Being Transgender: Effects of Behaviour, Arousal and Wellbeing

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Declaration

I declare that this thesis, *Being Transgender: Effects of Behaviour, Arousal and Wellbeing*, represents my own work, except where otherwise stated. None of the work referred to in this thesis has been accepted in any previous application for a higher degree at this or any other University or institution. All quotations have been distinguished by quotation marks and the sources of information specifically acknowledged.

Submitted by Jamie A. Raines

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General Abstract

The present thesis investigated the sex atypicality, physiological arousal, and wellbeing of transgender men (female to male) in order to better understand the behaviours and feelings of this under-researched group and to investigate the influences that one's gender identity and birth sex may have on various processes. Chapter 1 gives an overview of the literature. Chapter 2 focuses on sex atypicality (e.g., masculinity in birth sex females) from childhood onward, which predicts a same-gender attraction among cisgender groups in adulthood. However, transgender people have rarely been studied in this context. This was researched using observer ratings of childhood and adulthood participant photographs to avoid the limitations of self-report measures. Another component in which cisgender people differ is in their sexual arousal patterns, yet again, this has rarely been investigated in transgender people. Chapter 3 therefore examined the genital sexual arousal of transgender men and how it compares to cisgender men and women. Finally, the wellbeing of same-gender attracted cisgender groups, and transgender people generally can be negatively affected. Chapter 4 investigated the differences between cisgender and transgender people, including the influence of sexual attraction, as well as discrimination and transitioning, as potential factors in wellbeing discrepancies. Findings showed that transgender men were rated as more masculine (sex atypical) than cisgender women from childhood onwards, and they displayed more male-typical patterns of sexual arousal than cisgender women. These results indicate behavioral and physiological differences between transgender men and cisgender women, and similarities to cisgender men. Finally, transgender men had lower wellbeing than cisgender women, with transition stage appearing to be of importance in this difference: Transgender men who had taken more transitioned steps had increased wellbeing compared to those who had taken no transition steps.

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Chapter 1 General Introduction

1.1 General Overview

The present thesis focuses on people who are transgender. It plans to contribute towards the understanding of their developmental influences and of how being transgender may affect people behaviourally, physiologically, and psychologically. To achieve this, I investigated the physiological and behavioural processes, and wellbeing, of transgender men in comparison to cisgender groups.

A person's sex refers to their physical characteristics that typically differentiates biological males and biological females from one another, such as external genitalia that are categorised as male or female (Gender Identity and Education Research, 2008). Commonly, one's gender identity and assigned birth sex are the same, but they can be incongruent. People who are transgender are those who are a gender different to their assigned birth sex. For example, someone with a birth sex of female, but whose gender is male, would be a (female-to-male) transgender man. Cisgender is a term that can be used to describe people whose gender identity and birth sex are the same, so where both are female, or both are male. The following research will use the terms assigned sex and birth sex to refer to the sex someone was labelled at birth based on physical appearance, and the term assigned gender is used to refer to the gender that matches the birth sex of participants.

A notable distinction between transgender people and cisgender people, specifically those with a same-gender attraction (for cisgender women this would be attraction to women, and for transgender men this would be attraction to men), is that being transgender is a facet of identity based on one's gender, not sexual attraction. However, transgender people can also have varied sexual attractions, the same as cisgender groups. There has been a lack of consistency in the current literature as to what the sexual attraction, and consequently, sexual orientation, of transgender

people is based on, gender identity or birth sex. Therefore, leading to inconsistencies in the labelling of sexual orientation of this group. For example, transgender men who are exclusively attracted to women were defined as heterosexual (based on gender identity) in some research (Bockting, Benner, & Coleman, 2009), and as homosexual (based on birth sex) in other (Chivers & Bailey, 2000). Despite agreement to define sexual orientation to be based on gender, to avoid any confusion, the present research will therefore, wherever possible, focus on "sexual attraction to men or women" rather than using any sexual orientation labels. This will be the case for both transgender and cisgender groups.

Evidence that gender identity and sexual attraction are separate facets has been shown in findings that transgender men attracted to women, and those attracted to men, show similar levels of gender dysphoria in both childhood and adulthood, and desires to medically transition, despite identifying their sexual attractions differently (Chivers & Bailey, 2000). Thus, indicating that the sexual attraction of transgender men does not affect the dysphoria they experience, nor their need to transition.

Being attracted to the same gender and being transgender are not common. It has been approximated that around 3.5% of the adult population in the USA identify as lesbian, gay, or bisexual (and are cisgender) (Gates, 2011). This is compared to estimations that 0.3% to 1.3% (Zucker, 2017) of the population identify as transgender. Recent years have begun to see an increase in awareness of transgender people in society, including increased presence in mainstream media, reflecting the need and willingness to gain further understanding (Matlow, 2014).

Currently, there is no known cause of being transgender, although it has been suggested that exposure to atypical hormone levels, either increased or decreased, at certain stages of prenatal development, may subsequently lead to experiencing gender

dysphoria (Levy, Crown, & Reid, 2003). More specifically, abnormally high androgen levels in XX foetuses, or low levels in XY foetuses, at key development stages, are believed to subsequently cause an incongruent development between the brain and genitals, causing the development of brain structures that differ to birth sex (Gender Identity and Education Research, 2008). According to this theory, someone could be assigned a birth sex of female, but have more male-typical brain structures, and vice versa.

Evidence for this theory comes from findings that brain structures in transgender people have similarities to cisgender people of the same gender (but opposite birth sex). Sex differences have been found in cisgender groups in brain morphology, including total brain volume and within specific structures (Smith, Junger, Derntl, & Habel, 2015). Smith et al, (2015) conducted a review on transgender people's brain morphology and suggested that the corpus callosum was closer in shape to transgender people's genders rather than people with the same birth sex, and several regions were identified where the volume of grey matter of transgender people also resembled individuals with the same gender. However, one question raised was the role of taking cross-sex hormones, with the suggestion that total brain volume can be affected by these hormones. That said, transgender women were shown to have neuron numbers of the central part of the bed nuclear of the stria terminalis within the typical female range, and crucially hormone levels and age of transgender identification did not appear to influence this (Kruijver et al., 2000). Overall, these findings suggest that there could be some neurological basis for being transgender.

Thus far it has been suggested that the cause of being transgender may be influenced by biological factors. Behavioural studies can further this evidence, by

providing insight into the development of transgender people from a young age, particularly in comparison to cisgender groups. Therefore, findings of early behavioural differences between transgender and cisgender groups of the same assigned birth sex could potentially also indicate toward biological influences on being transgender.

Research currently suggests that from a young age, transgender children have patterns of gender cognition, and viewed themselves as being more in line with their expressed gender rather than their assigned gender (Olson, Key, & Eaton, 2015). Moreover, children with a female birth sex and gender dysphoria were judged as more masculine than those without gender dysphoria (Mcdermid, Zucker, Bradley, & Maing, 1998). However, there is limited knowledge if these children identified as transgender as they got older. Much of this previous research also lacked comparisons between transgender and cisgender groups and looking beyond childhood, which is key to determining how transgender people may differ from others with the same birth sex, and how early this begins to emerge. There is also very little research that has differentiated transgender groups based on sexual attractions. Limited evidence suggests that transgender men attracted to women report increased sex atypicality (masculinity) than transgender men with attraction to men (Chivers & Bailey, 2000).

Further to investigating behavioural differences or similarities between transgender and cisgender people, the present research also aimed to investigate physiological differences, in the form of genital arousal to sexual stimuli. Cisgender men and women show consistent differences in their patterns of physiological arousal. Most cisgender men show arousal to the gender they are attracted to, but not the other, whereas cisgender women typically show arousal to both genders, regardless of their self-reported attractions (Rieger, Savin-Williams, Chivers, &

Bailey, 2016). Investigating where transgender men fall within this physiological arousal pattern could be informative on biological similarities or differences between their gender (male) and birth sex (female). If transgender men's arousal does fall within the typical pattern of cisgender men, this could indicate an influence of gender identity over birth sex on sexual arousal.

Increasing understanding of the development of transgender children and adolescents is important as many lack the knowledge themselves to understand their own feelings. In adulthood, most transgender people express having always known that there was something different about themselves, but it was often by complete chance that they figured out why they feel different, and that they could do something about it, such as living as a gender different to their birth sex, and taking cross-sex hormones (Whittle, 2000). This lack of accessibility to knowledge about being transgender is perhaps a reason why a lot of transgender men identify as lesbians, and (male-to-female) transgender women as cross-dressers, before they transition. These identities are more widely known and accessible, whilst also still providing a sense of group belonging (Beemyn & Rankin, 2011). Additional evidence that even transgender people sometimes lack the relevant knowledge and awareness, is that when transgender people realised they had same-gender attractions (e.g., transgender men attracted to men), many subsequently questioned whether they were actually transgender as there is very little information about transgender people being able to have a same-gender attraction (Bockting et al., 2009). This may also be due to a lack of awareness that gender identity and sexual attraction are distinctly different factors of one's identity that can be in any combination.

Despite being transgender and having same gender attractions being different components of the self, both elements influence wellbeing. Both being transgender,

and cisgender sexual minority are linked to an overall decrease in general wellbeing (Meyer, 2003; Newfield, Hart, Dibble, & Kohler, 2006).

In this chapter, these elements of sex atypicality, sexual arousal, and wellbeing, will be further discussed in relation to being transgender or cisgender, sexual attraction, and comparisons between these groups. Findings into these factors may indicate how transgender people develop differently to cisgender people on several factors, as well as indicating differences or similarities between transgender people and cisgender people with the same birth sex. The present thesis focused on transgender men, with the aim to potentially provide insights into development of gendered behaviour and the roles of birth sex versus gender identity in both behavioural and biological processes.

1.2 Sex Atypicality

Sex atypicality can be defined as behaving and/or appearing in ways that are not typical of one's birth sex but instead the other sex: masculinity in birth sex females, or femininity in birth sex males. In the present research sex atypical behaviour is used in reference to one's birth sex, rather than gender identity, as for transgender people the two are incongruent. This means that sex atypicality in transgender men would be masculinity, as this is atypical behaviour to their birth sex of female. This also allows for the comparison between transgender men and cisgender women, which is of interest as both groups would have been socialised as females in childhood.

Sex atypical behaviour is not regularly accepted or encouraged, with pressure to conform to one's birth sex beginning early in life (Stieglitz, 2010). This pressure to conform is more prevalent for men than for women, as sex atypicality is less encouraged in sons than daughter by their parents (Kane, 2006). As early as preschool

years, children begin displaying intergroup bias and pressure to conform (Martin & Ruble, 2004). Young infants also appear to be able to discriminate between sex consistent and inconsistent activities, as they show longer gazing towards behaviours that are inconsistent with an actors gender (Hill & Flom, 2007). This indicates that even in infancy children begin to be able to discriminate between sex typical and atypical behaviours. Identity also appears to begin developing at a young age of two years old, with gender identity development beginning as young children start to learn which gender group they belong in. This identity development leads to an increase in motivation to conform to others who are perceived as being in the same gender group, because not conforming to the typical behaviour of one's birth sex would likely make someone stand out (Martin & Ruble, 2004). Despite this, not everyone adheres to sex typical behaviour. Two groups who have consistently been shown to be sex atypical are cisgender men attracted to men and cisgender women attracted to women.

This sex atypical behaviour often precedes same gender attractions in later life, and it can be seen from early childhood onward (Watts, Holmes, Raines, Orbell, & Rieger, 2018). This pattern has also been shown in longitudinal research (Li, Kung, & Hines, 2017), indicating that childhood sex atypicality is a predictor of adulthood sexual attraction. Many people with same gender attractions report having felt different from their peers when growing up (D'Augelli, Grossman, & Starks, 2006), and were also considered sex atypical by those around them (D'Augelli, Grossman, & Starks, 2008). These findings have mostly been conducted via self-report, however some research has used a more objective method of measuring childhood and adulthood sex atypicality, that reduces the biases related to self-report measures. Specifically, independent ratings of masculinity/femininity on participants' childhood and adulthood photographs or videos have been gathered (Watts et al., 2018). These

independent ratings of the behaviours and appearance of heterosexual and homosexual individuals, from both their childhood and adulthood, revealed that homosexual cisgender men and women were more sex atypical from childhood onwards than their heterosexual counterparts (Rieger, Linsenmeier, Gygax, & Bailey, 2008). This was indicated by more masculine ratings of videos of women attracted to women, and more feminine ratings of videos of men attracted to men, as compared to heterosexual men. Rieger et, al., (2008) also found a correlation between childhood and adulthood sex atypicality, indicating that sex atypicality is a potentially stable trait that begins in early childhood, and continues through adolescence into adulthood.

The development and pattern of sex atypicality has not been as well researched among transgender groups. This may be due to the fact that, as discussed earlier, being lesbian, gay, or bisexual (LGB) are much more commonly known, and more prevalent identities, than being transgender (Zucker, 2017). Due to these small population numbers, transgender groups can also be hard to access for research purposes, with many samples being clinical, very small, or using a qualitative approach (or all of the above). Specifically, very little research has studied transgender people with differing sexual attractions, however limited evidence suggests that transgender men attracted to women are more masculine than those attracted to men (Chivers & Bailey, 2000). This would indicate that transgender men attracted to women would be observed as more sex atypical than transgender men attracted to men. The investigation into sex atypical behaviours among transgender groups is of importance, as the relationship between sex atypicality and being transgender could provide insights into the early development of gender identity, and

early identification, and subsequent support, of gender dysphoric and transgender children.

Furthermore, very few comparisons have been made between cisgender and transgender groups. Those few studies that have been conducted give an indication on the early behavioural development of transgender children. In children diagnosed with gender dysphoria, the average age that sex atypical behaviour started being displayed was between 2-4 years (Zucker & Bradley, 1995). However, this study discussed childhood sex atypicality severity in relation to adulthood sexual attraction outcomes, rather than in relation to being transgender or cisgender. In studies that have specifically looked at transgender children, 5-12 year olds who identified as transgender showed early similarities in gender cognition to cisgender children with the same expressed gender, but different birth sex (Olson et al., 2015). Following childhood years of feeling, and being told they were different, as well as pressure to be sex typical, transgender teenagers begin, on average, identifying as a gender different to their birth sex between the ages of 13 and 15 (Grossman, D'Augelli, Salter, & Hubbard, 2006). It is therefore indicated that from a very young age, transgender people may show identification with their gender, and behaviour more in line with this gender, as opposed to their birth sex. For example, a transgender child who has an assigned birth sex of female, but whose gender identity is male, shows more in common with cisgender boys and male-typical behaviour, rather than girls and female-typical behaviour.

These findings provide evidence from a behavioural standpoint for the early development of being transgender, and potential non-social causes. Therefore, comparatively investigating sex atypicality between transgender and cisgender groups would aim to provide a more in-depth insight into the behavioural development of

transgender people in childhood, and how they differ to cisgender people of the same birth sex.

The present thesis aims to address research gaps by investigating the comparative observer rated sex atypicality between transgender men and cisgender women, in both childhood and adulthood, also taking into account any effect of sexual attraction within both groups. The aim is also to achieve a larger sample size than previous research, that is not limited by using a clinical sample.

