

# MASCULINITY, FEMININITY AND AUTISTIC TRAITS

Masters in Research (Psychology)

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## Abstract

Sex difference, i.e. biological sex has been studied quite extensively in Autism Spectrum Conditions (ASC). However, “gender” is multidimensional and not limited to the biological component of sex (Joel & McCarthy, 2016). Since gender tends to be viewed as non-binary more often by autistic than non-autistic people (Cooper et al., 2018), it is important to study other features of “gender” too. The current thesis focused on “gender role”, how much people align themselves with traditional masculinity and femininity traits. Categorized by stereotypes about gender, gender role is heavily influenced by the traditional social norms, which is in turn influenced by cultural values. This thesis aimed to discover the relationship between gender role and autistic traits, in addition to biological sex in neurotypical Malaysians.

Chapter 2 (Study 1) evaluated Baron-Cohen’s extreme male brain theory of autism. This theory is based on the finding that neurotypical Western males tend to be more systemizing and less empathizing than females, and that autistic people show the same profile, or even show an extreme form of this typical male profile (e.g. Baron-Cohen, 2009; Greenberg et al., 2018). However, culture might influence the relationship between systemizing-empathizing abilities and biological sex. In Asians, males appeared more systemizing than females, but empathy seemed equally presented by males and females (e.g. Zheng & Zheng, 2015). Moreover, the extreme male brain profile in systemizing-empathizing might not extend to gender role. There are indications that gender defiance (e.g. Cooper et al., 2018) or an androgynous gender role (e.g. Kallitsounaki & Williams, 2020) is more common in ASC.

Study 1 found that neurotypical Malaysian females demonstrated better empathizing than males, and empathizing correlated negatively with autistic traits. Demasculinization was observed in both sexes. Femininity was found to positively predict autistic traits in males but was independent of autistic traits in females. Moreover, the predicting relationship of masculinity and femininity on autistic traits was observed in self-reported masculinity and femininity traits<sup>1</sup>, but not in self-rated masculinity and femininity<sup>2</sup>. Hence, the extreme male brain theory was only partially supported, and not generalizable to gender role in Malaysia.

Chapter 3 (Study 2) focused on the possible influence of gender role, personality traits, and culture on camouflaging and autistic traits. Previous studies showed that autistic females camouflaged autistic traits more than males (e.g. Schuck et al., 2019). Moreover, autistic people camouflaged more when experiencing societal pressure and expectations to “pretend to be normal” (e.g. Hull et al., 2017). This indicates that apart from biological sex, certain personality traits or stronger attachment to a culture’s value might influence camouflaging. Possible factors influencing camouflaging in both males and females could be gender role (femininity in particular) (e.g. Bargiela et al., 2016), personality traits (Big 5 personality) (e.g. Robinson et al., 2020), and culture (specifically, collectivism) (e.g. Schuck et al., 2019), as these factors might influence the desire to “fit

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<sup>1</sup> Self-reported masculinity and femininity traits measured traits generally associated with masculinity and femininity.

<sup>2</sup> Self-rated masculinity and femininity measured how masculine and feminine one rate oneself.

in”. These factors might influence autistic traits as well (e.g. Cooper et al., 2018; Robinson et al., 2020).

In Study 2, high self-reported masculinity<sup>3</sup>, femininity traits<sup>4</sup> and autistic traits, and low conscientiousness predicted more camouflaging in neurotypical Malaysians. Low extraversion indicated autistic traits in both sexes. Neuroticism and individualism positively predicted autistic traits in males only. In females, no significant effects other than extraversion were observed. In short, camouflaging and autistic traits were associated with certain personality or cultural traits. Moreover, the extreme male brain theory again did not generalize to gender role in neurotypical Malaysians.

The current thesis showed that masculinized brain activities might be observed for systemizing and empathizing among neurotypical individuals with relatively high autistic traits. However, this “male brain” condition is not extendable to gender role. Masculinity and femininity are likely to be independent of autistic traits in Malaysia. Additionally, the findings provide some support that masculinity and femininity are related to camouflaging in non-autistic individuals with relatively high autistic traits. Nevertheless, the current thesis suggested a possible influence of culture in the relationship between gender role, autistic traits, and camouflaging, suggesting a possible future direction in researching the moderation and mediation effects of culture on the relationship between gender role, autistic traits, and camouflaging. It was also implied that biological sex and gender role should be considered in developing ASC assessments because gender might influence

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<sup>3</sup> Self-reported masculinity measured how masculine one rate oneself.

<sup>4</sup> Femininity traits measured traits generally associated with femininity.

the expression of autistic traits. Certain personality traits and culture (e.g. conscientiousness, individualism) were found to be associated with autistic traits and camouflaging among neurotypical Malaysians. This might be relevant to take into account in the diagnostic process. Some recommendations, e.g. validation of measures in different cultures are suggested for future studies.

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## List of Acronyms

American Psychiatric Association (APA)

Autism Spectrum Conditions (ASC)

Autism Spectrum Quotient Short Version (AQ 28)

Bem Sex Role Inventory (BSRI)

Camouflaging Autistic Traits Questionnaire (CAT-Q)

Dependent variable (DV)

Empathizing Quotient (EQ)

German Extended Personal Attributes Questionnaire (GEPAQ)

Horizontal and Vertical Individualism and Collectivism Scale (INDCOL)

Independent variable (IV)

Mean (M)

Number of participants (N)

Socioeconomic status (SES)

Standard Deviation (SD)

Systemizing Quotient (SQ)

Systemizing Quotient-Revised (SQ-R)

Ten-Item Personality Inventory (TIPI)

Traditional Masculinity-Femininity Scale (TMF)

Variance inflation factors (VIF)

## Chapter 1: General Introduction

Autism Spectrum Condition (ASC) is a neurodevelopmental disorder characterized by two core symptoms: social and communication difficulties, and restricted and repetitive behaviours, interests, and activities (American Psychiatric Association (APA), 2013). The phrase “spectrum” is used because ASC covers different types and severity of symptoms of the disorder (APA, 2013). A literature review by Ozonoff et al. (2008) suggested that signs of ASC tend to show in children around the first 18 months of life. Nevertheless, most of the cases are only diagnosed around the age of three, possibly resulting from parents being unaware of the symptoms (Mandell, 2005), and difficulty to diagnose ASC before the age of three based on the current diagnostic criteria (APA, 2013; World Health Organization, 1993). ASC is a highly heritable lifelong disorder. A meta-analysis done on twin studies has estimated the heritability to lay between 64% and 91% (Tick et al., 2015). Some risk factors of ASC include older parental age (Ildring et al., 2014) and having siblings with an ASC (Sandin et al., 2014). ASC is also commonly comorbid with other disorders such as mental retardation (O’Brien & Pearson, 2004) and attention-deficit/hyperactivity disorder (Rommelse et al., 2010), making the diagnostic process challenging.

ASC has an estimated prevalence of 18.5 per 1000 children as of 2016 (Maenner et al., 2020), where males are diagnosed more often with ASC than females by the ratio of around 4:1 (Fombonne, 2009; Maenner et al., 2020). Although gender differences have been a focus in ASC research, the studies mainly focused on biological sex. However, “gender” is multidimensional, not only made up by a biological component, but also involving interactions with other environmental and developmental factors, such as social

gender and internal gender experience (Joel & McCarthy, 2016). Cooper et al. (2018) also suggested that gender is viewed as a spectrum more frequently by autistic people than non-autistic people. This indicates that there is more to “gender” outside biological sex, which is worth paying attention to when researching the relationship between gender and ASC. Recently, some researchers began to focus their attention on other features of gender, such as gender role and gender identity.

The current thesis focused on gender role in addition to biological sex and its relation to autism traits. Gender role is defined as how an individual presents their gender identity (their internal sense of their own gender) or role to the public, which can be presented through their behaviours, traits, interests, and physical appearance (APA, 2015). In the current thesis, the phrase “gender role” refers to how much an individual align themselves with traditionally masculine or feminine personality traits. Gender role can be measured by the degree of someone aligning themselves with those traditional gender traits, or by simply asking how masculine/feminine someone feels. Gender role is categorized based on stereotypes about gender and is heavily influenced by societal traditional values. Gender role may or may not reflect a person’s gender identity, biological sex, and sexual orientation (APA, 2015).

Despite the suggestion that autism is an ‘extreme male brain’ condition (e.g. Baron-Cohen, 2002; Baron-Cohen, 2009), some studies reported that autistic men are often less masculine and more feminine, while autistic women are more masculine and less feminine compared to non-autistic men and women respectively. Autistic males have been found to have a greater fondness for female-typical activities and objects, i.e. doll play, female character imitation, etc, than non-autistic males (Williams et al., 1996).

Autistic males were also more often to display little interest in male-typical activities and objects (Williams et al., 1996). Autistic females on the other hand, more often prefer male-typical activities and objects (i.e. tomboyish behaviour development, a fascination for geometrical entities) than non-autistic females (Ingudomnukul et al., 2007; Kraemer et al., 2005). Moreover, female-typical activities and objects were rejected more often, and autistic females reported more tomboyism during childhood (Ingudomnukul et al., 2007). Cooper et al. (2018) found that autistic males showed lower masculinity than neurotypical males; autistic females on the other hand showed higher masculinity and lower femininity than neurotypical females when measured with self-report questionnaires. These findings suggest that autistic individuals did not always show masculinized gender roles, personality, and behaviour. ASC seems to be characterized by gender defiance; autistic males are less masculine and more feminine, autistic females are more masculine less feminine.

However, Bejerot and Eriksson (2014) had slightly different findings. Attenuated masculinity was observed in autistic people regardless of sex, although autistic females self-reported more tomboyish behaviour in childhood. In terms of femininity, no significant difference was found between the ASC group and controls. Kallitsounaki and Williams (2020) proposed a different perspective from gender defiance in ASC. They studied self-reported gender roles (explicit) and also explored the relationship between autistic traits and implicit gender role identification using the Implicit Association Task in neurotypical individuals. Neurotypical individuals with relatively high autistic traits demonstrated a weaker identification with masculinity and femininity in general, both explicitly and implicitly (Kallitsounaki & Williams, 2020). They were less inclined to endorse masculine

and feminine traits and to embrace these traits into their self-concept, suggesting the possibility that an androgynous gender role is independent of sex in ASC (Kallitsounaki & Williams, 2020). Since autistic individuals tend to fit less well into social norms as part of their condition, it was plausible they feel less of a need to comply with social gender expectations (Strang et al., 2018). Demasculinization and defeminization are observed among autistic individuals and neurotypical individuals with relatively high autistic traits because they are more prone to identify themselves outside of the gender binary. Regardless, ASC research on gender role is relatively new and there are still many gaps to fill in. The current studies aimed to discover more about gender role in autistic traits among neurotypical individuals from an Asian culture, i.e. Malaysia.

## Chapter 2: Study 1 – The Influence of Systemizing-Empathizing and Masculinity-Femininity on Autistic Traits

### Introduction

ASC is a developmental disorder including social interaction and communication difficulties, and restricted and repetitive behaviours, interests, and activities (APA, 2013). Males are more often diagnosed with autism than females (Fombonne, 2009). According to Baron-Cohen's extreme male brain theory of autism, this phenomenon might result from autistic individuals possessing an extreme form of the typical male profile in terms of strong systemizing and weak empathizing skills. Systemizing skills represent the drive to analyze a system and attain the underlying rules that control the behaviour, and empathizing skills represent the drive to identify another person's emotions and perspectives and respond accordingly (Baron-Cohen, 2002). To measure systemizing and empathizing ability, Baron-Cohen and his colleagues developed two measures, the Systemizing Quotient (SQ) (Baron-Cohen et al., 2003) and the Empathizing Quotient (EQ) (Baron-Cohen & Wheelwright, 2004). Males tend to score higher on the SQ and lower on the EQ when compared to females (Baron-Cohen, 2002). Autistic individuals generally score higher on the SQ and lower on the EQ (Baron-Cohen, 2002; Baron-Cohen, 2009; Wakabayashi et al., 2007), hence showing a male brain/Type S ( $S > E$ ) or extreme male brain/extreme Type S ( $S \gg E$ ) pattern, regardless of gender (Auyeung et al., 2009; Greenberg et al., 2018), suggesting that autistic people tend to show masculinized brain activity irrespective of their biological sex.

Baron-Cohen's theory; stating that ASC is characterized by masculinization in both genders, is hence based on an individuals' systemizing-empathizing abilities rather than



on gender role, i.e., masculinity and femininity. In most Western cultures, males do tend to be more systemizing, and females tend to be more empathizing, as found in Sweden (Von Horn et al., 2010), the United States (Wright & Skagerberg, 2012), Switzerland (Zeyer et al., 2012), and England (Baron-Cohen et al., 2014). However, in Asian cultures, the results are less straightforward. In the Japanese general population and university students (Wakabayashi et al., 2007), and elementary and secondary school students (Wakabayashi, 2012), males were more systemizing and females were more empathizing. In a Chinese sample, although men were more systemizing, men and women did not differ in empathizing (Zheng & Zheng, 2015). Similarly, in Korea, there was no significant difference between males and females in empathizing (Kim & Lee, 2010).

Western and Asian cultural values might influence the relationship between individuals' systemizing-empathizing abilities and biological sex. Asian cultures tend to prefer to experience less arousing emotions and do not encourage excessive show of emotions (Lim, 2016). Empathy might be expressed to a lesser extent in Asian cultures, both in men and women. The Western-based finding that neurotypical males are more systemizing and less empathizing than neurotypical females, might hence not be generalizable in Asian samples.

Furthermore, masculinization in systemizing-empathizing abilities might not extend to gender role. Gender role refers to an individual's presentation of their behaviours, traits, interests, and physical appearance related to gender, which is heavily influenced by societal traditional values (APA, 2015). Gender role is a facet of "gender", different from gender identity, biological sex, and sexual orientation. In the current thesis, the phrase "gender role" refers to how much an individual align themselves with traditionally

masculine or feminine personality traits. As discussed in Chapter 1, when looking at gender role in a broader sense, it seems ASC is characterized by gender defiance instead of masculinization (Cooper et al., 2018). Another perspective suggests demasculinization and defeminization (androgynous gender role) in autistic people regardless of sex (Kallitsounaki & Williams, 2020).

Stauder et al. (2011) studied the relationship between systemizing-empathizing, masculinity-femininity, and autistic traits. In line with the extreme male brain theory, autistic individuals were more systemizing and less empathizing than controls, and control males were more systemizing and less empathizing than females. However, autistic individuals were less masculine regardless of sex, suggesting that Baron-Cohen's extreme male brain theory is limited to systemizing-empathizing abilities (Stauder et al., 2011), and not generalizable to gender role. Interestingly, there was no significant difference between the autistic group and the control group in femininity. However, there was a trend that autistic males were *more* feminine than control males and autistic females were *less* feminine than control females (Stauder et al., 2011), consistent with Bejerot and Eriksson's findings (2014). These results suggest demasculinization and possible gender defiance in ASC. Therefore, it could be that autistic individuals are more systemizing and less empathizing, but that this is unrelated to the broader masculinization in gender role.

