced within this cohort may be quantitatively and indeed qualitatively different from belonging to one or the other minority populations alone.

Consistently, when examining the responses of individuals within the group with ASD, comparisons based on whether or not an individual had GDT, demonstrated that individuals with an ASD and GDT reported higher levels of depression, anxiety, stress and lower levels of subjective well-being when compared to individuals with an ASD who did not have GDT. In addition to minority stressors related to discrimination and exclusion, an intolerance to ambiguity in ASD (Grandin, 1995), where having a different psychological gender (how one perceives and experiences their gender) from a biological gender (physical gender related to the body) could lead to increased distress among individuals with ASD more than it would among TD individuals. However, when comparisons were made between non-heterosexual and heterosexual individuals with an ASD, relative to their heterosexual peers, individuals who were non-heterosexual reported differences only on levels of stress experienced. Individuals who were non-heterosexual reported higher levels of stress compared to their heterosexual peers. No differences were found on levels of depression, anxiety and personal well-being based on
an individual’s sexual orientation with an ASD. Sexual orientation is understood as a ‘concealable stigma’ unlike gender non-conformity (Herek & Capitanio, 1996). By not disclosing one’s sexual orientation, some level of stigmatization can be avoided. Additionally, gender unlike sexual-orientation, permeates every aspect of an individual’s life, and affects how we relate to the world and the world relates to us. Gender-nonconformity might thus induce a stronger negative reaction both from external events and internalization of negative social attitudes, phobia and guilt due to cognitive dissonance related to the individual’s personal desires and expectations versus sociocultural expectations. This dissonance in addition to the socio-communicative and interpersonal challenges characteristic of ASD, could understandably contribute to considerable psychological stress. Thus, adverse mental health consequences may be relatively more severe for individuals with an ASD who are gender-nonconforming than individuals with an ASD who are non-heterosexual, but gender-conforming.

Another finding was that the differences in rates of depression, anxiety, stress and subjective well-being between gender and sexual minority groups versus heteronormative groups was higher among TD individuals than among individuals with an ASD. This may be in part due to the relative insensitivity to social reputation among individuals with ASD. Izuma and colleagues (2011) suggest that individuals with autism may possess specific theory-of-mind related-deficits when considering their reputation in the eyes of others. This lack of concern with social judgement within the group with an ASD, may provide some protection and insulation from any stigmatization. Alternatively, perhaps individuals with ASD simply do not face the same level of hostility related to gender and sexuality differences as neurotypical individuals do. Neurotypical individuals might have
larger social networks and facilitate more visibility and thus more exposure to any stigmatization, while individuals with ASD might have limited social interaction, choose to socialize among like-minded individuals, or prefer the internet for socializing. Many individuals with ASD prefer computer chat-rooms, where most obstacles related to social cues, body-language and eye-contact are removed; as Temple Grandin (1999) admitted “Computers are great, because being weird is okay”. Furthermore, family and friends of those with ASD may choose to support their ward in their sexuality and gender-choices, in anticipation of reducing any additional stress that could be caused by disagreement. Parents of individuals with ASD report that their main concerns for their adult children are that they should not be lonely in life and demonstrated more accepting and liberated attitudes to sexuality when it came to their ward’s sexual or gender preferences, comparative to trends noted in the wider population (personal communication). If indeed a particular disposition and a supportive environment provides some level of protection from any minority stigmatization among individuals with an ASD, the protection appears to only reduce the effects of stigma, but not completely negate it, as indicated by poorer mental health among minority groups with an ASD compared to heteronormative groups with an ASD.

The present study yielded some important findings. The results were suggestive of the additive effects of GDT and non-heterosexuality to a diagnosis of ASD on mental health adversity. However, findings must be interpreted in light of the strengths and limitations of the study. This was the first study to quantitatively investigate the effects of non-heterosexuality and gender-nonconformity, together and separately, on mental health among individuals with an ASD. The composition of the control group was not
typical of the wider population, with a higher number of sexually and gender-diverse individuals who participated. This in fact would make the findings in this study even more remarkable and group differences may have been underestimated. The cross-sectional design of the study however, did not assess for psychological functioning through approaches less susceptible to self-report biases, such as through measures of daily functioning such as occupational status, job satisfaction, and relationship success, and it is recommended that future research examine these areas as well. Given ASD-characteristic cognitive and behavioural styles, it is likely that the stresses experienced by sexual and gender minorities who are on the spectrum are perceived differently from neurotypical sexual and gender minority groups. A qualitative study examining attitudes and experiences of individuals with ASD with relation to their sexual orientation and gender-identity should prove informative. Additionally, longitudinal studies following children with ASD who are both gender-conforming and nonconforming into adulthood would furnish opportunities to tease apart the influence of biological factors, developmental experiences and cultural environments on psychological functioning. Such a study will allow us to delineate the factors that contribute to or reduce mental distress among sexual and gender minorities, and this information could be used to develop programs aimed at enhancing psychological health among individuals with ASD.
Chapter 6. Attitudes toward Sexual Orientation and Gender-Identity in ASD: “Between my ears and not my legs!” - A Qualitative Analysis.
6.1 Introduction

Almost three decades since the removal of homosexuality from the list of recognized mental disorders from the Diagnostic and Statistical Manual of Mental Disorders (DSM), scientists continue to search for the origins of non-heterosexuality and gender non-conformity. Compelling arguments favoring a biological predetermination (LeVay, 1991) versus a socialist constructivist perspective (Alsop, Fitzsimmons & Lennon, 2002) still leave both sides with unsettled questions, leading to a stalemate position where it is agreed that sexual orientation and gender-identity is complex and finds its expression guided by a combination of biological, sociocultural, contextual and experiential factors. Again, most scholars contend that an individual’s gender is best understood as a product of an interaction between their genetics, hormones and sociocultural world (Fausto-Sterling, 2012).

Literature attests to the importance of social factors in the development and healthy expression of one’s sexuality and their gender-identity (Parker & Asher 1993; Simon & Gagnon, 2011). Given that impaired social functioning is a hallmark feature of ASD, the interactions between the many influences in a person’s sexual orientation and gender-identity may be more variable in ASD. This might contribute to an overrepresentation of sexual and gender minorities among individuals with ASD, and literature supports this (Bejerot et al., 2013; George & Stokes, 2016; Gilmour et al., 2012; Dewinter, Vermeiren, Vanwesenbeeck, Lobbestael & van Nieuwenhuizen, 2015; Dewinter, Van Parys, Vermeiren & van Nieuwenhuizen, 2016). Consistently, the first and second studies of this dissertation found this to be the case.
While quantitative data informs us about prevalence rates of the different sexual and gender expressions of adults on the spectrum, only one qualitative study was found that examined sexuality among eight adolescent boys with an ASD (Dewinter et al., 2016). There is a scarcity of personal accounts of both male and female adults with an ASD in relations to their sexual orientation and gender-identity and any unique challenges they may face. Such information should build on the quantitative findings from existing sexuality data and facilitate tailored support programs in ASD.

Accordingly, the current study aimed to address the gap in the literature related to insights of individuals with an ASD in the domain of sexual orientation and gender-identity. A qualitative inquiry was used to investigate recalled childhood socializing patterns with peers of the same and opposite-sex, attitudes towards sexual orientations and gender-identity, sexual arousal, gendered-behaviors and related personal reflections.

6.2 Method

6.2.1 Participants

The Plain Language Statement (see Appendix M) presented terms and conditions of the survey and invited individuals to participate in the study. A total of 164 individuals participated in the study. Of these, 69 were TD (36 males and 34 females) and 109 individuals reported a clinical diagnosis of ASD (41 males and 68 females). When examining the ages of the participants, no significant differences for age were found between males with \( M_{age} = 33.00, SD = 12.61 \) and without an ASD, \( M_{age} = 29.64, SD = 10.37; t(70)= 1.2, p= ns \); and between females with \( M_{age} = 28.53, SD = 9.71 \) and without an ASD, \( M_{age} = 29.88, SD = 11.61; t(117.43)= 0.73, p= ns \). Participants completed
a demographic questionnaire designed for this study, and group comparisons were undertaken on these questions based on diagnosis for each birth-sex separately, as presented in Table 6.1.

Table 6.1 Demographic trends between diagnostic groups by birth sex

<table>
<thead>
<tr>
<th>Variable</th>
<th>Males %</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ASD</td>
<td>TD</td>
</tr>
<tr>
<td></td>
<td>n=41</td>
<td>n=36</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Afro-American</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Middle-Eastern</td>
<td>2.4</td>
<td>3.0</td>
</tr>
<tr>
<td>Asian</td>
<td>0.0</td>
<td>9.1</td>
</tr>
<tr>
<td>Caucasian</td>
<td>80.5</td>
<td>81.8</td>
</tr>
<tr>
<td>Multiracial</td>
<td>12.2</td>
<td>6.1</td>
</tr>
<tr>
<td>Rather not say</td>
<td>4.9</td>
<td>0.0</td>
</tr>
<tr>
<td>$\chi^2(5)=6.12, p=ns$</td>
<td>$\chi^2(5)=6.94, p=ns$</td>
<td></td>
</tr>
<tr>
<td>School-type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single gendered School</td>
<td>45.6</td>
<td>33.3</td>
</tr>
<tr>
<td>Co-education school</td>
<td>54.4</td>
<td>45.6</td>
</tr>
<tr>
<td>$\chi^2(1)=0.33, p=ns$</td>
<td>$\chi^2(1)=6.94, p=ns$</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not sure</td>
<td>2.4</td>
<td>6.1</td>
</tr>
<tr>
<td>Primary School</td>
<td>2.4</td>
<td>0.0</td>
</tr>
<tr>
<td>High School</td>
<td>14.6</td>
<td>0.0</td>
</tr>
<tr>
<td>Vocational School</td>
<td>9.8</td>
<td>6.1</td>
</tr>
<tr>
<td>Some University</td>
<td>24.4</td>
<td>6.1</td>
</tr>
<tr>
<td>Bachelor Degree</td>
<td>29.3</td>
<td>78.8</td>
</tr>
<tr>
<td>Master Degree</td>
<td>12.2</td>
<td>0.0</td>
</tr>
<tr>
<td>Doctoral Degree</td>
<td>4.9</td>
<td>3.0</td>
</tr>
<tr>
<td>$\chi^2(7)=23.23, p&lt;.002, \phi=0.6$</td>
<td>$\chi^2(7)=24.09, p&lt;.002, \phi=0.5$</td>
<td></td>
</tr>
<tr>
<td>Religious Preference</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Atheist</td>
<td>78.4</td>
<td>34.4</td>
</tr>
<tr>
<td>Jewish</td>
<td>2.7</td>
<td>3.1</td>
</tr>
<tr>
<td>Christian</td>
<td>16.2</td>
<td>46.9</td>
</tr>
<tr>
<td>Islam</td>
<td>0.0</td>
<td>6.2</td>
</tr>
<tr>
<td>Buddhist</td>
<td>0.0</td>
<td>3.1</td>
</tr>
<tr>
<td>Hindu</td>
<td>0.0</td>
<td>3.1</td>
</tr>
<tr>
<td>Other</td>
<td>2.7</td>
<td>3.1</td>
</tr>
<tr>
<td>$\chi^2(6)=21.76, p&lt;.002, \phi=0.5$</td>
<td>$\chi^2(6)=29.07, p&lt;.001, \phi=0.5$</td>
<td></td>
</tr>
<tr>
<td>Variable</td>
<td>Males %</td>
<td>Females</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td></td>
<td>ASD</td>
<td>TD</td>
</tr>
<tr>
<td></td>
<td>n=41</td>
<td>n=36</td>
</tr>
<tr>
<td>Comorbid Psychiatric condition*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>29.3</td>
<td>87.9</td>
</tr>
<tr>
<td>Depression and Anxiety</td>
<td>56.1</td>
<td>9.3</td>
</tr>
<tr>
<td>Obsessive Compulsive Disorder</td>
<td>2.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Post-traumatic Stress Disorder</td>
<td>2.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Attention Deficit Hyperactivity Disorder</td>
<td>1.7</td>
<td>9.3</td>
</tr>
<tr>
<td>Bipolar Disorder</td>
<td>7.3</td>
<td>0.0</td>
</tr>
<tr>
<td>Borderline Personality</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Gender-Dysphoria</td>
<td>17.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Eating Disorders</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Tourette's syndrome</td>
<td>2.4</td>
<td>0.0</td>
</tr>
<tr>
<td>$\chi^2(9)=26.46, p&lt;.001, \phi=0.6$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\chi^2(9)=34.23, p&lt;.001, \phi=0.6$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cohabitation with an Intimate partner</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>22.0</td>
<td>60.6</td>
</tr>
<tr>
<td>No</td>
<td>78.0</td>
<td>39.4</td>
</tr>
<tr>
<td>$\chi^2(1)=11.46, p=.001, \phi=0.4$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\chi^2(1)=23.05, p&lt;.001, \phi=0.5$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender-Identity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Same gender role as birth-sex</td>
<td>41.5</td>
<td>90.9</td>
</tr>
<tr>
<td>Androgyny</td>
<td>22.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Transgender</td>
<td>14.6</td>
<td>3.0</td>
</tr>
<tr>
<td>Nonbinary</td>
<td>22.0</td>
<td>3.0</td>
</tr>
<tr>
<td>$\chi^2(3)=19.33, p&lt;.001, \phi=0.5$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\chi^2(3)=22.99, p&lt;.001, \phi=0.5$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sexual Orientation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heterosexual</td>
<td>34.1</td>
<td>87.9</td>
</tr>
<tr>
<td>Bisexual</td>
<td>7.3</td>
<td>0.0</td>
</tr>
<tr>
<td>Asexual</td>
<td>17.1</td>
<td>9.1</td>
</tr>
<tr>
<td>Pansexual</td>
<td>2.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Transsexual</td>
<td>9.8</td>
<td>3.0</td>
</tr>
<tr>
<td>Homosexual</td>
<td>7.3</td>
<td>0.0</td>
</tr>
<tr>
<td>Undetermined</td>
<td>22.0</td>
<td>0.0</td>
</tr>
<tr>
<td>$\chi^2(6)=24.05, p&lt;.001, \phi=0.6$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\chi^2(6)=32.86, p&lt;.001, \phi=0.7$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.2.2 Demographic trends

Demographic trends are presented in Table 6.1. The sample comprised of individuals from various ethnic backgrounds, comprising mainly of Caucasian individuals. No group differences were found on race based on diagnosis among males or females. Additionally, the sample was largely educated and reported having some college education. The groups with and without an ASD differed on education levels, where a higher number of individuals with ASD had postgraduate University degrees. Moreover, individuals with an ASD were more likely to report no religious preference, relative to TD individuals. Individuals in the group with ASD were less likely to be in a cohabiting relationship with an intimate partner relative to sex-matched controls. Furthermore, individuals with an ASD were more likely to report having a comorbid psychiatric diagnosis than their TD peers did. The most frequent responses in this category included mood disorders such as depression and anxiety. Nine individuals reported having a diagnosis of GD, comprising two females and seven males. All nine individuals had a diagnosis of ASD. Five of these individuals reported utilizing hormone replacement therapy (HRT) to address their gender-identity issues. Relative to their sex-matched peers, males and females with an ASD were more likely to report a gender-identity that differed from their birth-sex, as well as report higher rates of non-heterosexuality.
A new wave of participants was recruited for the current study, as analyses of results from the Study I, II and III informed the development of the qualitative measure for this study. Upon receiving ethical approval for the research from Deakin University Human Research Ethics Committee (DUHREC 2014-190), individuals were invited to participate in an online survey. Potential participants were informed about the study by posting information about the study on several national and international autism organizations and forums. Control participants were recruited by word of mouth and through social media such as Facebook.