It is predicted that transgender men will be rated, and report themselves, as more sex atypical (more masculine) than cisgender women, on average. Additionally, within transgender and cisgender groups an effect of sexual attraction is expected. Transgender men attracted to women are predicted to be higher in sex atypicality than those attracted to men. Finally, cisgender women attracted to women are predicted to be higher in sex atypicality that those attracted to men.

1.3 Physiological Sexual Arousal

Sex differences between cisgender men and women could be informative about the development of transgender people. Investigating these sex differences in relation to transgender groups could provide insight into whether transgender people are more similar to their gender identity or their birth sex.

Physiological sexual arousal can refer to genital vasocongesion and is commonly measured using a vaginal plethysmograph or circumferential penile strain gauge (Rieger et al., 2015). These measures have been used across multiple studies investigating sexual arousal differences between cisgender men and women that have found a robust sex difference. Consistently, on average, cisgender men have a category specific pattern of arousal, and women, on average, show a category non-specific arousal pattern (Chivers, 2005; Chivers, Rieger, Latty, & Bailey, 2004).

These differences in arousal specificity mean that cisgender men typically show significantly more arousal to sexual stimuli depicting the gender that corresponds with their self-reported sexual attraction. For example, men attracted to women show more arousal to female sexual stimuli than to male sexual stimuli. However, cisgender women do not typically show a gender preference in their arousal, regardless of self-reported attraction. Women of all degrees of sexual attractions, running from exclusively to men, to both, to exclusively to women, show similar arousal levels to both male and female sexual stimuli. However, one notable observation is that women attracted to women can show more male-typical arousal patterns as compared to women attracted to men. That is, on average, women attracted to women show more arousal to their preferred gender, whereas women attracted to men showed similar arousal levels to both male and female stimuli (Rieger et al., 2016). However, this difference between cisgender women based on attraction, is small compared to the large difference between cisgender men and cisgender women.

Investigating sexual arousal patterns in transgender men may provide insight into the sex differences found between cisgender men and women. The sexual arousal of transgender men using genital measures has not yet been investigated. However, one study investigated the genital arousal of transgender women. Their arousal patterns were more similar to that of cisgender men than cisgender women (Chivers et al., 2004).

The present research aimed to address the gap in sexual arousal research by investigating arousal measures and patterns among transgender men, who had varying self-reported attractions, ranging from exclusively attracted to women to exclusively attracted to men, and mixed attractions in between. The first component of this

investigation is into the specificity of arousal among transgender men, whether it is more similar to their gender identity (male, category specific) or birth sex (female, category non-specific). Transgender men and, cisgender men and women of differing sexual attractions, will be compared on their patterns of genital arousal to sexual stimuli.

A secondary component of this investigation is into the measurement method of genital arousal in transgender men. As has been previously demonstrated, vaginal plethysmography is a valid measure of genital arousal in postoperative transgender women (Lawrence, Latty, Chivers, & Bailey, 2005) but it is unknown if the penile strain gauge could be a valid measure of arousal in post-operative transgender men. Among the surgical options for transgender men in relation to genitals, there are two broad categories, phalloplasty and metoidioplasty. Phalloplasty aims to create an average sized, cisgender male appearing phallus, by using a full thickness skin graft from either the non-dominant forearm, thigh, or stomach (Cotten, 2012). Transgender men who have had this type of surgery would not be eligible to use the penile strain gauge in genital arousal as erections are obtained through a pump system, rather than occurring spontaneously to arousing stimuli. However, the other surgical option, metoidioplasty, creates a micro penis for transgender men by releasing the clitoris from the suspensory ligament. Testosterone supplements cause the clitoris to increase in size and it is homologous to a cisgender penis, and metoidioplasty surgery makes it a free standing micro penis, typically around 1-3 inches in length (Cotten, 2012). Among transgender men who have had this form of genital surgery, it may be possible to use a smaller penile gauge, as the released clitoris functions in terms of erections similarly to that of a cisgender penis. Therefore, in the present research transgender men's genital arousal will be measured using either the vaginal

plethysmograph or the penile string gauge, depending on their surgical choices. Using different measures in the same population will also allow for an investigation into potential differences in genital arousal results that may be as a result of the different measurement techniques, depending on genitalia.

Due to the lack of previous research in this area, particularly as genital arousal patterns have not been investigated among transgender men, two competing predictions were made. It could be that participants have arousal patterns that are more male-typical and are category specific, consistent with their gender identity. Or, transgender men may show more female-typical genital arousal that is category non-specific, consistent with their birth sex.

1.4 Wellbeing

Multiple factors can negatively impact psychological wellbeing. General populations experience poorer wellbeing when faced with factors such as poor peer relationships (Corsano, Majorano, & Champretavy, 2006), strenuous financial status (Oskrochi, Bani-Mustafa, & Oskrochi, 2018), and discrimination (Schmitt, Branscombe, Postmes, & Garcia, 2014). Further to this, same-gender attracted cisgender people (women attracted to women and men attracted to men), have been shown to be at risk of poorer wellbeing, as compared to other-gender attracted cisgender people (women attracted to men and men attracted to women).

Overall, LGB people have been found to be at an increased risk of experiencing negative psychological wellbeing, including having more instances of suicide ideation and self-harm (King et al., 2008). There are several believed reasons for the reduced well-being among this population, including a hostile social environment created though discrimination (Meyer, 2003), and unsupportive social

interactions (Berghe, Dewaele, Cox, & Vincke, 2010). In a similar pattern, LGB adults experience higher levels of discrimination than heterosexual people (Mays & Cochran, 2001).

Reduced quality of life has also been found among female-to-male transgender men in the US, and this was most prominent for mental health (Newfield, Hart, Dibble, & Koher, 2006). Transgender people also seem to have reduced well-being in comparison to cisgender LGB, particularly cisgender people who are exclusively same gender attracted (Landers & Gilsanz, 2009). Transgender people experience high levels of stigmatisation, higher than LGB cisgender groups (Ryan & Futterman, 1997), and this in turn has been linked to reduced psychological well-being (Bockting, Miner, Swinburne Romine, Hamilton, & Coleman, 2013). This supports the idea that transgender people may have the lowest wellbeing when compared to cisgender people of sexual minority.

A particular factor that has received attention in relation to wellbeing is discrimination, which can be experienced by different societal groups, and LGB cisgender people are one such group. They report feelings of discrimination due to their LGB identities (Mays, & Cochran, 2001; D'Augelli, Grossman, & Starks, 2006), and this can come in the form of unsupportive peer relationships (Diamond & Lucas, 2004). This reported discrimination has a large negative impact on wellbeing among LGB groups (Berghe et al., 2010), and is even higher in transgender, compared to cisgender, people (McGuire, Anderson, Toomey, & Russell, 2010; Su et al., 2016). Therefore, indicating that transgender people may be at an increased risk of poor wellbeing outcomes potentially, at least in part, due to increased experiences of discrimination.

There are also factors unique to being transgender that may affect wellbeing. Transitioning for transgender people can be split into two broad categories, social and medical. Socially transitioning is where a transgender person stops living and presenting as the gender congruent to their birth sex, and begins living and presenting as a gender different to their birth sex. Medically transitioning is the process of taking hormones (such as testosterone), and/or having surgeries related to being transgender. Transitioning has been posited as a triadic model of three stages; real life experience (also known as socially transitioning), hormone treatment, and transgender related surgeries (Whittle, 2000). Little research has been conducted into the direct effect of socially transitioning on wellbeing, with the exception that among transgender women, psychological gender affirmation predicted lower depressive symptoms (Glynn et al., 2016). In contrast, there is a large amount of evidence showing that medically transitioning improves quality of life and wellbeing. Testosterone treatment for transgender men reduces anxiety and depression (Davis & Colton Meier, 2014), and has a positive independent effect on self-esteem (Gorin-Lazard et al., 2013). Having surgery, such as chest reconstruction for transgender men, or breast augmentation for transgender women, is an effective treatment for improving wellbeing (Gijs & Brewaeys, 2007; Wierckx et al., 2011). In a follow-up study, transgender people were found to no longer experience gender dysphoria after medically transitioning (Gorin-Lazard et al., 2013). Likewise, among transgender youth, who showed comparable levels of wellbeing to the general population after medically transitioning (De Vries et al., 2014).

The present research aims to investigate potential factors that may be relevant to wellbeing among both cisgender transgender groups. The factors of interest

presently are gender identity (being transgender or cisgender), sexual attraction, discrimination, and transition status.

It is predicted that transgender men will have lower wellbeing than cisgender women, with an exploration into how controlling for sexual attraction may impact these differences. Furthermore, transgender men who had socially and medically transitioned are precited to have higher wellbeing than those who have not. Furthermore, discrimination is predicted to be higher in transgender men, compared to cisgender women. Finally, increased discrimination will negatively relate to wellbeing, and will explain (mediate) the difference in wellbeing between transgender cisgender participants.

Chapter 2 Sex Atypicality

2.1 Abstract

Childhood sex atypicality (e.g., masculinity in birth sex females) differentiates those with sexual attractions to men or women in adulthood, and further those who are cisgender (congruent birth sex and gender identity) or transgender (incongruent birth sex and gender identity). However, to what degree childhood sex atypicality predicts sexual attraction independently from gender identity is largely unknown. In the present research, sex atypicality of 90 cisgender women and 72 (female-to-male) transgender men with varied sexual attractions to men and women was assessed via ratings of photographs from childhood and adulthood. Transgender men were more sex atypical than cisgender women beginning in childhood. In each group, childhood sex atypicality preceded greater attraction to women over men. Thus, sexual attraction and gender identity appear to be independently predicted by childhood sex-typed traits.

Keywords: gender behavior, transgender, gender identity, sexual attraction

2.2 Introduction

The present work focused on cisgender and transgender people with a female birth sex, and how indicators of their sex atypicality (masculinity in birth sex females) aid in differentiating their gender identity from their sexual attractions. Thus, gender identity was one component of this research. In comparison to cisgender individuals (congruent gender identity and birth sex), transgender people identify as a gender incongruent with their birth sex (Levy et al., 2003). For instance, individuals with a birth sex of female who identify as male are transgender men. Transgender

individuals are estimated to make up approximately 0.3% of the population (Zucker, 2017).

Another element of identity is sexual orientation. The literature is inconsistent in classifying the sexual orientation of transgender individuals. Some base it on birth sex (Chivers & Bailey, 2000), and others on gender identity (Bockting et al., 2009). Due to these inconsistencies, the present research avoids the term "sexual orientation" and, instead, uses the phrase "sexual attraction to men and women" across cisgender and transgender individuals.

Furthermore, in the present research, sex atypicality (e.g., masculinity in birth sex females) was defined with respect to birth sex due to one focus on childhood sex atypicality. In those with a female birth sex, sex atypicality links to sexual attractions to women (in those with a male birth sex it links to sexual attraction to men). Sex atypicality further links to being transgender (Bailey & Zucker, 1995; Olson et al., 2015). This neither means that sexual attraction to a specific gender is equal to being transgender, nor that transgender people must be sexually attracted to a specific gender (Kiss, 2018; Nagoshi, Brzuzy, & Terrell, 2012). The relationships between sex atypicality, sexual attraction, and gender identity are poorly understood, as research lacks a systematic comparison of sex atypicality across cisgender and transgender people with different sexual attractions. By studying the development of sex atypicality in both cisgender and transgender individuals, with varied sexual attractions, we aimed to shed light onto the formation of both sexual attraction and gender identity.

2.2.1 Sex atypicality and Sexual Attraction within Cisgender Groups

In cisgender people, increased sex atypicality in childhood predicts greater sexual attraction to the same gender. This has been repeatedly shown with self-report measures (Bailey & Zucker, 1995;(Rieger, Linsenmeier, Gygax, Garcia, & Bailey, 2010). However, self-reports, especially of early childhood, may be prone to memory bias (Gottschalk, 2003; but see Zucker, 2005) and it is informative to validate this pattern with other measures. Longitudinal studies confirmed that cisgender people's early sex-atypical behavior predicts sexual attractions to the same gender in adulthood (Li et al., 2017; Steensma, Van der Ende, Verhulst, & Cohen-Kettenis, 2013; Xu, Norton, & Rahman, 2019). Yet, longitudinal studies are costly and time-consuming. An alternative method, which avoids limitations of self-report and logistical obstacles of longitudinal research, is the retroactive assessment of sex atypicality by evaluating childhood videos and photographs. Using such methodology, cisgender women attracted to women were rated as more sex atypical than those attracted to men. As in longitudinal findings, these differences emerged by 3-4 years old (Rieger et al., 2008; Watts et al., 2018). The present study used this rating method, as well as self-report, to assess childhood sex atypicality in cisgender women. We hypothesized that those attracted to women will be more sex atypical than those attracted to men, starting in early childhood. We further hypothesized that these differences still remain in adulthood, and can be verified with self-reported sex atypicality, consistent with prior work (Rieger et al., 2008).

2.2.2 Sex Atypicality and Sexual Attraction within Transgender Groups

Transgender people recall more sex-atypical behavior in childhood than cisgender people, and their parents' recollections match this (Grossman et al., 2006).

Similarly, prospective findings indicate that greater sex atypicality and cross-sex identification in early childhood leads to a higher probability of identifying as transgender in later childhood (Rae et al., 2019). Furthermore, a review suggests that differences between transgender and cisgender individuals in sex atypicality start to show from 2-4 years old (Zucker & Bradley, 1995), similar to the 3-4 years at which cisgender individuals with different sexual attractions start to differ (Li, Kung, & Hines, 2017). A previous study made use of photograph ratings of physical appearance of children with and without gender dysphoria. Children with gender dysphoria and a female birth sex were judged as more masculine and tomboyish than female children without gender dysphoria, and the opposite pattern was found in children with a male birth sex (Mcdermid et al., 1998; Zucker, Wild, Bradley, & Lowry, 1993). Thus, we hypothesized that transgender men will be more sex atypical than cisgender women from early childhood on.

During adulthood, transgender men attracted to women report greater sex atypicality (i.e. masculinity) than transgender men with stronger attractions to men (Chivers & Bailey, 2000). This mirrors findings from cisgender men; those attracted to women are more masculine, on average, than those attracted to men (Rieger, Linsenmeier, Gygax, & Bailey, 2008). Thus, we further hypothesized that transgender men attracted to women will be more sex atypical than transgender men with varying degrees of attraction to men.

2.2.3 Effects of Transitioning

Transitioning can be split into two categories: socially transitioning, wherein an individual begins living as a gender different to their birth sex, and medically transitioning via hormone therapy and surgeries (Whittle, 2000). Both these processes aim to masculinize transgender men's appearances. Transgender people have greater

sex atypicality from childhood, and before they transition (Rae et al., 2019). Yet, since one goal of transitioning for transgender men is to increase the chance of being socially accepted as male (Whittle, 2000), transitioning could increase perceived sex atypicality. One aim of this research was to explore this possibility.