Following Stauder et al.'s (2011) footsteps, the current study aimed to find out how biological sex, systemizing-empathizing abilities, and gender role are related to autistic traits, with some adaptations; an Asian sample was studied, and more participants were included. Two aims were proposed. The first was to replicate sex differences in

systemizing and empathizing, and the relationship between systemizing, empathizing, and autistic traits (e.g. Stauder et al., 2011; Wakabayashi et al., 2007) in an Asian sample. Males were expected to be more systemizing and less empathizing, and vice versa for females. Systemizing was expected to positively correlate with autistic traits, while empathizing would negatively correlate with autistic traits, consistent with Baron-Cohen's extreme male brain theory. The second aim was to explore if masculinity and femininity were differently related to autistic traits in females and males. It was hypothesized that low masculinity and high femininity indicated more autistic traits in males, and vice versa in females, similar to Cooper et al.'s (2018) findings.

## Methods

### *Participants*

Participants were recruited through convenience- and snowball sampling. A priori power analysis with GPower was conducted on multiple regression analysis and Power of 0.80, indicating at least 55 participants were needed to detect an effect. Only Malaysians with no known neurological disorders were included. 97 participants with a mean age of 21.28 years old were recruited. Demographic variables are displayed in Table 2.1. Courses such as International Relations, Hospitality Management, Accounting, and Finance were classified as Arts; Sciences students included students from courses such as Psychology, Architecture, and Engineering.

**Table 2.1**

<i>Participants Demographics Table</i>		
	<i>N</i>	<i>%</i>
Sex		

Male	36	37.1
Female	61	62.9
Gender Identity		
Male	35	36.1
Female	59	60.8
Non-Binary	2	2.1
Others	1	1.0
Race		
Malay	17	17.5
Chinese	74	76.3
Indian	4	4.1
Others	2	2.1
Course of Study		
Arts	20	20.6
Sciences	77	79.4
	<i>M (SD)</i>	Range
Age (years)	21.28 (2.405)	18 – 28

*Note.* *N* = Number of Participants. *M* = Mean. *SD* = Standard Deviation.

Gender Identity = Individuals' Internal Sense of Their Own Gender.

## **Measures**

### **Autism Spectrum Quotient Short Version (AQ 28).**

The AQ 28 (Hoekstra et al., 2010) is a shortened version of the AQ (Adult) (Baron-Cohen et al., 2001) questionnaire that measures autistic traits. It has 28 questions scored on a 4-point Likert scale ranging from 1 (“definitely agree”) to 4 (“definitely disagree”). For items where an “agree” response suggests autistic traits, the scorings are reversed. A higher score indicates more autistic traits. Examples of items asked include “I am fascinated by dates” and “New situations make me anxious” (see Appendix 1). Those who score 65 or higher in their total AQ score are suggested to be at a higher risk to have autism (Hoekstra et al., 2010), and in a clinical setting, would be referred for further screening.

### **Systemizing Quotient-Revised (SQ-R).**

The SQ-R (Wheelwright et al., 2006) is a revised version of the SQ questionnaire that measures systemizing. It has 75 items scored 2 (“strongly agree”), 1 (“slightly agree”) or 0 (“slightly disagree” and “strongly disagree”). Items where an “agree” response suggest less systemizing, the scores are reversed [2 (“strongly disagree”), 1 (“slightly disagree”) and 0 (both “agree” responses)]. Examples of items asked include “I find it difficult to read and understand maps” and “I am fascinated by how machines work” (see Appendix 2). The total score is calculated, ranging from 0 (least systematic) to 150 (most systematic).

### **Empathizing Quotient (EQ).**

The EQ (Baron-Cohen & Wheelwright, 2004) is a questionnaire that measures empathy. It has 60 items: 40 empathy-related items and 20 filler items. All empathy-related items are scored 2 (“strongly agree”), 1 (“slightly agree”) or 0 (both “disagree” responses). For items where an “agree” response suggest less empathy, the scores are reversed [2 (“strongly disagree”), 1 (“slightly disagree”) and 0 (both “agree” responses)]. Filler items are not scored. Examples of items are “I really enjoy caring for other people” and “It upsets me to see animals in pain” (see Appendix 3). The total score is calculated, ranging from 0 (least empathetic) to 80 (most empathetic).

### **Gender Role Questionnaires.**

Two gender role scales were used, the Bem Sex Role Inventory (BSRI) and the Traditional Masculinity-Femininity Scale (TMF). Two measures were used to be able to validate the measures.

#### ***Bem Sex Role Inventory (BSRI).***

The BSRI (Bem, 1974) is a 60 item test assessing how people see their gender role psychologically. Each item is answered on a 7-point Likert scale, ranging from 1 (“Never

or almost never true”) to 7 (“Always or almost always true”). Items are divided into 3 groups: masculine, feminine, and filler (neutral) traits respectively. Example items in the inventory include “ambitious” (masculine), “tender” (feminine) and “sincere” (neutral) (see Appendix 4). Masculinity and femininity are measured as two independent scales. A higher subscale score suggests more masculine or feminine traits.

***Traditional Masculinity-Femininity Scale (TMF).***

The TMF (Kachel et al., 2016) consists of 6 questions, each answered on a 7-point Likert scale. Two unipolar scales of masculinity and femininity are used, ranging from 1 (“not at all masculine”) to 7 (“totally masculine”) and from 1 (“not at all feminine”) to 7 (totally feminine”) (12 items in total). Masculinity and femininity were measured as separate scales in the current study because previous studies suggested that masculinity and femininity were not mutually exclusive (e.g. Cooper et al., 2018; Kallitsounaki & Williams, 2020). Examples of questions asked include “I consider myself...” and “Traditionally, my interests would be regarded as...” (see Appendix 5). A higher score on each scale indicates higher masculinity/femininity.

***Validation of Gender Role Questionnaires.***

The validity of BSRI in an Asian sample is unclear. In White American and Turkish samples, the BSRI was found valid (Holt & Ellis, 1998; Ozkan & Lajunen, 2005), though the difference between males and females was smaller compared to Bem’s (1974) sample. This suggested that gender role stereotypes or traditional values were weaker compared to two decades earlier (Holt & Ellis, 1998). In the past, women were family-orientated and thus aligned more to traditional feminine traits, i.e. expressive characteristics (e.g. “Gentle”, “Sensitive To Others Needs”) (Ozkan & Lajunen, 2005).

Currently, many women focus on both family and work, thus requiring them to possess some traditionally masculine traits, i.e. instrumental characteristics (e.g. “Independent”, “Act As A Leader”), and there is more gender equality in general. Modern females embrace more instrumental traits in addition to expressive traits compared to the past (Ozkan & Lajunen, 2005). Furthermore, females showed a trend of a decreasing association with femininity over the past 20 years (Donnelly & Twenge, 2016), suggesting changes in gender role stereotypes and traditional values.

Culture could also play a role. The BSRI is constructed and mostly validated in Western samples. Gender role stereotypes and values from Asian samples were not studied. Therefore, the BSRI might be less well able to capture gender role accurately in an Asian population. For example, in Asian cultures (South Indian and Malaysian) BSRI’s validity was doubted (Ward & Sethi, 1986). Asian’s view on traditional masculinity and femininity was different from the West, and the BSRI might correlate differently with Asian’s masculinity and femininity (Ward & Sethi, 1986).

The TMF was also not validated in Asia but is a more recent, and different, measure of masculinity and femininity. Since the BSRI and TMF measured masculinity and femininity differently, both measures were included to check whether they measured gender role similarly in Asian culture.

First, a principal axis factor analysis was performed to check the validity of the BSRI in Malaysia. The loadings of items were noticeably different from Bem’s (1974) (see Appendix 10). Second, a one-way MANOVA was conducted to investigate whether there were sex differences on the BSRI and TMF. Females scored higher on the BSRI and TMF femininity scale, and lower on the TMF masculinity scale than males. Females and males

scored similarly on the BSRI masculinity scale (see Table 2.3). Third, correlation tests were done to explore whether the BSRI and TMF were correlated (see Appendix 11). There were significant positive correlations between the two masculinity scales ( $r(97) = 0.288, p < .01$ ) and the two femininity scales ( $r(97) = 0.466, p < .001$ ). Finally, the reliability tests showed that both the BSRI and TMF are highly reliable (see Table 2.2). We hence decided to include both measures in the current analyses.

**Table 2.2**

*Subscales From The BSRI and TMF*

Subscale	Number Of Items	Cronbach's Alpha ( $\alpha$ )
BSRI_Masculinity	20	.895
BSRI_Femininity	20	.878
TMF_Masculinity	6	.837
TMF_Femininity	6	.893

Note. BSRI = Bem Sex Role Inventory. TMF = Traditional Masculinity-

Femininity Scale.

### **Procedure**

The study was an online questionnaire in Qualtrics. The survey was distributed at the university and through social media. Participants were first required to read through the information sheet. They were notified that their participation was voluntary and that they were allowed to withdraw anytime without giving a reason. After filling in the consent form, participants provided their demographic information (biological sex, gender identity, nationality, etc) before answering the survey. As a token of appreciation, participants were offered to participate in a RM50 lucky draw. The questionnaire took approximately 30 minutes to complete. A total of 72 incomplete entries were removed from the analyses. The final sample included 97 participants.



## Results

The mean and SD for all questionnaires are summarized in Table 2.3.

**Table 2.3**

*Mean (M) and Standard Deviation (SD) for Each Measure*

	Females (N = 61)		Males (N = 36)		F (1, 95)	p
	M	SD	M	SD		
SQ	56.131	17.146	57.778	16.947	0.211	.647
EQ	39.934	13.432	32.861	10.114	7.469	.010
BSRI_Masculinity	4.373	0.825	4.321	0.890	0.085	.771
BSRI_Femininity	4.841	0.795	4.381	0.786	7.660	< .01
TMF_Masculinity	3.672	0.951	4.315	0.979	10.125	< .01
TMF_Femininity	4.309	1.008	3.218	1.301	21.303	< .001
AQ	67.328	9.018	68.306	6.182	0.331	.567

Note. N = Number of Participants. SQ = Systemizing Quotient-Revised. EQ = Empathizing Quotient. BSRI = Bem Sex Role Inventory. TMF = Traditional Masculinity-Femininity Scale. AQ = Autism Spectrum Quotient Short Version (AQ 28).

### **Sex, Systemizing, Empathizing and Autistic Traits**

A one-way MANOVA was used to analyze sex differences on the SQ, EQ and AQ scores. A sex difference was observed only for the EQ scores,  $F(1, 95) = 7.469$ ,  $p < .01$ . Females scored higher on the EQ than males (See Table 2.3). Females and males did not differ in SQ and AQ scores.

To test the relationship between the SQ, EQ and AQ scores, correlation tests were conducted. A significant positive correlation was found between SQ and EQ scores. EQ scores significantly negatively correlated with AQ scores. No significant correlations were found between SQ and AQ scores (see Table 2.4). When correlation was carried out

separately for females and males, a negative correlation between EQ and AQ scores was observed for females,  $r(61) = -0.479$ ,  $p < .001$ , but no significant correlation was found for males ( $p = 0.748$ ) (see Appendix 12). No significant correlations were observed between SQ and AQ scores for both females and males (see Appendix 12).

**Table 2.4**

*Correlation Results (General Population, N = 97)*

	SQ	EQ	AQ
SQ	-	0.554***	-0.119
EQ		-	-0.382***
AQ			-

*Note.* \*\*\* $p < .001$ . \*\* $p < .01$ . \* $p < .05$ .  $N$  = Number of Participants. SQ = Systemizing Quotient-Revised. EQ = Empathizing Quotient. AQ = Autism Spectrum Quotient Short Version (AQ 28).

### ***Masculinity, Femininity and Autistic Traits in Females and Males***

To explore whether masculinity and femininity were differently related to autistic traits in males and females, a simultaneous entry method multiple regression with BSRI\_Masculinity, BSRI\_Femininity, TMF\_Masculinity and TMF\_Femininity scores as independent variables (IV) and AQ scores as dependent variable (DV) were carried out separately for females and males.

For females, multiple data assumptions were checked before interpreting the regression results. 1) Not all IVs have significantly correlated with AQ scores, the DV. Only BSRI\_Masculinity scores and BSRI\_Femininity scores correlated moderately with AQ scores. 2) There was no singularity or multi-collinearity observed between any variables

involved, all  $r_s < 0.667$ . 3) There was no collinearity issue among IVs, with variance inflation factors (VIFs) lower than 1.991 and tolerance higher than 0.502. 4) No outliers were identified because all Cook's distance values were smaller than 0.165. 5) The Cohen's  $f^2$  showed a large effect size,  $f^2 = 0.437$ , suggesting that the sample size was sufficient for analysis. 6) The AQ scores were normally distributed. 7) The data for the general regression model appeared to have a homoscedastic pattern, therefore it was appropriate for the regression analysis. However, when looking at the four relationships separately, BSRI\_Masculinity and BSRI\_Femininity scores showed a slight heteroscedastic pattern.

The model suggested that lower BSRI masculinity scores were related to higher AQ scores in females,  $R^2 = 0.304$ ,  $F(4, 56) = 6.119$ ,  $p < .001$  (see Table 2.5).

**Table 2.5**

<i>Influence of Masculinity and Femininity on AQ scores (Females)</i>					
Predictor Variables	Outcome Measure AQ Scores ( $N = 61$ )			Total $R^2$	$F(4, 56)$
	Unstandardized Coefficients $B$	$T$			
(Constant)	109.052	9.445***		0.304	6.119***
Masculinity					
BSRI_Masculinity	-4.580	-3.548***			
TMF_Masculinity	-1.384	-0.955			
Femininity					
BSRI_Femininity	-2.666	-1.838			
TMF_Femininity	-0.860	-0.611			

---

*Note.* \*\*\* $p < .001$ . \*\*  $p < .01$ . \* $p < .05$ .  $N$  = Number of Participants. BSRI = Bem Sex Role Inventory. TMF = Traditional Masculinity-Femininity Scale. AQ = Autism Spectrum Quotient Short Version (AQ 28).

For males, multiple data assumptions were also checked before the regression results were interpreted. 1) Not all IVs were significantly correlated with the DV, AQ scores. Only the BSRI\_Masculinity scores correlated moderately with AQ scores. 2) There was also no singularity or multi-collinearity found between any variables, all  $r_s < .590$ . 3) There was no collinearity issue among IVs, all VIFs were lower than 1.870 and tolerance was higher than 0.535. 4) No outliers were found; all Cook's distance values were smaller than 0.148. 5) The Cohen's  $f^2$  showed a large effect size,  $f^2 = 0.538$ , so the sample size was sufficient for analysis. 6) From the histogram for AQ scores, it showed that the DV was normally distributed. 7) The data for the general regression model appeared to have a homoscedastic pattern, therefore it was appropriate for the regression analysis. However, when looking at the four relationships separately, BSRI\_Femininity scores showed a slight heteroscedastic pattern.

In males, the regression model showed that lower BSRI masculinity and higher BSRI femininity scores were related to higher AQ scores for males,  $R^2 = 0.350$ ,  $F(4, 31) = 4.166$ ,  $p < .01$  (see Table 2.6).