After completing demographic questions, participants completed the qualitative questionnaire (See Table 6.2). Participants were cautioned on the highly personal nature and sensitivity of the study and given the choice to opt out of the interview at any time. There was a total of 29 questions, excluding the demographic questions (see Appendix M). Respondents input their answers in their own words into a text box online. Three domains were investigated; Social Development, Gender-identity, and Sexual Orientation.

Table 6.2

Domain-specific questions used in the survey

<table>
<thead>
<tr>
<th>I. Social Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>• During your pre-adolescent and adolescent years, could you please share how you found socializing with your peers of a. Same sex and b. Opposite sex</td>
</tr>
<tr>
<td>• Were you bullied or teased as a younger child? Were you bullied more often by boys or by girls?</td>
</tr>
<tr>
<td>• Do you at times feel different from others of your own sex?</td>
</tr>
<tr>
<td>• Do you at times feel more similar to members of the opposite-sex?</td>
</tr>
<tr>
<td>• Do you prefer your own company and doing things by yourself or do you prefer doing things with other people?</td>
</tr>
<tr>
<td>• Do you dress, talk, or behave a certain way because it is socially expected of you? If so, how do you “act”?</td>
</tr>
</tbody>
</table>
II. Gender-Identity

- What do you think about the concept of gender?
- Would you consider your gender as playing an important role in your identity as a person? Please share your thoughts as to why you do/don’t believe your gender defines your identity.
- Did you find understanding your gender-identity a straightforward process?
- Were or are there any struggles you care to share in relation to how you came to understand your gender-identity?
- Are your birth-sex and your gender-identity the same?
- Does your birth-sex agree with your self-conception (how you think about yourself)?
- Do you feel like you do not fit in or ‘belong’ to your birth-sex group?
- When choosing an intimate partner (sexual, romantic, or otherwise), would you consider companionship more important than the gender of the person? Please share your thoughts.
- Which is most important to you: friendship and companionship or sexual intimacy?
- Are you happy with your gender-identity? Feel free to elaborate.

III. Sexual Orientation

- What is your sexual orientation?
- Are you content with your sexual orientation? Feel free to elaborate.
- If you are aroused sexually, would you describe the type of things that arouse you sexually?
- Do you approve of sexual orientations other than heterosexuality? Kindly elaborate on your answer as you see fit.

The survey took approximately 30 minutes to complete and was conducted solely online. A benefit of conducting such a survey online was, given the sensitive nature of the questions, respondents were provided with the opportunity to reflect on the answers to the questions at their own convenience and with privacy. There is evidence that points to such responses being more complete (Boyer, Olson, Calantone, & Jackson, 2002), more honest, and less influenced by social desirability (Mangan & Reips, 2007) than those responses obtained from more traditional face-to-face interviews or focus groups.
6.2.3 Data analysis

The responses were analyzed using theoretic thematic analysis based on methodology outlined by Braun and Clark (2006). Thematic analysis seeks to identify themes and patterns from qualitative data through an iterative process of familiarization, coding, theme-development, defining themes and reporting. The analysis was based on a-priori hypotheses and driven by findings from Studies 1, 2 and 3 of the dissertation, which were quantitative in nature. Given the a priori nature of the study, to ensure an unbiased analysis of data, a semantic approach was used during analysis such that themes and codes were identified based on actual surface text rather than on apparent underlying concepts prompting the text. A frequency chart was created to record emerging codes to aid with the recognition of salient and prevalent themes. Initial themes were grouped under broader and major themes, where applicable. Data collection was terminated once data saturation was reached. To ensure that the coding-scheme was unbiased, well-grounded and consistent, an independent blind second coder was recruited to double-code the data. Unique codes were developed and assigned to each of the 29 items on the survey that reflected relevant impressions from the reviewed responses. Based on this coding-scheme, Cohen’s kappa ($\kappa$) was run to determine if there was agreement between the two raters on codes to the 29 questions. Disagreement between codes was counted as a coding-discrepancy. There was a substantial agreement between the two raters’ judgements, $\kappa = 0.65$, $p<0.001$, as defined by guidelines from Bland and Altman (2007) and adapted from Landis and Koch (1977), where any kappa value between 0.61 to 0.80 is regarded as substantial.
6.3 Results

Data was separately analyzed for males and females to delineate any sex-specific differences related to sexuality and gender-identity. Three domains were investigated; Social Development, Gender-Identity, and Sexual Orientation. The different themes that emerged from each domain are discussed below with exemplar quotes and explanations of the same. Table 6.3 contains frequency data comparing responses between individuals in the TD group and group with ASD by birth-sex.

Table 6.3

Descriptive data comparing responses between individuals in the TD and ASD group by birth-sex

<table>
<thead>
<tr>
<th></th>
<th>TD%</th>
<th>ASD%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Males</td>
<td>Females</td>
</tr>
<tr>
<td>Bullied by boys</td>
<td>23.90</td>
<td>8.80</td>
</tr>
<tr>
<td>Bullied by girls</td>
<td>0.00</td>
<td>22.40</td>
</tr>
<tr>
<td>Gender is not important to personal identity</td>
<td>8.57</td>
<td>8.82</td>
</tr>
<tr>
<td>Struggles understanding gender-identity</td>
<td>8.57</td>
<td>8.82</td>
</tr>
<tr>
<td>Birth-sex and gender-identity match</td>
<td>94.28</td>
<td>91.17</td>
</tr>
<tr>
<td>Feel different from own sex</td>
<td>8.57</td>
<td>5.88</td>
</tr>
<tr>
<td>Feel similar to opposite sex</td>
<td>5.71</td>
<td>5.88</td>
</tr>
<tr>
<td>In intimate relationship with another person</td>
<td>92.86</td>
<td>100.00</td>
</tr>
<tr>
<td>Partner-gender matters</td>
<td>94.28</td>
<td>88.23</td>
</tr>
<tr>
<td>Companionship matters more than partner-gender</td>
<td>2.85</td>
<td>5.88</td>
</tr>
<tr>
<td>Companionship matters more than sexual intimacy</td>
<td>97.14</td>
<td>97.05</td>
</tr>
<tr>
<td>Prefer own company to going out</td>
<td>10.71</td>
<td>55.55</td>
</tr>
<tr>
<td>Content with sexual orientation</td>
<td>100.00</td>
<td>100.00</td>
</tr>
<tr>
<td>Content with gender-identity</td>
<td>100.00</td>
<td>100.00</td>
</tr>
<tr>
<td>Birth-sex agrees with self-conception</td>
<td>100.00</td>
<td>100.00</td>
</tr>
<tr>
<td>Approve of non-heterosexuality</td>
<td>78.57</td>
<td>66.66</td>
</tr>
</tbody>
</table>
6.3.1 Social Development- Disconnectedness

Three sub-themes emerged from the data that were subsumed under one major theme, Disconnectedness. The subthemes were 1. Loners, Geeks, Tomboys and Mother-hens, 2. Aliens among humans, and 3. Hide the Aspie. These subthemes are separately discussed below.

6.3.1.1 Loners, Geeks, Tomboys and Mother-hens

Retrospective accounts of socializing experiences in pre-adolescent and adolescent years were examined among males and females. In response to ‘how you found socializing with your same-sex peers during pre-adolescent and adolescent years’ 90.6% of TD males found socializing with their own-sex “easy” with “no major issues”. Socializing took place mainly through competitive team-sports, such as soccer or cricket. Other activities included fishing, bike-riding, video-games, and after-school play in the local parks with children from the neighbourhood. Three TD males reported difficulties with their same-sex socializing; one male was an immigrant and found communicating in the English language challenging and felt isolated as a result, while two other TD males found making friends was difficult due to their “mental condition”, where one person had a diagnosis of attention deficit hyperactivity disorder and the other reported having a diagnosis of depression. In the group with ASD, 29.3% of males described same-sex socializing difficult mainly due to challenges with initiating the social activity “they would be the ones who had to make the first move…I was too shy…my parents invited kids over”. On the other hand, 70.7% of male participants with an ASD reported friendships with the same-sex as being absent or limited to one to two friends, and
reported being “loners in school…people kept their distance from me…just did my own thing” and were often targets for bullying “mostly for being quirky…without even realizing it”. As one participant with ASD shared “I really didn’t interact with other kids and much preferred to be left alone… couldn’t keep up with conversations, which went too fast for me”, while others conceded to interactions with other boys in a structured classroom context only. Two male participants reported befriending “other geeks” who were outcasts, one participant recalled having “another Aspie-boy as a friend”, while another preferred the company of “older men”. Seven male participants reported enjoying “video-games and Lego” as a conduit for socializing.

When examining responses of females with relation to same-sex socializing during pre-adolescent and adolescent years, 93.9% of control females described their interactions with girls as “generally easy and fun…well-connected with my friends”. Social activities among TD females during their school years included parties, spending time at the mall with ‘cliques’, shopping, dance-lessons, play-dates and phone-calls. Two TD females described socializing with same-sex peers as awkward and not enjoyable “too materialistic…never had pretty clothes”. In comparison, 10.3% of females with ASD described socializing with same-sex peers was easy when it was in a small group of one to two girls, while 63.2% of female participants with ASD described interaction with other girls as being absent and mostly feeling like “other girls were speaking a different language”. Females with ASD recalled “wanting to relate and fit in” but finding it “very hard to communicate”. A common strategy reported by female participants with ASD to fit in with TD peers was to “pretend … go along … and copy the other girls”.

“I pretended to be someone else and act like them - it worked to a point but when you don’t understand the mechanics stuff goes wrong so I was kind of accepted but was always the dumb one eg. always holding the skipping rope but never skipping - a life analogy”

Specific friendship-types were also described by 23.5% of female participants with ASD such as making friends with “mother-hens or older, protective females … who took me under their wings and made me feel safe”, as well as girls who “were not part of the accepted stereotypes”, such as “geeks who preferred to read and talk about anime and manga…were interested in animals, nature and music” or “tomboys that were not afraid to get dirty and did not talk about their hair, make-up and boys all the time”. Females with an ASD also described how socializing during adolescent years was “extremely difficult” compared to pre-adolescent years, and TD females agreed to there being “a clear set pattern of different cliques during adolescence…you belong to one particular clique and socialize within that group freely and easily”.

“I found it hard. Especially in my teenage years. I didn’t have an obsession over boys, make-up etc. It was a lot easier… before secondary school…when you could just play some simple game instead of gossip and what not. I was very often excluded and the other students perceived me as odd.”

In response to ‘how you found socializing with the opposite-sex’, both male and female TD participants recalled reduced interactions with the opposite-sex than with own-sex peers, and as taking place mainly through school-organized events, dates, or during recess breaks at schools. Among individuals with ASD, males with an ASD
described their opposite-sex interactions as “non-existent or even more limited than with same-sex peers” and “confusing, uncomfortable and awkward”. Three males with ASD recalled easier interaction with girls during pre-adolescence “usually kinder and less judgmental to me … used me as an accessory in their games, I was the husband or baby, I think they forgot I was a boy sometimes”, but agreed that interactions became “disappointingly different around puberty”. Females with an ASD similarly reported reduced interaction with boys, but this interaction was described as being better than interactions with girls “boys were more direct and blunt when they spoke…no social politics or mind-games like girls”; and “boys were interested in the same sort of stuff I was interested in and were less catty”.

In response to ‘did you find that you were bullied more often by boys or by girls?’ overall females, unlike their male peers, experienced bullying from both their own and the opposite-sex members, while males reported being mainly bullied by their own-sex peers. Both males and females agreed that bullying from boys was “straightforward”, while bullying from girls was more “underhanded”. Females with an ASD added to this when describing same-sex bullying from girls as being “especially vicious … they were nasty and used verbal-attacks and exclusion” while boys tended to be more physical and “shove or throw things” at their target. Females with ASD and a diagnosis of GD did not recall experiencing different bullying patterns from their non-GD peers. Three females with ASD reported being sexually-assaulted by their male peers during their secondary school years; one person shared how she “was called a slut and became a social hermit after being raped”, while the other person “avoided any interaction with boys after being sexually-assaulted”.
When asked to report on *leisure activities in childhood*, most individuals with ASD reported enjoying solitary activities that did not require the company of other children, while leisure activities among TD individuals appeared to center more around social activities. TD males enjoyed team-sports (cricket, soccer, basketball) and video gaming, while TD females preferred shopping, movies, slumber-parties and reading more. The common leisure activities in childhood among individuals with ASD included reading science-fiction books, writing poetry, watching television shows among which Star Trek, fantasy movies and science documentaries were most popular, collecting paraphernalia related to ‘Pokémon’ and anime, pattern-watching, Lego-building, astronomy and spending time with animals, mostly horses and cats. No notable differences were found between males and females with an ASD on their leisure interests, other than males expressing an increased interest in physical activities such as hiking and swimming, as well as video gaming.

6.3.1.2 Aliens among humans

When investigating accounts on whether participants ‘at times feel different from others of your own sex?’ responses revealed that while TD participants did not feel different from their own-sex group, 87% of individuals with an ASD reported feeling different “all the time…I’m autistic…lol…a space ship dropped me off on this planet full of primitives…I feel different from my own sex only as much as I feel different from the rest of the species!” Males with an ASD described how they did not fit the “neurotypical macho-man…alpha-male stereotype”, but instead felt “more passive and sensitive in temperament, not aggressive and competitive… or into sporting events, loud and lewd jokes at the pub or sexual exploits”. Females with an ASD described themselves as “not
girly girls…that can neatly fit into normative femininity” and instead expressed their preference for “practicality, comfort and functionality over aesthetics with clothing” and for speaking the truth and being direct in contrast to “self-effacing and people-pleasing attitudes among neurotypical females”. Females shared that they did not experience “touchy-feely” emotions and were more “cold, rational, aloof and stoic”. One participant described her disconnectedness “I feel like I’m on the outside, looking in through a window, when I’m with other women”. Both males and females with an ASD reported that they felt “like aliens among other humans” and how “autism sets [us] apart”.

In response to “do you at times feel more similar to members of the opposite-sex?”, two females and one male participant from the TD group reported feeling similar to the opposite-sex in terms of their thinking. The two TD female participants reported an androgynous identity and felt more “practical and technical-minded”, while the male TD participant reported a transgender identity and got accused of “thinking like a chick often”. Among individuals with ASD, 92% of the sample described feeling more similar to the opposite sex. Males described how they did not see themselves as feminine, but expressed certain traits that culture has defined “as more socially-acceptable and typical of females than of males… I tend to be shy, submissive, introverted… don’t like having dirt on my hands, …. not wanting to hurt animals or insects… gifted at poetry… vulnerable”. Males with an ASD however shared how they were not into “shopping and gossip” though. Similarly, females with an ASD reported feeling more similar to males, as they were “more mechanically-inclined, logical …. not obsessed with appearance, over-dramatic and emotional; prefer a good debate to gossip; and solve problems rather than just nod and agree with everyone”. Females with an ASD however stated that they
were not like males when it came to “preoccupation with sex, sport and competition” and still “feel like a woman, just not a full woman… It’s like asking me if I feel more affinity to girl aliens or boy aliens. Girl aliens sure, we have being female in common, but they are still aliens”. Overall, males and females with an ASD felt like their birth-sex agreed with their self-conception, and believed that “social-stereotyping and not a gender-conflict” explained their disconnection with their own sex and relatedness to the opposite-sex, as described by one participant below.