2.2.4 The present study

The present research focused on people with an assigned birth sex of female. We compared the sex atypicality of transgender men and cisgender women with different sexual attractions to men and women, using observer ratings of sex atypicality as seen in photographs from childhood and adulthood, in addition to self-reports of sex atypicality from childhood and adulthood. In sum, we hypothesized that:

1) Transgender men will be more sex atypical than cisgender women, on average. Based on observer ratings this difference will start in early childhood.

2) Within cisgender groups, those attracted to women will be higher in sex atypicality than those with varying attractions to men, also starting in early childhood.

3) Within transgender men, those attracted to women will be higher in sex atypicality than those with varying degrees of sexual attraction to men. The current literature does not indicate whether this differentiation emerges in early childhood.

Furthermore, effects of transitioning on transgender men's sex atypicality were explored.

2.3 Method

2.3.1 Participants

Targets. We recruited through advertisements on social media sites including Facebook and Tumblr, university mailing lists, and at pride events. Of the recruited participants, 42 were cisgender women with varying attractions to men, 50 were cisgender women attracted to women, 16 were transgender men attracted to women, and 54 transgender men with varying attractions to men. The lower number of transgender men attracted to women in our research reflects findings that transgender men are more likely to indicate mixed to exclusive attractions to men than exclusive or almost exclusive to women (James et al., 2016). Participants were defined as cisgender if they reported that their assigned birth sex was the same as their current gender identity, and transgender if they indicated it was different. This was determined by asking for participants' birth sex, gender identity, and a direct question as to whether the two differed.

Sexual attraction of all participants was assessed with their self-reported attraction to men or women on 7-point scales ranging from exclusive attraction to women, to varied degrees of equal bisexual attractions, to exclusive attraction to men (Kinsey, Pomeroy, & Martin, 1948). Among transgender men, those with exclusive or almost exclusive attraction to women were grouped as "attracted to women"; the remainder had varied bisexual attractions to exclusive attraction to men, and these were grouped as "attracted to men" for analyses. Among cisgender women, those with exclusive or almost exclusive attraction to men were grouped as "attracted to men"; the remainder had varied degrees of bisexual attractions to exclusive attraction to women, and these were grouped as "attracted to women" for analyses. Participants were grouped in this way to compare, within transgender and cisgender participants,

majorities to minorities with respect to their sexual attractions: In cisgender women, those with attraction to men are the majority, whereas those with bisexual attractions and attractions to women are a minority (Gates, 2011). However, as aforementioned, in transgender men, the majority report some to exclusive attraction to men, and the minority report exclusive to almost exclusive attraction to women (James et al., 2016). Participants were also grouped in this way due to a primary focus on the group of transgender men attracted to women, as this group is under-researched compared to both cisgender participants and transgender participants of other sexual attractions.

Mean ages (SD) in years were 23.4 (5.7), 21.7 (4.9), 22.1 (5.2), and 24.3 (6.8), for cisgender women attracted to men, cisgender women attracted to women, transgender men attracted to men, and transgender men attracted to women, respectively. Age did not significantly differ between groups, $p = .44$, $R^2 = .03$.

Raters. Photographs of targets were rated by undergraduate students for course credit. A total of 325 raters took part; 172 were cisgender women attracted to men, 52 cisgender women attracted to women, 68 cisgender men attracted to women, and 32 cisgender men attracted to men. The high number of photographs necessitated multiple rating sets to avoid rater fatigue; thus, the high number of raters. The greater proportion of female raters was due to female students being the majority at our department; however, sex and sexual attractions of raters typically have a minimal effect on ratings of sex-typed behavior (Rieger, et. al., 2008; Rieger, et. al., 2010; Watts et. al., 2018), and this was also the case for the present ratings.

2.3.2 Self-Report Measures

Sex Atypicality. An adaptation of the Childhood Gender Nonconformity Scale assessed childhood sex atypicality with 7 items, and an adaptation of the Continuous Gender Identity Scale assessed adulthood sex atypicality with 6 items,

each on 7-point scales (Rieger, Linsenmeier, Gygax, & Bailey, 2008). The adaptations made the scales gender neutral by removing gendered comparisons, please see appendix for a complete list of scale items. These were completed by all participants according to their birth sex. Item reliability (Cronbach's Alpha) for the childhood scale for cisgender women attracted to men, cisgender women attracted to women, transgender men attracted to men, and transgender men attracted to women, was .96, .87, .88 and .56, respectively. This value was low for transgender men attracted to women because most responded highly across items and the low variance prevented strong item reliability. For the adulthood scale, reliability was .90, .86, .82 and .89, respectively. For both the childhood and adulthood scale, average scores were created with higher scores indicating higher sex atypicality in relation to birth sex.

2.3.3 Procedure

Collecting Target Data and Photographs. Targets completed an online survey about their demographics and sex atypicality, and were asked to arbitrarily select and send, at a minimum, 1-3 photographs (with no upper limit) from any available age from childhood into adulthood. Most common were close-ups of the individual, and photographs taken at school, birthday events, and holidays. Participants were asked to identify themselves and state their age in each photograph. If needed, photographs were cropped so only the target was shown.

A total of 1056 photographs were used for analyses. The average number of photographs in childhood (operationalized as ages 0-15) and adulthood (from age 16, the legal age of consent in the UK) were calculated for each group. For childhood, mean (SD) numbers provided by cisgender women attracted to men, cisgender women attracted to women, transgender men attracted to women, and transgender

men attracted to men, were 4.60 (2.61), 2.94 (2.33), 6.00 (3.03), and 4.18 (2.98) respectively. For adulthood, mean (SD) numbers were 2.74 (1.43), 2.20 (1.25), 3.84 (2.46), and 2.34 (1.61), respectively. Transgender men further reported whether they had socially or medically transitioned (the latter referring here to starting testosterone) in each photograph. This means that they simply answered the question about whether they had socially or medically transitioned in each photograph. For analyses into the effect of transitioning on sex atypicality, whether a participant had socially or medically transitioned was determined through this information provided by participants.

Mean (SD) ages in photographs from childhood provided by cisgender women attracted to men, cisgender women attracted to women, transgender men attracted to men, and transgender men attracted to women were 6.77 (4.24), 7.69 (4.31), 8.18 (4.29), and 8.58 (4.65), respectively. For adulthood photographs, the average ages were 22.66 (5.53), 21.01 (4.95), 21.04 (3.28), and 24.10 (5.85), respectively.

Ratings. Photographs were presented to participants via the survey software Qualtrics, separated into different rating sets for each age period (childhood and adulthood). In total there were 10 sets each for childhood and for adulthood ratings. Several sets were needed to restrict each rater to no more than 45 minutes of rating.

Raters were informed about the targets' assigned birth sex, but not their sexual attraction or gender identity. Each rater evaluated one set of photographs from childhood and one, from different targets, from adulthood. At a minimum each set was rated by 20 raters. Because most targets provided multiple photographs, raters were informed that they might see the same person more than once but should give ratings independently for each picture.

In each set and age period, photographs were displayed in a random order. After each photograph, raters used a 7-point scale, ranging from "1 = very feminine" to "4 = average" to "7 = very masculine" to make their judgments as compared to the average cisgender female of that age. Inter-rater reliability (Cronbach's Alpha) exceeded .90 both within and across the four groups of raters (cisgender men and cisgender women with varying sexual attractions) and for each of the four target groups. Thus, ratings were averaged for each photograph across all raters.

2.4 Results

2.4.1 Observer-rated Sex Atypicality

Transgender men were expected to be more sex atypical than cisgender women, on average, with differences emerging in early childhood (Hypothesis 1). Moreover, cisgender women attracted to women were expected to be more sex atypical than cisgender women attracted to men (Hypothesis 2), and transgender men attracted to women more sex atypical than transgender men attracted to men (Hypothesis 3). To test these hypotheses simultaneously, a mixed-effects regression analysis was conducted. The dependent variable was observer-rated sex atypicality, averaged for each photograph across raters. Independent variables were gender identity (transgender or cisgender), sexual attraction, and age in photographs. We also examined possible interactions, to test whether gender identity differences and sexual attraction differences in sex atypicality were qualified by each other or by age. Participants were included as a random effect to account for repeated ratings across photographs of the same participant.

Results of the regression analysis are depicted in Figure 1A. A main effect of gender identity indicated that, in general, transgender men were rated as more sex

atypical (more masculine) than cisgender women, B = 1.2, 95% CI [.92, 1.50], p < .0001. A significant interaction of gender identity with age suggested that the effect of being transgender or cisgender on sex atypicality differed by age, B = .80 [.69, .90], p < .0001. We examined this interaction by conducting further analyses separately for transgender and cisgender participants. Transgender men became increasingly more sex atypical with older age, B = .80 [.69, .90], p <. 0001, whereas cisgender women did not increase in sex atypicality with age, B = .06 [-.05, .16], p = .27.

Results of the mixed-effects regression analysis also indicated a main effect of sexual attraction: a stronger attraction to women than to men was linked to higher sex atypicality ratings in both transgender and cisgender groups, B = .57 [.27, .86], p = .0002. There was no significant interaction between gender identity and sexual attraction, B = .08, [-.53, .7], p = .79. In total, transgender participants appeared more sex atypical than cisgender participants, but in both groups, sexual attraction differences in sex atypicality were similar, with those attracted to women being more sex atypical than those attracted to men (Figure 1A).

In addition, Figure 1A shows that the difference in sex atypicality between cisgender women attracted to women and both transgender groups began to occur early in childhood. This was determined by examining where the 95% confidence intervals of the groups' regression coefficients started to separate. This differentiation was the earliest, approximately age 3, between cisgender women attracted to men and transgender men attracted to women. The corresponding differentiation between cisgender women attracted to men and transgender men attracted to men was at age 5. In contrast, cisgender groups separated in their sex atypicality later, at age 7, which was an older age than observed in previous work with the same methodology (Watts

et al., 2018). However, overall, the analyses supported Hypotheses 1, 2, and 3, with transgender men being rated as more sex atypical than cisgender women, cisgender women attracted to women being more sex atypical than cisgender women attracted to men, and transgender men attracted to women being rated as more sex atypical than transgender men attracted to men.

2.4.2 Effect of Transitioning

We further tested for the potential effect that medically and socially transitioning may have on sex atypicality ratings of transgender men. The above analyses were repeated, excluding transgender participants at various stages of transition.

Our first analysis regarded physical changes due to testosterone treatment. All photographs of participants who had started taking testosterone were excluded. In general, results remained similar. A main effect of gender identity indicated that transgender men were rated as more sex atypical than cisgender women, $B = 1.01$ [.71, 1.31], $p < .0001$. A significant interaction of gender identity with age suggested that, as transgender men became older, they were rated as increasingly more sex atypical than cisgender participants, $B = .63$ [.51, .75], $p < .0001$. Likewise, the main effect of sexual attraction remained significant, $B = .50$ [.20, .80], $p = .0012$, indicating that, in general, those with stronger attraction to females were more sex atypical than those with stronger attraction to males. There was no significant interaction between gender identity and sexual attraction, $B = -.05$, [-.7, .58], $p = .86$ (Figure 1B).

Next, we excluded photographs of all socially transitioned participants. Again, results remained similar: a main effect of gender identity suggested that transgender men were rated as more sex atypical than cisgender women, $B = .85$ [.54, 1.16], $p <$

.0001. A significant interaction of gender identity with age suggested that the effect of gender identity increased with age, B = .49 [.34, .63], p < .0001. A significant main effect of sexual attraction indicated that those with stronger attraction to women were more sex atypical than those with stronger attraction to men, B = .50 [.20, .81], p = .0013. There was no significant interaction of sexual attraction with gender identity, B = -.03 [-.68, 63], p = .93 (Figure 1C).

2.4.3 Self-reported Sex Atypicality

We then examined whether self-reports could support patterns found with observer ratings. In a multiple linear regression analysis, self-reported childhood sex atypicality (ages 0-15) was regressed on gender identity, sexual attraction, and their interaction. We found a significant main effect of gender identity, with transgender participants reporting greater sex atypicality than cisgender participants, B = 2.3 [1.67, 2.99], p <.0001. A significant main effect of sexual attraction suggested that, in general, those who were more attracted to women than men were more sex atypical, B = .89 [.23, 1.55], p <. 0001. No significant interaction between sexual attraction and gender identity was found, B = -.38 [-1.70, .94], p = .60; thus, sexual attraction differences in self-reported childhood sex atypicality were similar for cisgender and transgender participants. Overall, cisgender women attracted to men were lowest in sex atypicality, transgender men attracted to women were highest, and cisgender women attracted to women and transgender men attracted to men fell in-between (Figure 2A).

Results for self-reported adulthood sex atypicality (age 16 or older) were similar. We found a significant main effect of gender identity, B = 2.38 [1.91, 2.85], p <.0001, and of sexual attraction, B = .86 [.32, .1.41], p = .002, but no significant interaction between sexual attraction and gender identity, B = -.64 [-1.72, .45]. p =

.25. Overall, cisgender women attracted to men scored the lowest, and transgender men attracted to women scored the highest in reported adulthood sex atypicality, and cisgender women attracted to women and transgender men attracted to men fell in-between (Figure 2B). These findings supported Hypotheses 1-3 in that transgender men attracted to women reported the most atypicality, and cisgender women attracted to men reported the least. However, we note that even though the two transgender groups differed in their self-report, on average, the mean confidence intervals overlapped, suggesting that (unlike for analyses with observer ratings) the differences between these groups were not as distinct (Figure 2).

2.5 Discussion

Hypothesis 1 was that transgender men would be more sex atypical than cisgender women. Hypothesis 2 was that cisgender women attracted to women would be more sex atypical than those attracted to men, and Hypothesis 3 that transgender men attracted to women would be more sex atypical than those attracted to men. Findings for observer ratings supported these hypotheses. Differences between transgender men and cisgender women emerged between 3-5 years of age and increased with age (given the separation of groups' confidence intervals; Figure 1A). Even when excluding photographs of participants who had already transitioned from analyses, those who would transition were rated as more sex atypical than cisgender women. Thus, transgender men were already more masculine in appearance and mannerisms even before taking steps to live as male in society. This finding, and the emergence of differences between cisgender and transgender individuals starting at an early age, are consistent with the possibility that the development of gender identity is influenced by non-social factors such as prenatal hormonal influences (Byne, 2006; Leinung & Wu, 2017). However, the social environment has also been argued to have

an influence on the formation gender identity (Littman, 2018), although the present author does not agree with the study by Littman (2018).

Within transgender groups, those attracted to women were rated as more sex atypical (or more masculine) than those with attractions to men from as young as 4-5 years old (Figure 1A), This difference was to some extent reflected in their self-report (Figure 2), similar to one past finding (Chivers & Bailey, 2000). This difference reflects a pattern seen in cisgender men, with those attracted to women being more masculine, starting from an early age, than those attracted to men (Rieger et al., 2008). This suggests similarities in development between cisgender and transgender men with respect to sexual attraction and gendered behavior.