### **Table 2.6**

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*Influence of Masculinity and Femininity on AQ scores (Males)*

Outcome Measure  
AQ Scores ( $N = 36$ )

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Predictor Variables	Unstandardized Coefficients <i>B</i>	<i>t</i>	Total <i>R</i> <sup>2</sup>	<i>F</i> (4, 31)
(Constant)	67.826	12.386***	0.350	4.166**
Masculinity				
BSRI_Masculinity Scores	-5.160	-3.751***		
TMF_Masculinity Scores	0.809	0.686		
Femininity				
BSRI_Femininity Scores	3.977	2.582*		
TMF_Femininity Scores	0.579	0.755		

*Note.* \*\*\* $p < .001$ . \*\* $p < .01$ . \* $p < .05$ . *N* = Number of Participants. BSRI = Bem Sex Role Inventory. TMF = Traditional Masculinity-Femininity Scale. AQ = Autism Spectrum Quotient Short Version (AQ 28).

To conclude, the relationship between masculinity, femininity and autistic traits was different for females and males. Lower BSRI masculinity scores were related to higher AQ scores for both females and males, while higher BSRI femininity scores were related to higher AQ scores within males only.

## Discussion

### ***Sex, Systemizing, Empathizing and Autistic Traits***

The first aim of the current study was to find out whether there were sex differences in systemizing and empathizing, and how systemizing, empathizing and autistic traits were related. The first hypothesis, that males would show better systemizing and worse empathizing than females were partially supported. In line with previous research (e.g. Stauder et al., 2011; Wakabayashi et al., 2007), males showed poorer empathizing skills

than females. However, no sex difference was observed in systemizing. The second hypothesis, that systemizing would positively correlate, and empathizing would negatively correlate with autistic traits regardless of sex, was also partially supported. Empathizing did negatively correlate with autistic traits, but systemizing was unrelated to autistic traits, contrary to Baron-Cohen's extreme male brain theory. Interestingly, within males, empathizing and autistic traits were unrelated, in contrast to the results in the full sample.

The lack of sex differences in systemizing ability contrasted previous findings that males are more systemizing than females regardless of culture (e.g. Baron-Cohen & Wheelwright, 2004; Wakabayashi et al., 2007). Possibly, the current sample was too homogeneous. Participants were mostly universities students from the Science and Engineering field (see Table 2.1). Participants with a Science and Engineering background were reported to be more systemizing than participants with Humanities and Social Sciences background (Kidron et al., 2018; Svedholm-Häkkinen & Lindeman, 2016). Hence maybe within our current sample, with all participants being relatively high in systemizing, a ceiling effect is observed instead, thus minimizing the possible sex differences.

Consistent with previous studies in Western and certain Asian cultures (e.g. Baron-Cohen & Wheelwright, 2004; Zhao et al., 2017), and in contrast with other studies in Asian samples (e.g. Kim & Lee, 2010; Zheng & Zheng, 2015), the current results provided support that females are more empathizing than males in Malaysia.

Contrasting with Baron-Cohen's extreme male brain theory, systemizing was found unrelated to autistic traits in the current study. This could result from our homogeneous sample, which consisted of mostly Sciences students, leading to a ceiling effect in these

measures (SQ, AQ). However, the findings are in line with previous findings that autistic traits are unrelated to maths-, spatial thinking- or systemizing-related measures in the general population (Morsanyi et al., 2011). Within a subsample of the general population of Sciences students (who are expected to score high in systemizing), the relationship between systemizing and autistic traits might disappear.

On the other hand, supporting Baron-Cohen's extreme male brain theory, empathizing was negatively correlated with autistic traits in neurotypical Malaysians, replicating previous findings (Wheelwright et al., 2006; Wright & Skagerberg, 2012; Zhou et al., 2020). Since empathizing focused on the ability to identify another's emotions and perspectives and respond accordingly (Baron-Cohen, 2002), empathizing contradicted with autistic traits, which is linked to a less well-developed Theory of Mind. Although within the male sample, empathizing and autistic traits were unrelated, this might be due to the small male sample (Faber & Fonseca, 2014).

Notably, there was no sex difference observed for autistic traits in the current study, in contrast to previous studies (e.g. Freeth et al., 2013; Hoekstra et al., 2010; Lau et al., 2013). A possible explanation could be the small male sample (Faber & Fonseca, 2014), and the homogeneous Sciences student samples with relatively high autistic traits (Wakabayashi et al., 2006a) that might lead to a ceiling effect. Thus, sex differences are possibly minimized.

### ***Masculinity, Femininity and Autistic Traits in Females and Males***

The second question focused on whether masculinity, femininity, and autistic traits were differently related in males and females. Low masculinity and high femininity were

expected to indicate more autistic traits in males; high masculinity and low femininity were expected to indicate more autistic traits in females. The hypothesis was supported in males; low masculinity and high femininity predicted high autistic traits. In females, however, the hypothesis was rejected; low masculinity was found indicating higher autistic traits. Moreover, this predictive relation between masculinity, femininity and autistic traits was limited to masculinity and femininity traits (BSRI), and not to self-reported masculinity/femininity (TMF).

For males, the current findings were in line with Bejerot and Eriksson's (2014) and Stauder et al.'s (2011) findings; demasculinization in high autistic traits was observed. Previous literature showed that autistic males reported a lack of self-confidence, timidity, and fearfulness about joining conversations, dislike of leading and attention, and difficulty making important decisions (Stauder et al., 2011); these traits contradict traditional masculinity and align with traditional femininity. Thus, it was inferred that males with relatively high autistic traits in the current sample would report similarly, resulting in low masculinity and high femininity.

For females in the current study, demasculinization in high autistic traits was observed, but femininity was found unrelated to autistic traits. Autistic females reported a lack of self-confidence, timidity, dislike of leading and difficulty making important decisions, similar to autistic males (Stauder et al., 2011); a similar conclusion can hence be drawn for females in the current study. Within females, no predicting relationship was found between femininity and autistic traits, consistent with Stauder et al. (2011). This indicated that traditional femininity traits might be independent of autistic traits in females. The



findings *do* indicate that Baron-Cohen's extreme male brain theory is not extendable to gender role; demasculinization was observed instead for both sexes.

The relationship between masculinity, femininity and autistic traits was limited to masculinity and femininity traits (BSRI). These traits might not necessarily be applicable in Malaysia (see Chapter 2 Methods' principal factor analysis of BSRI), consistent with Ward and Sethi's (1986) findings. Nevertheless, the weak significant positive relationship between the masculinity scales and femininity scales of the BSRI and TMF, and the good reliability found for both measures *do* suggest that the BSRI subscales still measured masculinity and femininity traits, but not perfectly.

### ***Limitation***

The gender role measures used in the current study was not validated in the Asian culture, i.e. Malaysia. We tried to compensate for this by using two measures of gender role and we did some validation analyses. The measures did show some concurrent validity. However, since the BSRI traits might not necessarily be applicable in Malaysia (see Chapter 2 Methods' principal factor analysis of BSRI), the BSRI might not be ideal to capture masculine and feminine traits in the current sample.

Furthermore, small samples were shown to influence study findings (Faber & Fonseca, 2014). Although an a priori analysis was done to estimate the minimum number of participants needed to detect an effect, the sample was unbalanced between two sexes.

### ***Chapter Conclusion***

This research is the first to study the relationship between biological sex, masculinity-femininity, systemizing-empathizing abilities, and autistic traits in neurotypical individuals from an Asian country, i.e. Malaysia, and provided new insights into the field.

To conclude, there was no sex difference for systemizing ability, while females showed greater empathy than males, similar to previous findings (e.g. Zhao et al., 2017). Systemizing was unrelated to autistic traits. Empathizing skills consistently correlated negatively with autistic traits in neurotypical Malaysians (Zhou et al., 2020). Moreover, there was no sex difference for autistic traits. For neurotypical Malaysians, Baron-Cohen's extreme male brain theory was supported for empathizing but not for systemizing.

Demasculinization was related to autistic traits in non-autistic Malaysians, consistent with Stauder et al.'s (2011) findings. However, while high femininity predicted high autistic traits in males, it was independent of autistic traits in females. Baron-Cohen's extreme male brain theory was *not* extendable to gender role in the Malaysian context. In addition, the relationship between masculinity, femininity and autistic traits was limited to masculinity and femininity traits (BSRI), and not to self-reported masculinity/femininity (TMF).

## **Chapter 3: Study 2 - Camouflaging and Autism: The Role of Femininity, Personality and Collectivism**

### **Introduction**

As mentioned in Chapters 1 and 2, there is a relatively high male-to-female (4:1) ratio in ASC. Although there are indications that autism is more common in men, it might be that autism is underdiagnosed in women and that the ratio might not be a good reflection of the actual occurrence of autism in men and women. The most prominent reason for this possible incorrect ratio is that the screening and diagnostic tools were constructed based on mostly male populations. During the initial development and standardization of the screening and assessment tools (e.g. Autism Diagnostic Observation Schedule-General), more male samples were studied (Lord et al., 2000). The validity and reliability of screening and diagnostic instruments (e.g. Autism Diagnostic Interview-Revised, AQ) were established based on male-dominant samples (Baron-Cohen et al., 2001; Baron-Cohen et al., 2006; Lord et al., 1994). The studies comparing across cultures (e.g. Japan), generally also include more autistic male samples than autistic female samples when assessing the validity and reliability of tools (e.g. Wakabayashi et al., 2006a). This might have led to the screening and diagnostic instruments being well capable of capturing ASC symptoms in autistic males but not equally well in autistic females. Thus, the validity and reliability of screening and diagnostic instruments in the autistic female population are questionable.

Autism studies being mostly based on males (e.g. around 80% of the ASC study samples are males; Thompson et al., 2003) might lead to bias in diagnosis (e.g. diagnostic criteria, disorder symptoms). Indeed, a recent British study reported that 42% of females

were misdiagnosed with other mental disorders instead of ASC; while 30% of males were misdiagnosed (Muller, 2019). Autistic females might be diagnosed late or misdiagnosed with other disorders such as anxiety or depression due to the impression that ASC is more of a male disorder (Bargiela et al., 2016).

These under- and misdiagnoses might result from autistic females displaying ASC symptoms differently than autistic males, described as “female autism phenotype”. High-functioning autistic females tend to display more social, thought and attention problems than males (Holtmann et al., 2007). Moreover, autistic females tend to show less restricted and repetitive behaviours, better motor skills, more internalizing difficulties (e.g. anxiety, depression) and fewer externalizing problems (e.g. hyperactivity, antisocial behaviour) compared to autistic males (Mandy et al., 2011). Finally, autistic females displayed less restricted and repetitive behaviours than autistic males (Van Wijngaarden-Cremers et al., 2014). Even when autistic females did show signs of narrow interests, they were less likely to be discovered immediately due to weak intensity (Lai & Szatmari, 2020). Thus, “without these autism symptoms”, e.g. restricted and repetitive behaviours, and social problems, autistic females tend not to get an ASC diagnosis from clinicians.

Autistic females are also more likely than autistic males to camouflage autistic traits. Camouflaging refers to an autistic individual consciously or unconsciously “acting normal” by changing their cognition, attitudes, and behaviours to fit in their social environment (Hull et al., 2017). Hull et al. (2017) proposed that camouflaging is motivated by assimilation, the desire to blend into social situations, and connection, the desire to develop relationships with others. Camouflaging has two strategies: compensation and masking. Compensation refers to strategies developed to compensate for social and

communication difficulties. Masking refers to strategies made to present themselves as non-autistic or less autistic to the public (Hull et al., 2017). In general, autistic females displayed more camouflaging behaviour than autistic males (Lai et al., 2016; Schuck et al., 2019). Moreover, autistic people camouflaged because they felt pressured to “pretend to be normal” (Hull et al., 2017; Milner et al., 2019), suggesting that in addition to gender differences, individual differences in personality or cultural traits such as wanting social acceptance, and in adhering to gendered social expectations, might influence camouflaging.

One possible factor influencing camouflaging in both males and females could be gender role, especially level of femininity, i.e., a higher level of femininity might be related to more camouflaging behaviour. As discussed in Chapters 1 and 2, in the current thesis “gender role” refers to how much an individual aligns themselves with traditionally masculine or feminine personality traits. Gender role is categorized based on gender stereotypes and is heavily influenced by societal traditional values. The trait “femininity” is generally characterized by gentleness, empathy, and sensitivity (Bem, 1974). Most cultures (e.g. Western, Asian) have similar ideas about femininity. Societal pressure which reflects the social norms, expects females to act more feminine, i.e. more empathic and sociable (Milner et al., 2019). However, the traits associated with femininity (e.g. gentleness, sensitivity) are mostly conflicting with autistic traits (e.g. trouble understanding others’ feelings). This might lead females with ASC to find it difficult to align to a traditional feminine identity because it conflicts with their autistic identity (Bargiela et al., 2016). Therefore, to align with social expectations and present themselves within the norm, i.e. more feminine, autistic females and neurotypical females with relatively high autistic traits

might camouflage more to hide their autistic traits compared to neurotypical females with relatively low autistic traits. Moreover, high autistic traits were associated with more camouflaging behaviour in both autistic and non-autistic individuals (Hull et al., 2018), suggesting that individuals with relatively high autistic traits will camouflage more regardless of a clinical diagnosis. Hence, in addition to sex, the level of femininity might be related to more camouflaging in both sexes.

Apart from femininity, personality traits (i.e. Big-Five personality) could influence camouflaging. The Big-Five personality traits are openness, conscientiousness, extraversion, agreeableness, and neuroticism (McCrae & Costa, 1987). Openness is characterized by a preference for novelty and, appreciation for creativity. Conscientiousness refers to an individuals' dutifulness and competence. Extraversion measures the tendency to be outgoing, sociable, and excitement-seeking. Agreeableness is described as a tendency to be warm, trusting, and reliable. Neuroticism reflects proneness to emotional instability (McCrae & Costa, 1987). A recent meta-analysis concluded that high autistic traits were associated with high neuroticism and low openness, conscientiousness, extraversion and agreeableness in autistic individuals (Lodi-Smith et al., 2018). Since high autistic traits were associated with more camouflaging in both autistic and non-autistic individuals (Hull et al., 2018), it is inferable that autistic individuals with high neuroticism and low openness, conscientiousness, extraversion and agreeableness will camouflage more. Robinson et al. (2020) found that in autistic individuals, only neuroticism was positively correlated with camouflaging. In non-autistic individuals, camouflaging was positively correlated with neuroticism and negatively associated with conscientiousness, extraversion and agreeableness. Since

Robinson et al.'s (2020) study was the first and only known to study the relationship between camouflaging behaviour in autism and personality traits, the findings are yet to be replicated.

Another factor that might influence camouflaging could be cultural norms such as collectivism and individualism. In an individualistic culture, the self is valued highly, and independent uniqueness is important. Expressing inner feelings and thoughts is encouraged, along with influencing others (Tsai et al., 2007). In a collectivistic culture, the group is considered more important than the individual. Interpersonal harmony is most important. For the sake of society and community, suppressing and adjusting oneself to fit into society and obtain societal acceptance is desirable (Lim, 2016; Tsai et al., 2007). Thus, in a collectivistic society, one might have to camouflage more to conform, blend into society and avoid causing discomfort to others (Schuck et al., 2019). In most Asian, usually collectivistic, cultures, autistic traits are demonstrated slightly differently from the West. Cross-cultural comparison showed that Asians (e.g. Japan, India, Malaysia) tend to score higher on the AQ (Freeth et al., 2013; Wakabayashi et al., 2006a). This might result from cultural differences in certain behaviours. For example, a lack of eye contact is considered an autistic trait (Madipakkam et al., 2017), but in Asia, direct or constant eye contact is considered inappropriate (Uono & Hietanen, 2015). Moreover, Asian cultures discourage excessive show of emotions (Lim, 2016), hence “reading emotions from facial expression” might be less applicable in Asia, compared to individualistic cultures which tend to encourage expressiveness. It was inferred that high collectivism might associate with high autistic traits. Since high autistic traits were associated with

more camouflage in both autistic and neurotypical individuals (Hull et al., 2018), one might expect that collectivism would positively relate to autistic traits and camouflaging.