“My struggle was discovering why I felt so peculiar in comparison to my peers. I never truly felt feminine, however I didn't feel masculine either. I was - and still am - essentially genderless......I have always had difficulty entering in or maintaining romantic relationships, I don’t get along with any sex... even transgendered people... I thought that was at least partially due to a failure on my part to 'perform as a woman'. Lately, I think it has to do with Asperger-specific idiosyncrasies of communication and behavior...it’s hard out there for Aspies”.

6.3.1.3 Hide the Aspie

When participants were questioned “do you generally prefer your own company and doing things by yourself or do you prefer doing things with others, such as going out?”, TD participants’ responses were mixed with some preferring a quiet evening and others preferring socializing. Reasons for preference to stay home rather than go out were “tiredness after long hours at work” and “too busy with studies”, but agreed that they did not mind socializing as well “I thoroughly enjoy going out with my close group of friends and partner on the weekend”. Among individuals with ASD, 73% of individuals with
ASD generally preferred solitude. Participants with ASD described a desire to be with others, but shared how “socializing was exhausting and anxiety-provoking…I don’t enjoy home alone …but I don’t get invited out a lot…I’m a mix. I like socializing, but online not in person… I’m like a cat. Stay for a while …but then you have to leave me alone”.

On the other hand, TD individuals found socializing “relaxing and fun”. Furthermore, after socializing, individuals with ASD “required recharging and down-time to recover”. Most individuals with ASD reported the hardest part about socializing was “being afraid to say or do the wrong thing… avoiding confrontation or hurting someone”.

When asked if participants “dressed, acted or behaved in a certain way due to social expectations or to avoid rejection”, controls did not seem overly concerned and “were not aware of any drastic modifications to behavior…not particularly focused on any conscious efforts…and keep with social expectations”. Individuals with ASD however reported ongoing efforts “to pretend to be normal…mimic others to get it right… say less, nod and agree…do not offend… and hide the Aspie”.

“Yeah, I have to fit in with social norms more than I’d like as an autistic person, especially in work environments. I basically act as a socially adept version of myself. It’s hard, draining but doable. How you may ask? many years of observing popular people… I’d love to not have to look people in the eye and say what I think instead of playing social games. But it's expected of me”.

6.3.2 Gender-Identity- Social Stereotyping, not cross-gender ideation

6.3.2.1 Between my ears, not my legs

In response to the question “What do you think about the concept of gender?”, 98% of TD individuals described gender as being “something fixed; central to identity; decided by brain and body” but agreed that “society plays a role; and makes you a man or a woman”. However, 71% of individuals from the group with ASD described gender as “non-binary … fluid … restricting … annoying … complex and wish it didn’t exist … I think it's like the Matrix. Everyone around me thinks it's real, but it's really not. It is more a social construct than a biological one”. Participants with ASD agreed to their maleness and femaleness, but also argued against the binary gender system. Responses indicated that participants believed in the abstract nature of gender and how “gender is not decided by your genitals… you don’t look between your legs to understand who you are”.

When examining responses to the item “are your birth-sex and your gender-identity the same?”, 92.7% of TD individuals and 68.6% of individuals with ASD felt their birth-sex and gender-identity agreed. TD individuals who had gender-identities different to their birth-sex expressed how they did not agree with society putting them in a box. Individuals with an ASD who disagreed about their gender-identity and birth-sex being the same explained this to be due to “clashes of with annoying social constructions of what a particular gender should be like…I spent a lot of time trying to sort my gender out…but then realized its my autism…social issues rather than gender issues”. Individuals with ASD who had a diagnosis of GD reported finding gender “conceptually confusing, but extant… dissatisfied with narrow definitions of man or woman” and
shared how they possessed a mix of their own and opposite-gender traits (males liked poetry and theatre, females preferred looser clothing, not itchy tight dresses).

In response to the item “did you find understanding your gender-identity a straightforward process?” 95% of TD individuals and 39.7% of individuals with ASD described the process of understanding their gender-identity as a straightforward process. Among males, 70.7% of males with an ASD found understanding their gender-identity “troublesome and frustrating” and blamed their autism for their struggles “trying to be overly masculine to try to soothe my insecurities is a huge regret… controlling my mannerisms, which I later discovered were due to my Autism instead of "femininity" and through it all my mother assured me that she would love me, gay or straight, boy or girl, yet I was too worried about everyone else to listen". One male participant with ASD shared how his gender-confusion impacted on his sexual orientation “for the longest time people thought I was gay because I have so many feminine traits, but that it didn't ‘feel’ right…not gay…just a sensitive man”. An extract from a genetic male respondent who surgically transitioned at the age of 60 describes confusion around gender and regret over treatment of gender-issues.

“I now consider myself to be a woman, albeit one with a "different" history to most. Being an Aspie makes it very hard, no impossible, to make friends. All my life I blamed my transsexuality for relationship problems, then after transitioning and settling into life as a woman I was massively disappointed to find my relationship issues didn’t go away. Subsequently diagnosed with Asperger’s, and on reviewing my memories of early childhood in conjunction with an older sister, came to the realisation that I had most probably been autistic as a child”.
Among females with an ASD, 54.3% indicated that understanding their gender-identity was “an illogical process”. Four female participants complained about confusion during puberty and that “breasts and periods are annoying… hate childbirth…scared about the changes to my body that were too fast and sudden”, two shared their dislike for “girly girly things like dressing up, texturally I hate lace, ribbons, buttons… liked to wear sweatshirts…boyish activities…but never wanted to be a boy”. Females with an ASD struggled with “their sense of feeling so peculiar” in comparison to their female TD peers, and never truly feeling fully feminine, but not feeling masculine either; and feeling essentially genderless”, while another female participant with ASD shared “No. I'm a girl and I know it. I don't see no reason to change my gender to better fit my interests and those I hang out with…I'm still a girl”. Females with ASD however felt “at home in the company of other autistic females, but not TD females”.

Furthermore, when questioned on ‘whether gender played an important role in personal identity?’ TD participants shared how “gender helps to form a huge part of my identity… informs how you should act, think, and feel - as dictated by society”. Participants with an ASD described gender as “a big deal to everyone else…people treat me a certain way because of my gender…but my personality is more important than my gender”. However, individuals with a diagnosis of GD described gender as a focused point of discussion and was “absolutely…. definitely a part of their identity”.

When deciding whether ‘companionship was more important than the gender of a partner in an intimate relationship’, TD individuals considered the gender of their intimate-partner as the “primary decider”. However, responses were mixed among individuals with an ASD. Individuals in an asexual relationship disregarded gender as
relevant and stressed more on partner-personality and compatibility “you love the person, not their genitals”, while individuals with an ASD who were in a sexual relationship described partner-gender as an important factor, but still maintained flexible attitudes towards sexual intercourse with a willing partner “As an Aspie, who gets to choose?” and attitudes of sexual openness and sexual experimentation with different genders. Males regarded the gender of their intimate partner more important than females did. Both individuals with and without an ASD placed more value on companionship in a relationship over sexual intimacy, and TD individuals added that sexual intimacy was often an indicator of a good relationship.

6.3.3 Sexual Orientation- Sexual and Gender fluidity

An analysis of responses to the item ‘What is your sexual orientation?’, revealed that the rates of non-heterosexuality in the TD sample was 17.8% while this rate was 72.9% in the group with ASD (see Table 6.1). When asked if participants were content with their sexual orientation, TD individuals who were heterosexual shared their contentment and assuredness in their sexual orientation “absolutely…yes, never thought about it…quite natural”, and similarly TD individuals who were non-heterosexual expressed contentment with their sexuality, but preferred to keep their sexual orientation private at work “Yes. I am out to my family members… no problem accepting my sexual orientation while growing up…still closeted at work because it's very closed profession”. However, individuals with an ASD reported uncertainty and complications with their sexual orientation.
“I really am not sure what my orientation is. Most of my life I have been awkward with my autism, and crushed by gender roles ... I think I would not totally care about the sex, sexual orientation, gender or race of another if I really am attracted to them and am compatible, they are trustworthy”.

Asexuality rates were also high overall in the current sample, but this rate was higher among individuals with ASD (26.4%) compared to asexuality rates in the TD group (8.95%). There were degrees to asexuality, such as “conditional-arousal (solitary masturbation or online masturbation)”, “sapiosexual (attraction to intellect not body)”, “demisexual (emotional attraction without physical intimacy)”, or “gray romantic (sexual fantasies and sexual attraction but not to genitalia)”. Sexual identity is how one thinks of oneself with regards to whom one is sexually or romantically-attracted. However, sexual identities were not always based on this criterion among individuals with an ASD, where sexual identities were chosen for different reasons and appeared to change and evolve across time; a. as an outcome of life experiences: “Over the years I identified as bisexual, gay, lesbian, pansexual, queer. But now, I prefer calling myself asexual, I don't have to seek out sexual partners but still get the mental pleasure from my fantasies. Sexual arousal is like an itch…it goes away after sometime” b. to cope with confusion: “I’m still trying to figure it out...trying on different labels to see which fits… logical to remain single, but don’t want to rule it out... leaving my sexual orientation ambiguous, and calling myself queer makes it easier to ignore”, c. to find community: “During my teenage years I was very confused. I didn't know I was autistic and couldn't fit in. I thought I was bisexual as I had a crush on a girl at college. Also it would mean I would be part of the LGBT community which would mean I would belong somewhere. After a
lot of confusion, I realized I was autistic not bisexual ”, and d. to increase accessibility to sexual partners: “why tempt fate… I feel pansexuality is a good label to increase the number of possible partners”.

When asked about the sort of things that would play a role in sexual-arousal, several participants with and without an ASD described being aroused by erotic stimuli related to nudity, kissing, cuddling, genital stimulation, and pornography. However, there were also reports of not commonly reported sexual stimuli. Two TD participants reported being aroused by bondage and dominance “interests range from vanilla to kinky… werewolf fantasies, rough sex”, while 17 individuals in the sample with ASD expressed sexual interest in bondage, dominance, submission and sadomasochism. Two TD participants reported “not experiencing sexual arousal”, while 33 participants with an ASD reported being asexual “not applicable…never been aroused…incapable of any sexual feeling”. Certain atypical sexual-arousal stimuli were reported by individuals with ASD only, that were not reported by any TD participants. One male participant with ASD reported paedophilia (pervasive fantasies of sex with children and masturbation while viewing pictures of children) and two males with ASD reported experiencing sexual arousal by imagining himself as a woman (autogynephilia). Five males with ASD reported different types of fetishism such as being sexually aroused by feet and shoes, tights/stockings (without people being involved), writing on glossy art paper, drinking urine, and transvestic fetishism (sexual arousal when wearing women’s clothing in private). Attitudes toward non-heterosexuality were largely positive among individuals with an ASD, compared to TD participants, who were less positive. Table 6.4 below, summarizes the main sub-themes and themes that were extracted from the data.
Table 6.4

*Framework for analysis of themes*

<table>
<thead>
<tr>
<th>Codes</th>
<th>Sub-themes</th>
<th>Themes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Challenges with social interaction</td>
<td>Loners, Geeks, Tomboys,</td>
<td></td>
</tr>
<tr>
<td>Specific friendship-types</td>
<td>Mother-hens</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Macho man</td>
<td>Aliens among humans</td>
<td>Disconnectedness</td>
</tr>
<tr>
<td>Non-Girly girl</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male-avoidant strategies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female-engaging strategies</td>
<td>Hide the Aspie</td>
<td></td>
</tr>
<tr>
<td>Gender is meaningless</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender is confusing and restricting</td>
<td>Not a ‘full’ man/woman</td>
<td></td>
</tr>
<tr>
<td>Autism as a barrier to understanding gender</td>
<td>Between my ears and not my legs</td>
<td>Social stereotyping, not cross-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>gender ideation</td>
</tr>
<tr>
<td>Gender and sexual gender-diversity</td>
<td>As an Aspie, who gets to choose your sex-partner?</td>
<td></td>
</tr>
<tr>
<td>Dissatisfaction with gender-roles and sexual orientation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alternative gender and sexual identities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sexual openness</td>
<td>Love the person, not their genitals</td>
<td>Sexual and Gender fluidity</td>
</tr>
</tbody>
</table>
6.4 Discussion

This qualitative study investigated attitudes towards gender-identity and sexual orientation among individuals with an ASD and compared this to attitudes among individuals without an ASD. The main themes that emerged were 1) disconnectedness; 2) gender-struggles due to social stereotyping not gender-conflict per se; and 3) sexual and gender fluidity. Each main theme is discussed below.

The current study found that relative to TD individuals, males and females with an ASD described experiencing a disconnectedness from their same and opposite-sex peers from their early childhood through into adulthood. Social isolation in primary and secondary school years was tied in to difficulties initiating, reciprocating and maintaining friendships, and differences in interests between individuals with and without an ASD. Adult accounts of disconnectedness among individuals with ASD was attributed to social awkwardness stemming from autism-related traits that in turn led to an incompatibility with gendered-stereotypes. A trend toward increasing loneliness and marginalization was noticed among individuals across their lifespan and this appears to be an outcome of developmental trends where increasing gender-polarization occurs among the sexes with age.

Females are generally assumed to be more socially-oriented than their male peers (Barbu, Cabanes, & Maner-Idrissi, 2011). This gender-difference was evident among individuals with ASD as well. From their early school-years forward into their adult years, based on the social milieu, females with an ASD demonstrated greater aptitude for devising engaging strategies to blend in with their peers either through profitable friendships in the school environment (tomboys, nerds, geeks, mother-hens), or through
social mimicry of popular female role-models in school or at work with regards to their clothing, speech, and mannerisms, or still yet through compliant attitudes that would insure against any social faux-pas and ensure a friendly façade. These ‘camouflage attempts’ by females with ASD have been noted in other literature (Head, McGillivray & Stokes, 2014, Lai et al., 2011) and may contribute to difficulties with identification of girls for a diagnosis of ASD (Attwood, 2006). Males with an ASD on the other hand relied on avoidant strategies to evade being singled-out either through social-aloofness or the adoption of passive personalities in social situations, where autistic-typical behaviors such as talking about special interests or blunt communication styles were suppressed.