Finally, cisgender women attracted to women were more sex atypical than attracted to men from childhood onward, similar to past work (Rieger et. al., 2008; Watts et. al., 2018). Yet, compared to these past studies, where the difference started at about 3-5 years old, in the present work this difference emerged at a later age, at approximately 7 years old. Whether this difference from previous studies is meaningful is unclear.

Regarding limitations of the present research, the use of photographs avoids limitations of self-report and longitudinal designs but has its own limitations. For instance, despite us requesting a random selection, some participants may have selected photographs that showed them in a way that they preferred. Transgender men may have sent in photographs in which they appeared very masculine, if they prefer to be perceived that way. Yet, the limited longitudinal work on this population supports the hypothesis that transgender men are indeed more sex atypical from early childhood onwards. That is, increased sex atypicality precedes a higher likelihood that a child will socially transition (Rae, et al., 2019). Such longitudinal work should

be extended into adulthood, to further investigate the relationship between early sex-typed traits and later gender identity, independently of sexual attraction.

In conclusion, the present research suggests that starting from an early age, transgender men display behaviors and appearance typical for those with their adulthood gender identity (male) rather than their birth sex (female), and this continues throughout childhood into adulthood. Transgender people may therefore develop typically, in certain ways, for those with their adult gender identity, but their behaviors appear sex atypical because their assigned birth sex and gender are incongruent.

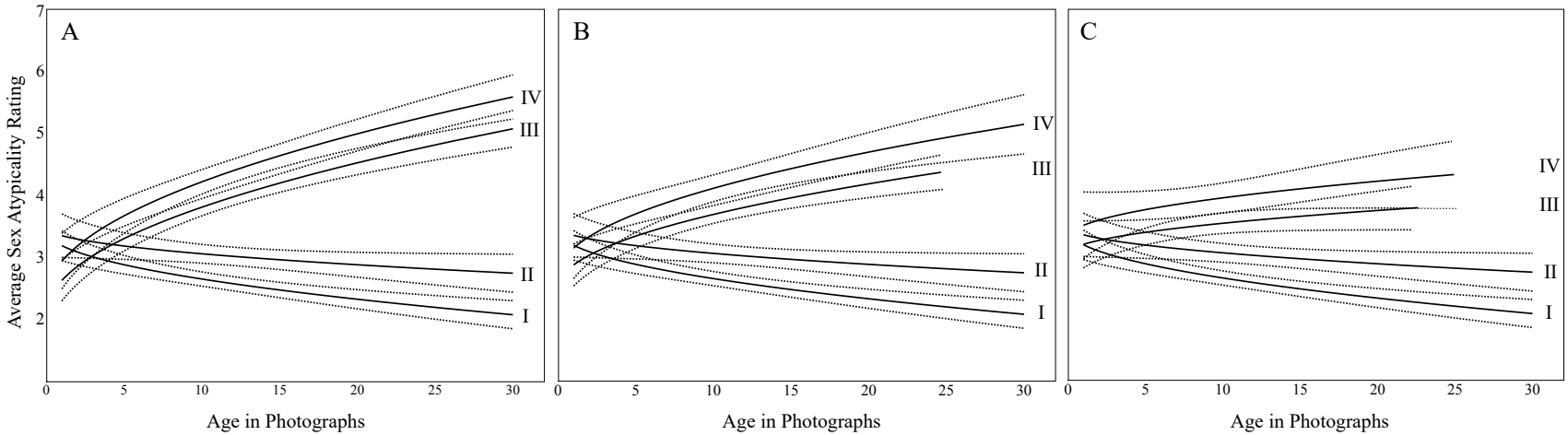

Figure 1. Observer-rated sex atypicality of cisgender women attracted to men (I), cisgender women attracted to women (II), transgender men attracted to men (III), and transgender men attracted to women (IV). Patterns are depicted across all available photographs (A), and by excluding photographs of transgender participants who had started testosterone treatment (B) and social transitioning (C). The x-axis represents the age in the photographs. The y-axis represents rated sex atypicality. 1 is the least sex-atypical (most feminine) score, and 7 the most sex-atypical (most masculine) score. Triple lines represent regression coefficients with 95% confidence intervals.

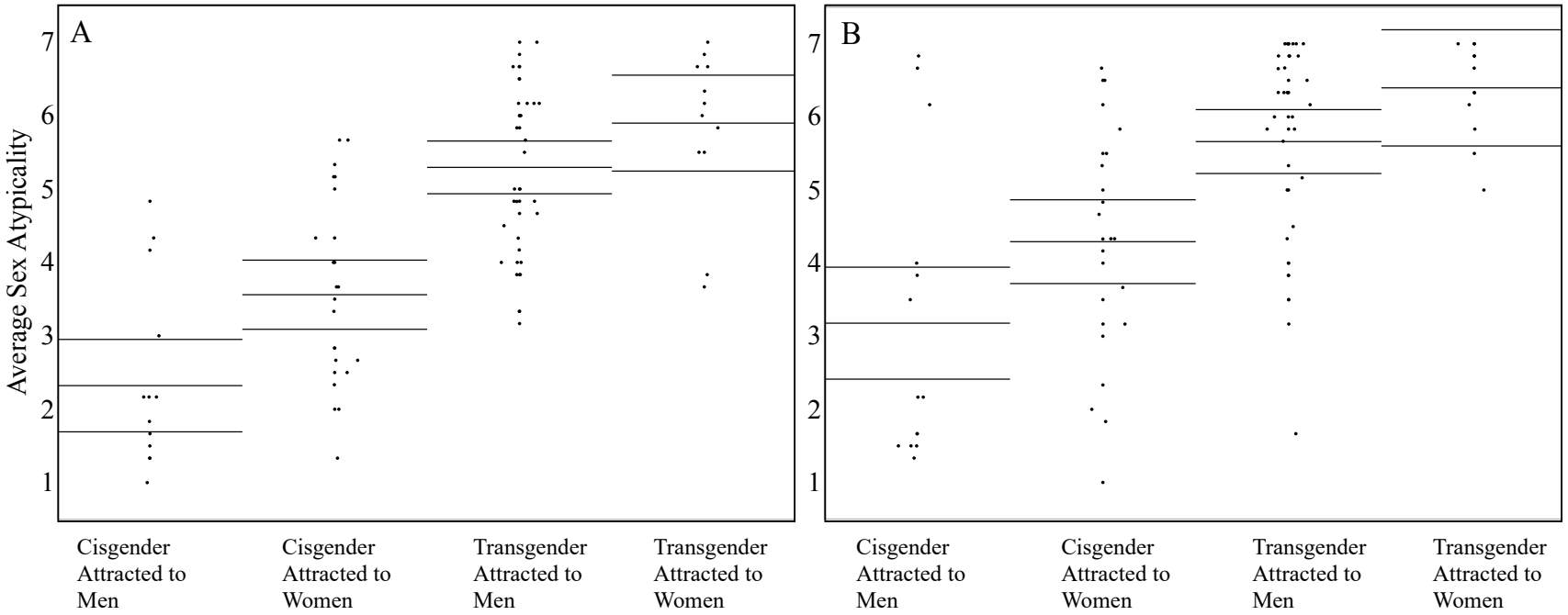

Figure 2. Self-reported sex atypicality in childhood (A), and adulthood (B). The x-axis lists groups split by gender identity and sexual attractions. On the y-axis, 1 is the least sex-atypical (most feminine) score, and 7 is the most sex-atypical (most masculine) score. Triple lines for each group are means with their 95% confidence intervals.

2.6 Appendix

Scale items: Childhood Gender Nonconformity Scale (Assigned birth sex female)

As a child I felt I had more in common with boys than girls.

As a child I was perceived as masculine by my peers.

As a child I preferred playing with boys rather than girls.

I was more masculine than feminine.

As a child I sometimes wish I had been born a boy rather than a girl.

As a child I usually avoided feminine clothing (such as dresses).

Scale items: Adulthood Continuous Gender Identity Scale (Assigned birth sex female)

My mannerisms are not very feminine.

I assume most people see me as not very feminine.

I assume most people see me as masculine.

I consider myself very masculine in my behaviors and interests.

I do not consider myself very feminine in my behaviors and interests.

I consider myself more masculine than feminine.

Chapter 3 Genital Sexual Arousal of Transgender Men

3.1 Abstract

Most men show genital sexual arousal to one, preferred gender. Most women show genital arousal to both genders, regardless of their sexual preferences. There is limited knowledge whether this difference is driven by biological sex or gender identity. Transgender individuals, whose birth sex and gender identity are incongruent, provide a unique opportunity to address this question. we tested whether the genital responses of 25 (female-to-male) transgender men followed their female birth sex or male gender identity. Depending on their surgical status, arousal was assessed with penile gauges or vaginal plethysmographs. Transgender men's sexual arousal showed both male-typical and female-typical patterns. Across measures, they responded more strongly to their preferred gender than other gender, similar to (but not entirely like) 145 cisgender (non-transgender) men. However, they still responded to both genders, similar to 178 cisgender women. In birth-assigned females, both gender identity and biological sex may influence sexual arousal patterns.

3.1.1 Statement of Relevance

People who are transgender identify as male but were born with female bodies, or vice versa. We do not know much about how exactly transgender people differ from most people. Do transgender people behave in line with their birth sex, or in line with the gender they identify as? Because most men and women differ substantially in their sexual responses to erotic videos showing males or females, these sexual responses can tell whether a person behaves in a male-typical or female-typical way. We therefore studied, for the first time, how transgender men (that is, male-to-female transgender) responded to erotic videos. Findings showed that even though transgender men had some female-typical responses, in line with their female birth sex, they also showed striking male-typical responses, in line with their male

gender identity. Hence, for transgender men, their physiological sexual arousal is in part reflective of their male identity.

3.2 Introduction

3.2.1 Cisgender Genital Arousal

In cisgender people, a female birth sex matches a gender identity of woman, and a male birth sex matches a gender identity of man. There is a consistent difference between cisgender men and women in the specificity of their genital sexual arousal to sexual stimuli, measured with either a penile strain gauge or vaginal plethysmograph. Most cisgender men show genital sexual arousal to one, preferred gender, but not to the other gender, whereas most cisgender women show arousal to both genders, regardless of self-reported sexual preferences (Bailey et al., 2016). There are exceptions to this general sex difference. For instance, in cisgender men, sexual responses to one, preferred gender is more pronounced in heterosexual and homosexual men than bisexual men (Jabbour et al., 2020). Another exception to the general sex difference is among cisgender women. Even though homosexual women are, like heterosexual women, sexually aroused to both genders, they also respond, unlike heterosexual women, somewhat more strongly to their preferred gender than the other gender (Rieger et al., 2016). In general, however, specific sexual arousal to a preferred gender characterizes men more than women and can therefore be considered male-typical, whereas non-specific arousal to both genders can be considered female-typical (Bailey, 2009; Chivers, Seto, & Blanchard, 2007).

Because the majority people are cisgender, their birth sex and gender identity are strongly correlated (Zucker, 2017). Thus, for most people, it is unknown whether sex differences in their sexual arousal are linked to their birth sex or gender identity. However, the very existence of transgender individuals suggests that birth sex and

gender identity do not have to match, and in theory, one or the other could be more relevant for the organization of sexual arousal. The literature often focuses on birth sex (Bailey, 2009), but gender identity could also be influential.

3.2.2 Transgender Genital Arousal

Gender identity is a component of social identity that affects the sense of self, treatment by others, and the ascription of social roles (Eagly & Wood, 2017). Furthermore, because gender identity is so central to the self, it can cause individuals distress if their gender identity is not correctly expressed: transgender people can experience gender dysphoria until their physical sex becomes aligned with their gender identity (De Vries et al., 2014; Murad et al., 2010). Given the relevance of gender identity to the self, it is informative to understand its potential contributions to sexual arousal, independent of birth sex.

Moreover, through a focus on transgender individuals, the study on sexual of arousal can aid in understanding the identity of those who are transgender. There are several stereotypical and stigmatizing beliefs about transgender individuals (Howansky, Wilton, Young, Abrams, & Clapham, 2019). For instance, one public perception is that transgender men (i.e., female-to-male) are indistinguishable from homosexual cisgender women (Kiss, 2018), or that transgender men have to be attracted to women, which might make transgender men with attractions to men doubt their own gender identity (Bockting et al., 2009). A study of transgender men's physiological sexual arousal could help supporting the notion of their gender identities and their sexual attractions.

Transgender people have rarely been studied in this context. One reason for this is that the estimated population size is small, ranging from 0.3% to 1.3 (Zucker, 2017). One study examined the genital sexual arousal patterns of postoperative

transgender women (i.e., male-to-female) with vaginal photoplethysmographs. Transgender women's arousal was specific towards their preferred gender, similar to the patterns in cisgender men, and unlike the patterns in cisgender women (Chivers et al., 2004). Thus, in people with a male birth sex, sexual arousal patterns might not be driven by their gender identity but by their birth sex.

Sexual responses of transgender men have not been studied, and because of the difference in specificity between cisgender men and women, it cannot be assumed that transgender men have sexual responses that are either equivalent to, or opposite from, those of transgender women. Thus, one aim of the present study was to examine whether the arousal patterns of transgender men reflects their gender identity (gender-specific sexual arousal like most men), or their birth sex (gender-nonspecific sexual arousal like most women).

Gender identity relates to appearance, motor behavior, and cognition; for example, transgender men are in this respect more male-typical than most cisgender women, starting in childhood (Olson & Gülgöz, 2018; Olson et al., 2015; Singh et al., 2010; Zucker et al., 2012). Transgender men could therefore be more male-typical than cisgender women in other ways, including their physiological sexual arousal patterns. That is, if, like appearance, cognition and motor behavior, genital sexual arousal is associated with gender identity, transgender men might show male-typical arousal, consistent with their male identity. Therefore, they may show substantial sexual arousal to their preferred gender but not the other gender, similar to cisgender men. However, because one study found that transgender women have male-typical arousal (Chivers et al., 2004), it could mean that for transgender people, in general, birth sex has a primary influence on their sexual arousal patterns. Therefore, transgender men could have female-typical genital arousal, and be sexually aroused to

both genders, in line with their female birth sex. Furthermore, transgender men could show a combination of male-typical and female-typical patterns. That is, similar to homosexual cisgender women, who are female-typical in their sexual arousal because of their responses to both genders, but also male-typical in the sense that they respond more to their preferred gender than the other gender (Rieger et al., 2016), it could be that transgender men show such combination of male-typical and female-typical responses.

A further question of the present research was how genital sexual arousal can be measured in transgender men. Around 2% of transgender men undergo a surgery called metoidioplasty (James et al., 2016), which releases the clitoris, enlarged by testosterone, from the suspensory ligament. The penis created by this procedure is 1-3 inches in length and enlarges during arousal (Cotten, 2012). It may therefore be viable to measure arousal in postoperative transgender men using a smaller-sized penile strain gauge. As this surgery is rare, in the present study, 6 transgender men have had metoidioplasty, whereas 19 had not. We therefore measured the genital sexual arousal of transgender men with either a penile strain gauge or a vaginal plethysmograph, depending on surgical status. Using different measures within the same birth sex allowed for the investigation into potential differences in genital sexual arousal responses due to differences in measurement technique.