In short, besides the known relationship between biological sex and camouflaging behaviour, societal expectations (such as gender role and cultural norms) and individual factors such as personality traits, might be the additional indicators of camouflaging. Therefore, the current study aimed to find out how these variables are related in neurotypical Malaysians.

The first aim of this study was to find out how sex, gender role, personality traits, culture, and autistic traits influence camouflaging. A positive effect of femininity, neuroticism, collectivism and autistic traits on camouflaging was expected. Moreover, a negative effect of masculinity, openness, conscientiousness, extraversion, agreeableness, and individualism was expected on camouflaging behaviour (Bargiela et al., 2016; Freeth et al., 2013; Hull et al., 2018; Lodi-Smith et al., 2018; Robinson et al., 2020; Schuck et al., 2019). Secondly, we explored whether gender role, personality traits, and culture were *differently* related to autistic traits in females and males. It was expected that low masculinity and high femininity would indicate more autistic traits in males, and vice versa in females<sup>5</sup>. High neuroticism and low openness, conscientiousness, extraversion, and agreeableness were hypothesized to indicate more autistic traits regardless of sex (Lodi-Smith et al., 2018). Low individualism and high collectivism are expected to indicate more autistic traits for both sexes (Freeth et al., 2013).

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<sup>5</sup> This hypothesis is similar to Chapter 2's hypothesis, though measured with a different gender role questionnaire because the BSRI in chapter 2 was not optimal.



## Methods

### *Participants*

A priori power analysis with GPower, conducted on multiple regression analysis and Power of 0.80, indicated that a minimum number of 55 participants from each sex were needed. Only Malaysians with no known neurological disorders were recruited through convenience- and snowball sampling. 193 participants with a mean age of 21.55 years old were recruited. In the early stage of recruitment, an unbalanced number of males and females were recruited (insufficient male participants). Data collection was continued until an equal number of males and females was reached. In the end, the total number of participants recruited was more than planned. Demographic variables are displayed in Table 3.1.

**Table 3.1**

<i>Participants Demographics Table</i>		
	<i>N</i>	<i>%</i>
Sex		
Male	88	45.6
Female	101	52.3
Others (Prefer not to say, etc)	4	2.1
Gender Identity		
Male	88	45.6
Female	97	50.3
Non-Binary	5	2.6
Others	3	1.6
Race		
Malay	15	7.8
Chinese	162	83.9
Indian	13	6.7
Others	3	1.6
Course of Study		
Arts (Education, Law, Photography, Finance)	57	29.5

Sciences (Psychology, Biotechnology, Sport Science)	136	70.5
	<i>M (SD)</i>	Range
Age (years)	21.55 (2.111)	18 - 29

*Note.* *N* = Number of Participants. *M* = Mean. *SD* = Standard Deviation.

Gender Identity = Individuals' Internal Sense of Their Own Gender.

## **Measures**

### **AQ 28.**

The AQ 28 (Hoekstra et al., 2010) is a shortened version of the AQ (Adult) questionnaire that measures autistic traits (see Chapter 2 Methods).

### **Camouflaging Autistic Traits Questionnaire (CAT-Q).**

The CAT-Q (Hull et al., 2018) is a 25-item self-report questionnaire on camouflaging behaviour. There are three subscales in the questionnaire, assimilation (8 items), compensation (9 items), and masking (8 items). All items are answered on a 7-point Likert scale, ranging from 1 ("strongly disagree") to 7 ("strongly agree"). For those items where an "agree" response suggests less camouflaging, the scores are reversed. Examples of questions include "I have developed a script to follow in social situations" and "I feel free to be myself when I am with other people" (see Appendix 6). A higher score indicates more camouflaging behaviour.

### **Gender Role Questionnaires.**

Two gender role scales were used: the TMF and the German Extended Personal Attributes Questionnaire (GEPAQ). Two measures were included to test the validity of the

questionnaires in Malaysia. In Chapter 2, the BSRI was found a suboptimal measure of gender role. Therefore, in this study, the GEPAQ was used. Moreover, while the TMF asked participants to self-report how traditionally masculine/feminine they considered themselves (see Appendix 5), the GEPAQ asked participants to rate themselves on specific presumably masculine and feminine traits (see Appendix 7). To check whether the GEPAQ that measured Western's masculinity and femininity traits correlate differently with Asian's masculinity and femininity traits, both measures were relevant.

### ***TMF.***

The TMF (Kachel et al., 2016) is a 6 question gender role test (see Chapter 2 Methods).

### ***German Extended Personal Attributes Questionnaire (GEPAQ).***

The GEPAQ (Runge et al., 1981) is a 16 item gender role test. Items are answered on a 5-point bipolar scale and are divided into 2 scales measuring masculinity (instrumentality) and femininity (expressivity). All items are answered on a 5-point bipolar scale, ranging from 1 to 5. For some items, the scorings are reversed. Example items asked include "cold"/"warm" and "decisive"/"not decisive" (see Appendix 7). A higher score on each scale indicates more masculinity/femininity.

### ***Validation of Gender Role Questionnaires.***

To evaluate the validity of the TMF and GEPAQ, we tested sex differences and the relationship between the two scales. First, a one-way MANOVA was used to investigate sex differences on the TMF and GEPAQ. Significant differences were observed between sexes for TMF masculinity and femininity scales. No significant differences were observed between sexes for GEPAQ masculinity and femininity scales. Post hoc Bonferroni test

revealed that females scored lower on the TMF masculinity scale and higher on the femininity scale than males (see Table 3.3). Females and males scored similarly on both GEPAQ scales. Secondly, there were significant positive correlations between the two masculinity scales ( $r(193) = 0.271, p < .001$ ) and the two femininity scales ( $r(193) = 0.210, p < .01$ ) of the questionnaires (see Appendix 13). Finally, the reliability tests found the TMF highly reliable, but the GEPAQ, especially the GEPAQ femininity scale's reliability questionable (see Table 3.2).

Most participants in the current study had congruent biological sex and gender identity, hence it was assumed that men and women would show behaviours corresponding to their gender roles (Athenstaedt, 2003; Kachel et al., 2016). This was observed for the TMF, but not in the GEPAQ. Current research provided some support that TMF is a valid gender role measure in the Malaysian context. However, the GEPAQ might correlate differently with traditional masculinity and femininity in the Asian culture; the GEPAQ, especially the GEPAQ femininity scale has questionable reliability. Nevertheless, given the positive correlations between the masculinity scales and the femininity scales of the TMF and GEPAQ suggested the TMF and GEPAQ subscales still measure masculinity and femininity slightly similarly, and we decided to analyze both measures despite the suboptimal validity of the GEPAQ.

**Table 3.2**

<i>Subscales From The TMF and GEPAQ</i>		
Subscale	Number Of Items	Cronbach's Alpha ( $\alpha$ )
TMF_Masculinity	6	.889
TMF_Femininity	6	.928
GEPAQ_Masculinity	8	.752
GEPAQ_Femininity	8	.674

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Note. TMF = Traditional Masculinity-Femininity Scale. GEPAQ = German Extended Personal Attributes Questionnaire.

### **Ten-Item Personality Inventory (TIPI).**

The TIPI (Gosling et al., 2003) measures Big-Five personality dimensions. It consists of 10 items with 2 items in each dimension: emotional stability (opposite of neuroticism), openness, conscientiousness, extraversion, and agreeableness. All questions are answered on a 7-point scale, ranging from 1 (“strongly disagree”) to 7 (“strongly agree”). For those items where an “agree” response would suggest low emotional stability/openness/conscientiousness/extraversion/agreeableness, the scorings were reversed. Examples of questions asked include “I see myself as critical, quarrelsome” and “I see myself as reserved, quiet” (see Appendix 8). A higher score in each independent dimension suggests higher emotional stability/openness/conscientiousness/extraversion/agreeableness.

### **Horizontal and Vertical Individualism and Collectivism Scale (INDCOL).**

The INDCOL (Triandis & Gelfand, 1998) is a 16-item questionnaire measuring four dimensions of collectivism and individualism, Vertical Collectivism (VC), Vertical Individualism (VI), Horizontal Collectivism (HC), and Horizontal Individualism (HI). In the current study, however, vertical and horizontal dimensions were not studied, hence VC and HC, and VI and HI were combined into Collectivism and Individualism respectively. All items are scored on a 9-point scale, ranging from 1 (“never or definitely no”) to 9 (“always or definitely yes”). Examples of items asked include “Winning is everything” and

“I feel good when I cooperate with others” (see Appendix 9). A higher score in one independent dimension indicates a more collectivist/individualist orientation.

### ***Procedure***

The study was an online questionnaire in Qualtrics, distributed at the university and through social media. Participants first read through the information sheet, fill in the consent form, and provided their demographic information (biological sex, gender identity, nationality). Then, all questionnaires were filled-in in random order. Participants were compensated for their time. The questionnaire took approximately 25 minutes to complete. Incomplete responses (N = 76) were excluded from the analysis. The final sample included 193 participants.

### **Results**

The mean and SD for each scale are summarized in Table 3.3. A one-way MANOVA was used to analyze sex differences in masculinity, femininity, openness, conscientiousness, extraversion, agreeableness, emotional stability, individualism, collectivism, autistic traits, and camouflaging. Apart from the TMF, no significant differences were observed between sexes for any of the variables.

To analyze the relationship between sex, gender role, personality traits, culture, autistic traits, and camouflaging, simultaneous multiple regression analyses were performed. For the first aim of study sex, gender role (masculinity, femininity), personality traits (openness, conscientiousness, extraversion, agreeableness, emotional stability), culture (individualism, collectivism), and autistic traits were the IVs, camouflaging behaviour was the DV. For the second aim, gender role, personality traits and culture were the IVs, while

the DV was autistic traits. The regressions were conducted separately for females and males. Since only four reported their sex as “Others”, they were not included in the split data analysis as the data were insufficient for analyses.

**Table 3.3**

*Mean (M) and Standard Deviation (SD) for Each Measure*

	Females (N = 101)		Males (N = 88)		Others (N = 4)		F(2, 190)	p
	M	SD	M	SD	M	SD		
TMF_Masculinity	3.683	1.188	4.407	1.166	4.167	1.700	8.768	< .001
TMF_Femininity	4.312	1.268	3.295	1.381	3.833	2.329	13.451	< .001
GEPAQ_Masculinity	3.215	0.576	3.288	0.549	3.531	0.213	0.896	.410
GEPAQ_Femininity	3.714	0.469	3.560	0.470	3.656	0.188	2.578	.079
Openness (TIPI)	4.792	1.190	4.710	1.210	4.625	1.436	0.131	.877
Conscientiousness (TIPI)	4.545	1.247	4.409	1.188	5.125	0.629	0.845	.431
Extraversion (TIPI)	3.738	1.537	3.585	1.309	4.125	0.854	0.469	.626
Agreeableness (TIPI)	4.703	1.063	4.420	1.058	4.500	0.408	1.699	.186
Emotional Stability (Opposite of Neuroticism) (TIPI)	3.822	1.401	3.960	1.216	3.625	1.887	0.331	.719
Individualism (INDCOL)	6.359	1.081	6.183	1.023	6.969	0.819	1.505	.225
Collectivism (INDCOL)	6.396	1.019	6.376	1.046	7.094	1.706	0.904	.407
AQ	68.24	8.272	69.17	8.043	65.25	3.304	0.659	.518
CAT-Q	103.90	19.058	106.58	15.983	104.25	17.056	0.545	.581

Note. N = Number of Participants. TMF = Traditional Masculinity-Femininity Scale.

GEPAQ = German Extended Personal Attributes Questionnaire. TIPI = Ten-Item

Personality Inventory. INDCOL = Horizontal and Vertical Individualism and

Collectivism Scale. AQ = Autism Spectrum Quotient Short Version (AQ 28). CAT-Q = Camouflaging Autistic Traits Questionnaire.

### ***Camouflaging***

Before interpreting the regression results, multiple data assumptions were checked. 1) Not all IVs were significantly correlated with CAT-Q scores, the DV. GEPAQ\_Masculinity, TMF\_Masculinity, Conscientiousness, Extraversion, and AQ scores correlated weakly with DV. 2) There was no issue of singularity or multi-collinearity since the strength of all variables was lower than 0.9,  $r_s < 0.744$ . 3) No collinearity issues were observed as for all IVs, all VIFs were lower than 2.706 and tolerance higher than 0.369. 4) No outliers were found or removed because all Cook's distance values were smaller than 0.161. 5) The Cohen's  $f^2$  showed a medium effect size,  $f^2 = 0.209$ , the sample size was sufficient to explain the regression model. 6) From the histogram for CAT-Q scores, it showed that the DV was normally distributed. 7) The data for the general regression model appeared to have a homoscedastic pattern, thus it was appropriate to use the regression model to explain the predictive relationship between IVs and DV. However, when looking at the relationships separately, GEPAQ\_Femininity, TMF\_Masculinity, TMF\_Femininity and Agreeableness scores showed a slight heteroscedastic pattern.

Higher GEPAQ femininity scores, higher TMF masculinity scores, lower conscientiousness and higher autistic traits were related to higher CAT-Q scores,  $R^2 = 0.173$ ,  $F(13, 179) = 2.873$ ,  $p < .001$  (see Table 3.4).

### **Table 3.4**



*Influence of Sex, Gender Role, Personality Traits, Culture and Autistic Traits on CAT-Q scores*

Predictor Variables	Outcome Measure CAT-Q Scores (N = 193)			Total R <sup>2</sup>	F(13, 179)
	Unstandardized Coefficients B	T			
(Constant)	38.401	1.663		0.173	2.873***
Sex	1.901	0.912			
Masculinity					
TMF_Masculinity	3.767	2.363*			
Scores					
GEPAQ_Masculinity	-2.548	-0.788			
Scores					
Femininity					
TMF_Femininity	2.486	1.799			
Scores					
GEPAQ_Femininity	6.451	1.992*			
Scores					
Personality Traits					
(TIPI)					
Openness	0.073	0.066			
Conscientiousness	-2.417	-2.146*			
Extraversion	-1.995	-1.816			
Agreeableness	-0.867	-0.602			
Emotional Stability					
(Opposite of	0.106	0.094			
Neuroticism)					
Culture (INDCOL)					
Individualism	1.788	1.372			
Collectivism	1.313	1.015			
Autistic Traits (AQ)	0.402	2.225*			

*Note.* \*\*\* $p < .001$ . \*\* $p < .01$ . \* $p < .05$ . N = Number of Participants. TMF = Traditional Masculinity-Femininity Scale. GEPAQ = German Extended Personal Attributes Questionnaire. TIPI = Ten-Item Personality Inventory. INDCOL = Horizontal and Vertical Individualism and Collectivism Scale. AQ = Autism Spectrum Quotient Short Version (AQ 28). CAT-Q = Camouflaging Autistic Traits Questionnaire.