Furthermore, females typically place greater value on social acceptance (Pletsch, Johnson, Tosi, Thurston, & Riesch, 1991), intimacy and cooperation in thoughts and feelings (Clark & Ayers, 1993), and belonging and conforming to a primary peer group or a clique (Savin-Williams & Berndt, 1990), unlike their male peers who desire autonomy in relationships (Letendre, 2007). The relatively superior social intelligence among girls in general when compared to age-matched males (Happé, 1995) coupled with an increased awareness of ASD symptoms among females with ASD (Gould & Ashton-Smith, 2011; Head et al., 2014) would most likely enhance gender-related social difficulties for females more than males with an ASD. This would explain why females with an ASD experienced social isolation more severely than their male peers did, and these results line up with findings from Study III of this dissertation that revealed increased levels of loneliness among females with an ASD in the company of their own-sex peers.
Engaging-type strategies as employed by females would require a more cognitive and emotional investment than the avoidant strategies reported by males, and consequently this incurred a cost to females in the study, who reported experiencing more self-frustration, increased bullying in school from both sexes, exhaustion and feeling drained after social interactions than their male peers did. Fears of physical confrontation among males, and judgement and exclusion among females underpinned choices for solitary leisure activities or structured activity with one or two trusted companions, rather than group social activities, despite clear confessions by both males and females with an ASD for friendships with other people. Hall (2010) confirms that prejudice and discrimination act as main contributors to social exclusion among individuals with ASD. Childhood social interactions patterns noted in this study fit in with Wing and Gould’s (1979) typography of children with ASD (the socially-aloof child; the passive child; the active but odd child; and the ‘loners’). Furthermore, findings from this study build on existing literature that suggests that individuals with ASD lack close friendships and experience greater loneliness than their neurotypical peers (Bauminger & Kasari, 2000; Howlin, Mawhood & Rutter, 2004).

When asked to describe what the concept of gender meant to participants, TD individuals differed from individuals with ASD. While TD individuals believed that their gender was central to their identity, biologically-determined, but culturally-programmed, individuals with ASD described gender as personally meaningless and socially-determined, and recognized that their gender-struggles were due to social stereotyping, and not a cross-gender ideation, and how having an ASD made understanding gender-roles challenging. Contrarily, the nine individuals with ASD with a diagnosis of GD
argued on the importance of gender-identity to personal identity. Empirical literature associates ASD and GD (George & Stokes, 2016; Jones et al., 2102; Pasterski et al., 2014), and the association between ASD and GD may in part be due to an elevated presence of obsessive symptoms in both conditions (VanderLaan et al., 2014). Perhaps the centrality of their gender-identity to personal identity among individuals with GD in the current study might be related to intense and obsessive gender-related interests in this cohort. In addition to socio-communicative impairments, psycho-sensory issues and an aversion to change in ASD appeared to contribute to some “genital-dysphoria” as described by a few participants who were distressed by pubertal bodily changes, that was perceived as taking place at a pace that was too rapid to manage. However, irrespective of whether they had GD or not, all individuals with ASD demonstrated clear cognizance of their maleness or femaleness.

Individuals with an ASD reported more sexual and gender fluidity with their identities and attitudes compared to TD individuals, and this was more pronounced among females. This trend was noted in the first and second study of this dissertation in a different sample of individuals with ASD. A higher percentage of individuals with ASD (58.7%) than TD (8.8%) described that partner-character mattered over partner-gender in an intimate relationship, and this trend has been reported elsewhere (Lai et al., 2011; Mandy et al., 2012). While individuals with ASD revealed an intolerance toward gender and sex-labelling, cognitively-dissonant attitudes were evident in a strong desire to forge alternative gender and sex-labels that rebelled against the heteronormative system. These alternative labels provided a sense of relief and belonging to a community of like-minded individuals who shared gender-ambivalence and sexual openness. While most individuals
with and without an ASD reported sexual arousal to commonly reported erotic stimuli, some deviant sexual behavior was noted among individuals with ASD, and this was described in other studies as well (Van Bourgondien et al., 1997; Hellemans et al., 2007; Realmuto & Ruble, 1999; Robinow, 2009). The presence of repetitive behaviors, sensory issues, stereotypical interests, a fundamental difficulty in understanding social constructs, and nonchalant attitudes toward social norms (Izuma, Matsumoto, Camerer, & Adolphs, 2011) might contribute toward the development of untoward sexual behaviors and sexual liberties compared to TD individuals who may be more concerned with public approval and suppress any id-related desires.

A higher number non-heterosexual identities were reported by participants with an ASD, (72.9%). This is higher than rates of non-heterosexuality reported in other literature investigating sexual orientation in ASD. Hellemans et al. (2007) found that 42% of their sample consisting of 24 male adolescents with ASD living in residential care-settings reported non-heterosexual orientations and Haracopos and Pedersen’s (2004) survey of 38 residents with ASD reported 59% of their sample as non-heterosexual. Perhaps the increased rate of non-heterosexuality in the current study was due to the format of the study, where participants were free respond in their own words and describe their sexual interests, without being forced to choose from a set of options which may not have been fully-representative of their sexual orientation. Liberal sexual identities such as pansexuality, bisexuality, polyamory (multiple sexual partners at one time of different sexes) or ‘undetermined’ appeared to be strategically preferred to increase accessibility and visibility to sexual partners, and sexual-identity labels changed often across the life-span as a function of life-experience. Asexual labels were sometimes chosen due to an
absence of sexual desire. Other times asexuality was a preferred label as it best reflected the individual’s lived experience, such as an absence of sexual partners, lack of sexual knowledge, social anxieties, tactile-defensiveness (dislike for penetrative sex), failed “experiments”, or lowered libidos due to psychiatric medications. Besides same-sex attraction, other reasons for increased homosexuality in ASD in the current study included increased accessibility to consensual same-sex partners versus opposite-sex partners, traumatic opposite-sex experiences, and the safety and predictability of a same-sex partnership. Study I similarly found that relative to their TD peers, sexual identities did not always correspond with sexual attractions and sexual behaviors in the group with ASD.

Females with an ASD reported finding it easier to communicate with and relate to males, and this might provoke some females to seek out males for companionship. This might increase vulnerability of females with ASD to sexual victimization by men (Brown-Lavoie, Viecili, & Weiss, 2014). This together with an increased utilization of non-authoritative sources of sex education, would increase risks for females with ASD for sexual victimization (Attwood, 1998; Henault, 2005; Mehzabin & Stokes, 2011). Distressingly, three females with ASD reported being sexually-assaulted during their school years and expressed feelings of betrayal, confusion and shame. Two females reported an asexual identity, and the third reported an ‘undetermined’ sexual orientation.

The majority of individuals with GD are homosexual (Smith, van Goozen, Kuiper, & Cohen-Kettenis, 2005). However, six of the nine individuals with ASD who had a comorbid GD in the current study were heterosexual. This is of clinical-relevance as individuals with GD who are heterosexual report poor sociosexual functioning after
sexual reassignment (Smith et al., 2005). There has been some debate in the scientific literature on whether GD feelings in ASD are genuine feelings of cross-gender ideation or a consequence of misattributed social ‘differentness’ (DeVries et al., 2010; Jones et al., 2012), and findings from the current study add to these concerns. All nine individuals with ASD who had a GD, like their non-GD peers, reported social causes as underpinning their ‘differentness’. Six of these individuals were on hormone-treatment and one had sexually-reassigned, but expressed regret over their transition. Careful evaluation of motives behind sexual reassignment is recommended to ensure that the decisions made by the individual with ASD and a comorbid GD are well-informed.

6.4.1 Androgyny in Autism- “I lean towards the middle!”

Individuals in the study were clear on their ‘biological-gender’, but were confused about their ‘social-gender’. Social gender in this context refers to gendered-behaviors that are influenced by the political and sociocultural context of the time. The media often disproportionately highlights exaggerated gender-stereotypes as the norm, where men are presented in hypermasculinized versions as being more confident, aggressive, competitive and sexually-experienced, while hyperfeminized versions of females expect women to be more nurturing, overemotional, submissive and flirtatious. Core-autism features such as difficulties with perspective-taking, as well as rigid-thinking styles might lead some individuals with ASD into interpreting these extreme stereotypes as the norm and fail to acknowledge that there are degrees of gendered behaviors. Difficulties living up to such extreme gender-presentations might be misconstrued as the reason for their differentness, and related back to a gender-mismatch which in some cases could lead to a clinical gender-dysphoria.
In reality, gender can be conceptualized as a bi-axial construct in a Cartesian system, with masculinity and femininity on different axes, with fluctuating degrees of masculinity and femininity within each axis, such that males and females would be positioned in varying positions in the Cartesian plane, based on their physical and emotional characteristics. Such a system does not view masculinity and femininity as exclusive of one another, and does not penalize an individual who is higher or lower on their ‘gender-attributes’. This system is depicted in Figure 6.1. Across time, as the socio-political climate of our culture shifts from a patriarchal model to an egalitarian model, gender boundaries are not as exclusive of each other today as they were earlier, and society constantly finds itself redefining gender-roles.

*Figure 6.1 A Bi-axial Gender-Spectrum.*
However, individuals with ASD conceptualize gender as being mono-dimensional, on a linear plane, with extreme stereotypical presentations of masculinity and femininity at opposite ends of the spectrum. Due to the unforgiving nature of such a conceptualization, they may perceive themselves as not belonging to their gender-role, and place themselves in the center of such a spectrum, where masculinity and femininity mingle in androgyny. This conceptualization is clearly penalizing to individuals who do not fit into extreme masculine or feminine stereotypes. A diagrammatic representation of this concept is presented below in Figure 6.2.

![Figure 6.2 A Mono-dimensional Gender-Spectrum.](image)

6.4.2 Conclusions and Future Directions

This qualitative study aimed to understand how individuals with an ASD experience their sexual and gender identities. It is important to recognize that several questions were retrospective in nature and may have been susceptible to recall bias, especially when disclosing traumatic events. Desirability bias is generally a concern with
studies of this nature, but as individuals with ASD are not given to counter factual reasoning (Grant, Riggs, & Boucher, 2004), this concern is somewhat mitigated. However, control participants may have been susceptible to this bias.

Notwithstanding limitations, the findings of this study offer valuable insights into the lives of individuals with ASD across their lifespans, the unique hardships they might face while negotiating their gender and sexuality, and the different means of coping with these challenges. Individuals with ASD found rigid gender-roles confusing and shared the notion that social isolation and difficulties around gender was rooted in core-autism impairments. An unclear sense of gender-identity, together with an apathy towards social norms contributed to increased sexual diversity. Consequences of an unclear gender and sexual identity included marginalization and loneliness and adversely affected mental health, where an increased number of mood disorders were reported among individuals with an ASD.

‘Disconnectedness’ was experienced from primary school onwards, and was related back to difficulties with gendered and sexuality-norms. The limited ability to clearly articulate an inner experience, as well as an intolerance of variability in gender and sexuality, as a function of inflexible thinking in ASD, may present with difficulties to the formation and consolidation of a gender and sexual identity. It is thus recommended that developmentally-appropriate specialized programs be developed for the individual with ASD to support individuals with the understanding of their gender and sexual-identity. Sexuality and gender-identity is a highly sensitive and moralistic matter for many, as well as a matter of psychological well-being and fulfilled living. It is thus
recommended that these educational programs be designed with these weighty issues in mind, while honoring the needs and desires of the individual with ASD.
Chapter 7. General Discussion
7.1 Overall Summary

7.1.1 Research questions

The present thesis assessed the demographic profile of sexual orientations and gender-identities of high-functioning adults with ASD in an international sample using validated psychometric measures, and compared this to the profile of TD individuals. The thesis also assessed for gender-dysphoric traits (GDT) among individuals with ASD and contrasted these findings to that of TD individuals, while also exploring for any association between autistic traits, GDT and sexual orientation. Additionally, the thesis examined for any differences in mental health between individuals with and without ASD based on their sexual orientation and presence of GDT. A single sample of individuals with and without ASD was used to examine these variables using a quantitative approach. Lastly, through qualitative inquiry, the thesis explored how someone with and without an ASD experiences their sexuality with a particular focus on their sexual orientation and their experiences related to their gender-identity. A different sample of adults with and without ASD were recruited for the qualitative study. Empirical literature is scarce on the sexual orientations and gender-identities of individuals with ASD and any unique challenges they may experience in understanding their sexuality and gender. The present thesis sought to answer the following questions:

1. Are there increased rates of non-heterosexuality in ASD?
2. Are there increased rates of gender-dysphoric traits in ASD?
3. Is there an association between autistic traits, gender-dysphoric traits and sexual orientation?
4. Does belonging to a sexual and gender minority decrease the mental health of an individual with ASD?

5. How does a person with ASD experience their sexuality and their gender-identity?

7.1.2 Empirical findings

The main empirical findings of this study were that relative to their TD peers, individuals with ASD reported a diverse range of sexual orientations and gender-identities, and reported higher rates of GDT. GDT influenced sexual-orientation and the levels of GDT increased with the severity of autistic symptoms. Relative to their TD peers, individuals with ASD reported reduced mental health and subjective well-being and belonging to a non-heterosexual orientation and having GDT amplified mental health concerns. Lastly, individuals with ASD experienced difficulty understanding their gender-identity and sexual orientation. An overall androgynous expression of gender was evident. Individuals with ASD attributed challenges with understanding their gender-identity and sexual orientation to social impairments inherent to autism. A discussion of the key findings below aims to present a cohesive and internally-consistent model of sexuality and gender-identity in ASD that could inform the design of specialized sex education programs for individuals with ASD.
7.1.3 Key Findings from each Study

7.1.3.1 Empirical Study I- Sexual Orientation in ASD

Study I examined sexual orientations among individuals with and without an ASD and assessed for this separately among males and females, to identify any sex-specific trends. Relative to their sex-matched TD peers, males and females with ASD reported more diversity in their sexual identities. Previous literature suggested that individuals with ASD are asexual beings (Block, 2000), but Study I found that sexuality was important to many with ASD, and that asexuality was only one component of ASD. Other sexual identities such as heterosexuality, homosexuality, bisexuality, pansexuality, transgenderism, and ‘other’ orientations were also represented. Females with an ASD reported a more diverse range of sexual orientations than their male peers. Moreover, when sexual attractions, contacts and identities were separately assessed for, relative to sex-matched TD peers, males and females with an ASD were less heterosexual, but more homosexual, bisexual and asexual with their sexual attractions. Similarly, males and females with an ASD reported lower levels of heterosexuality, but more homosexuality and asexuality with their sexual behaviors. No differences were found on bisexuality contact rates. When examining how strongly an individual considered themselves homosexual or heterosexual, both males and females with an ASD considered themselves more homosexual than their TD peers. However, only females with an ASD considered themselves less heterosexual, while males with an ASD considered themselves to be as heterosexual as their TD peers. This was unexpected, given the increased homosexuality and decreased heterosexuality trends reported by males with an ASD on measures of sexual attractions and contacts.
7.1.3.2 Empirical Study II- Gender-Identity in ASD

Study II compared the levels of GDT between individuals with and without an ASD. The study also examined the relationship between autistic traits, GDT and sexual orientation. Findings demonstrated that individuals with ASD reported a higher number of GDT than their TD peers. Moreover, GDT were higher among non-heterosexual individuals than among heterosexual individuals. Furthermore, GDT were positively correlated to autistic traits, and this correlation was stronger among females than males. Additionally, GDT partially mediated the relationship between autistic traits and sexual orientation. Other additional tests were conducted to investigate retrospective socializing patterns among individuals with ASD with and without GDT, with same and opposite-sex peers. When examining friendship quality among individuals with an ASD, findings revealed that relative to their non-GDT peers, individuals with GDT recalled having poorer friendship quality when socializing with their peers, but this did not vary as a function of the sex of their peers. However, when examining reports of loneliness as a function of GDT, males with GDT felt lonelier with their own-sex peers, while females, regardless of whether they had GDT or not, felt lonelier in the company of their own-sex.