3.2.3 The Present Study

In sum, we predicted that:

1) Cisgender men will be more gender-specific in their sexual arousal patterns than cisgender women.

Furthermore, based on the available literature, one, or both, of the following patterns could be detected:

2) Transgender men will show male-typical sexual arousal with stronger sexual responses to the preferred gender than the other gender, similar to cisgender men.

3) Transgender men will show female-typical sexual arousal, with sexual responses to both genders, similar to cisgender women.

In addition, we explored the utility of a penile gauge instead of a vaginal probe in measuring genital sexual arousal of transgender men.

3.3 Method

3.3.1 Participants

Participants were recruited via UK Pride festivals, university mailing lists and fairs, and online forums for transgender men (e.g., on Tumblr). Whether participants were transgender was assessed with separate questions about gender identity, birth sex, and whether the two differed. This was initially recorded through a survey and confirmed during the visit to the lab.

Participants consisted of 25 transgender men, 6 of which used a small penile gauge and 19 used the vaginal probe. Self-reported sexual attraction to men and women was assessed with a 7-point scale (Kinsey et al., 1948). A score of 0 or 1 meant exclusive or almost exclusive attraction to women (n = 5), scores of 2, 3 or 4 stood for varied degrees of bisexual attractions (n = 16), and a score of 5 or 6 for almost exclusive or exclusive attraction to men (n = 4). Three transgender participants took part twice, due to their interest in another assessment. Because these participants are rare, we did not immediately exclude their second assessments, but rather, analyzed data in different ways: first, by including participant as a random effect to account for the repeated measures of these three participants; second, by excluding the second assessment of these three participants (and not using participant as a

random effect). The inclusion or exclusion of their repeated participation did not alter findings (see Results).

Cisgender participants reported a gender identity that was congruent with their birth sex. A total of 178 cisgender women and 145 cisgender men participated during the same time frame as transgender participants. Their sexual attraction was assessed with identical scales as for transgender participants (Kinsey et al., 1948). A score of 0 or 1 meant exclusive or almost exclusive attraction to women (60 cisgender women, 74 cisgender men), 2 to 4 stood for varied degrees of bisexual attractions (39 cisgender women, 28 cisgender men), and 5 or 6 meant almost exclusive or exclusive attraction to men (79 cisgender women, 43 cisgender men).

For cisgender men, the relationship (standardized regression coefficient β) of their sexual attraction with their genital sexual arousal to male or female sexual stimuli falls between .80 and .90 (Rieger, et al., 2015; Watts, et al., 2018). Thus, significant power of .80 can be achieved with a minimum of 9 cisgender men with different sexual attractions. The present study exceeded this minimum number. For cisgender women, the corresponding effect is low, approximately .20 (Rieger et al., 2016). For this weak effect, the relationship of their sexual attraction with their genital response to male or female stimuli is often not significant, and a focus may be given on the expected magnitude of effect rather than on level of significance. In fact, to achieve significant power of .80 for this effect, it requires a minimum of 193 cisgender women with varied sexual attractions. We aimed to achieve this minimum number but fell 15 participants below (results for cisgender women were still significant in predicted directions). Finally, prior data from our lab indicate that the sex difference in effect (i.e., the interaction of sexual attraction with sex, predicting genital response to males or females) has a magnitude of $\beta = .23$. For this interaction,

a minimum of 173 cisgender men and women with varied sexual attractions were needed to achieve significant power of .80. The present sample exceeded this number.

Given these power analyses, if one assumes that transgender men show sexual attractions effects like cisgender men, then a minimum of 9 transgender men with varied sexual attractions are required. Our sample of 25 transgender men with different sexual attractions exceeded this minimum. However, if one assumes that transgender men show sexual attraction effects like cisgender women, a minimum number of 193 is required. Our sample was below that minimum. Yet, as aforementioned, sexual attraction effects in cisgender women are weak, and it may be more insightful to focus on the expected magnitude and direction of effect rather than level of significance. Furthermore, transgender men willing and able to come to a lab are drawn from a small population and therefore difficult to find. For this reason, it is scientifically informative to examine their physiological sexual arousal patterns, even if their numbers are small.

There was no pre-specified target number of transgender participants. However, once we realized that we had maxed out our opportunities to recruit transgender men (in addition to cisgender women of different sexual attractions, for whom we calculated a large number to achieve powerful effects), we stopped. For consistency in methodology, all cisgender men that were recruited in the same time frame as transgender men and cisgender women were included in analyses, even if their numbers exceeded the number set by above power analyses.

Mean (SD) ages for transgender men, cisgender men, and cisgender women were 22.88 (3.70), 24.67 (9.47), and 24.37 (7.23), respectively. Group did not significantly differ in age, F (2,345) = .65, p = .52, R^2 [95%CI] = .004 [-.009, .02]. In transgender men, 88% were white and 12% of other ethnicities. In cisgender men

83% were white, and in cisgender women 77%. Groups did not significantly differ in these proportions, $\chi^2(2) = 2.82$, $p = .24$.

3.3.2 Materials and Measures

Sexual Attraction. Two Kinsey-type 7-point scales were used (Kinsey et al., 1948), which participants completed upon arrival in the lab. One scale asked about sexual attraction, raining for exclusive attraction to the opposite gender (a score of 0), to degrees of bisexual attractions with the midpoint being equal bisexual attractions (a score of 3), to exclusive attraction the same gender (a score of 6). The other scale asked other about sexual orientation identities, ranging from exclusively heterosexual (a score of 0), to bisexual (a score of 3), to exclusively homosexual (a score of 6) orientations. Measures were highly correlated. In cisgender men, attraction to the opposite gender (women) corresponded with a heterosexual orientation and attraction to the same gender (men) with a homosexual orientation; $r(144) = .98$, $p < .0001$, 95% CI = [.98, .99]. Conversely, in cisgender women, attraction to the opposite gender (men) corresponded with a heterosexual orientation, and attraction to the same gender (women) with a homosexual orientation; $r(176) = .97$, $p < .0001$, 95% CI = [.96, .98]. In transgender men (who have a male identity), correlations were as in cisgender men, with an attraction to the opposite gender (women) corresponding with a heterosexual orientation and attraction to the same gender (men) with a homosexual orientation; $r(23) = .93$, $p < .0001$, 95% CI = .[84, .97]. Cisgender women's responses were reverse scored. Response were then averaged for each participant. Thus, for each group, higher average scores meant stronger attraction and orientation towards men. This composite score is, from here on, described as "sexual attraction to men or women."

Stimuli. Sexual videos were 3 minutes long, with 3 featuring a male model and 3 featuring a female model masturbating. These stimuli had been previously selected to be the most arousing videos from a large pool (Rieger et al., 2015). Baseline arousal was assessed using six 2-minute clips without any sexual content taken from a nature documentary. These clips have been verified to facilitate a return to an unaroused level (Rieger et al., 2015). Videos were presented full screen with a resolution of 768 by 536 pixels.

Genital Data. Genital responses were recorded every 5 milliseconds using a BIOPAC MP100 data acquisition unit and the program AcqKowledge. A vaginal photoplethysmograph measured change in vaginal pulse amplitude in cisgender women and preoperative transgender men. The amplitude signal was sampled at 200 Hz, and high-pass filtered at 0.5 Hz with 16 bits resolution. Amplitude was measured as peak-to-trough amplitude for each vaginal pulse.

Penile responses of cisgender men and postoperative (metoidioplasty) transgender men were measured with a penile strain gauge, as the phallus created from the enlarged clitoris is homologous to a cisgender penis. The signal was sampled at 200 Hz, low-pass filtered to 10 Hz and digitized with 16 bits resolution. Most gauges for cisgender men were 70 mm in circumference. Gauges for transgender men were 50 mm in circumference. Before sessions, gauges were calibrated with a cone to assess circumference increase in 5-mm steps. Signals were transformed into millimeters of circumference.

3.3.3 Procedure

Written consent was obtained from participants before seating them in a booth, where they faced a screen with a resolution of 1024 by 768 pixels. Participants were briefed how to handle measurement devices and were then left in privacy for the

remainder of the study. Once the genital device was in place, they were instructed via an intercom to keep their eyes on the screen regardless of whether they liked the content or not. Firstly, participants viewed a neutral stimulus, followed by sexual stimuli alternating with nature scenes, playing in a randomized order. The procedure took approximately 45 minutes.

Analyses of genital data were conducted in ways that have previously produced reliable results (Watts, Holmes, Raines, Orbell, & Rieger, 2018). Response to each stimulus was averaged within participants, and these averages were *z*-scored within participants. Next, standardized responses to the 10 seconds preceding a sexual stimulus (at the end of a neutral stimulus and at which time they had returned to baseline) were subtracted from the standardized response to this stimulus. Then, for each participant, we computed an average response to all male stimuli, and separately, to all female stimuli. These average responses were then used to create a contrast score for each participant. Positive numbers indicated stronger genital responses to males, and negative numbers indicated stronger responses to females.

A further arousal score was computed to measure level of bisexual arousal, by examining average arousal to female stimuli and to male stimuli and by selecting for each participant the lower of the two responses, as compared to baseline. This created a new variable representing participants' responses to their less-arousing gender. Stronger responses to the less-arousing gender indicate more bisexual arousal in a participant. Cisgender women usually respond more strongly to their less-arousing gender than cisgender men, consistent with the observation that cisgender women are more bisexual in their response, on average (Rieger et al., 2015). Response to the less-arousing gender therefore appeared useful to examine the degree of male-typical or female-typical arousal patterns of transgender men.

3.4 Results

3.4.1 Differences between Transgender Men and Cisgender Men and Women

We predicted that among cisgender participants, men would show more male-typical (gender-specific) sexual arousal than women, whereas women would show more female-typical (gender-nonspecific) sexual arousal. We further examined whether transgender men could show male-typical genital sexual arousal patterns, similar to cisgender men, if they could show female-typical arousal pattern, similar to cisgender women, or a combination of male-typical and female-typical patterns.

At first, we computed three multiple regression analyses, one for each group: transgender men, cisgender men, and cisgender women. The dependent variable was the genital sexual arousal contrast score. Negative numbers meant stronger sexual responses to females, and positive numbers stronger responses to males, and this across all groups. The independent variable was self-reported sexual attraction, with lower numbers meaning more attraction to women and higher numbers meaning more attraction to men, also across all groups. In the case of transgender men, we computed a mixed-effects regression analysis to account for repeated measures of three participants. Results indicated a main effect of transgender men's sexual attraction on their sexual responses to males or females, B [95% CI] = .34 [.12, .57], p = .005, β [95% CI]= .61 [.29, .93]. (B is the unstandardized and β the standardized regression coefficient.) This finding means that transgender men who reported stronger attractions to women had greater genital responses to females, whereas those who reported stronger attractions to men responded more strongly to males. The corresponding effect was stronger in cisgender men, B = .50 [.44, .55], $p < .0001$, β = .83 [.74, .92], and weaker in cisgender women, B =.07 [.01, .12], p = .02, β = .18

[.03, .32] (Figure 1A-C). Thus, in each group, sexual attraction to men or women related positively to genital response to males or females, and for this effect, transgender men were between cisgender men and cisgender women.

We then conducted an additional regression analysis to test for a potential difference in effect between transgender men, cisgender men, and cisgender women, again predicting genital sexual arousal to males or females by sexual attraction. Further predictors were participant group (transgender men, cisgender men, cisgender women) and the interaction of sexual attraction with group. This interaction was significant, B = -.22 [-.25, -.18], $p < .0001$, β = -.42 [-.50, -.35], suggesting that the relationship of sexual attraction with genital sexual arousal to males or females differed by group. Specifically, for cisgender men the effect of their sexual attraction on their arousal to males or females was significantly stronger than the average effect (taken across all groups), B = .19 [.11, .27], $p < .0001$, β = .37 [.21, .53]. In contrast, for transgender men the effect was not significantly different from the average effect, B = .05 [-.09, .20], p = .46, β = .08 [-.13, .29]. For cisgender women this effect was smaller than the average effect, B = -.24 [-.32, -.16], $p < .0001$, β = -.45 [-.60, -.30]. These results confirm the findings illustrated in Figure 1: Transgender men's arousal was shifted in a male-typical direction, because they were more aroused to their preferred gender than other gender. This effect was not as strong as in cisgender men, but stronger than in cisgender women.

We note in Figure 1B that one of the repeatedly measured transgender men had a change in self-reported sexual attraction (from Kinsey 1 to 5), and this was reflected in a change in arousal. Excluding the second sessions of these repeated participants, the overall effect of transgender men’s sexual attraction on their arousal

patterns remained similar to the one reported above, B = .35 [.14, .56], p = .002, β = .59 [.24, .94].

To further test the degree to which transgender men's arousal was shifted in a male-typical or female-typical direction, we examined group differences in their responses to the less-arousing gender, which was our index of bisexual arousal. On average, cisgender men had the weakest responses to their less-arousing gender, M [95% CI] = .24 [.17, .31], although a one-sample t-test indicated that their responses still exceeded baseline (zero), $t(144) = 6.70$, $p < .0001$, dz = .56 [.45, .68]. Transgender men had stronger responses to their less-arousing gender, compared to baseline, M = 1.02 [.66, 1.39], $t(24) = 5.83$, $p < .0001$, dz = 1.16 [.91, 1.46]. Cisgender women had the strongest responses, M = 1.29 [1.20, 1.38], $t(177) = 27.95$, $p < .0001$, dz = 2.08 [1.98, 2.19] (Figure 2A-C).

Based on prior work, bisexual individuals may respond more strongly to their less-arousing sex than those with exclusive attraction to men or women (Rieger et al., 2015). Bisexuality was not the main focus of the present research, but it was important to statistically control for such a pattern. This can be tested with the quadradic effect of sexual attraction on the response to less-arousing sex: Participants in the mid-range (bisexual range) of the Kinsey scale could have greater responses to their less-arousing sex, and thus, greater bisexual responses, than those who are on either end of the Kinsey scale (exclusively attracted to women or men).

Regression analyses suggested that the groups differed in the quadratic relationship of sexual attraction with bisexual arousal, which is visualized in Figures 2A-C. In cisgender men, those with bisexual attractions had greater bisexual responses than those attracted to women only or men only; this quadratic effect of sexual attraction was significant, B = -.04 [-.06, -.01], p = .001, β = -.36 [-.58, -.14].

No such quadratic effect of sexual attraction on bisexual response was found in cisgender women, B = .03 [-.003, .06], p = .07, β = .15 [-.01, .31], and transgender men, B = -.04 [-.21, .12], p = .60, β = -.10 [-.50, .31]. A further regression analysis indicated that, when controlling for these differences in the quadratic effect of sexual attraction, average group differences in bisexual response remained significant. Cisgender men showed lower than the average bisexual responses (averaged across all groups), B = -.46 [-.63, -.28], p < .0001, β = -.56 [-.78, -.33], transgender men had greater bisexual responses, compared with the average response, B = .23 [.01, .44], p = .04, β = .19 [.01, .37], and ciswomen also had greater bisexual responses, B = .22 [.05, .38], p = .009, β = .29 [.07, .51].