### ***Autistic Traits***

For females, multiple data assumptions were checked before the regression results were interpreted. 1) Not all IVs were significantly correlated with DV. Other than Conscientiousness, Agreeableness and Emotional Stability scores, all IVs correlated either weakly or moderately with AQ scores. 2) There was no singularity or multicollinearity observed between all variables involved,  $rs < 0.782$ . 3) Collinearity issue was not found among IVs, with VIFs lower than 3.229 and tolerance higher than 0.310. 4) No outlier was identified nor removed because all Cook's distance values were smaller than 0.427. 5) The Cohen's  $f^2$  showed a large effect size,  $f^2 = 0.754$ , suggesting that there was a sufficient sample size for analysis. 6) From the histogram for AQ scores, it showed that the DV was normally distributed. 7) The data for the general regression model appeared to have a homoscedastic pattern, therefore it was appropriate for the regression analysis. However, when looking at the 11 relationships separately, TMF\_Masculinity, TMF\_Femininity, Openness, Extraversion and Agreeableness scores showed a slightly heteroscedastic pattern.

Lower extraversion was related to higher AQ scores within females,  $R^2 = 0.430$ ,  $F(11, 89) = 6.093$ ,  $p < .001$  (See Table 3.5).

**Table 3.5**

<i>Influence of Gender Role, Personality Traits and Culture on AQ scores (Females)</i>					
Predictor Variables	Outcome Measure AQ Scores ( $N = 101$ )			Total $R^2$	$F(11, 89)$
	Unstandardized Coefficients $B$	$t$			
(Constant)	105.765	12.027***		0.430	6.093***

Masculinity		
TMF_Masculinity	-0.113	-0.115
Scores		
GEPAQ_Masculinity	-3.193	-1.733
Scores		
Femininity		
TMF_Femininity	-1.317	-1.403
Scores		
GEPAQ_Femininity	-0.740	-0.365
Scores		
Personality Traits		
(TIPI)		
Openness	-0.635	-1.019
Conscientiousness	-0.013	-0.021
Extraversion	-2.318	-4.522***
Agreeableness	-1.098	-1.321
Emotional Stability		
(Opposite of	-0.135	-0.219
Neuroticism)		
Culture (INDCOL)		
Individualism	0.789	0.985
Collectivism	-0.936	-1.212

Note. \*\*\* $p < .001$ . \*\*  $p < .01$ . \* $p < .05$ .  $N$  = Number of Participants. TMF = Traditional Masculinity-Femininity Scale. GEPAQ = German Extended Personal Attributes Questionnaire. TIPI = Ten-Item Personality Inventory. INDCOL = Horizontal and Vertical Individualism and Collectivism Scale. AQ = Autism Spectrum Quotient Short Version (AQ 28).

For males, multiple data assumptions were checked before the regression results were interpreted. 1) Not all IVs were significantly correlated with the DV, AQ scores. GEPAQ\_Femininity, Individualism, Openness, Conscientiousness, Extraversion and Emotional Stability scores correlated with AQ scores at either weak or moderate levels. 2) There was also no singularity or multi-collinearity found between all variables involved,

$r_s < 0.628$ . 3) Collinearity issue was not observed among IVs, all VIFs were lower than 2.359 and tolerance higher than 0.424. 4) No outlier was found nor removed; all Cook's distance values were smaller than 0.223. 5) The Cohen's  $f^2$  showed a large effect size,  $f^2 = 0.506$ , so the sample size was sufficient for analysis. 6) From the histogram for AQ scores, it showed that the DV was normally distributed. 7) The data for the general regression model appeared to have a homoscedastic pattern, therefore it was appropriate for the regression analysis. However when looking at the relationships separately, GEPAQ\_Masculinity, GEPAQ\_Femininity and Openness scores showed a slightly heteroscedastic pattern. Note that lower Emotional Stability scores in TIPI indicated higher neuroticism.

In males, higher individualism, lower extraversion and higher neuroticism were related to higher AQ scores,  $R^2 = 0.336$ ,  $F(11, 76) = 3.489$ ,  $p < .001$  (see Table 3.6).

**Table 3.6**

<i>Influence of Gender Role, Personality Traits and Culture on AQ scores (Males)</i>					
Predictor Variables	Outcome Measure AQ Scores (N = 88)			Total $R^2$	$F(11, 76)$
	Unstandardized Coefficients $B$	$t$			
(Constant)	82.715	8.848***		0.336	3.489***
Masculinity					
TMF_Masculinity	-0.722	-0.729			
Scores					
GEPAQ_Masculinity	3.755	1.848			
Scores					
Femininity					
TMF_Femininity	-0.671	-0.888			
Scores					
GEPAQ_Femininity	-1.296	-0.685			
Scores					

Personality Traits (TIPI)		
Openness	-1.170	-1.530
Conscientiousness	-0.855	-1.228
Extraversion	-2.234	-3.057**
Agreeableness	0.479	0.515
Emotional Stability (Opposite of Neuroticism)	-1.711	-2.184*
Culture (INDCOL)		
Individualism	1.934	2.398*
Collectivism	-0.925	-1.114

*Note.* \*\*\* $p < .001$ . \*\*  $p < .01$ . \* $p < .05$ .  $N$  = Number of Participants. TMF = Traditional Masculinity-Femininity Scale. GEPAQ = German Extended Personal Attributes Questionnaire. TIPI = Ten-Item Personality Inventory. INDCOL = Horizontal and Vertical Individualism and Collectivism Scale. AQ = Autism Spectrum Quotient Short Version (AQ 28).

In conclusion, lower extraversion was related to higher AQ scores for both females and males. For males, higher individualism and higher neuroticism were also related to higher AQ scores in addition to lower extraversion. For females, there were no additional significant relationships.

## Discussion

### ***Camouflaging***

The first aim was to study how sex, gender role, personality traits, culture, and autistic traits influence camouflaging. The hypotheses (regardless of sex, a positive effect of femininity, neuroticism, collectivism, and autistic traits on camouflaging, and a negative effect of masculinity, openness, conscientiousness, extraversion, agreeableness, and

individualism on camouflaging) were partially supported. In the current neurotypical Malaysian sample, high femininity traits (GEPAQ), high self-reported masculinity (TMF), low conscientiousness and high autistic traits predicted more camouflaging.

In terms of gender role, in contrast to the hypothesis, high self-reported masculinity predicted camouflaging. Traits such as being more independent and self-confident and better leadership are usually associated with traditional masculinity (Bem, 1974; Runge et al., 1981). Individuals with high masculinity might hence find camouflaging necessary because they might consider displaying autistic traits a weakness.

As hypothesized, high femininity traits also predicted camouflaging. Traits such as gentleness and warmth are usually associated with traditional femininity and communion (Bem, 1974; Runge et al., 1981), but contradict with autistic traits (e.g., trouble understanding others' feelings). Individuals with high femininity might camouflage to present themselves as relatively less autistic and more socializing.

The predictive relation of masculinity and femininity on camouflaging was only observed for one scale of each of the two questionnaires used. The TMF and GEPAQ measured masculinity and femininity differently. The TMF asked participants to self-report their traditional masculinity and femininity, while the GEPAQ asked participants to rate themselves on specific traits related to masculinity or femininity. As mentioned in the Methods section, since no sex differences were observed for masculinity and femininity traits in the GEPAQ, the Western-developed GEPAQ might correlate differently with Asian's masculinity and femininity traits. For the current Malaysian sample, the GEPAQ might not be a valid nor reliable measure (see Table 3.2). Thus, the finding on femininity

traits might be less reliable, as culture might influence participants' views on traditional masculinity and femininity.

In the current study, only low conscientiousness indicated more camouflaging, partially supporting Robinson et al. (2020). Conscientiousness is generally characterized by organized, diligence and planned characteristics (McCrae & Costa, 1987), including planning to make a good impression. Conscientiousness is an important trait for successful academic and job performance. Thus, camouflaging was possibly practiced to maintain a good self-presentation and impression to others.

Cultural norms did not predict camouflaging. The current study only included a sample from the same culture, i.e. Malaysia, with hence relatively similar cultural values. This might explain the absence of a relationship between culture (individualism, collectivism) and camouflaging.

In the current study, high autistic traits predicted more camouflaging, in line with previous studies (Hull et al., 2018). Individuals with relatively high autistic traits seem motivated to camouflage autistic traits that are considered "improper" by society, to maintain social connections with others, and to get on and succeed in life. People with fewer autistic traits might not feel the need to camouflage their behaviour as there will be no autism traits to camouflage.

### ***Autistic Traits***

The second aim of the current study was to find out if gender role, personality traits, and culture were differently related to autistic traits in females and males. The hypotheses, that low masculinity and high femininity would indicate more autistic traits in males; and

high masculinity and low femininity would indicate more autistic traits in females, were rejected. Masculinity and femininity were not predictors of autistic traits. The second hypothesis, that high neuroticism and low openness, conscientiousness, extraversion, and agreeableness would indicate more autistic traits regardless of sex, was minimally supported. Only low extraversion predicted high autistic traits in both sexes. High neuroticism indicated high autistic traits as well, but only in males. The third hypothesis, that low individualism and high collectivism would indicate more autistic traits for both sexes were rejected. In contrast with expectations, high individualism predicted high autistic traits in males.

Masculinity and femininity did not predict autistic traits in neurotypical Malaysians, which is partially in line with the findings from Chapter 2, which reported demasculinization for both sexes and femininization for males with relatively high autistic traits only. Moreover, the findings from the current Chapter 3 were consistent within females and males, unlike the findings from Chapter 2. The current study had more participants than Chapter 2, and a different measure was introduced (GEPAQ). The current study suggests that masculinity and femininity are independent of autistic traits for non-autistic Malaysians. Autistic individuals were less likely to feel the need to comply with social gender expectations (Strang et al., 2018). Moreover, they tend to view gender as a spectrum more (Cooper et al., 2018). Autistic people may identify themselves with masculinity and femininity traits more "randomly", being less influenced by social norms. Thus, it was deduced that individuals with relatively high autistic traits would be the same, i.e. align with masculinity and femininity traits arbitrarily with a minor influence of social pressure.



These findings again suggest that the extreme male brain theory *does not* apply to gender role.

In personality traits, only low extraversion predicted high autistic traits in the current sample, partially in line with previous findings (Austin, 2005; Robinson et al., 2020, Wakabayashi et al., 2006b). People with relatively high autistic traits might display a more introverted personality, linked to limited social communication skills, and social withdrawal when compared with people with relatively low autistic traits (APA, 2013). High neuroticism indicated high autistic traits in males. Limited socializing skills and rigidity to changes and interruption in routine were associated with high autistic traits (APA, 2013; Hoekstra et al., 2010); which might lead to stress and irritation, causing more emotional instability in males with relatively high autistic traits. Although partially, these findings supported that specific personality traits are associated with autistic traits.

For culture, only high individualism predicted high autistic traits within males, in contrast with expectations. Autistic traits were associated with traits such as preferring to be alone/no interest in peers and decreased sharing of interests (APA, 2013), which might be linked to individualistic traits, e.g. autonomous, uniqueness and focusing on “self” (Triandis & Gelfand, 1998). Thus, neurotypical Malaysian males with relatively high autistic traits might show more individualistic traits. Although partially, these findings supported that specific cultural norms were more associated with autistic traits.

### ***Limitation***

The gender role measures used in the current study was not validated in the Asian culture, i.e. Malaysia. We tried to compensate for this by using two measures for gender role and

did a rough validation analysis. The measures did show a certain level of concurrent validity. However, since the GEPAQ did not show gender differences on either scale suggested that the measure does not capture feminine and masculine traits well in the current Malaysian sample.

The differences in the findings between the current study and past studies do provide some indications that personality or cultural traits might be presented differently among individuals from different cultures (e.g. Kajonius, 2017). The measures might be suitable to measure traits in Western samples but might not be optimal for Asian samples.

### ***Chapter Conclusion***

As the first study to research the relationship between biological sex, gender role (masculinity, femininity), personality traits (openness, conscientiousness, extraversion, agreeableness, neuroticism), culture (individualism, collectivism), autistic traits and camouflaging in neurotypical individuals in an Asian country, i.e. Malaysia, the current study shed light on how each factor predicted camouflaging and autistic traits.

High femininity traits (GEPAQ), self-reported masculinity (TMF) and autistic traits, and low conscientiousness predicted camouflaging. Culture was found unproductive of camouflaging behaviour. Camouflaging *is* influenced more by masculinity, femininity and certain personality traits (conscientiousness), compared to biological sex differences.

Masculinity and femininity were found unproductive of autistic traits. With an increased number of participants and the introduction of a new measure (GEPAQ), the current findings provided additional support to Chapter 2's findings. The extreme male brain theory was hence *not* generalizable to gender role. Low extraversion predicted high

autistic traits in non-autistic individuals. High neuroticism indicated high autistic traits in non-autistic males only. High individualism also predicted autistic traits within males. Personality traits and culture *did* have some association with autistic traits.

## Chapter 4: General Discussion

### Research Overview and Implications

#### *Research Summary*

Gender tends to be viewed more as non-binary by autistic individuals than by non-autistic people (Cooper et al., 2018), suggesting the importance to research on other features of “gender” than biological sex only, i.e. gender role. In the current thesis, “gender role” refers to how much an individual align themselves with traditionally masculine or feminine traits. The current thesis aimed to discover the influence of gender role, in addition to biological sex on autistic traits and camouflaging behaviour in non-autistic neurotypical Malaysians.

Study 1 aimed to replicate past findings on the relationship between biological sex, systemizing, empathizing and autistic traits (e.g. Wakabayashi et al., 2007) in an Asian sample. In contrast with the hypothesis, no sex difference was observed for systemizing. The current findings suggested that neurotypical females *did* demonstrate better empathizing than males in Malaysia. Inconsistent with previous research (e.g. Stauder et al., 2011), systemizing was unrelated to autistic traits in Malaysians. Empathizing was negatively correlated with autistic traits, in line with previous studies (e.g. Stauder et al., 2011).

Consistent with past research (e.g. Stauder et al., 2011), in Study 1 demasculinization and feminization were observed with higher autistic traits in males. In females, however, demasculinization was observed while femininity was unrelated to

autistic traits, inconsistent with past research (e.g. Stauder et al., 2011). Moreover, this predictive relation of masculinity and femininity on autistic traits was observed in masculinity and femininity traits, but not in self-reported masculinity/femininity. Westerners and Asians seem to have different views on masculinity and femininity traits (see Chapter 2 Methods). Moreover, Asians, mostly collectivists, seem to have relatively higher autistic traits than the mostly individualist Westerners (Freeth et al., 2013). Culture was implied to moderate the relationship between masculinity, femininity, and autistic traits.