7.1.3.3 Empirical Study III- Mental Health among sexual and gender minorities in ASD

Study III examined the mental health of individuals who belonged to minority populations. Three populations were investigated; individuals with ASD, individuals with a non-heterosexual orientation; and individuals with GDT. Each population was compared to its respective control group. Findings indicated that individuals with an ASD
reported poorer mental health than their TD peers. Furthermore, individuals with a non-heterosexual orientation reported poorer mental health than their heterosexual peers. Additionally, individuals with GDT reported poorer mental health than their non-GDT peers. These three effects demonstrated statistical parallelism in a profile analysis. Thus, as minority-status increased, mental health worsened.

7.1.3.4 Empirical Study IV- A Qualitative Enquiry into Attitudes toward Sexual Orientation and Gender-Identity in ASD

Study IV compared qualitative accounts related to sexual orientation and gender-identity among individuals with and without ASD. Relative to their TD peers, who found the process of understanding their gender-identity to be straightforward and natural, individuals with ASD found understanding their gender-identity a difficult process. Individuals with ASD did not deny their assigned gender-roles but found it difficult to adhere to gendered-stereotypes. There was a tendency to interpret extreme gender-stereotypes as the norm. Participants with an ASD felt overwhelmed with repeated attempts to meet these standards and described their frustration with themselves at having to hide their true selves and present a different persona to the public. Constant fears of rejection and confrontation as a consequence of any failure to ‘perform their gender-roles’ was a source of ongoing stress and anxiety, and this was more severe among females with an ASD. These struggles were not evident in the responses of TD individuals. Furthermore, individuals with ASD, unlike their TD peers, demonstrated a liberal attitude toward sexuality and reported struggles coming to a clear understanding of their sexual orientation, and instead forged novel sexual identities that were socially-
driven and not biologically-driven. Overall, individuals with ASD experienced their gender-identity as being an androgynous mixture of masculine and feminine traits, and believed their autism underpinned their challenges with gender-identity and sexual orientation.

7.2 An Unholy Triad: Autistic traits, Gender-Dysphoric traits, and Sexual Orientation

Findings across the four empirical studies supported some of the contentions raised in previous literature, while also refuting a few other contentions. Older literature on individuals with ASD suggested that they were asexual beings and disinterested in sexual relationships and intimacy (Block, 2000). More recent literature debunked some of these findings and revealed that individuals with ASD both desire sexual intimacy and engage in sexual relationships (Byers, Nichols, Voyer, & Reilly, 2013; Mehzabin & Stokes, 2011). This thesis adds to the body of literature that suggests that individuals with ASD are sexual beings. However, the sexual profile in ASD may differ on some quantitative and qualitative aspects. Individuals with ASD reported a wider range of sexual orientations than TD individuals. Following heterosexuality, ‘other sexual orientation’ and asexuality were the most frequent choices. Some of the ‘other sexual orientations’ were ‘demisexual’, ‘gray asexual’, ‘celibate’ and ‘queer’, all of which are variant terms that come under the broader ‘asexual’ umbrella term (Richards & Barker, 2013). While TD individuals were more opposite-sex than same-sex oriented, trends were reversed among individuals with ASD, who were comparatively more same-sex oriented. Moreover, the level of sexual contact reported by males and females with an ASD was
disproportionately low compared to levels of sexual desire, as revealed in their responses on the Sell Scale (sexual desire was in the extreme range, but sexual contact was not).

When investigating gender-identities in a sample of individuals with and without ASD, individuals with an ASD were more likely than their TD peers to report non-conforming gender-identities (gender-identities that did not match birth-sex). The most frequent non-conforming gender-identity reported was gender-queer or ‘other gender-identity’. In the ‘other gender-identity’ category, participants reported androgyny, agender, gender-fluid and gender-neutrois most commonly. Moreover, the rates of transgenderism in the ASD sample was 20 to 40 times higher than existing prevalence estimates (Olyslager & Conway, 2007). Furthermore, when examining for the presence and levels of GDT, individuals with ASD reported higher levels of GDT compared to their TD peers. Six individuals with ASD had GDT levels high enough to warrant a clinical diagnosis of GD. Based on this estimate, the rates of GD in the sample was approximately 135 times more than that found in the wider population given existing rates of gender-dysphoria (Zucker & Lawrence, 2009). An emerging empirical evidence base points to the association of ASD and GD (DeVries et al., 2010; Jones et al., 2011; Pasterski et al., 2013) and the current thesis adds to this evidence base.

7.3 Explanations for Sexual and Gender Diversity in ASD- Biological or Social?

When compared to their TD peers, increased sexual and gender diversity in ASD was noted in two separate samples across the quantitative and qualitative components of this thesis, when compared to sex-matched controls. Besides the ambiguous nature of many of the sexual and gender-identity labels endorsed by individuals with ASD,
qualitative accounts revealed that gender-identity and sexual orientations changed for many across their lifespan.

Existing sexuality and gender studies typically turn to neurohormonal theories to explain non-heterosexuality and gender-nonconformity in human beings and suggest that exposure to altered levels of fetal testosterone (fT) influences the development of gender-identity and sexual orientation. Evidence for this comes from non-human primate studies which demonstrate that animals exposed to either increased or decreased levels of fT can exhibit behaviors typical of the opposite-sex, yet the argument that similar effects can be seen in human sexual behavior is a much debated topic (Hines, 2004). A robust body of evidence associates ASD with elevated fT (Auyeung et al., 2009; Baron-Cohen, Knickmeyer, & Belmonte, 2005; Chapman et al., 2006), and accordingly, Baron-Cohen (2002) suggests that ASD is an overdevelopment of certain male-typical traits such as logical thinking, low emotionality and high level of perseverance in the Extreme Male Brain (EMB) theory. The dual role of elevated fT in neural masculinization and in ASD intuitively provides a straightforward explanation for why some females with ASD would more readily identify with the male gender and experience increased rates of gynophilia (sexual attraction to females; Gooren, 2006) and bisexuality, but the theory struggles to explain male homosexuality and bisexuality, with some scholars favoring the argument on the role of elevated fT in male homosexuality (Rahman & Wilson, 2003; Robinson & Manning, 2000) and others refuting it (Williams et al., 2000; Lippa, 2003).

A synthesis of findings from the current thesis are discussed below in relation to the increased sexual and gender diversity in ASD, and speculations based on these
findings are proposed and where possible, findings from existing literature and theory are drawn on for support.

7.3.1 Disregard for social norms

Literature informs us that individuals with ASD may demonstrate a general ambivalence toward social norms (Izuma, Mastumoto, Camerer, & Adolpfs, 2011) and hold permissive attitudes toward sexuality (DeWinter et al., 2014; Ray, Marks, & Bray-Garretson, 2004). This thesis supports these findings. Individuals with ASD demonstrated a disregard for sex, gender and race labels when it came to their sexual interests and indicated how compatibility with the character of the person was more important to them instead. However, cognitively-dissonant motives and feelings were evident where on the one hand there was a unanimous intolerance of and disapproval toward rigid gender and sex-labelling, but on the other hand there was a clear desire to ‘belong to a label’ and many shared how novel labels were forged, that denied the heteronormative-binary gender system, and instead permitted an unrestricted order of sexuality comprising androgyny and liberal attitudes towards sexual intimacy.

7.3.2 Adaptations and compromises to meet sexual needs

Secondly, competing interests of desiring a certain ‘quantity or quality’ of sexual intimacy and not achieving these desires might demand a liberal and less-stringent sexuality regime. Individuals with ASD shared how sexual liaisons were not always based on preferred choice, but on possibility of sexual intimacy with a consensual partner. Hellemans et al. (2007) similarly speculated that the rates of homosexuality and bisexuality may have been higher in their survey of 24 male adolescents with ASD living
in institutionalized settings comprised of primarily male residents possibly due to ease of access to consensual same-sex partners. These ‘trade-offs’ were not reported by TD individuals. Accordingly, individuals with an ASD reported sexual intimacy with same-sex, opposite-sex, transgendered individuals, and sometimes endorsed polyamory or the practice of having intimate relationships with more than two people at the same time. Some individuals opted for labels that increased their visibility for sexual alliances. Other times fear acted as a hindrance to enter into sexual relationships, be it fear of intimacy overall, fear of sexual intimacy with the opposite-sex, fear of failure, or memories of traumatic developmental experiences. This thesis revealed that individuals with ASD desire social relationships and sexual intimacy, but face barriers in entering into and developing a meaningful relationship due to lower levels of global self-worth and social anxiety (Farrugia & Hudson, 2006; Williamson, Craig, & Slinger, 2008) as well as difficulties with social-competence (Bauminger et al., 2003). Based on this, some individuals chose to remain celibate and ‘suppress any libido’, while others compromised and accepted sexual relationships that were not fulfilling. Still others adopted sexual identities based on internalized stereotypes, where feminine traits in a man or masculine traits in a woman with ASD was taken to indicate that the person was either a gay male or a lesbian female, respectively, and therefore accepted to be the case. Such cognitive-inflexibility is characteristic of ASD (Volkmar et al., 2004). While there were positive responses among some who agreed to feeling content with their gender and sexuality, others admitted to discontentment and failure, while some others found respite in alternative or novel labels.
7.3.3 Socio-communicative deficits and cognitive inflexibility

Thirdly, gender-identity is one of the most intensively socialized-constructs, and socio-communicative impairments inherent to ASD would understandably interfere with the formation and ‘performance’ of a clear gender-identity (Abelson, 1981). Accordingly, qualitative accounts of individuals with ASD resonated with Abelson’s speculations about how individuals believed their autism underpinned their gender-confusion. Quantitative results from Study II further supported qualitative findings, when positive correlations were demonstrated between autistic traits and GDT, or more importantly, the communication and social skills subscales of the AQ with GDT. Similarly, positive correlations of the cognitive-inflexibility subscale of the AQ with GDT were found as well, and rigid inflexible thinking styles inherent to ASD around gender-roles could also be one pathway for GD-like symptoms or indeed clinical GD to develop; a speculation that was supported by other researchers too (Galluci et al; 2005; Landén & Rasmussen, 1997; Perera & Gadambanathan, 2003; VanderLaan et al., 2014). Accordingly, in Study IV, individuals with an ASD who had a comorbid GD or adopted alternative non-binary gender-identities indicated that gender-identity was extremely important to their personal identity, while individuals with an ASD who reported traditional gender-identities felt gender was personally meaningless to them and declared gender-roles as being arbitrary. Interestingly, the gender-struggles described by individuals with ASD who had GD were not qualitatively different from the rest of the sample of individuals with ASD who did not have GD, and pointed to their dissatisfaction with social-gender (socially-constructed gender-roles) as being at the root of their gender confusion, rather than any biological concerns.
7.3.4 Impaired Theory of Mind

Fourthly, given the relationship between gender-identity and sexual orientation (Hines, Brook, & Conway, 2004), it is not unexpected that a person’s gender-dysphoric state would impact on their sexuality, and the association between these two variables along with autistic traits was supported in mediation model in the current thesis. It is known that individuals with ASD experience difficulties with Theory of Mind (ToM; Baron-Cohen, Leslie, & Frith, 1985) and deficits with pragmatic understanding and emotional intuition (Senju, 2012). Taylor and Bagby (2004) state that alexithymia is a personality characteristic in which the individual has difficulty identifying and describing their emotions, and studies have revealed a high degree of comorbidity between alexithymia and ASD (Berthoz & Hill, 2005; Lombardo et al., 2007). Together, these deficits would make the understanding and reciprocating of emotions difficult for the individual with ASD, which in turn would negatively impact upon the quality of social relationships. The importance of positive developmental social experiences to the development of a clear sense of gender and sexuality, is known (Robinow, 2009), and personal accounts of individuals with ASD in the current thesis confirm the poor quality of social experiences from their pre-pubescent years onward. It is speculated that these negative social experiences hinder the formation of a clear sense of gender-identity, which in turn affects a clear sense of a sexual-identity.
7.3.5 Weak Central Coherence

Lastly, ‘weak central coherence’ is seen among individuals with ASD (Volkmar et al., 2004; Frith & Hill, 2003) and is defined as a poor ability to process information holistically or ‘gestalting the whole picture’ when such is called for, but rather to process stimuli locally or in a fragmented style (Rajendran & Mitchell, 2007). Qualitative accounts of individuals with ASD revealed a clear cognizance of one’s maleness or femaleness, but feelings of ‘incompleteness’ in their gender-roles. This incompleteness appeared to be a consequence of a perceived failure at meeting societal expectations of gender-roles. Males with an ASD shared how they could not live up to the ‘macho-man model’ while females struggled with ‘girly-girl’ stereotypes, while passionately defending their sense of masculinity and femininity, respectively. A greater dependence on unauthoritative sources of ‘social learning’ such as the internet and media (Attwood, 1998; Henault, 2005; Mehzabin & Stokes, 2011) would only perpetuate skewed and exaggerated views of masculinity and femininity. An acknowledgement of the more prevalent gender-model as it exists in society where masculinity and femininity traits are endorsed to varying degrees within each gender-role, was not evident. It is speculated that this incapacity to recognize variations within each gender-role might be partly attributed to a weak central coherence in ASD. A co-contributor to such a ‘piecemeal’ rigid view of gender could also be attributed to the inherent tendency toward restricted and inflexible-type thinking in ASD. Together, a weakened capacity to recognize variations in gender-roles along with an intolerance to the many degrees of masculinity and femininity there are, might create difficulties for the individual with ASD to come to a clear understanding of their gender, where a failure to ‘tick every trait-box’ in the
stereotypical male or female gender-role might lead some individuals with ASD to regard themselves not ‘fully man’ or ‘fully woman’, and this speculation was evident among qualitative responses.

The limited ability to articulate an inner experience, weak self-advocacy skills, deficits in ToM and a weak central coherence, a nonchalance toward social norms, along with the intolerance of ambiguity as an indicator of the cognitive inflexibility inherent to ASD, may present with unique challenges to gender-identity and sexual orientation formation and consolidation. Put together, sexual and gender diversity in ASD appeared to be outcomes of social and experiential factors, rather than biological factors. The study does not refute the fT hypothesis, but instead finds that socialization experiences may be sufficient to exceed the effects of fT on gender-identity and sexual orientation, at least in ASD, where social impairments are a cardinal characteristic of the condition.

7.4 Clinical implications of study findings

Reports of loneliness and social disconnection in the current thesis dated back to pre-adolescent years and worsened with age for individuals with an ASD, as socialization patterns become more gender-polarized. Researchers in the field of socio-sexual development have stressed the importance of early sexual education which factors in social skills training and interpersonal skills (Dewinter et al., 2015; Stokes & Kaur, 2007). Timely intervention can help impede the negative psychosexual trajectories of individuals with ASD and help with the development of a clear gender and sexual identity. Given the liberal attitudes toward sex and increased rates of homosexuality, bisexuality, and polyamory, concerns for increased risk of sexually-transmitted diseases
among such populations (Centers for Disease Control and Prevention, 2014) need to be addressed via sexual education programs that are tailored to the physical and emotional needs of individuals with ASD. An increased risk for more mental health problems among individuals with ASD who are non-heterosexual, gender non-conforming or both compared to heteronormative and gender-conforming individuals with ASD, necessitates that clinicians and family members be prepared to openly discuss such matters and offer any support required.