Overall, results indicated that transgender men were relatively more male-typical than cisgender women in their genital sexual arousal because they showed stronger responses to their preferred gender, but still more female-typical than cisgender men because of their levels of bisexual arousal. Cisgender men and cisgender women differed in the predicted way.

3.4.2 Penile Gauge and Vaginal Probe Measures in Transgender Men

A further component of the present research was investigating the use of a penile gauge or vaginal probe in transgender men. For transgender participants only, we conducted a mixed-effects regression analysis, with genital sexual arousal to males or females as the dependent variable, and sexual attraction and measurement device (vaginal probe or penile gauge) as the independent variables. We also tested for an interaction between sexual attraction and device. Participants were a random effect to account for repeated measures of three participants.

Results showed a significant effect of sexual attraction, B = .36 [.14, .58], p < .003, β = .63 [.30, .97], no significant effect of device, B = -.23 [-.99, .52], p = .52, β = -.12 [-.45, .22], and no significant interaction of sexual attraction with device, B = -.17 [-.70, .37], p = .52, β = -.10 [-.44, .24]. Thus, across measures, transgender men had male-shifted arousal patterns as their arousal to males or females was linked to their self-reported attraction. When excluding the second session for the three participants who took part twice, both the main effect for sexual orientation, B = .36 [.14, .58], p =.003, β = .60 [.24, .97], and device, B = -.17 [-.95, .60], p = .64, β = -.08 [-.45, .28], remained similar, as did the interaction, B = -.16 [-.71, .39], p = .56, β = -.10 [-.47, .26].

To further examine the effects of each measurement device, we computed additional mixed-effects regression analyses, separately for each device, predicting sexual arousal patterns by sexual attraction. For the 19 participants using the vaginal probe, their self-reported attraction correlated with their genital sexual arousal to males or females, B = .33 [.04, .63], p = .03, β = .59 [.20, .98]. This effect was not significant in the 6 participants using the penile gauge, B = .48 [-.16, .1.13], p = .10, β = .73 [-.06, 1.52], even though their effect was larger in magnitude than for those using the vaginal probe. Overall, with both measures there were correspondences of transgender men's self-reported sexual attractions with their sexual arousal patterns (Figure 3A-B). When excluding the second session for the three participants who took part twice, both the effect for the vaginal probe, B = .33 [.08, .58], p = .01, β = .55 [.13, .98], and the penile gauge, B = .48 [-.16, 1.22], p = .10, β = .72 [-.24, 1.68], remained similar to those reported above.

3.5 Discussion

Present findings suggested the existence of both male-typical and female-typical sexual arousal patterns in transgender men, because they showed some gender-specific sexual arousal, similar to cisgender men, but also showed bisexual arousal, similar to cisgender women.

Due to the small population of transgender men (Zucker, 2017), the sample of transgender men was small, and reduced further by the intrusive nature of the experiment. Insofar, we consider it notable that we were able to recruit 25 transgender men. However, their small sample is a limitation of this work and our following interpretations are tentative.

Present findings differed from results of a previous study that investigated genital sexual arousal in transgender women, and who showed patterns typical for their male birth sex, and atypical for their female gender identity (Chivers et al., 2004). In our sample of transgender men, arousal patterns were at least partially in line with their male gender identity. This included that transgender men who reported attraction to women were indeed sexually aroused by women, and those attracted to men were indeed aroused by men. This makes these two groups of transgender men distinct from each other, in addition to each group being distinct from cisgender women of different sexual attractions. Hence, neither should transgender men be dismissed as being "lesbians in denial" (Kiss, 2018), nor should those who report attractions to men being dismissed as not having a male gender.

Another component of the present study was the use of different arousal measures for transgender men. Penile gauges appeared to capture arousal in postoperative transgender men and did not lead to different patterns of sexual responses as compared to transgender men using the vaginal probe. We stress that the

number of transgender men using a penile gauge was small, and no firm conclusions can be made. Still, some speculation is useful. If one assumed that findings were valid, it would suggest that the arousal functions of a penis created through metoidioplasty are similar to those of cisgender penises. This interpretation, too, would verify the male-typicality of transgender men. Furthermore, because transgender men using the vaginal probe and those using the penile gauge had similar arousal patterns, it suggests that different measurement devices do not inherently result in different responses. Cisgender men and women often use different measurement devices and repeatedly show different arousal patterns (Chivers, 2017). The present findings indicate that the vaginal probe can pick up gender-specific arousal patterns in birth sex females, which suggests that it is not a matter of the device that leads to gender-nonspecific arousal patterns in cisgender women. This conclusion is in line with emerging work using alternative measures of sexual arousal that confirm that sexes differ in the gender-specificity of their sexual responses, such as genital thermography (Huberman & Chivers, 2015), or clitoral responses (Suschinsky, Dawson, & Chivers, 2020).

Future research should test a larger sample of transgender men with more equal distribution of sexual attraction, measurement type, and transition stage. In the present sample, 20 participants used testosterone supplements, whereas 5 did not. We could not detect reliable differences in effect, depending on the use of testosterone[1], but because the latter group was so small, this null finding may not be reliable. Further work should also consider other factors that could affect transgender men's

[1]The results of a multiple regression analysis for the effect of being on testosterone or not was B = .43 [-.75, .004], p = .08, β = -.36 [- 1.74, 0.10]. This indicated that transgender men who were on testosterone showed increased sexual arousal to men compared to those who were not on testosterone, and this was regardless of their self-reported sexual attractions. This effect was not significant.

sexual arousal patterns, including the types of sexual stimuli used, or their history of male and female romantic and sexual partners.

In conclusion, transgender men appear to show a combination of male-typical and female-typical genital sexual arousal patterns. These results indicate that for birth-assigned females, differences in sexual arousal may not be solely based on their natal sex, but their gender identity also has an influence. In other words, for transgender men, their physiological sexual arousal is at least in part reflective of their gender identity.

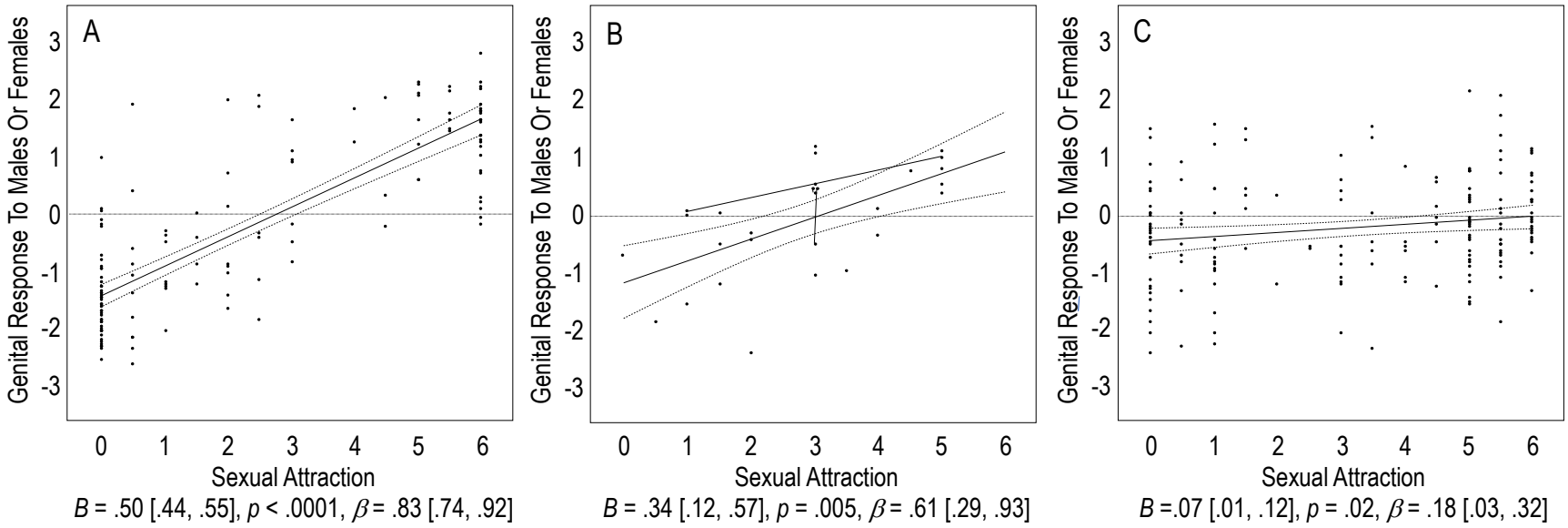

Figure 3. Genital responses to males or females in relation to self-reported sexual attraction in cisgender men (N = 145; A), transgender men (N = 25; B), and cisgender women (N = 178; C). On the x-axis, lower scores indicate more self-reported attraction towards women, three an equal bisexual attraction, and higher scores more attraction towards men. On the y-axis, negative scores indicate more genital sexual arousal towards females (standardized within participants), zero equal arousal, and positive scores more arousal towards males. Each dot represents a participant. Solid lines connect data of repeatedly measured participants. Triple lines represent regression estimates with 95% confidence intervals. Statistics represent main effects of sexual attraction on genital sexual arousal to males or females.

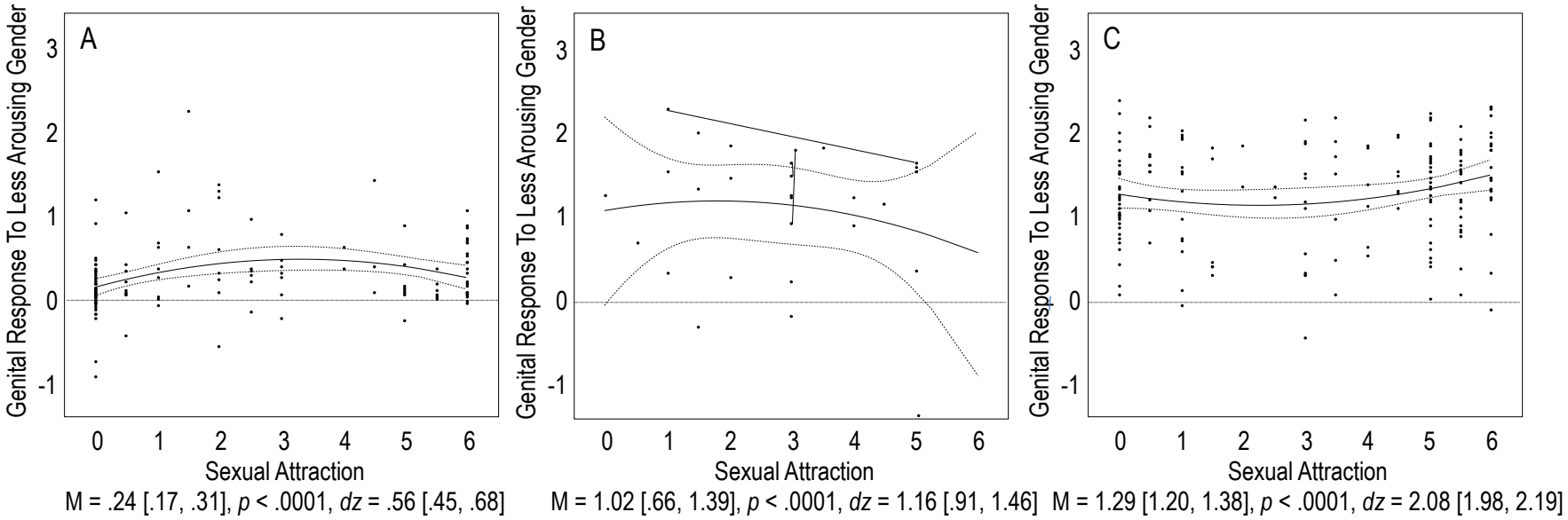

Figure 4. Genital responses to the less-arousing gender in relation to self-reported sexual attraction in cisgender men (N = 145; A), transgender men (N = 25: B), and cisgender women (N = 178; C). On the x-axis, lower scores indicate more self-reported attraction towards women, 3 an equal bisexual attraction, and higher scores more attraction towards men. The y-axis, higher scores indicate stronger genial arousal responses towards the less-arousing gender (standardized within participants). Each dot represents a participant. Solid lines connect data of repeatedly measured participants. Triple lines represent regression estimates with 95% confidence intervals. Statistics represent average responses to the less arousing gender as compared to baseline (zero).

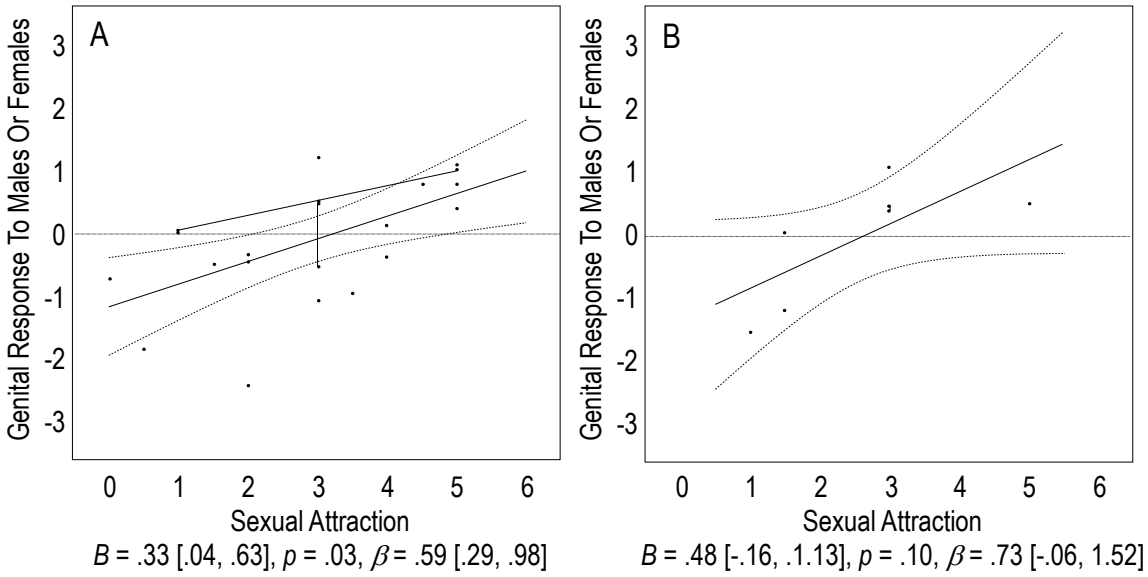

Figure 5. Genital responses to males or females in relation to self-reported sexual attraction in transgender men using the vaginal probe (N = 19; A) and the penile gauge (N = 6; B). On the x-axis, lower scores indicate more self-reported attraction towards women, 3 an equal bisexual attraction, and higher scores more attraction towards men. On the y-axis, negative scores indicate more genital sexual arousal towards females (standardized within participants), zero equal arousal, and positive scores more arousal towards males. Each dot represents a participant. Solid lines connect data of repeatedly measured participants. Triple lines represent regression estimates with 95% confidence intervals. Statistics represent main effects of sexual attraction on genital sexual arousal to males or females.