Study 2 found that high self-reported masculinity (TMF), femininity traits (GEPAQ), and autistic traits, and low conscientiousness predicted camouflaging in Malaysians. However, the predictive relationship of masculinity and femininity on camouflaging was observed for only one scale of each of the two gender role tests, i.e. self-reported masculinity (TMF) and femininity traits (GEPAQ). Culture might moderate the relationship between masculinity, femininity, and camouflaging. Westerners and Asians seem not to share similar views on masculinity and femininity traits (see Chapter 3 Methods), which might indirectly influence the relationship between gender role and camouflaging. Nevertheless, masculinity and femininity *did* seem to associate with camouflaging, along with certain personality traits (conscientiousness) and autistic traits.

Study 2 did not show any relations between masculinity, femininity, and autistic traits, suggesting that gender role was independent of autistic traits in neurotypical Malaysians, contradicting previous research (e.g. Stauder et al., 2011). Partially supporting Robinson et al. (2020), extraversion was negatively correlated to autistic traits. Although neuroticism and individualism positively predicted autistic traits only in males,

the current findings *did* support the claim that certain personality and cultural traits were associated with autistic traits.

### ***Main Objective of Research***

The main focus of the current thesis lies on Baron-Cohen's extreme male brain of autism theory, where masculinization among autistic individuals was suggested. However, the idea was based on systemizing and empathizing abilities of Westerners; and tends to be generalized to gender role even when the few research studies investigating the relationship between gender role and autistic traits had suggested otherwise (e.g. Cooper et al., 2018). The current thesis intended to provide some input to the existing literature, not to reject Baron-Cohen's theory but to draw lines between systemizing-empathizing and masculinity-femininity, and to investigate the relationship between masculinity, femininity and autistic traits among neurotypical individuals.

### ***Research Implications***

It is supported by the current findings in both Study 1 and 2 that masculinization is *not* extendable to gender role. In Study 1, demasculinization and feminization appeared in males, while in females only demasculinization appeared related to autistic traits. In Study 2, masculinity and femininity were found unrelated to autistic traits in both sexes. Since Study 2 had a larger sample and a more balanced male-to-female ratio than Study 1, the current thesis thus supported the idea that masculinity and femininity *are* independent of autistic traits in non-autistic Malaysians. Individuals with relatively higher autistic traits might align with masculinity and femininity randomly. Since they might not

feel pressured to comply with social gender norms, they identified with the gender spectrum as they see fit.

Moreover, the current findings reflect specifically the Malaysian culture only. The direction of the relationship between masculinity, femininity and autistic traits might be different in other non-Western cultures since Westerners and Asians seem to view masculinity and femininity traits differently. In both the BSRI and GEPAQ that measured masculinity and femininity traits, the validity and reliability of the measures were questionable (see Chapter 2's principal factor analysis of BSRI and Chapter 3's reliability test of GEPAQ). Not only do Westerners and Asians have different ideas on masculinity and femininity traits, but collectivists also seem to have relatively higher autistic traits than individualists (Freeth et al., 2013). Culture seems to mediate the relationship between masculinity, femininity, and autistic traits in non-autistic Malaysians. Different features of "gender" should be considered when developing and administering ASC assessments in clinical settings because different "genders" might present autistic traits symptoms differently.

In terms of the relationship between biological sex, systemizing, empathizing and autistic traits, Study 1 found partial support for Baron-Cohen's extreme male brain theory; males were less empathizing than females, and autistic traits associated negatively with empathizing. However, inconsistent with previous claims, not only did males *not* have better systemizing than females, systemizing and autistic traits *were* unrelated. However, there is a possibility that a ceiling effect occurred due to the homogenous sample of Sciences students in Study 1, who are known to be more systemizing than Art and Humanities students (Kidron et al., 2018). Thus, rather than solely studying the influence

of sex differences on systemizing-empathizing skills, it is also important to study how other possible factors (i.e. course of study) and interaction between factors might influence systemizing and empathizing skills.

In Study 2, the results provided new insights into the relationship between sex, masculinity, femininity, personality traits, culture norms, autistic traits, and camouflaging behaviour. Individual differences in wanting social acceptance and in adhering to gendered social expectations *did* have some influence on camouflaging behaviour, instead of biological sex. Although possible independence of cultural norms from camouflaging was suggested, the homogenous Malaysian university student samples in Study 2 might have influenced the study results as well. Nevertheless, the current findings suggest a possibility that culture plays the role of moderator/mediator on the relationship between gender role and camouflaging in neurotypical Malaysians, rather than being a direct influencing factor on camouflaging. Since the reliability of GEPAQ is doubted (see Chapter 3 Methods), it is plausible that Westerners and Asians viewed masculinity and femininity traits differently. Thus, the current findings reflect the relationship between masculinity, femininity and camouflaging in Malaysian culture only.

Moreover, Study 2 also implied that certain personality (extraversion, neuroticism) or cultural (individualism) traits can predict autistic traits, thus providing some assistance in diagnosing autistic traits and in identifying camouflaging in clinical settings. To provide a more accurate diagnosis, clinicians can pay more attention to personality traits and culture, i.e. assess individuals' personality and cultural background in addition to autistic traits. This might help to reduce under- and misdiagnosis of ASC due to camouflaging and get insights into the underlying mechanisms for certain behaviours. Moreover,



continuous camouflaging has been shown to bring exhaustion as it required high levels of emotional, mental, and physical effort to maintain (Hull et al., 2017; Lai et al., 2016). Camouflaging might result in more depression symptoms, mental distress, and poor life quality (Cage et al., 2017; Cassidy et al., 2019). If properly identified, suitable advice, assistance and interventions can be provided in time. In addition, awareness could also be raised among the general population to learn to accept and support autistic individuals, protecting them against mental illness (Cage et al., 2017).

### **Strengths, Limitations and Directions for Future Research**

The current thesis provided valuable insights and filled the literature gap for autistic traits and camouflaging behaviour in an Asian country. Gender role, i.e. masculinity and femininity in ASC is still a relatively new topic. The relationship between gender role and autistic traits (e.g. Stauder et al., 2011) has been studied to a limited extent, while the relation between gender role and camouflaging has not been properly studied. The current thesis focused on finding out how masculinity and femininity were related to autistic traits and camouflaging in neurotypical Asians, i.e. Malaysians. Moreover, only a small number of studies (e.g. Robinson et al., 2020) examined the role of personality traits or cultural norms on autistic traits and camouflaging. The current thesis was one of the first few to research their relationship outside Western cultures, i.e. Malaysian culture.

However, the current thesis also had its limitations. Firstly, the gender role questionnaires were understudied in Asia. To compensate for this limitation, we added some validation steps to the current study. In Study 1, the validity of the BSRI was checked through factor analysis. The BSRI was not as suitable in Asia as in the West to

measure gender role, at least in the Malaysian context, in line with past studies (Ward & Sethi, 1986). Given that the BSRI is relatively old, alternatively, the TMF was also introduced. The correlation and the reliability tests suggested that the BSRI and TMF had some concurrent validity and are highly reliable. In Study 2, the reliability of the GEPAQ, which also measured masculinity and femininity traits like the BSRI, was found questionable, although the TMF and GEPAQ did show some concurrent validity. The TMF (self-reported masculinity and femininity) on the other hand, showed not only concurrent validity with both BSRI and GEPAQ, but also had a good reliability level in both studies. Therefore, it can be inferred either that the BSRI and GEPAQ correlated differently with modern masculinity and femininity traits, or that the BSRI and GEPAQ are not ideal measures of masculinity and femininity traits in the current Malaysian population, i.e. mostly private university Sciences students. The findings from the current thesis might be influenced by the validity and reliability of the measures.

The findings from the current study samples were also difficult to generalize to the general population. While an a priori power analysis was done to estimate the minimum number of participants needed to detect an effect, insufficient male samples were recruited for Study 1. This might affect the findings in Study 1 (Faber & Fonseca, 2014). Nevertheless, in Study 2, a sufficient number of participants and a more balanced male-to-female ratio were reached. Thus, it is feasible that the findings in the current thesis may not have been impacted too much.

Moreover, the samples from both studies consisted of mostly Malaysian Chinese student samples (Study 1: 76.3%, Study 2: 83.9%). The findings might be difficult to

generalize to other Malaysian ethnic groups (i.e. Bumiputera, Malays and various indigenous people; and Indian communities; Department of Statistics Malaysia, 2021). Furthermore, the participants recruited in both studies were mostly students from private universities. The student samples may have a relatively high socioeconomic status (SES) (capable to afford expensive school fees) and live in an urban area.

Additionally, the homogenous sample background (e.g. Sciences background, private university students) in both Study 1 and 2 might lead to the disappearance of some differences in the results. Most participants were from a Sciences and Engineering background, which tend to demonstrate better systemizing and worse empathizing compared to individuals from a Humanities and Social Sciences background (Kidron et al., 2018). The absence of sex difference in systemizing might be the result of both insufficient male samples and a large number of Sciences background participants. The lack of sex difference in autistic traits in both Study 1 and 2 might also result from profession/study course (Wakabayashi et al., 2006a).

The probably high SES and urban sample might also be less likely to be influenced by the traditional mindset on masculinity and femininity due to more exposure. Individuals with a higher SES were shown more open-minded and less conservative (Jonassaint et al., 2011). It might be plausible that high SES individuals feel less compelled to fit themselves into traditional gender expectations, thus minimizing the differences in masculinity and femininity between both sexes. Moreover, since females in the current sample were university students, they might be less likely to pursue traditionally feminine “jobs”, e.g. housewives, preschool teachers, etc. The relationship between masculinity,

femininity, autistic traits, and camouflaging might be influenced directly. We did not collect this part of the demographic information from the participants, thus the influence of these factors on the results is speculative.

Further research should aim to recruit a more balanced sample that can properly reflect the general Malaysian population. Replication of studies can be done with a larger sample containing both autistic and non-autistic groups to ensure generalizability of the claims since the current thesis only studied neurotypical individuals. Samples from different age groups, ethnic groups, and educational and socioeconomic levels should also be included for better generalizability of the current findings. Furthermore, there are studies suggesting differences in performance in factors (e.g. autistic traits) between different groups. For example, high SES is generally associated with high openness, conscientiousness and extraversion, and low neuroticism (Jonassaint et al., 2011), which might indirectly influence performance on the TIPI in Study 2. As discussed before (see Chapter 2 Discussion), individuals with Sciences and Engineering background seem to show better systemizing and more autistic traits than individuals from other backgrounds (e.g. Humanities and Social Sciences) (e.g. Kidron et al., 2018), which might influence Study 1's findings. Thus, it is important to recruit heterogeneous samples so that we would not miss the differences in the relationship between gender role, personality traits, cultural norms, autistic traits and camouflaging behaviour, if present.

Since the current thesis focused on how the other features of "gender", i.e. gender role associated with autistic traits and camouflaging, the involvement of participants from the LGBTQ+ group, who tend to have incongruent biological sex, gender role and gender

identity is recommended as well. Autistic individuals identify with non-heterosexuality more than non-autistic individuals (George & Stokes, 2017). Moreover, individuals with relatively high autistic traits tend to report being unable to identify with any traditional categories of sexual orientation (e.g. homo-, bisexual) (Rudolph et al., 2018). Thus, the relationship between masculinity, femininity and autistic traits might be different for the LGBTQ+ community and should be investigated more.

Secondly, although the measures introduced in both studies were validated reliable measures in Western samples, some were not validated in Asian samples, i.e. Malaysians (e.g. TMF, CAT-Q); which might have impacted the validity of the current results. Although only rough analyses were performed, the TMF seems to be a valid and reliable gender role measure. The validity of the BSRI and GEPAQ and the reliability of the GEPAQ were found questionable in our Malaysian samples. However, the validity and reliability of the other measures were not checked as this was not the main aim of the current thesis. Nevertheless, the differences in findings from the current thesis with past research may be suggesting actual differences in the presentation of personality or cultural traits among individuals with different cultural backgrounds. Studying the reliability and validity of measures across cultures before using the measures in scientific studies is advised for future studies to minimize the possible impact of unvalidated and unreliable measures on the results.

The current findings suggest a possible influence of culture on the relationship between gender role, personality traits, autistic traits, and camouflaging behaviour. Although cross-cultural comparison was not made in the current thesis, Malaysians seem

to score differently in the measures (e.g. AQ) than the Westerners, similar to past research (e.g. Freeth et al., 2013). It is better to first understand how Asians, especially Malaysians view these factors (e.g. masculinity, autistic traits). Some additional questions can be asked to study how Malaysian feel about the items and use the information to help in interpreting the results of questionnaires. For example, in terms of gender role questionnaires, researchers can ask whether participants find those gender traits to be more masculine or feminine, or gender unrelated.

Moreover, it seems that differences in factors (e.g. autistic traits) can even be found among Western countries or Asian countries. For example, autistic traits manifested differently between Finnish and British broader autism phenotype individuals (Mandy et al., 2014). Empathizing was also differently demonstrated between Japanese (e.g. Wakabayashi et al., 2007) and Chinese (Zheng & Zheng, 2015). Therefore, more studies in different Asian samples, focusing on the themes introduced by the current thesis are recommended. Cross-cultural comparison of the results between Malaysian and other Asian and Western samples should be conducted as well. More studies are needed to establish the generalizability of the current ASC theories across cultures.

## **Overall Conclusions**

The current thesis provided partial support for Baron-Cohen's extreme male brain theory in systemizing and empathizing but was unable to find support that the theory is extendable to gender role in a broader sense in neurotypical Malaysians. While Study 1 suggested demasculinization, Study 2 suggested independence of masculinity and femininity in autistic traits. Study 2 also expanded the findings on autistic traits to

personality traits and cultural norms. Certain personality (extraversion, neuroticism) and cultural (individualism) traits were implied to associate with autistic traits to some extent. Additionally, in Study 2, masculinity, femininity, and certain personality traits, i.e. conscientiousness was found related to camouflaging behaviours, in addition to autistic traits.

Sampling from a more general population, e.g. different educational and socioeconomic levels, is suggested for better generalizability of the current findings. Validation of measures across different cultures is also recommended.

Importantly, the current findings suggest that different features of “gender” should be considered when developing and administering ASC assessments. Moreover, gender role, personality traits and cultural norms can provide assistance in diagnosing autistic traits and in identifying camouflaging in clinical settings.