It is also worth noting that male and female clients with ASD may present with clinically-different phenotypes and an awareness of these different presentations is recommended. Given what is known about the female profile of socio-communicative development and a greater awareness of ASD-related deficits among females with an ASD (Head, McGillvray, & Stokes, 2014), this group would be more disadvantaged than their male peers. Findings from the current thesis demonstrated that females with an ASD used more engaging strategies to blend in socially, than males with an ASD did. As a result, females with an ASD reported feeling more exhausted due to these constant day-to-day camouflage and compensation efforts. Accordingly, females with ASD reported experiencing more gender-dysphoric symptoms, more severe psychosocial pathology, and increased risk for sexual victimization than their male peers and would thus require an extra level of support. There is a need for female-tailored support services that are developmentally suited to the young girl with ASD, the adolescent female with ASD and the adult female with ASD. Social skills training related to building friendships, increasing personal safety and well-being, and reducing their social naivety and vulnerability, is recommended. Special attention to matters such as pubertal body-
changes is warranted, as this phase of development can be particularly distressing for the female with ASD, as noted by qualitative reports in the current thesis. Clinicians should be aware of the female phenotype in ASD, common co-occurring internalizing mental health issues such as anxiety, depression and eating disorders, and be provided with the necessary training to manage these conditions.

Loneliness and confusion over gender-related dilemmas and sexuality might lead some individuals with ASD to falsely attribute their social difficulties to their gender-identity and believe that they have gender-dysphoria, when it may be an ‘autistic personality’ at odds with a neurotypical world. Findings from the current thesis support the contention that gender-dysphoric expressions described by individuals with ASD were rooted in their sense of feeling different, but at the same time acknowledges the likelihood that in some cases, these gender-dysphoric expressions could culminate into a clinical GD. Concerning extracts from the present thesis and other research (DeVries et al., 2010) demonstrate how a diagnosis of GD among individuals with ASD could lead to decisions about surgical transitioning that offer no respite post-operatively from social difficulties, but instead lead to increased frustration. Disentangling a true clinical GD from GD-mimicking symptoms inherent to ASD presents an added level of complexity in the clinical management of clients with ASD who present to gender-identity clinics for management of their gender concerns. Clear discernment would be required by the clinician to ensure that any chosen remedial path is well-informed.
7.5 Methodological Strengths and Limitations

This is the first study that investigated the different constructs, namely sexual orientation, gender-identity, and related mental health concerns together in conjunction, in a sample of individuals with ASD using both quantitative and qualitative methods of analysis, while using different samples for each approach. Results from the quantitative and qualitative study complemented each other, which increases confidence in the conclusions. Moreover, studying the different constructs together afforded opportunities to investigate any potential associations between the constructs. Findings from the study contribute towards developing a comprehensive understanding of how individuals with ASD experience their sexual orientation and their gender-identity, and the relationship between an individual’s autistic traits and how they come to an understanding of their sexual identity and gender identity.

Methodological limitations were related to study design. Firstly, participants self-reported that they had a clinical diagnosis of ASD. Given that this thesis was exploratory and hoped to interest a large international sample, this was achieved at the cost mentioned. However, mean AQ scores of individuals with a diagnosis of ASD fell considerably above the most stringent recommended cut-off on the AQ, and as such it is likely that individuals that reported having a diagnosis of ASD were on the spectrum. Secondly, the sample had a large representation of females, which is not common in studies of ASD. This might be due to the online format of the study, where females are more likely than males to rely on the internet for interaction and self-help (Addis & Mahalik, 2003; Santor et al, 2007). As such, the study provided an opportunity to study females with an ASD. Thirdly, given this was a study looking into sexual orientation,
participants who volunteered may have had a pre-existing interest in sexuality, and thus results need to be interpreted with this in mind. However, this concern can be somewhat mitigated as the study was presented on a large number of reputable autism websites to raise awareness in an area that is novel and several respondents reported their readiness and satisfaction in being able to help. Moreover, such recruitment criteria make it likely that the current study sample was more diverse in composition than clinically-referred samples. A large number of control participants in the quantitative study (30.9%) and qualitative study (17.8%) reported a non-heterosexual orientation, which is much higher than figures quoted in existing sexual demographic data (Gates, 2011). This in fact would make the findings in this study even more remarkable and group differences on sexual orientations may have been notably underestimated. Fourthly, there may have been reporting bias on retrospective measures measuring socializing patterns, as participants would have to rely on childhood memories to answer and may have been susceptible to recall bias, especially when disclosing traumatic events. Desirability bias is generally a concern with studies of this nature, but as individuals with ASD are not given to counter factual reasoning (Grant, Riggs, & Boucher, 2004), this concern may not be warranted. Furthermore, TD participants were mainly recruited from sociology and psychology courses from local Australian Universities and students from such disciplines are often more liberal in their thinking, and this would impact their attitudes gender and sexuality. This could again underestimate group differences between individuals with and without an ASD. Lastly, given the exploratory nature of this study and the sensitivity of the topic, it was beyond the scope of this study to grasp the full degree of how sexuality and gender is perceived and understood, and questions were sometimes broad in nature.
According to the fT hypothesis, hypermasculinization would be expected of both males and females (Hines et al., 2004). Contrarily, males with an ASD reported feeling less manly. While females with an ASD reported feeling less womanly and expressing more relatedness to males, an explicit identification with the male gender identity and a rejection of belonging to their biological sex, was conspicuously absent. Additionally, while males and females with a GD reported cross-gender identification, they did not deny their maleness or femaleness. The study does not refute the fT hypothesis in relation to gender and sexuality. However, as autism is primarily a socio-communicative condition, and gender and sexuality have a strong social component, social impairments in ASD may surpass any biological effects of fT. Still, the association of fT to sexual orientation and gender-identity in ASD should be tested. Prospective observational studies on animal models of autism that are manipulated for testosterone levels offers one avenue to study associations between sexual development and prenatal and postnatal testosterone levels. However, due to the many developmental differences between species, it is difficult to extrapolate findings from animal models to human beings. The study of the relationship between fT on human gender and sexual development is difficult due to ethical reasons. Consequently, surrogate markers of fT levels such as second-to-fourth digit ratios, or the examination of clinical populations exposed to atypical fT levels (congenital adrenal hyperplasia), have been focused on. However, studies related to digit ratios are fraught with conflict and it is difficult to extrapolate findings from clinical populations to the wider population. Currently, the screening of human cord blood offers a practical method of correlating circulating fetal hormones to later-life gender and sexual
development. This can be undertaken separately for males and females with an ASD. This information could also be used to confirm the role of fT in sexual orientation based on different gender-identity typologies (‘butch-femme lesbians’ and ‘macho-sissy gays’).

Secondly, longitudinal investigations of children into adulthood would help better explore how environmental influences play a role in the developmental trajectories of sexual and gender identity formation, so as to provide cues for age-appropriate sex education programs and support. Thirdly, identifying the meaning of the words masculine and feminine as perceived by individuals with ASD, seems warranted. At this stage, it is unclear as to what an individual with ASD perceives as masculine or feminine, when rating themselves. The designing of such a questionnaire should be informative to provide more clarity around concepts such as ‘I feel as though I am’ and ‘I appear as though I am’ or ‘Other people see me as if I am’. Information gained from such surveys can then be used to help design education programs around gender-related themes to help alleviate any confusion or misconceptions related to one’s gender-identity. Fourthly, this is the first study that examined the association between ASD, sexual orientation and gender-dysphoria, but this is an area of growing concern. Further research is required to replicate the findings of the current study as well as gain more information on whether issues pertaining to gender and sexuality are of a permanent nature or have peak-points in the developmental span of the person with ASD and then regress, or are aspects of a special interest, or displaced social dissatisfaction. Such studies will help inform the design of programs to educate, support and tap into resources for individuals and families living with ASD. Fifthly, there were reports of sexual abuse in this study among females and one report of pedophilic tendencies. Education to target sexual naïveté among
females, and inform members of this group on sexual offences, sexually-risky behaviors and pregnancy is recommended. Finally, based on participant-feedback, a qualitative approach to the study of sexuality and gender-related matters might be better suited for this group. Several participants from the quantitative study reported not finding a response-option that suits them. Other times there were requests to the researcher to rephrase a question or include a particular theme, as some participants felt marginalized, when having to choose an option such as ‘other’ to questions asking about sexual or gender-identity, because none of the existing options suited them. Qualitative responses were wide-ranging, conflicting and ‘fluid’. Trying to categorize responses into groups was a challenging exercise, due to variations and conditions within each response, at times. Providing fixed options or norm-setting may limit individuals with an ASD from freely describing what some may consider atypical sexuality. A free-format questionnaire to learn about sexuality and gender in this group, might thus be more instructive.

7.7 Conclusions

Sexuality is an intrinsic component of human identity, and our sexual-identity and gender-identity can fundamentally mold our life experience, decide how we are treated, whom we socialize, love and live with, guide our educational choices and the jobs we secure, dictate what opportunities we are afforded, and what kind of inequalities we may face. The more we understand our sexual orientation and our gender-identity, the more we understand ourselves, and how we relate to other people. Gender-roles are socially-constructed. An unclear gender-identity could lead to an unclear sexual identity. ASD is a socio-communication condition. Given this, it is understandable that some individuals with ASD struggle with their gender and sexual identity. This thesis found that
individuals with ASD reported higher rates of non-heterosexual orientations, higher levels of gender-dysphoric traits, and more sexual and gender-diversity. Gender-dysphoric traits increased as autistic traits increased. Although some individuals across both studies had a clear sense of their gender and sexual identities, others reported 'gray and unclear' identities. Responses reflected confusion and struggles with coming to an understanding of their gender and sexual identities and identity-labels were not always borne out of clarity and confidence. Overall, there was a pervasive sense of dissatisfaction with the heteronormative system of sexuality and gender, and this discontentment was related back to problems arising from autism-inherent traits. Relative to their male peers, females with an ASD reported more sexual and gender diversity, experienced a higher level of gender-dysphoric traits and more severe social isolation. At this stage, there is sufficient evidence to consider gender-dysphoric expressions in ASD as one possible phenotype of ASD. Whether a diagnosis of GD is warranted in clients presenting with this particular phenotype is a matter of prudent clinical discernment in unravelling displaced feelings of social discontentment from a true gender-dysphoria. It is important that clinicians working with ASD are aware of the sexual and gender diversity in ASD, the mental health problems faced by this group due to their minority sexual and gender status, so that the necessary support required is provided to permit healthy socio-sexual functioning and mental well-being.
References


in strength of sex drive? Theoretical views, conceptual distinctions, and a review


Bauminger, N., Shulman, C., & Agam, G. (2003). Peer interaction and loneliness in high-
functioning children with autism. *Journal of autism and developmental
disorders, 33*(5), 489-507.

androgens and genital appearance: evidence from girls with congenital adrenal
hyperplasia. *The Journal of Clinical Endocrinology & Metabolism, 88*(3), 102-
1106.

case–control study of psychiatric patients. *BMC Psychiatry, 13*(1), 1.

Bejerot, S., Eriksson, J. M., Bonde, S., Carlström, K., Humble, M. B., & Eriksson, E.
(2012). The extreme male brain revisited: gender coherence in adults with autism


*Association for Research in Nervous and Mental Disease, 57, 265.*


child psychology and psychiatry, 34(8), 1327-1350.


Gates, G. J. (2011). How many people are lesbian, gay, bisexual and transgender?


Ingason, A., Sigmundsson, T., Steinberg, S., Sigurdsson, E., Haraldsson, M.,


McCauley, J. L., Li, C., Jiang, L., Olson, L. M., Crockett, G., Gainer, K., ... & Sutcliffe, J. S. (2005). Genome-wide and Ordered-Subset linkage analyses provide support for autism loci on 17q and 19p with evidence of phenotypic and interlocus genetic correlates. *BMC Medical Genetics,* 6(1), 1.


Spectrum Disorders in Adults with Gender Dysphoria. Archives of Sexual

Discordance between sexual behavior and self-reported sexual identity: a
population-based survey of New York City men. Annals of Internal
Medicine, 145(6), 416-425.


developmental disorders. Neurobiology of mental illness, 761-78.

global processing along the dorsal visual pathway in autism: A possible
mechanism for weak visuospatial coherence? Neuropsychologia, 43(7), 1044-
1053.

capabilities/deficits in children with an autism spectrum disorder:" Weak"
centralcoherence and its relationship to theory of mind and executive
control. Development and psychopathology, 18(1), 77.


Appendices
Appendix A: Plain Language Statement to Participants for Study I

Full Project Title: Sexual Orientation and High-Functioning Individuals with Autism Spectrum Disorder

Principal Researchers: Dr. Mark Stokes

Student Researcher: Dr. Rita George

Purpose and Background
Individuals aged 18 years and older are invited to participate in this research project. The aim of the project is to examine how people experience their sexuality. We are interested in responses from people with High-Functioning Autism Spectrum Disorder (ASD) and those without this; typically developing individuals. The project is being conducted by researchers at Deakin University and will form part of a Doctor of Psychology research thesis.

Procedures
If you agree to participate, you will be asked to provide information in the form of a survey. The survey will take about 40 minutes or less to complete. Survey items include information about your sexual preferences, sexual attraction and sexual behaviour. Examples of questions that will be asked include “During the past year, on average, how often did you have sexual contact with a man?”, “During the past year, how many different women were you attracted to?” and “I consider myself: a. Not at all Homosexual, b. Very Homosexual, c. Not at all Heterosexual, d. Very Heterosexual”.

Possible Benefits
There are no direct benefits from your participation in this project. However, this research may help our understanding about how people experience their sexuality and come to understand their sexual orientation. We believe that improving the understanding of sexuality will enhance sex-education programs designed to help those with ASD, and improve the understanding offered by parents, family, carers and supporters of persons with ASD.

Possible Risks
Given that the questionnaires will include questions regarding issues such as your sexual experience, there is a possibility that you may experience some concern or discomfort about your responses. If you find yourself feeling this at any point, you are encouraged to contact your GP and/or other health care professional.

Additionally, you may call one of the following services for further information, to discuss your concerns, or to obtain a referral for treatment if necessary:
- Lifeline: 13 11 14
- Gay and Lesbian Welfare Association: Free call 1800 184 527 or online counselling is available via the website www.glwa.org.au
- Life Supports: Free call 1300 735 030 or online counselling available via the website www.lifesupportscounselling.com.au
- Relationships Australia: Free call 1300 364 277 or online counselling is available via the website www.relationshipsaustralia.org.au

You will have the opportunity to discuss your concerns in a confidential manner and appropriate follow-up will be suggested if necessary.

Participation is Voluntary
Participation in any research project is voluntary. If you do not wish to take part you are not obliged to. Due to the completely anonymous nature of this study, no identifying information will be placed on your completed survey. As such, it will not be possible to withdraw your survey from the project once it has been submitted. Your decision whether to take part or not to take part, or to take part and then withdraw, will not affect your relationship with Deakin University in any way.

Once you have read this information and agreed to participate, please select the “Begin Survey” button below. If you decide to take part and later change your mind, you may withdraw from the study at any time before the survey has been submitted by closing your browser window.

Privacy, Confidentiality and Disclosure of Information
No identifying information such as your name or address will be collected. Storage of data will comply with University regulations and kept in secure electronic storage for six years following publication, after which the data will be disposed of in a confidential manner. Electronic information will be stored in password-protected files on a computer, which will only be accessible by the Principal and student researcher. You can be assured that you will not be identified by name in any way in the reporting of our results in the research thesis, publications and conference presentations.