Chapter 4 Wellbeing of Transgender Men

4.1 Abstract

Lesbian, gay, bisexual, and transgender (LGBT) people have lower wellbeing than that of the general population, and within this community transgender individuals appear most vulnerable. Discrimination may contribute to this disparity, and, uniquely to transgender people, the process of transitioning may impact their wellbeing. However, large-scaled direct comparisons of transgender and cisgender (i.e., non-transgender) groups of differing sexual attractions have rarely been conducted. A total of 861 cisgender women and 1443 (female-to-male) transgender men were recruited from social media sites such as YouTube, Instagram, and Twitter. Transgender men had, in general, lower wellbeing and reported higher discrimination than cisgender women, whereas, across cisgender and transgender groups, a same-gender sexual attraction had less effect. Discrimination and rejection did not explain the lower wellbeing of transgender than cisgender individuals. Furthermore, medically, but not socially, transitioning had a significant positive effect on wellbeing for transgender men.

Keywords: wellbeing, transgender, sexual attraction, gender identity

4.2 Introduction

Among general populations wellbeing can be negatively affected by various factors, including discrimination (Schmitt, Branscombe, Postmes, & Garcia, 2014), and poor peer relationships (Corsano, Majorano, & Champretavy, 2006). There are various groups within society whose wellbeing may be more adversely affected, in including those within the lesbian, gay, bisexual, and transgender (LGBT) community. In the present study we investigated potential wellbeing differences between those who are cisgender (same birth sex and gender), and those who are transgender (different birth sex and gender), as well as accounting for participants

sexual attractions. The present study aimed to address these questions by using a large sample of transgender and cisgender participants with varied sexual attractions, all with a birth sex of female, as comparisons of larger samples of these groups are currently lacking in the literature.

4.2.1 Sexual Attraction and Being Transgender

In a meta-analysis, lesbian, gay, and bisexual (LGB) people had increased mental health issues, as compared to heterosexual people (Meyer, 2003). In a longitudinal study of 1040 participants, sexual minority participants were at greater risk of increased mental health problems over their lifetime compared to heterosexual participants (Spittlehouse, Boden, & Horwood, 2019). Furthermore, transgender people have been indicated within the LGBT community as particularly vulnerable to mental health issues, suicide, and self-harm (Gnan et al., 2019). In a study with nearly 3000 participants, those who identified as transgender had greater depression, anxiety, and stress compared to LGB cisgender people, even when controlling for demographics such as age, race, and employment status (Warren, Smalley, & Barefoot, 2016). Rates of depression and anxiety for transgender participants are increased as compared to those of the general population, with depression rates being higher by between 31.4% to 45.4% in transgender people (Budge, Adelson, & Howard, 2013). Suicide risk among transgender groups was also found to be 3-4 times higher as compared with the general population (Wiepjes et al., 2020).

Overall, the above findings indicate wellbeing differences between different societal groups, with transgender people have worse wellbeing than (cisgender) LGB people. However, the majority of past research has worked with small samples, which may not fully reflect the variety within cisgender and transgender people with

different sexual attractions. Although Warren et, al., (2016) conducted a large-scale comparison between LGB cisgender and transgender groups with almost 3000 participants, they did not include heterosexual cisgender people as a comparison, nor did they consider the sexual attraction or transition stage of transgender participants, nor the role of discrimination. Thus, both sexual attraction and being transgender or cisgender appear to have an effect on wellbeing, but the relationship between these traits is not well understood, and direct comparisons between transgender and cisgender groups with different sexual attractions are lacking. The present study explored the independent effects of both gender identity (cisgender or transgender) and sexual attraction (towards men or women) on wellbeing. It therefore aims to build upon previous research in this area by directly comparing cisgender women, and transgender men, on their life satisfaction, depression, and anxiety, while considering participant sexual attraction. The first hypothesis is that the wellbeing of transgender men will be significantly lower than the wellbeing of cisgender women. The subsequent exploration was whether the effect of gender identity (being transgender or cisgender) on wellbeing will remain even when controlling for sexual attraction, due to transgender wellbeing being lower than cisgender LGB wellbeing.

Further to determining a significant difference in wellbeing between these groups, the present study also aims to discuss potential reasons for these disparities, such as transition status of transgender people, and reported discrimination in the form of everyday discrimination and childhood peer rejection.

4.2.2 Transition Status

Transition status is a factor unique to transgender groups that can impact wellbeing. There are two broad categories of transitioning, social and medical. Socially transitioning is the process where a transgender person begins openly living

as their correct gender (one different to their birth sex) and often includes using a different name and pronouns. Medically transitioning involves hormone replacement therapy (such as taking testosterone or oestrogen) and/or having surgery related to being transgender, such as having a double mastectomy for transgender men (Whittle, 2000). Medically transitioning has a positive effect on the wellbeing of transgender youth and adults. Hormone replacement therapy decreases symptoms of anxiety and depression (Davis & Colton Meier, 2014), and increase self-esteem (Gorin-Lazard et al., 2013). Having surgeries related to being transgender also improves quality of life and sexual satisfaction (Wierckx et al., 2011). Once transgender youth have access to treatment such as puberty blockers, their psychological functioning and wellbeing became similar to young adults from the general population (De Vries et al., 2014).

Compared to the research into the effects of medically transitioning on wellbeing, little research has been done into the effect of socially transitioning. But some results indicate that it also has a positive effect on factors such as self-esteem (Glynn et al., 2016), and transgender children who had socially transitioned do not score higher in depression than matched cisgender controls (Durwood, McLaughlin, & Olson, 2017). Correspondingly, teenagers who identified as transgender, where a majority had not socially transitioned, had higher rates of depressive symptoms, compared to their cisgender peers (Clark et al., 2014).

One aim of the present research is to investigate the effect of socially transitioning on wellbeing, as well as comparing to this to the effects of medically transitioning. Therefore, the second hypothesis is that among transgender individuals, both socially and medically transitioning will have a positive effect on wellbeing.

4.2.3 Discrimination

Discrimination is experienced by different groups within society and is the prejudicial treatment of others based on an attribute they possess or may possess. In LGB samples, a majority attribute experienced discrimination to their same-gender sexual attractions (Mays & Cochran, 2001). This includes reports of being subject to verbal victimisation in the form of name calling, teased, or being threatened (D'Augelli et al., 2006). These types of verbal abuse and rejection have large negative effect on the wellbeing of LGB youth (Berghe et al., 2010), and are linked to increased instances of suicidal ideation (Salentine, Hilt, Muehlenkamp, & Ehlinger, 2020). One source of an unsupportive environment are poor peer relationships for LGB youth, whereby they experience more friendship loss and fear about these relationships (Diamond & Lucas, 2004). This is highly relevant, as acceptance and integration into the peer group are critical in psychological wellbeing (Corsano et al., 2006). This suggests that discrimination, including from peers, can lead to poorer wellbeing among LGB people.

Self-reported discrimination is even higher in transgender groups than (cisgender) LGB groups (Su et al., 2016). This may be due to attitudes towards transgender people being more negative than toward LGB cisgender people (Norton & Herek, 2013). Transgender people also experience negative peer relationships, with on-going school harassment reported by transgender youth which negatively affected their feelings of personal safety (McGuire et al., 2010).

These previous findings suggest that discrimination plays a critical role in the wellbeing of cisgender LGB and transgender people, and transgender people may be at an increased risk of lower wellbeing outcomes due to increased discrimination. The present research aims to investigate levels of discrimination faced by cisgender and

transgender groups of all sexual attractions and compare this to self-reported wellbeing.

We hypothesized that transgender participants will experience the highest levels of discrimination and childhood peer rejection, as compared to cisgender participants. Finally, we hypothesized that discrimination and rejection will relate to self-reported adulthood wellbeing and will therefore explain (mediate) the difference in wellbeing between transgender and cisgender groups.

4.2.4 The Present Study

The present study focused on comparing differences in wellbeing of 2304 participants, all with a female birth sex, and who differed in gender identity (transgender vs. cisgender), and sexual attraction. We compared transgender and cisgender participants on their wellbeing, how sexual attraction played a role in this, and specifically for transgender participants, we also investigated the impact transitioning may have on their wellbeing. We further measured differences in discrimination between transgender and cisgender groups and how this discrimination links to wellbeing.

In sum, we focused on the following hypotheses and explorations:

1) Wellbeing (life satisfaction, anxiety, and depression) of transgender men will be lower than of cisgender women.
2) We explored whether wellbeing difference between transgender men and cisgender women will remain significant when statistically controlling for participants' sexual attraction.
3) Transgender men who have socially and medically transitioned will have higher wellbeing than those who have not.

4) Transgender men will experience higher levels of discrimination and childhood peer rejection, as compared to cisgender women.
5) Increased discrimination and rejection will correlate with the level of self-reported adulthood wellbeing and will mediate the difference in wellbeing between transgender and cisgender groups.

4.3 Method

4.3.1 Participants

Participants were recruited to take part in a survey through online social media sites, including Instagram and Twitter. A large sample was achieved through sharing of the survey via LGBT+ online creators, including the author of the present research, on platforms including YouTube and Instagram. This led to a larger group of transgender men as this was the target audience of the pages where the survey was shared. There was an increased effort to gain a larger sample of transgender men due to the lack of such large samples in previous research, as well as the aim to split transgender participants by sexual attraction and transition stage for certain analyses. For these reasons, a large overall sample of transgender men was deemed necessary. However, this recruitment strategy led to an unforeseen imbalance between cisgender and transgender participants, and an imbalance based on participant birth sex. Due to this imbalance, the relatively small samples of (male-to-female) transgender women (77), and cisgender men (106) were excluded from the present study (this imbalance is further addressed in the Discussion). There was also a focus in the present research of comparing transgender men and cisgender women.

Of remaining participants, a total of 108 responses were excluded as they were under 18 years old. A further 15 were excluded due to indicating their birth sex as intersex, as this group are not a focus of the present study. After all exclusions, a total of 2304 participant were used for analyses. All participants had an assigned birth sex of female.

Participants were grouped as being transgender if they responded as having a different assigned birth sex to their current gender identity and answered yes to a direct question as to whether the two differed. Conversely, participants were grouped as cisgender if they answered that their assigned birth sex and gender identity were matching. Sexual attraction of all participants was assessed with their self-reported attraction to men or women (Kinsey et al., 1948). A score of 0 or 1 meant exclusive or almost exclusive attraction to men (grouped in some - but not all - analyses as "male attraction"), scores of 2, 3, or 4 stood for varied degrees of attractions to men over women (also grouped as "male attraction" in some analyses), and a score of 5 and 6 indicated exclusive or almost exclusive attraction to women (grouped as "female attraction" in some analyses). Participant attractions were grouped in this way due to a primary focus on the group of transgender men attracted to women, as this group is under-researched compared to both cisgender participants and transgender participants of other sexual attractions. In addition, transgender men with attractions to women are typically less common than transgender men with a mixed to exclusive attraction to men (James et, al., 2016). However, this grouping was only relevant for initial analyses and for visualisation of effects in associated figures. Further regression analyses used the full Kinsey scale of attractions as a continuous measure rather than breaking participants into groups. Please note that findings did

not change in statistical significance or direction of effect, depending on whether sexual attraction was broken into groups or used as a continuous measure.

A breakdown of participant numbers based on gender identity and sexual attractions is displayed in Table 1, which also shows mean ages of participants within each group. A regression analysis indicated that age differed significantly between participant groups, $p = <.001$, $R^2 = .03$, with cisgender women attracted to women being younger than those attracted to men, and transgender men attracted to men being younger than those attracted to women. Age was therefore included as a covariable in analyses.

Table 1 also shows comparisons of other demographic information: ethnicity, country of birth, education level, and household income. Ethnicity was coded as 0 = white (83% of participants were white) versus 1 = non-white. Country was assessed by participants selecting from a dropdown menu which country they currently live in, these responses were then grouped into North America & Europe (with 91% of participants being from here), and rest of world. Education was assessed on a scale ranging from 1 (middle school level) or income to 5 (university postgraduate level). Income was assessed with a scale ranging from 1 (under £10,000/$10,000) to 6 (over £60,000/$60,000). The four groups did not significantly differ on ethnicity, χ^2 (3) = 3.97, $p = .27$. But they did significantly differ on country of birth, with male attracted transgender men and female attracted cisgender women more likely to be from North America or Europe than the other two groups, χ^2 (3) = 14.07, $p = .003$. They also significantly differed on levels of education, with transgender groups indicating lower education levels than cisgender groups, χ^2 (6) = 109.80, $p <. 0001$, and on income levels, with cisgender women attracted to women having lower incomes than those attracted to men, and transgender men attracted to men having lower incomes than

those attracted to women, χ^2 (7) = 44.69, p <. 0001. Even though the demographics of country, age, income, and education had little influence on reported findings, we decided to include them as covariables in all analyses.

4.3.2 Measures and Procedure

Discrimination

All participants completed The Everyday Discrimination Scale (Williams, Yu, Jackson, & Anderson, 1997), which measured feelings of current day-to-day treatment from others. Statements included "you are treated with less respect than other people" and "you are threatened or harassed". All statements were rated on a 7-point scale, ranging from "almost every day" to "never". These scores were recoded so that higher scores indicated increased feelings of day-today discrimination. This scale showed internal consistency (Cronbach's Alpha) of .84 and .90 for transgender and cisgender participants, respectively.

Psychological Health Measures

The Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985) was used to measure general feelings of subjective wellbeing and included statements such as "in most ways my life is close to ideal". All statements were rated on a 7-point scale from "strongly agree" to "strongly disagree", lower scores indicated lower satisfaction with life. This scale had an internal consistency (Cronbach's Alpha) of .87 and .88 for transgender and cisgender participants, respectively.

The Beck Depression (Beck, Steer, & Brown, 1996) and Anxiety (Beck, Epstein, Brown, & Steer, 1988) inventories were also used. The Depression inventory consisted of 21 statements about how participants felt about topics such as feelings of failure and their appearance. Participants had 4 statements to select from and were

asked to provide an answer starting from (0) being very positive to (3) being negative about each statement. Scores for each statement were then combined to create an overall depression score for each participant. Higher scores indicated increased depression. The Depression Inventory had an internal consistency (Cronbach's Alpha) of .91 for both transgender and cisgender participants.

The Anxiety Inventory consisted of 21 common symptoms of anxiety, including dizziness and indigestion, of which participants rated how much they had been bothered by each symptom during the past month, ranging from "not at all" to "severely – it bothered me a lot". Higher scores indicated more instances of feeling anxiety-related symptoms. This scale had an internal consistency (Cronbach's Alpha) of .93 and .94, respectively, for transgender and cisgender participants.