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## Appendix 1

### The Adult Autism Spectrum Quotient Short Version (AQ 28) With Scoring Key

*Responses that score 1 point are marked. Other responses score 0. For total score, sum all items.*

		<b>definitel y agree</b>	<b>slightly agree</b>	<b>slightly disagre e</b>	<b>definitel y disagre e</b>
1.	I prefer to do things with others rather than on my own.	1	2	3	4
2.	I prefer to do things the same way over and over again.	4	3	2	1
3.	If I try to imagine something, I find it very easy to create a picture in my mind.	1	2	3	4
4.	I frequently get so strongly absorbed in one thing that I lose sight of other things.	4	3	2	1
5.	I usually notice car number plates or similar strings of information.	4	3	2	1
6.	When I'm reading a story, I can easily imagine what the characters might look like.	1	2	3	4
7.	I am fascinated by dates.	4	3	2	1
8.	In a social group, I can easily keep track of several different people's conversations.	1	2	3	4

9.	I find social situations easy.	1	2	3	4
10.	I would rather go to a library than a party.	4	3	2	1
11.	I find making up stories easy.	1	2	3	4
12.	I find myself drawn more strongly to people than to things.	1	2	3	4
13.	I am fascinated by numbers.	4	3	2	1
14.	When I'm reading a story, I find it difficult to work out the characters' intentions.	4	3	2	1
15.	I find it hard to make new friends.	4	3	2	1
16.	I notice patterns in things all the time.	4	3	2	1
17.	It does not upset me if my daily routine is disturbed.	1	2	3	4
18.	I find it easy to do more than one thing at once.	1	2	3	4
19.	I enjoy doing things spontaneously.	1	2	3	4
20.	I find it easy to work out what someone is thinking or feeling just by looking at their face.	1	2	3	4



21.	If there is an interruption, I can switch back to what I was doing very quickly.	1	2	3	4
22.	I like to collect information about categories of things (e.g. types of car, types of bird, types of train, types of plant, etc.).	4	3	2	1
23.	I find it difficult to imagine what it would be like to be someone else.	4	3	2	1
24.	I enjoy social occasions.	1	2	3	4
25.	I find it difficult to work out people's intentions.	4	3	2	1
26.	New situations make me anxious.	4	3	2	1
27.	I enjoy meeting new people.	1	2	3	4
28.	I find it very easy to play games with children that involve pretending.	1	2	3	4

## Appendix 2

### The Systemizing Quotient-Revised (SQ-R) With Scoring Key

*Responses that score 1 or 2 points are marked. Other responses score 0. For total score, sum all items.*

		strongly agree	slightly agree	slightly disagree	strongly disagree
1.	I find it very easy to use train timetables, even if this involves several connections.	2	1		
2.	I like music or book shops because they are clearly organised.	2	1		
3.	I would not enjoy organising events e.g. fundraising evenings, fetes, conferences.			1	2
4.	When I read something, I always notice whether it is grammatically correct.	2	1		
5.	I find myself categorising people into types (in my own mind).	2	1		
6.	I find it difficult to read and understand maps.			1	2
7.	When I look at a mountain, I think about how precisely it was formed.	2	1		

8.	I am not interested in the details of exchange rates, interest rates, stocks and shares.			1	2
9.	If I were buying a car, I would want to obtain specific information about its engine capacity.	2	1		
10.	I find it difficult to learn how to programme video recorders.			1	2
11.	When I like something I like to collect a lot of different examples of that type of object, so I can see how they differ from each other.	2	1		
12.	When I learn a language, I become intrigued by its grammatical rules.	2	1		
13.	I like to know how committees are structured in terms of who the different committee members represent or what their functions are.	2	1		
14.	If I had a collection (e.g. CDs, coins, stamps), it would be highly organised.	2	1		
15.	I find it difficult to understand instruction manuals for putting appliances together.			1	2
16.	When I look at a building, I am curious about the precise way it was constructed.	2	1		

17.	I am not interested in understanding how wireless communication works (e.g. mobile phones).			1	2
18.	When travelling by train, I often wonder exactly how the rail networks are coordinated.	2	1		
19.	I enjoy looking through catalogues of products to see the details of each product and how it compares to others.	2	1		
20.	Whenever I run out of something at home, I always add it to a shopping list.	2	1		
21.	I know, with reasonable accuracy, how much money has come in and gone out of my bank account this month.	2	1		
22.	When I was young I did not enjoy collecting sets of things e.g. stickers, football cards etc.			1	2
23.	I am interested in my family tree and in understanding how everyone is related to each other in the family.	2	1		
24.	When I learn about historical events, I do not focus on exact dates.			1	2
25.	I find it easy to grasp exactly how odds work in betting.	2	1		

26.	I do not enjoy games that involve a high degree of strategy (e.g. chess, Risk, Games Workshop).			1	2
27.	When I learn about a new category I like to go into detail to understand the small differences between different members of that category.	2	1		
28.	I do not find it distressing if people who live with me upset my routines.			1	2
29.	When I look at an animal, I like to know the precise species it belongs to.	2	1		
30.	I can remember large amounts of information about a topic that interests me e.g. flags of the world, airline logos.	2	1		
31.	At home, I do not carefully file all important documents e.g. guarantees, insurance policies			1	2
32.	I am fascinated by how machines work.	2	1		
33.	When I look at a piece of furniture, I do not notice the details of how it was constructed.			1	2
34.	I know very little about the different stages of the legislation process in my country.			1	2
35.	I do not tend to watch science documentaries on television or read articles about science and nature.			1	2

36.	If someone stops to ask me the way, I'd be able to give directions to any part of my home town.	2	1		
37.	When I look at a painting, I do not usually think about the technique involved in making it.			1	2
38.	I prefer social interactions that are structured around a clear activity, e.g. a hobby.	2	1		
39.	I do not always check off receipts etc. against my bank statement.			1	2
40.	I am not interested in how the government is organised into different ministries and departments.			1	2
41.	I am interested in knowing the path a river takes from its source to the sea.	2	1		
42.	I have a large collection e.g. of books, CDs, videos etc.	2	1		
43.	If there was a problem with the electrical wiring in my home, I'd be able to fix it myself.	2	1		
44.	My clothes are not carefully organised into different types in my wardrobe.			1	2

45.	I rarely read articles or webpages about new technology.			1	2
46.	I can easily visualise how the motorways in my region link up.	2	1		
47.	When an election is being held, I am not interested in the results for each constituency.			1	2
48.	I do not particularly enjoy learning about facts and figures in history.			1	2
49.	I do not tend to remember people's birthdays (in terms of which day and month this falls).			1	2
50.	When I am walking in the country, I am curious about how the various kinds of trees differ.	2	1		
51.	I find it difficult to understand information the bank sends me on different investment and saving systems.			1	2
52.	If I were buying a camera, I would not look carefully into the quality of the lens.			1	2
53.	If I were buying a computer, I would want to know exact details about its hard drive capacity and processor speed.	2	1		

54.	I do not read legal documents very carefully.			1	2
55.	When I get to the checkout at a supermarket I pack different categories of goods into separate bags.	2	1		
56.	I do not follow any particular system when I'm cleaning at home.			1	2
57.	I do not enjoy in-depth political discussions.			1	2
58.	I am not very meticulous when I carry out D.I.Y or home improvements.			1	2
59.	I would not enjoy planning a business from scratch to completion.			1	2
60.	If I were buying a stereo, I would want to know about its precise technical features.	2	1		
61.	I tend to keep things that other people might throw away, in case they might be useful for something in the future.	2	1		
62.	I avoid situations which I can not control.	2	1		
63.	I do not care to know the names of the plants I see.			1	2



64.	When I hear the weather forecast, I am not very interested in the meteorological patterns.			1	2
65.	It does not bother me if things in the house are not in their proper place.			1	2
66.	In maths, I am intrigued by the rules and patterns governing numbers.	2	1		
67.	I find it difficult to learn my way around a new city.			1	2
68.	I could list my favourite 10 books, recalling titles and authors' names from memory.	2	1		
69.	When I read the newspaper, I am drawn to tables of information, such as football league scores or stock market indices.	2	1		
70.	When I'm in a plane, I do not think about the aerodynamics.			1	2
71.	I do not keep careful records of my household bills.			1	2
72.	When I have a lot of shopping to do, I like to plan which shops I am going to visit and in what order.	2	1		
73.	When I cook, I do not think about exactly how different methods and ingredients contribute to the final product.			1	2

74.	When I listen to a piece of music, I always notice the way it's structured.	2	1		
75.	I could generate a list of my favourite 10 songs from memory, including the title and the artist's name who performed each song.	2	1		

### Appendix 3

#### The Empathizing Quotient (EQ) (60 item version) With Scoring Key

*Responses that score 1 or 2 points are marked. Other responses score 0. For total score, sum all items.*

		<b>strongly agree</b>	<b>slightly agree</b>	<b>slightly disagree</b>	<b>strongly disagree</b>
1	I can easily tell if someone else wants to enter a conversation.	2	1	0	0
2	I prefer animals to humans.	0	0	0	0
3	I try to keep up with the current trends and fashions.	0	0	0	0
4	I find it difficult to explain to others things that I understand easily, when they don't understand it first time.	0	0	1	2
5	I dream most nights.	0	0	0	0
6	I really enjoy caring for other people.	2	1	0	0
7	I try to solve my own problems rather than discussing them with others.	0	0	0	0
8	I find it hard to know what to do in a social situation.	0	0	1	2
9	I am at my best first thing in the morning.	0	0	0	0
10	People often tell me that I went too far in driving my point home in a discussion.	0	0	1	2
11	It doesn't bother me too much if I am late meeting a friend.	0	0	1	2
12	Friendships and relationships are just too difficult, so I tend not to bother with them.	0	0	1	2
13	I would never break a law, no matter how minor.	0	0	0	0
14	I often find it difficult to judge if something is rude or polite.	0	0	1	2
15	In a conversation, I tend to focus on my own thoughts rather than on what my listener might be thinking.	0	0	1	2

16	I prefer practical jokes to verbal humour.	0	0	0	0
17	I live life for today rather than the future.	0	0	0	0
18	When I was a child, I enjoyed cutting up worms to see what would happen.	0	0	1	2
19	I can pick up quickly if someone says one thing but means another.	2	1	0	0
20	I tend to have very strong opinions about morality	0	0	0	0
21	It is hard for me to see why some things upset people so much.	0	0	1	2
22	I find it easy to put myself in somebody else's shoes.	2	1	0	0
23	I think that good manners are the most important thing a parent can teach their child.	0	0	0	0
24	I like to do things on the spur of the moment.	0	0	0	0
25	I am good at predicting how someone will feel.	2	1	0	0
26	I am quick to spot when someone in a group is feeling awkward or uncomfortable.	2	1	0	0
27	If I say something that someone else is offended by, I think that that's their problem, not mine.	0	0	1	2
28	If anyone asked me if I like their haircut, I would reply truthfully, even if I didn't like it.	0	0	1	2
29	I can't always see why someone should have felt offended by a remark.	0	0	1	2
30	People often tell me that I am very unpredictable.	0	0	0	0
31	I enjoy being the centre of attention at any social gathering.	0	0	0	0
32	Seeing people cry doesn't really upset me.	0	0	1	2
33	I enjoy having discussions about politics.	0	0	0	0
34	I am very blunt, which some people take to be rudeness, even though this is unintentional.	0	0	1	2
35	I don't tend to find social situations confusing	2	1	0	0

36	Other people tell me I am good at understanding how they are feeling and what they are thinking.	2	1	0	0
37	When I talk to people, I tend to talk about their experiences rather than my own.	2	1	0	0
38	It upsets me to see animals in pain.	2	1	0	0
39	I am able to make decisions without being influenced by people's feelings.	0	0	1	2
40	I can't relax until I have done everything I had planned to do that day.	0	0	0	0
41	I can easily tell if someone else is interested or bored with what I am saying.	2	1	0	0
42	I get upset if I see people suffering on news programmes.	2	1	0	0
43	Friends usually talk to me about their problems as they say I am very understanding.	2	1	0	0
44	I can sense if I am intruding, even if the other person doesn't tell me.	2	1	0	0
45	I often start new hobbies but quickly become bored with them and move on to something else.	0	0	0	0
46	People sometimes tell me that I have gone too far with teasing.	0	0	1	2
47	I would be too nervous to go on a big rollercoaster.	0	0	0	0
48	Other people often say that I am insensitive, though I don't always see why.	0	0	1	2
49	If I see a stranger in a group, I think that it is up to them to make an effort to join in.	0	0	1	2
50	I usually stay emotionally detached when watching a film.	0	0	1	2
51	I like to be very organised in day to day life and often make lists of the chores I have to do.	0	0	0	0
52	I can tune into how someone else feels rapidly and intuitively.	2	1	0	0
53	I don't like to take risks.	0	0	0	0

54	I can easily work out what another person might want to talk about.	2	1	0	0
55	I can tell if someone is masking their true emotion.	2	1	0	0
56	Before making a decisions I always weigh up the pros and cons.	0	0	0	0
57	I don't consciously work out the rules of social situations.	2	1	0	0
58	I am good at predicting what someone will do.	2	1	0	0
59	I tend to get emotionally involved with a friend's problems.	2	1	0	0
60	I can usually appreciate the other person's viewpoint, even if I don't agree with it.	2	1	0	0

## Appendix 4

### The Bem Sex Role Inventory (BSRI) With Scoring Key

Items for evaluating masculinity	Items for evaluating femininity	Non-typed items
1.- Self-reliant.	2.- Yielding.	3.- Helpful.
4.- Defends own beliefs.	5.- Cheerful.	6.- Moody.
7.- Independent.	8.- Shy.	9.- Conscientious.
10.- Athletic.	11.- Affectionate.	12.- Theatrical.
13.- Assertive.	14.- Not susceptible to flattery.	15.- Happy.
16.- Strong personality.	17.- Loyal.	18.- Unpredictable.
19.- Forceful.	20.- Feminine.	21.- Reliable.
22.- Analytical.	23.- Sympathetic.	24.- Jealous.
25.- Leadership ability.	26.- Sensitive to others' needs.	27.- Truthful.
28.- Willing to take risks.	29.- Understanding.	30.- Secretive.
31.- Makes decisions easily.	32.- Compassionate.	33.- Sincere.
34.- Self-sufficient.	35.- Eager to soothe hurt feelings.	36.- Conceited.
37.- Dominant.	38.- Soft-spoken.	39.- Likeable.
40.- Masculine.	41.- Warm.	42.- Solemn.
43.- Willing to take a stand.	44.- Tender.	45.- Friendly.
46.- Aggressive.	47.- Gullible.	48.- Inefficient.
49.- Acts as a leader.	50.- Childlike.	51.- Adaptable.
52.- Individualistic.	53.- Does not use harsh language.	54.- Unsystematic.
55.- Competitive.	56.- Loves children.	57.- Tactful.
58.- Ambitious.	59.- Gentle.	60.- Conventional.

Source: Hyde (1995, p. 134).

Range from 1 ("Never or almost never true") to 7 ("Always or almost always true")





## Appendix 6

### The Camouflaging Autistic Traits Questionnaire (CAT-Q) With Scoring Key

Please read each statement below and choose the answer that best fits your experiences during social interactions.

Strongly Disagree (1)	Disagree (2)	Somewhat Disagree (3)	Neither Agree nor Disagree (4)	Somewhat Agree (5)	Agree (6)	Strongly Agree (7)
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1. When I am interacting with someone, I deliberately copy their body language or facial expressions
2. I monitor my body language or facial expressions so that I appear relaxed
3. I rarely feel the need to put on an act in order to get through a social situation\*
4. I have developed a script to follow in social situations (for example, a list of questions or topics of conversation)
5. I will repeat phrases that I have heard others say in the exact same way that I first heard them
6. I adjust my body language or facial expressions so that I appear interested by the person I am interacting with
7. In social situations, I feel like I'm 'performing' rather than being myself
8. In my own social interactions, I use behaviours that I have learned from watching other people interacting
9. I always think about the impression I make on other people
10. I need the support of other people in order to socialise
11. I practice my facial expressions and body language to make sure they look natural
12. I don't feel the need to make eye contact with other people if I don't want to\*
13. I have to force myself to interact with people when I am in social situations
14. I have tried to improve my understanding of social skills by watching other people
15. I monitor my body language or facial expressions so that I appear interested by the person I am interacting with
16. When in social situations, I try to find ways to avoid interacting with others
17. I have researched the rules of social interactions (for example, by studying psychology or reading books on human behaviour) to improve my own social skills
18. I am always aware of the impression I make on other people
19. I feel free to be myself when I am with other people\*
20. I learn how people use their bodies and faces to interact by watching television or films, or by reading fiction
21. I adjust my body language or facial expressions so that I appear relaxed
22. When talking to other people, I feel like the conversation flows naturally\*

23. I have spent time learning social skills from television shows and films, and try to use these in my interactions
24. In social interactions, I do not pay attention to what my face or body are doing\*
25. In social situations, I feel like I am pretending to be 'normal'

Scoring:

All items are scored 1-7, with higher scores reflecting greater camouflaging. Items with an asterisk (\*) should be reverse scored.