Results of Project
A summary of the findings will be provided to the School of Psychology, Deakin University and will be available for any interested participants to read at the completion of the study. Please contact mark.stokes@deakin.edu.au if you would like to receive a copy of this report.

Complaints
If you have any complaints about any aspect of the research, the way it is being conducted or any questions about your rights as a participant then you may contact:
Email: research-ethics@deakin.edu.au
Phone: + 61 03 9251 7123
Postal Address: Human Research Ethics Office, Deakin Research Integrity, Deakin University, 221 Burwood Hwy, Burwood VIC 3125

Please quote project number 2014-008

Further Information, Queries or Any Problems
For further information concerning this project, you can contact the principal researcher Associate Professor Mark Stokes in the School of Psychology, Deakin University, 221 Burwood Highway, Burwood, Victoria, 3125, on telephone: +61-3-9244-6865 or email: mark.stokes@deakin.edu.au.
Appendix B: Personal Wellbeing Index - Adult

Please select a number which corresponds to how satisfied you feel with your life.

Thinking about your own life and personal circumstances, how satisfied are you with the following:

<table>
<thead>
<tr>
<th>Question</th>
<th>Not Satisfied At All (0)</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
<th>(9)</th>
<th>Completely Satisfied (10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Your life as a whole?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Your standard of living?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Your health?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. What you are currently achieving in life?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Your personal relationships?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. How safe you feel?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Feeling part of your community?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Your future security?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Appendix C: Autism Spectrum Quotient (AQ)

Please indicate how much you agree or disagree for the following statements:

<table>
<thead>
<tr>
<th></th>
<th>Definitely Agree</th>
<th>Slightly Agree</th>
<th>Slightly Disagree</th>
<th>Definitely Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I prefer to do things on my own rather than with others.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. I prefer to do things the same way over and over again.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. If I try to imagine something, I find it very easy to create a picture in my mind.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. I frequently get so strongly absorbed in one thing that I lose sight of other things.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. I often notice small sounds when others do not.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. I usually notice car number plates or similar strings of information.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Other people frequently tell me that what I’ve said is impolite, even though I think it is polite.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. When I’m reading a story, I can easily imagine what the characters might look like.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. I am fascinated by dates.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. In a social group, I can easily keep track of several different people’s conversations.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. I find social situations easy.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. I tend to notice details that others do not.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. I would rather go to a library than a party.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. I find myself drawn more strongly to people than to things.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. I tend to have very strong interests, which I get upset about if I can’t pursue.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. I enjoy social chit-chat.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. When I talk, it isn’t always easy for others to get a word in edgeways.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td>I am fascinated by numbers.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>When I’m reading a story, I find it difficult to work out the characters’ intentions.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21.</td>
<td>I don’t particularly enjoy reading fiction.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22.</td>
<td>I find it hard to make new friends.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23.</td>
<td>I notice patterns in things all the time.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24.</td>
<td>I would rather go to the theatre than a museum.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25.</td>
<td>It does not upset me if my daily routine is disturbed.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26.</td>
<td>I frequently find that I don’t know how to keep a conversation going.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27.</td>
<td>I find it easy to 'read between the lines' when someone is talking to me.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28.</td>
<td>I usually concentrate more on the whole picture, rather than the small details.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29.</td>
<td>I am not very good at remembering phone numbers.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30.</td>
<td>I don’t usually notice small changes in a situation, or a person’s appearance.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31.</td>
<td>I know how to tell if someone listening to me is getting bored.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32.</td>
<td>I find it easy to do more than one thing at a time.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33.</td>
<td>When I talk on the phone, I’m not sure when it’s my turn to speak.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34.</td>
<td>I enjoy doing things spontaneously.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35.</td>
<td>I am often the last to understand the point of a joke.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36.</td>
<td>I find it easy to work out what someone is thinking or feeling just by looking at their face.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37.</td>
<td>If there is an interruption, I can switch back to what I was doing very quickly.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38.</td>
<td>I am good at social chit-chat.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39.</td>
<td>People often tell me that I keep going on and on about the same thing.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>40.</td>
<td>When I was young, I used to enjoy playing games involving pretending with other children.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41.</td>
<td>I like to collect information about categories of things (e.g. types of cars, birds, trains, plants, etc.).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42.</td>
<td>I find it difficult to imagine what it would be like to be someone else.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43.</td>
<td>I like to plan any activities I participate in carefully.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44.</td>
<td>I enjoy social occasions.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45.</td>
<td>I find it difficult to work out people’s intentions.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46.</td>
<td>New situations make me anxious.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47.</td>
<td>I enjoy meeting new people.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48.</td>
<td>I am a good diplomat.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49.</td>
<td>I am not very good at remembering people’s date of birth.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50.</td>
<td>I find it very easy to play games with children that involve pretending.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix D: Sell Scale of Sexual Orientation

Sexual Attractions - The following eight questions are asked to assess how frequently and intensely you are sexually attracted to men and women. Consider times you had sexual fantasies, daydreams or dreams about a man or woman, or have been sexually aroused by a man or woman.

1. During the past year, how many different men were you sexually attracted to:
(choose one answer)
None
1
2
3-5
6-10
11-49
50-99
100 or more

2. During the past year, on average, how often were you sexually attracted to a man:
(choose one answer)
Never
Less than 1 time per month
1-3 times per month
1 time per week
2-3 times per week
4-6 times per week
Daily

3. During the past year, the most I was sexually attracted to a man was: Please rate your response by clicking on a position along the line that best reflects your answer.

Not at all sexually attracted ___________________________ Extremely sexually attracted

4. During the past year, how many different women were you sexually attracted to:
(choose one answer)
None
1
2
3-5
6-10
11-49
50-99
100 or more
5. During the past year, on average, how often were you sexually attracted to a woman: (choose one answer)
   Never
   Less than 1 time per month
   1-3 times per month
   1 time per week
   2-3 times per week
   4-6 times per week
   Daily

6. During the past year, the most I was sexually attracted to a woman was: Please rate your response by clicking on a position along the line that best reflects your answer.

   Not at all sexually attracted ........................................... Extremely sexually attracted

7. During the past year I was sexually attracted to a man:
   Yes
   No
   I have had no sexual attraction toward anyone in the past year

8. During the past year I was sexually attracted to a woman:
   Yes
   No
   I have had no sexual attraction toward anyone in the past year

II. Sexual Contact - The following four questions are asked to assess your sexual contacts. Consider times you had contact between your body and another man or woman’s body for the purpose of sexual arousal or gratification.

9. During the past year, how many different men did you have sexual contact with: (choose one answer)
   None
   1
   2
   3-5
   6-10
   11-49
   50-99
   100 or more
10. During the **past year**, on average, how often did you have sexual contact with a **man**? (choose one answer):
   - Never
   - Less than 1 time per month
   - 1-3 times per month
   - 1 time per week
   - 2-3 times per week
   - 4-6 times per week
   - Daily

11. During the **past year**, how many different **women** did you have sexual contact with? (choose one answer)
   - None
   - 1
   - 2
   - 3-5
   - 6-10
   - 11-49
   - 50-99
   - 100 or more

12. During the **past year**, on average, how often did you have sexual contact with a **woman**? (choose one answer):
   - Never
   - Less than 1 time per month
   - 1-3 times per month
   - 1 time per week
   - 2-3 times per week
   - 4-6 times per week
   - Daily

**III. Sexual Orientation Identity** - The following two questions are asked to assess your sexual orientation identity.

13. **I consider myself**: Please rate your response by clicking on a position along the line that best reflects your answer.

   Not at all homosexual ____________________________ Extremely homosexual

14. **I consider myself**: Please rate your response by clicking on a position along the line that best reflects your answer.

   Not at all heterosexual ____________________________ Extremely heterosexual
15. I consider my sexual orientation identity as:
Lesbian
Gay
Bisexual
Transgender
Questioning
Asexual
Pansexual
Intersexual
Heterosexual
Other - please specify:

16. When choosing a romantic partner, is the gender of your partner important to your decision-making?
Yes, the gender of my partner matters
No, the gender of my partner does not matter
The options do not apply to me. Please input your thoughts here:
Appendix E: Gender-Identity/Gender-Dysphoria Questionnaire for Adolescents and Adults (for a female participant)

Please indicate how often the following has occurred over the past 12 months:

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. In the past 12 months, have you felt satisfied being a woman?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. In the past 12 months, have you felt uncertain about your gender, that is, feeling somewhere in between a woman and a man?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. In the past 12 months, have you felt pressured by others to be a woman, although you don’t really feel like one?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. In the past 12 months, have you felt, unlike most women, that you have to work at being a woman?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. In the past 12 months, have you felt that you were not a real woman?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. In the past 12 months, have you felt, given who you really are (e.g., what you like to do, how you act with other people), that it would be better for you to live as a man rather than as a woman?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. In the past 12 months, have you had dreams? If NO, skip to Question 8.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7a. If YES, have you been in your dreams? If NO, skip to Question 8.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7b. If YES, In the past 12 months, have you had dreams in which you were a man?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. In the past 12 months, have you felt unhappy about being a woman?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. In the past 12 months, have you felt uncertain about yourself, at times feeling more like a man and at times feeling more like a woman?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. In the past 12 months, have you felt more like a man than like a woman?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. In the past 12 months, have you felt that you did not have anything in common with either men or women?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question</td>
<td>Answer</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
<td>--------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. In the past 12 months, have you been bothered by seeing yourself identified as female or having to check the box “F” for female on official forms (e.g., employment applications, driver’s license, passport)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. In the past 12 months, have you felt comfortable when using women’s restrooms in public places?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. In the past 12 months, have strangers treated you as a man?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. In the past 12 months, at home, have people you know, such as friends or relatives, treated you as a man?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. In the past 12 months, have you had the wish or desire to be a man?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. In the past 12 months, at home, have you dressed and acted as a man?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. In the past 12 months, at parties or at other social gatherings, have you presented yourself as a man?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. In the past 12 months, at work or at school, have you presented yourself as a man?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. In the past 12 months, have you disliked your body because it is female (e.g., having breasts or having a vagina)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. In the past 12 months, have you wished to have hormone treatment to change your body into a man’s?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. In the past 12 months, have you wished to have an operation to change your body into a man’s (e.g., to have your breasts removed or to have a penis made)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. In the past 12 months, have you made an effort to change your legal sex (e.g., on a driver’s license or credit card)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. In the past 12 months, have you thought of yourself as a “hermaphrodite” or an “intersex” rather than as a man or woman?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25. In the past 12 months, have you thought of yourself as a “transgendered person”?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26. In the past 12 months, have you thought of yourself as a man?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27. In the past 12 months, have you thought of yourself as a woman?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix F: Gender-Identity/Gender-Dysphoria Questionnaire for Adolescents and Adults (for a male participant)

Please indicate how often the following has occurred over the past 12 months:

<table>
<thead>
<tr>
<th>Question</th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. In the past 12 months, have you felt satisfied being a man?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. In the past 12 months, have you felt uncertain about your gender, that is, feeling somewhere in between a man and a woman?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. In the past 12 months, have you felt pressured by others to be a man, although you don’t really feel like one?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. In the past 12 months, have you felt, unlike most men, that you have to work at being a man?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. In the past 12 months, have you felt that you were not a real man?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. In the past 12 months, have you felt, given who you really are (e.g., what you like to do, how you act with other people), that it would be better for you to live as a woman rather than as a man?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. In the past 12 months, have you had dreams? If NO, skip to Question 8.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7a. If YES, have you been in your dreams? If NO, skip to Question 8.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7b. If YES, have you had dreams in which you were a woman?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. In the past 12 months, have you felt unhappy about being a man?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. In the past 12 months, have you felt uncertain about yourself, at times feeling more like a woman and at times feeling more like a man?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. In the past 12 months, have you felt more like a woman than like a man?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. In the past 12 months, have you felt that you did not have anything in common with either women or men?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. In the past 12 months, have you been bothered by seeing yourself identified as male or having to check the box “M” for male on official forms (e.g., employment applications, driver’s license, passport)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. In the past 12 months, have you felt comfortable when using men’s restrooms in public places?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. In the past 12 months, have strangers treated you as a woman?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. In the past 12 months, at home, have people you know, such as friends or relatives, treated you as a woman?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. In the past 12 months, have you had the wish or desire to be a woman?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. In the past 12 months, at home, have you dressed and acted as a woman?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. In the past 12 months, at parties or at other social gatherings, have you presented yourself as a woman?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. In the past 12 months, at work or at school, have you presented yourself as a woman?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. In the past 12 months, have you disliked your body because it is male (e.g., having a penis or having hair on your chest, arms, and legs)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. In the past 12 months, have you wished to have hormone treatment to change your body into a woman’s?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. In the past 12 months, have you wished to have an operation to change your body into a woman’s (e.g., to have your penis removed or to have a vagina made)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. In the past 12 months, have you made an effort to change your legal sex (e.g., on a driver’s license or credit card)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. In the past 12 months, have you thought of yourself as a “hermaphrodite” or an “intersex” rather than as a man or woman?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>25. In the past 12 months, have you thought of yourself as a “transgendered person”?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26. In the past 12 months, have you thought of yourself as a woman?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27. In the past 12 months, have you thought of yourself as a man?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix G: Loneliness and Social Dissatisfaction Questionnaire (for female participant)

Please rate your response to the following questions by clicking on a position along the line that best reflects your answer.

1. When in school, it was easy for me to make new female friends

   Not true at all ____________________________ Always true

2. When in school, I didn’t have female friends I could confide in

   Not true at all ____________________________ Always true

3. I used to be good at working with other girls in school

   Not true at all ____________________________ Always true

4. It was hard for me to make friends with other girls at school

   Not true at all ____________________________ Always true

5. I had a lot of female friends at school

   Not true at all ____________________________ Always true

6. I felt alone when I was around girls at school

   Not true at all ____________________________ Always true

7. I could find a female friend to talk to when I needed one

   Not true at all ____________________________ Always true
8. It was hard to get other girls to like me at school
Not true at all  
Always true

9. The other girls didn’t include me in their games and play time in school
Not true at all  
Always true

10. I got along with other girls at school
Not true at all  
Always true

11. I felt left out of things that other girls did together at school
Not true at all  
Always true

12. There was no female friend from school I could go to when I needed help
Not true at all  
Always true

13. I didn’t get along with other girls at school
Not true at all  
Always true

14. I felt lonely around other girls at school
Not true at all  
Always true

15. I was well-liked by other girls in my class
Not true at all  
Always true

16. I didn’t have any female friends in school
Appendix H: Loneliness and Social Dissatisfaction Questionnaire (for male participant)

Please rate your response by clicking on a position along the line that best reflects your answer.

1. When in school, it was easy for me to make new male friends

Not true at all  Always true

2. When in school, I didn’t have male friends I could confide in

Not true at all  Always true

3. I used to be good at working with other boys in school

Not true at all  Always true

4. It was hard for me to make friends with other boys at school

Not true at all  Always true

5. I had a lot of male friends at school

Not true at all  Always true

6. I felt alone when I was around boys at school

Not true at all  Always true

7. I could find a male friend to talk to when I needed one

Not true at all  Always true

8. It was hard to get other boys to like me at school
9. The other boys didn’t include me in their games and play time in school
Not true at all
Always true

10. I got along with other boys at school
Not true at all
Always true

11. I felt left out of things that other boys did together at school
Not true at all
Always true

12. There was no male friend from school I could go to when I needed help
Not true at all
Always true

13. I didn’t get along with other boys at school
Not true at all
Always true

14. I felt lonely around other boys at school
Not true at all
Always true

15. I was well-liked by other boys in my class
Not true at all
Always true

16. I didn’t have any male friends in school
Not true at all
Always true
Appendix I: Friendship Quality Questionnaire- Same-Sex Friendship

With this questionnaire, we are going to ask you to select the response option which describes your experience.

These questions are about you and a friend/acquaintance that is of the same biological sex as you. Let's look at the example.

Example: "_________ and I are the same height."
Based on how much you agree that this statement is true, select either "definitely agree", "slightly agree", "slightly disagree", or "definitely disagree".

Enter your same biological sex friend/acquaintance's name here:

<table>
<thead>
<tr>
<th></th>
<th>Definitely Agree</th>
<th>Slightly Agree</th>
<th>Slightly Disagree</th>
<th>Definitely Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. When we were kids, _________ and I lived really close to each other.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. When at school, _________ and I always sit together at lunch.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. As kids, _________ and I used to get mad at each other a lot.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. _________ used to tell me I was good at things.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. If the other kids were talking behind my back, _________ would always stick up</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. _________ and I made each other feel important and special.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. _________ and I always picked each other as partners in school activities.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. If _________ hurt my feelings, _________ used to say &quot;I'm sorry.&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. I can think of some times when _________ has said mean things about me to other kids.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. I could always count on _________ for good ideas about games to play.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. If _________ and I got mad at each other, we would always talk about how to get over it.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. _________ would still like me even if all the other kids didn't like me.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>_______ always told me I was pretty smart.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>_______ and I always told each other about our problems.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>_______ made me feel good about my ideas.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>When I was mad about something that happened to me, I could always talk to _______ about it.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>_______ and I would help each other with chores or other things a lot.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>_______ and I did special favors for each other.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td>_______ and I did fun things together a lot.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>_______ and I argued a lot.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21.</td>
<td>I could always count on _______ to keep promises.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22.</td>
<td>_______ and I would go to each other's homes after school and on weekends.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23.</td>
<td>_______ and I always played together at recess in school.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24.</td>
<td>When I was having trouble figuring out something, I usually asked _______ for help and advice.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25.</td>
<td>_______ and I talked about the things that made us sad.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26.</td>
<td>_______ and I always made up easily when we had a fight.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27.</td>
<td>_______ and I fought.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28.</td>
<td>_______ and I always shared things like stickers, toys, and games with each other.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29.</td>
<td>If _______ and I were mad at each other, we would always talk about what would help to make us feel better.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30.</td>
<td>If I told _______ a secret, I could trust _______ not to tell anyone else.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31.</td>
<td>_______ and I bugged each other.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
32. _________ and I always came up with good ideas on ways to do things.
33. _________ and I loaned each other things all the time.
34. _________ often helped me with things so I could get them done quicker.
35. _________ and I always got over our arguments really quickly.
36. _________ and I always counted on each other for ideas on how to get things done.
37. _________ didn’t listen to me.
38. _________ and I told each other private thoughts a lot.
39. _________ and I helped each other with schoolwork a lot.
40. I can think of lots of secrets _________ and I have told each other.
41. _________ cared about my feelings.
Appendix J: Friendship Quality Questionnaire—Opposite-Sex Friendship

**Enter your opposite sex friend/acquaintance's name here:**

<table>
<thead>
<tr>
<th></th>
<th>Definitely Agree</th>
<th>Slightly Agree</th>
<th>Slightly Disagree</th>
<th>Definitely Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. When we were kids, _________ and I lived really close to each other.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. When at school, _________ and I always sit together at lunch.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. As kids, _________ and I used to get mad at each other a lot.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. _________ used to tell me I was good at things.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. If the other kids were talking behind my back, _________ would always stick up</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. _________ and I made each other feel important and special.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. _________ and I always picked each other as partners in school activities.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. If _________ hurt my feelings, _________ used to say &quot;I'm sorry.&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. I can think of some times when _________ has said mean things about me to other kids.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. I could always count on _________ for good ideas about games to play.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. If _________ and I got mad at each other, we would always talk about how to get over it.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. _________ would still like me even if all the other kids didn't like me.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. _________ always told me I was pretty smart.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. _________ and I always told each other about our problems.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. _________ made me feel good about my ideas.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
16. When I was mad about something that happened to me, I could always talk to _______ about it.

17. _______ and I would help each other with chores or other things a lot.

18. _______ and I did special favors for each other.

19. _______ and I did fun things together a lot.

20. _______ and I argued a lot.

21. I could always count on _______ to keep promises.

22. _______ and I would go to each other's homes after school and on weekends.

23. _______ and I always played together at recess in school.

24. When I was having trouble figuring out something, I usually asked _______ for help and advice.

25. _______ and I talked about the things that made us sad.

26. _______ and I always made up easily when we had a fight.

27. _______ and I fought.

28. _______ and I always shared things like stickers, toys, and games with each other.

29. If _______ and I were mad at each other, we would always talk about what would help to make us feel better.

30. If I told _______ a secret, I could trust _______ not to tell anyone else.

31. _______ and I bugged each other.

32. _______ and I always came up with good ideas on ways to do things.

33. _______ and I loaned each other things all the time.

34. _______ often helped me with things so I could get them done quicker.
35. _________ and I always got over our arguments really quickly.

36. _________ and I always counted on each other for ideas on how to get things done.

37. _________ didn’t listen to me.

38. _________ and I told each other private thoughts a lot.

39. _________ and I helped each other with schoolwork a lot.

40. I can think of lots of secrets _________ and I have told each other.

41. _________ cared about my feelings.
**Appendix K: Depression Anxiety Stress Scale- 21**

Please read each statement and select a response option which indicates how much the statement applied to you over the past week. There are no right or wrong answers. Do not spend too much time on any statement.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Did not apply to me at all</th>
<th>Applied to me to some degree, or some of the time</th>
<th>Applied to me to a considerable degree, or a good part of time</th>
<th>Applied to me very much, or most of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I found it hard to wind down</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. I was aware of dryness of my mouth</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. I couldn't seem to experience any positive feeling at all</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. I experienced breathing difficulty (e.g., excessively rapid breathing, breathlessness in the absence of physical exertion)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. I found it difficult to work up the initiative to do things</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. I tended to over-react to situations</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. I experienced trembling (e.g., in the hands)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. I felt that I was using a lot of nervous energy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. I was worried about situations in which I might panic and make a fool of myself</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. I felt that I had nothing to look forward to</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. I found myself getting agitated</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. I found it difficult to relax</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. I felt down-hearted and blue</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. I was intolerant of anything that kept me from getting on with what I was doing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. I felt I was close to panic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
16. I was unable to become enthusiastic about anything

17. I felt I wasn't worth much as a person

18. I felt that I was rather touchy

19. I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat)

20. I felt scared without any good reason

21. I felt that life was meaningless
Appendix L: Plain Language Statement for Study II

Full Project Title: Sexual Orientation and High-Functioning Individuals with Autism Spectrum Disorder

Principal Researchers: Dr. Mark Stokes

Student Researcher: Dr. Rita George

Individuals aged 18 years and older are invited to participate in this research project. The aim of the project is to examine how people experience their sexuality. We are interested in responses from people with High-Functioning Autism Spectrum Disorder (ASD). The project is being conducted by researchers at Deakin University and will form part of a Doctor of Psychology research thesis.

Procedures
If you agree to participate, you will be asked to provide information in the form of a survey. The survey will take about 30 minutes to complete. Survey items include information about your sexual preferences, sexual attraction and sexual behaviour. A text-box is provided after each question for your answer. Examples of questions that will be asked include “What do you think about the concept of gender?”, “Did you find understanding your gender-identity a straightforward process, “Are you happy with your gender-identity?” “Do you at times feel different from others of your own sex, when it comes to how you think, feel, react to and behave in different situations and contexts?”, and “Are you in an intimate relationship (sexual, romantic, or otherwise) at the moment or were you in one at an earlier time? If yes, what is or what was the gender of your partner?”.

Possible Benefits
There are no direct benefits from your participation in this project. However, this research may help our understanding about how people experience their sexuality and come to understand their sexual orientation. We believe that improving the understanding of sexuality will enhance sex-education programs designed to help those with ASD, and improve the understanding offered by parents, family, carers and supporters of persons with ASD.
**Possible Risks**
Given that the questionnaires will include questions regarding issues such as your sexual experience, and your satisfaction with your gender-identity, there is a possibility that you may experience some concern or discomfort about your responses. If you find yourself feeling this at any point, you are encouraged to contact your GP and/or another health care professional.

Additionally, you may call one of the following services for further information, to discuss your concerns, or to obtain a referral for treatment if necessary:

- **Lifeline:** 13 11 14
- **Gay and Lesbian Welfare Association:** Free call 1800 184 527 or online counselling is available via the website [www.glwa.org.au](http://www.glwa.org.au)
- **Life Supports:** Free call 1300 735 030 or online counselling available via the website [www.lifesupportscounselling.com.au](http://www.lifesupportscounselling.com.au)
- **Relationships Australia:** Free call 1300 364 277 or online counselling is available via the website [www.relationshipsaustralia.org.au](http://www.relationshipsaustralia.org.au)

You will have the opportunity to discuss your concerns in a confidential manner and appropriate follow-up will be suggested if necessary.

**Participation is Voluntary**
Participation in any research project is voluntary. **If you do not wish to take part, you are not obliged to.** Due to the completely anonymous nature of this study, no identifying information will be placed on your completed survey. As such, it will not be possible to withdraw your survey from the project once it has been submitted. Your decision whether to take part or not to take part, or to take part and then withdraw, will not affect your relationship with Deakin University in any way.

Once you have read this information and agreed to participate, please select the “Begin Survey” button below. If you decide to take part and later change your mind, you may withdraw from the study at any time before the survey has been submitted by closing your browser window.

**Privacy, Confidentiality and Disclosure of Information**
No identifying information such as your name or address will be collected. Storage of data will comply with University regulations and kept in secure electronic storage for six years following publication, after which the data will be disposed of in a confidential manner. Electronic information will be stored in password-protected files on a computer, which will only be accessible by the Principal and student researcher. You can be assured that you will not be identified by name in any way in the reporting of our results in the research thesis, publications and conference presentations.
**Results of Project**

A summary of the findings will be provided to the School of Psychology, Deakin University and will be available for any interested participants to read at the completion of the study. Such a request may identify interested parties, potentially violating their anonymity to the researchers. We will maintain their confidentiality.

Please contact mark.stokes@deakin.edu.au if you would like to receive a copy of this report.

**Complaints**

If you have any complaints about any aspect of the research, the way it is being conducted or any questions about your rights as a participant then you may contact:

**Email:** research-ethics@deakin.edu.au

**Phone:** +61 03 9251 7123

**Postal Address:** Human Research Ethics Office, Deakin Research Integrity, Deakin University, 221 Burwood Hwy, Burwood VIC 3125

Please quote project number 2014-190

---

**Further Information, Queries or Any Problems**

For further information concerning this project, you can contact the principal researcher Associate Professor Mark Stokes in the School of Psychology, Deakin University, 221 Burwood Highway, Burwood, Victoria, 3125, on telephone: +61-3-9244-6865 or email: mark.stokes@deakin.edu.au.

The student researcher responsible for this project is:

**Dr. Rita George**

School of Psychology
Deakin University
221 Burwood Highway
Burwood, 3125.
Email: rita.george@deakin.edu.au
Appendix M: Qualitative Survey Questions

The questions in this interview are of a highly personal nature. These questions ask that you thoughtfully answer them. Some of the questions may be confronting and uncomfortable. We hope you will not find them too uncomfortable. If you do, feel free to cease. You may withdraw from the study at any time before the survey has been submitted by closing your browser window.

Please proceed with the questions knowing that your answers will contribute to an understanding of how persons with Autistic Spectrum Condition experience their sexuality. It is hoped that the information gained through this interview will inform the design of specialized sex-education programs and raise awareness and support among family, friends and supporters of people with Autistic Spectrum Condition.

1. During your pre-adolescent and adolescent years, could you please share how you found socialising with your peers:
   (examples of socialising would be something like chatting on the phone, emailing, shopping trips, playing board games, playing during school-recess, working on school projects, or other activities you may have shared with your peers) of the

   a. Same sex:
   b. Opposite sex:

2. Were you bullied or teased as a younger child?
   Yes
   No
a. If 'no', please move to the next question or leave a related comment if you wish to:

b. If 'yes', did you find that you were bullied more often by boys or by girls? Please share your thoughts:

c. Were you at a mainly girls or a mainly boys school?

3. What were some of the leisure activities you enjoyed as a younger person? Please be specific such as for example, naming a TV show or a sporting activity if this is applicable:

4. What are some of the leisure activities you currently engage for relaxation or enjoyment?

5. What do you think about the concept of gender?

6. Would you consider your gender as playing an important role in your identity as a person? Please share your thoughts as to why you do/don't believe your gender defines your identity:

7. Did you find understanding your gender-identity a straightforward process?

8. Were or are there any struggles you care to share in relation to how you came to understand your gender-identity?

9. Are your birth-sex and your gender-identity the same? Your gender identity is how you think of your gender, not necessarily what you born as.
10. Do you at times feel different from others of your own sex? For instance, you may feel different when it comes to how you think, feel, or behave? If yes, please explain how so? If no, please go to the next question.

11. Do you at times feel more similar to members of the opposite-sex when it comes to how you think, feel, and behave in different situations and contexts? If yes, please explain how so? If no, please go to the next question.

12. Are you in an intimate relationship (sexual, romantic, or otherwise) at the moment or were you in one at an earlier time? If yes, what is or what was the gender of your partner?

13. When considering an intimate relationship (sexual, romantic, or otherwise) with someone, is the gender of your partner important to you?

14. Is companionship important when choosing a partner? Please share your thoughts.

15. When choosing an intimate partner (sexual, romantic, or otherwise), would you consider companionship more important than the gender of the person? Please share your thoughts.

16. Which is most important to you: friendship and companionship or sexual intimacy?

17. Do you generally prefer your own company and doing things by yourself or do you prefer doing things with other people, such as going out? Please elaborate.

18. Do you dress, talk, or behave a certain way because it is socially expected of you? If so, how do you ‘act’? If No, please go to the next question.
19. Do you sometimes ‘act’ a certain way to gain acceptance and avoid rejection? If so, how do you ‘act’? If No, please go to the next question.

20. What is your sexual orientation?

21. Are you content with your sexual orientation? Feel free to elaborate

22. How would you describe your gender-identity?

23. Are you happy with your gender-identity? Feel free to elaborate

24. Does your birth sex agree with your self-conception (i.e. how you think about yourself)?

25. Do you feel like you do not fit in or ‘belong’ to your birth-sex group?

26. Are you happy with your sexual orientation? If yes, move on to the next question, if No, please let us know why this is so.

27. If you are aroused sexually, would you describe the type of things that arouse you sexually?

28. Do you approve of sexual orientations other than heterosexuality? Kindly elaborate on your answer as you see fit.

29. Would you care to leave any other comments related to your sexual orientation and gender-identity? General comments related to the survey are also welcome.