Factors:

Compensation = 1, 4, 5, 8, 11, 14, 17, 20, 23

Masking = 2, 6, 9, 12, 15, 18, 21, 24

Assimilation = 3, 7, 10, 13, 16, 19, 22, 25

## Appendix 7

### The German Extended Personal Attributes Questionnaire (GEPAQ) With Scoring Key

*German Extended Personal Attributes Questionnaire Masculinity-Scale (GEPAQ-M by Runge, Frey, Gollwitzer, Helmreich, and Spence, 1981).*

Not independent	1	2	3	4	5	Very independent
Very passive	1	2	3	4	5	Very active
Not competitive	1	2	3	4	5	Very competitive
*Decisive	5	4	3	2	1	Not decisive
Gives up easily	1	2	3	4	5	Never gives up
Not self-confident	1	2	3	4	5	Self-confident
Feels inferior	1	2	3	4	5	Feels superior
Doesn't stand up under pressure	1	2	3	4	5	Stands up under pressure

\*Items with asterisks had to be recoded (1 to 5, 2 to 4, 3 to 3, 4 to 2, 5 to 1).

*German Extended Personal Attributes Questionnaire Femininity-Scale (GEPAQ-F by Runge, Frey, Gollwitzer, Helmreich, and Spence, 1981).*

Not emotional	1	2	3	4	5	Very emotional
*Devotes self to others	5	4	3	2	1	Doesn't devote self to others
Very rough	1	2	3	4	5	Very gentle
Not helpful	1	2	3	4	5	Very helpful
Very unkind	1	2	3	4	5	Very kind
Not aware of feelings	1	2	3	4	5	Aware of feelings
Not understanding	1	2	3	4	5	Very understanding
Cold	1	2	3	4	5	Warm

\*Items with asterisks had to be recoded (1 to 5, 2 to 4, 3 to 3, 4 to 2, 5 to 1).

## Appendix 8

### The Ten-Item Personality Inventory (TIPI) With Scoring Key

Here are a number of personality traits that may or may not apply to you. Please write a number next to each statement to indicate the extent to which you agree or disagree with that statement. You should rate the extent to which the pair of traits applies to you, even if one characteristic applies more strongly than the other.

Disagree strongly (1)	Disagree moderately (2)	Disagree A Little (3)	Neither Agree nor Disagree (4)	Agree A Little (5)	Agree moderately (6)	Agree strongly (7)
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I see myself as:

1. \_\_\_\_\_ Extraverted, enthusiastic.
2. \_\_\_\_\_ Critical, quarrelsome.
3. \_\_\_\_\_ Dependable, self-disciplined.
4. \_\_\_\_\_ Anxious, easily upset.
5. \_\_\_\_\_ Open to new experiences, complex.
6. \_\_\_\_\_ Reserved, quiet.
7. \_\_\_\_\_ Sympathetic, warm.
8. \_\_\_\_\_ Disorganized, careless.
9. \_\_\_\_\_ Calm, emotionally stable.
10. \_\_\_\_\_ Conventional, uncreative.

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TIPI scale scoring ("R" denotes reverse-scored items): Extraversion: 1, 6R; Agreeableness: 2R, 7; Conscientiousness: 3, 8R; Emotional Stability: 4R, 9; Openness to Experiences: 5, 10R.

## Appendix 9

### The Individualism and Collectivism Scale (INDCOL) With Scoring Key

INDIVIDUALISM AND COLLECTIVISM SCALE (also known as the Culture Orientation Scale)

Reference:

Triandis, H. C. & Gelfand, M. J. (1998). Converging measurement of horizontal and vertical individualism and collectivism. *Journal of Personality and Social Psychology*, 74, 118-128.

Description of Measure:

A 16-item scale designed to measure four dimensions of collectivism and individualism:

*Vertical Collectivism* – seeing the self as a part of a collective and being willing to accept hierarchy and inequality within that collective

*Vertical Individualism* – seeing the self as fully autonomous, but recognizing that inequality will exist among individuals and that accepting this inequality.

*Horizontal Collectivism* – seeing the self as part of a collective but perceiving all the members of that collective as equal.

*Horizontal Individualism* – seeing the self as fully autonomous, and believing that equality between individuals is the ideal.

Scale: *The items should be mixed up prior to administering the questionnaire. All items are answered on a 9-point scale, ranging from 1= never or definitely no and 9 = always or definitely yes.*

Horizontal individualism items:

1. I'd rather depend on myself than others.
2. I rely on myself most of the time; I rarely rely on others.
3. I often do "my own thing."
4. My personal identity, independent of others, is very important to me.

Vertical individualism items:

1. It is important that I do my job better than others.
2. Winning is everything.
3. Competition is the law of nature.
4. When another person does better than I do, I get tense and aroused.

Horizontal collectivism items:

1. If a coworker gets a prize, I would feel proud.
2. The well-being of my coworkers is important to me.
3. To me, pleasure is spending time with others.
4. I feel good when I cooperate with others.

Vertical collectivism items:

1. Parents and children must stay together as much as possible.
2. It is my duty to take care of my family, even when I have to sacrifice what I want.
3. Family members should stick together, no matter what sacrifices are required.
4. It is important to me that I respect the decisions made by my groups.

Scoring: Each dimension's items are summed up separately to create a VC, VI, HC, and HI score.

## Appendix 10

### Principal Axis Factor Analysis on BSRI

To study whether factors on the BSRI would be similar in Malaysia as in the original, a principal axis factor analysis was performed on the 60 BSRI items with orthogonal rotation (varimax) to further explore the validity of BSRI in Malaysia context. The Kaiser–Meyer–Olkin (KMO) measure showed  $KMO = 0.687$ , which was greater than the acceptable limit of 0.5. Thus, the sampling adequacy for the analysis was verified. However, in the anti-image correlation matrix, some items had anti-image correlation  $< 0.5$ , which led them to be questionable items. The items include “yielding”, “flatterable”, “childlike”, “does not use harsh language”, “analytical”, “masculine”, “aggressive”, “moody”, “theatrical”, “conceited”, “solemn”, “unsystematic”, and “conventional” ( $0.301 < r_s < 0.495$ ). Regardless, the items were not removed, because we intended to check how all items were related to masculinity and femininity. The proportion of common variance, average communality = 0.796, suggesting that a sample size of below 100 subjects was acceptable (the current study had 97 participants). The  $R$ -matrix showed that not all  $0.3 < r_s < 0.8$ , and the determinant of the correlation matrix was  $2.050 \times 10^{-23}$ , which was below the necessary value of 0.00001. Some items might not fit in with the rest of the pool of items. Nevertheless, the Bartlett’s Test of Sphericity displayed a significant value ( $p < .001$ ), the correlations between variables were overall significantly different from zero. Thus, the factor analysis was continued.

An initial analysis was run to obtain eigenvalues for each factor in the data. 16 factors had eigenvalues over Kaiser’s criterion of 1. The scree plot was ambiguous, however showed inflexions that would suggest extracting three and five factors. Since the BSRI

measured 3 dimensions (Masculinity, Femininity, Neutral), in this factor analysis the factors extracted were thus limited to three factors. In combination, the three factors explained 37.876% of the variance. Orthogonal varimax rotation was used since most items were found weakly correlated when a pre-analysis check was done. Table 10A showed the factor loadings after rotation. The items that clustered on the same factor suggested that factor 1 represented Femininity traits, factor 2 Masculinity traits and factor 3 Neutral/Filler traits.

**Table 10A**

*Summary of Exploratory Factor Analysis Results for BSRI (N = 97)*

Item	Rotated Factor Loadings		
	Femininity	Masculinity	Neutral/Filler
Sympathetic	<b><u>0.754</u></b>	0.127	0
Sincere	<b>0.750</b>	0	<b><u>0.321</u></b>
Warm	<b><u>0.731</u></b>	0.156	0
Compassionate	<b><u>0.720</u></b>	0.291	0.176
Sensitive To Others Needs	<b><u>0.716</u></b>	0.179	0.244
Affectionate	<b><u>0.699</u></b>	0.215	-0.144
Gentle	<b><u>0.695</u></b>	0	0
Understanding	<b><u>0.672</u></b>	0.227	<b>0.346</b>
Eager To Soothe Hurt Feelings	<b><u>0.655</u></b>	0.100	0
Tender	<b><u>0.655</u></b>	0	-0.232
Loyal	<b><u>0.637</u></b>	<b>0.366</b>	<b>0.334</b>
Truthful	<b>0.585</b>	0	<b><u>0.314</u></b>
Friendly	<b>0.585</b>	0.214	<u>0</u>
Helpful	<b>0.576</b>	0.249	<u>0.241</u>
Loves Children	<b><u>0.566</u></b>	0.100	0
Defends Own Beliefs	<b>0.549</b>	<b><u>0.458</u></b>	0.171
Cheerful	<b><u>0.499</u></b>	0.142	0
Likeable	<b>0.490</b>	0.163	<u>0</u>
Happy	<b>0.471</b>	0	<u>0</u>
Reliable	<b>0.448</b>	<b>0.354</b>	<u>0.239</u>
Tactful	<b>0.444</b>	0.275	<u>0.144</u>

Shy	<b><u>0.419</u></b>	-0.214	0
Conscientious	<b>0.417</b>	0.182	<u>0.239</u>
Soft Spoken	<b><u>0.396</u></b>	<b>-0.306</b>	-0.143
Feminine	<b><u>0.372</u></b>	0	-0.171
Does Not Use Harsh Language	<b><u>0.344</u></b>	-0.271	0
Conventional	<b>0.312</b>	0	<u>0</u>
Childlike	<u>0.295</u>	0	-0.243
Theatrical	0.295	0.135	<u>0</u>
Flatterable	<u>0.287</u>	0.138	-0.173
Solemn	0.132	0	<u>0</u>
Dominant	0.104	<b><u>0.693</u></b>	0
Strong Personality	0.268	<b><u>0.690</u></b>	0.168
Competitive	0.200	<b><u>0.660</u></b>	0
Leadership Ability	<b>0.330</b>	<b><u>0.634</u></b>	0
Assertive	0	<b><u>0.631</u></b>	0
Acts As A Leader	<b>0.380</b>	<b><u>0.627</u></b>	0.126
Willing To Take A Stand	<b>0.313</b>	<b><u>0.584</u></b>	0
Willing To Take Risks	0	<b><u>0.577</u></b>	0
Forceful	0	<b><u>0.564</u></b>	-0.281
Ambitious	0.216	<b><u>0.530</u></b>	0.190
Independent	<b>0.371</b>	<b><u>0.491</u></b>	<b>0.394</b>
Aggressive	-0.143	<b><u>0.482</u></b>	<b>-0.325</b>
Unpredictable	0	<b>0.456</b>	<u>-0.166</u>
Masculine	0	<b><u>0.426</u></b>	-0.100
Self-Reliant	<b>0.322</b>	<b><u>0.406</u></b>	<b>0.389</b>
Makes Decisions Easily	0	<b><u>0.399</u></b>	0
Adaptable	<b>0.367</b>	<b>0.384</b>	<u>0.109</u>
Individualistic	0.200	<b><u>0.381</u></b>	0
Athletic	0.292	<b><u>0.377</u></b>	0
Self Sufficient	0.167	<b><u>0.329</u></b>	0.292
Moody	0	<b>0.305</b>	<u>-0.165</u>
Secretive	0.260	0.295	<u>-0.150</u>
Unsystematic	0	0	<b><u>-0.584</u></b>
Inefficient	0	-0.126	<b><u>-0.526</u></b>
Jealous	0.157	0.288	<b><u>-0.455</u></b>
Conceited	0	0.121	<b><u>-0.406</u></b>
Gullible	<b><u>0.318</u></b>	0	<b>-0.344</b>
Analytical	0.210	<u>0.201</u>	0.294



Yielding	<u>0.147</u>	0	0.195
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*Note.* *N* = Number of Participants. Factor loading threshold = 0.30. The current loading of items was bolded. Original loading of items was underlined.

The loadings of items were different between Bem (1974) and the current sample. Overall, only half of the traits were loaded similarly (see Table 10B). An interesting point was 6 traits associated with traditional masculinity were cross-loaded between Femininity and Masculinity factor. These traits, e.g. “Leadership Ability”, “Independent” were related to work performance. Thus, these traits loaded on both gender role probably because, in the current study, most participants were students from universities or colleges. Participants had to work on school projects, held events and even lead clubs; both sexes are expected to possess these traits. Therefore, compared to the time when the BSRI was first constructed, in modern background, the BSRI might not be as suitable to measure masculinity and femininity.

**Table 10B**

<i>Factor Loading Comparison between West and Malaysia Samples</i>				
Traits	Loaded Similarly	Loaded Differently	Cross-Loaded	Not Loaded
Feminine (20)	13	0	4	3
Masculine (20)	12	0	7	1
Neutral/Filler (20)	4	9	4	3

## Appendix 11

### Correlation Results Between BSRI and TMF

**Table 11**

*Correlation Results (General Population, N = 97)*

	BSRI_Masculini ty	BSRI_Feminini ty	TMF_Masculini ty	TMF_Feminini ty
BSRI_Masculini ty	-	0.367***	0.288**	0.121
BSRI_Feminini ty		-	-0.085	0.466***
TMF_Masculini ty			-	-0.430***
TMF_Feminini ty				-

*Note.* \*\*\* $p < .001$ . \*\* $p < .01$ . \* $p < .05$ .  $N$  = Number of Participants.

## Appendix 12

### Correlation Results Between Systemizing Skill, Empathizing Skill and Autistic Traits

(Split By Sex)

**Table 12**

*Correlation Results (Split By Sex)*

		SQ	EQ	AQ
Female (N = 61)	SQ	-	0.530***	-0.186
	EQ		-	-0.479***
	AQ			-
Male (N = 36)	SQ	-	0.742***	0.036
	EQ		-	-0.056
	AQ			-

*Note.* \*\*\* $p < .001$ . \*\* $p < .01$ . \* $p < .05$ .  $N$  = Number of Participants.

### Appendix 13

#### Correlation Results Between TMF and GEPAQ

**Table 13**

*Correlation Results (General Population, N = 193)*

	TMF_Masculi nity	TMF_Femini nity	GEPAQ_Masculi nity	GEPAQ_Femini nity
TMF_Masculinit y	-	-0.744***	0.271***	-0.155*
TMF_Femininity		-	-0.044	0.210**
GEPAQ_Masculi nity			-	0.042
GEPAQ_Femini nity				-

*Note.* \*\*\* $p < .001$ . \*\* $p < .01$ . \* $p < .05$ .  $N$  = Number of Participants.