Transitioning and Gender

Transgender participants answered seven yes or no questions about their transition status, including whether or not they have socially transitioned, if they had any plans to, and if they had begun medically transitioning, or had any plans to. Questions were; "Do you currently live full time in your correct gender (which is different from the gender you were assigned at birth)?", "Do you present, or introduce yourself, as your correct gender at least some of the time?", "Have you come out to anyone as transgender?", "Have you begun medically transitioning (e.g. have you started hormones or had any surgery)?", "Do you have any plans to take any medical steps in your transition?", "Have you started hormone replacement therapy?" and "Have you had any surgeries related to being transgender?" The three questions to create the groups shown in Table 2 were, "Do you currently live full time in your correct gender (which is different from the gender you were assigned at birth)?" (socially transitioned or not), "Have you started hormone replacement therapy?" (for

hormonally transitioned or not), and “Have you had any surgeries related to being transgender?” (for surgical transition steps being taken or not).

Group numbers for transition status across transgender participants is displayed in Table 2. A large proportion of participants had not taken any transition steps. This was likely due to the recruitment method of social media pages. These are more frequented by those seeking advice, because they plan on transitioning or are early in the transition process, and less frequented by those who have already transitioned and therefore do not seek further advise.

Participants completed an online survey that was created in Qualtrics. The survey was accessed anonymously through links posted on social media sites, and pages that were targeted toward transgender and sexual minority people. The survey took between 20-30 minutes to complete. All participants consented to take part in the survey after reading an information sheet, making them aware of the use of their data and that they were able to withdraw at any point.

4.4 Results

4.4.1 Differences in Wellbeing between Transgender Men and Cisgender Women

We hypothesized that wellbeing, in the form of satisfaction with life, depression, and anxiety would be poorer for transgender men than for cisgender women. We also explored whether these differences would remain after controlling for participants' sexual attraction.

We first conducted a simple analysis of variance to test for differences between the four groups, transgender and cisgender, with male or female attractions. This showed a significant difference in all satisfaction with life, $p < .0001$, $R^2 = .09$, depression, $p < .0001$, $R^2 = .02$, and anxiety, $p < .0001$, $R^2 = .01$ (Figures 1A-C).

In general, transgender participants in each sexual attraction group scored lower in each of the wellbeing measures, compared to cisgender participants of each sexual attraction group. However, for satisfaction with life, in particular, sexual attraction of cisgender people also had an effect, as those with a same-gender attraction scored lower compared to their opposite-gender attracted counterparts.

We followed these simple analyses of variance (using sexual attraction groups) with multiple regression analyses, using sexual attraction as a continuous measure. In these analyses, we predicted wellbeing variables by gender identity, in addition to sexual attraction, and their interaction. We included the demographic variables of country, age, income and education as controls, as previous analyses have shown that groups differed in them. Transgender men scored significantly lower in satisfaction with life, B = -.42 [-.50, -.34], $p < .0001$, β = -.25, significantly higher in depression, B = 1.35 [.73, 1.97], $p < .0001$, β = .10, but not significantly higher anxiety, B = .61 [-.05, 1.27], p = .07, β = .04. There was no significant difference by sexual attraction for satisfaction with life, B = -.04 [-.08, .01], p = .12, β = -.04, depression, B = -.15 [-.51, .21], p = .43, β = .02, or anxiety, B = .04 [-.34, .43], p = .82, β = .01. However, the interaction between being transgender or cisgender and sexual attraction was significant for satisfaction with life, B = .07 [.03, .12], p = .002, β = -.07, indicating that the effect of sexual attraction depended on whether participants were transgender or cisgender. This interaction was due to the finding that there was a minimal difference in satisfaction between transgender men with different sexual attractions, but for cisgender women, those attracted to women had lower satisfaction with life than those attracted to men (this interaction is visualized in Figure 6A). The corresponding interaction between gender identity and sexual attraction were close to - but did not reach- statistical significance for depression, B =

-.28 [-.65, .08], p = .13, β = -.04, and anxiety, B = -.31 [-.70, .08], p = .12, β = -.04. Thus, for depression and anxiety, transgender men suffered more than cisgender women, regardless of their sexual attractions (these main effects - and non-significant interactions - are visualized in Figures 6B-C). The results of these regression analyses, controlling for demographic variables, can be seen in Table 3.

These results indicate that transgender men have poorer wellbeing than cisgender women in the form of satisfaction with life and depression levels. These differences remained significant even when including sexual attraction of participants, and sexual attraction, if impactful, mostly mattered for cisgender people.

4.4.2 The Effects of Transitioning on Transgender Men's Wellbeing

The next prediction of the present research was that socially and medically transitioning would have a positive effect on the wellbeing of transgender men. We therefore tested for the effect of transition status on wellbeing. This analysis focused on transgender participants only. Transition status was split into four steps; (1) no transition steps taken, (2) socially transitioned, (3) socially transitioned and taking testosterone, (4) socially transitioned, on testosterone and had at least one surgery. For further comparison cisgender women were also included in the analysis.

We first conducted simple analysis of variances to test for differences in the wellbeing measures between the four transition groups. This showed a significant difference between the transition groups in their satisfaction with life, p <.0001, R^2 = .07, depression, p <.0001, R^2 = .08, and anxiety, p <.0001, R^2 = .04. These results can be seen in Figures 7A-C and indicate that participants further along in their transition had greater satisfaction with life, and lower depression and anxiety. This figure also

shows that those who have taken all transition steps were similar in their degree of life satisfaction, depression, and anxiety, to cisgender women.

A Dunnett's test was used to compare the difference in wellbeing between participants in each transition stage, with those who had not taken any transition steps as the comparison group. Cisgender women were also included in these analyses. Results showed that socially transitioning compared to not transitioning at all and did not lead to a significant increase in satisfaction with life, although it was near significance, B = .23 [-.08, .54], p = .07 Taking both social and hormonal transition steps did lead to a significant increase in satisfaction with life, B = .45 [.18, .72], p <.0001, as did taking social, hormonal, and surgical steps in transitioning, B = .86 [.56, 1.17], p = <.0001. Cisgender women also had better satisfaction with life than those who had not taken any transitional steps, B = 1.08 [.86, 1.31], p = <.0001. The magnitude of this effect looked comparable to the difference between those who had taken surgical steps and those who had not transitioned (see also Figure 7A).

The pattern was similar for levels of depression, with taking just social steps not leading to significantly decreased depression, B = - .94 [-3.33, .1.45], p = .33, but taking social and hormones steps leading to a significant decrease in depression, B = -4.85 [-6.92, -3.04], p <.0001, as did taking social, hormonal, and surgical steps in transitioning, B = -6.48 [-8.84, -4.12], p = <.0001. Again, the effect for the latter group who had at least one surgery, was comparable to the effect found in cisgender women in contrast to those who had not taken any transitioning steps, B = - 4.81 [-6.59, -3.03], p = <.0001.

Finally, for anxiety socially transitioning did not lead to a significant decrease in symptoms, B = -.03 [-2.67, 2.60], p = .97, but those who had socially and hormonally transitioned did have significantly lower anxiety, B = -2.87 [- 5.16, -.59],

p <.001, as did those who taken social, hormonal, and surgical steps, B = - 3.72 [- 6.33, - 1.12], p <.001. As with satisfaction with life and depression, the effect for the latter group who had at least one surgery, was comparable to the effect found in cisgender women in contrast to those who had not taken any transitioning steps, B = - 2.17 [- 4.13, - .21], p = <.001.

Overall, these results suggested that the combination of social and medical transition has the greatest impact on improving wellbeing, particularly for those who had also had surgeries related to being transgender, with this group showing similar wellbeing levels to cis women when compared to those who had taken no transition steps.

4.4.3 Differences in Discrimination between Transgender Men and Cisgender Women

Next, we hypothesized that transgender men would report higher levels of everyday discrimination and facing increased peer rejection in childhood, as compared to cisgender women. We computed a simple analysis of variance to compare to participants groups (grouped into cisgender or transgender, with attraction to men or attraction to women) on discrimination and childhood peer rejection.

The results indicated a significant difference between groups in discrimination, p <.0001, R^2 = .01, and peer rejection, p <.0001, R^2 = .02. Figures 3A-B show that transgender men faced more discrimination and rejection than male-attracted cisgender women, and, potentially, those attracted to men faced more discrimination and rejection than those attracted to women.

A further regression analysis predicted discrimination variables by being transgender or cisgender, sexual attraction (used for these analyses as a continuous measure), and their interaction. We also included the demographic variables of

country, age, income and education as controls. Results are summarized in Table 4. We found a significant main effect of gender identity on everyday discrimination, B = .05 [.00, .09], p = .05, β = .04, and peer rejection, B = .08 [.04, .12], p <.0001, β = .10. No significant effect of sexual attraction was found for discrimination, B = .006 [-.02, .03], p = .70, β = -.01, or on peer rejection, B = -.02 [-.04, .006], p = .16, β = -.03. The interaction of being transgender and sexual attraction was significant for discrimination, B = -.05 [-.08, -.02], p = <.001, β = -.08, and for peer rejection, B = -.03 [-.05, -.004], p = .02, β = -.06. This interaction m§eant that transgender men attracted to men reported greater discrimination than those attracted to women, whereas cisgender women attracted to women reported greater discrimination than those attracted to men (these interactions are visualized in Figures 8A-B).

4.4.4 The Effect of Discrimination on Wellbeing

We hypothesized that increased discrimination and peer rejection would be linked to poorer wellbeing and further explain (mediate) differences between cisgender and transgender people in wellbeing. First, we conducted a regression analysis simultaneously testing for the correspondence of discrimination and peer rejection on wellbeing, controlling for the demographics of country, age, income, and education. Both discrimination and peer rejection had independent and negative effect on wellbeing, with higher rates of both being related to lower satisfaction with life, and higher depression and anxiety (Table 5).

We had hypothesized that discrimination variables would mediate the effects of gender identity on wellbeing. We computed multiple regression analyses predicting either satisfaction with life, depression, or anxiety. For each analysis, in Step 1, gender identity, sexual attraction, their interactions, were the predictors of the given wellbeing measure. We further controlled for country, age, income, and

education. In Step 2, we built the identical models, but further included everyday discrimination and peer rejection as potential mediators of gender identity (cisgender or transgender) on wellbeing. If our hypothesis were confirmed, then the inclusion of discrimination variables should weaken the effect of being transgender on wellbeing. Table 6 summarizes the results of the analysis for both Step 1 (without discrimination variables as mediators) and Step 2 (with discrimination variables as mediators). The effect of gender identity on wellbeing remained similar across all three measures (satisfaction with life, depression, and anxiety) in Step 2, although it decreased slightly across wellbeing measures. However, mediation analyses on the basis of 5000 bootstrapped samples (Preacher & Hayes, 2008) did not support that discrimination or rejection significantly mediated the link if gender identity (cisgender or transgender) with any measure of wellbeing. All confidence intervals of all indirect effects, representing these mediations, included zero, $-.05 < B's < .07$, $-.08 < 95\%$ CI's $< .10$.

4.5 Discussion

Overall these results indicate that being transgender has negative impact on wellbeing. Although discrimination and rejection linked to both gender identity and wellbeing, it did not appear to be a substantial reason for why transgender individuals experienced less wellbeing. Sexual attraction had in comparison less strong influences on wellbeing, even though there was some indication that it mattered more within cisgender participants than transgender participants. Finally, transgender participants who were further along in their transitions, particularly those who had taken hormonal and surgical steps, had increased wellbeing.

Present work supports previous findings that transgender people have poorer wellbeing than those of sexual minority cisgender people (Warren et al., 2016). The

present study added to these previous findings by including cisgender and transgender participants of all sexual attractions and finding a robust negative effect of being transgender even when controlling for their sexual attractions.

Furthermore, unlike medical transitioning, socially transitioning alone did not appear to significantly improve the wellbeing of participants above those who had taken no transition steps. This could mean that medical steps, such as taking hormones and having transgender-related surgeries, has the biggest impact on transgender men's wellbeing. However, unlike in the present research, there is evidence that socially transitioning reduces depression in transgender women (Glynn et al., 2016). That previous finding, and the present null finding are, in combination, surprising, as anecdotally, transgender men typically have an easier time during their social transition than transgender women in terms of correct social perception of their gender. However, present findings support the current literature on the effects of medically transitioning, with testosterone and surgery being shown to significantly and positively impact wellbeing (Davis & Colton Meier, 2014; Gómez-Gil et al., 2012). Present findings also indicate that socially transitioning, starting hormones, and having at least one transition-related surgery, leads to comparable levels of satisfaction with life, depression, and anxiety as cisgender women. Further suggesting that transitioning is a key factor to the wellbeing of transgender people.

The final component of the present study was into differences in discrimination experiences between transgender and cisgender participants and whether this mediated differences in wellbeing. In fact, discrimination and rejection are linked to lower wellbeing. Similar negative impact of discrimination among LGB groups has been shown (Mays & Cochran, 2001), and peer rejection was reported in previous research on behavioural outcomes for transgender children, including

internalizing factors (e.g., depression, and social withdrawal), and externalizing factors (e.g., aggression and hyperactivity) (Cohen-Kettenis, Owen, Kaijser, Bradley, & Zucker, 2003; Mays & Cochran, 2001), and which could potentially be linked to wellbeing. Moreover, in the present work, transgender men experiencing more everyday discrimination and peer rejection than cisgender women. However, discrimination and peer rejection do not significantly reduce (mediate) the difference in wellbeing between transgender men and cisgender women.

In combination, present findings suggest that discrimination is not a critical factor in the lower wellbeing of transgender men, whereas medically transitioning, more than socially transitioning may have an impact. Future research should aim to investigate the mechanisms behind the significant improvement in wellbeing coming after medical transition steps were taken, with one focus of being on gender dysphoria. Gender dysphoria is a series of symptoms that typically accompany being transgender and includes feelings of a strong desire to not have one's primary and/or secondary sex characteristics (American Psychiatric Association, 2013). High feelings of gender dysphoria have been linked to negative effects on wellbeing (Rabito-Alcón & Rodríguez-Molina, 2016). Therefore, alleviation of gender dysphoric symptoms could explain the outcome of increase wellbeing when medically transitioning, but not socially transitioning.

A primary limitation of the present research in is the imbalanced group sizes of the sample. There was a substantially smaller sample of cisgender women, compared to transgender men. This was an unforeseen result of the recruitment method, that focused on reaching transgender men. Future research should aim to have a more balanced samples, further including transgender women and cisgender men. This could be achieved by circulating a survey through online social media

creators with different target audiences who would share the survey with their following, e.g., a transgender woman would be able to recruit a larger sample of other transgender women. Also, targeting forums and group pages on websites such as Reddit and Facebook can help target further participants, such as cisgender men.

In conclusion, transgender men appear to have lower overall wellbeing than cisgender women, and despite reporting higher discrimination, this does not seem to play a major role in this difference. Transitioning medically, in the form of taking hormones and having transition-related surgeries, significantly improved wellbeing in the present sample, but socially transitioning alone did not have this significant impact. These findings are of importance for transgender people as they consistently struggle to gain access to healthcare, often facing many barriers (Roberts & Fantz, 2014), including long wait lists to access hormones and surgery (Ellis, Bailey, & McNeil, 2015). Due to the importance of transitioning on their wellbeing, and further findings that a delay in healthcare leads to worse mental health (Seelman, Colón-Diaz, LeCroix, Xavier-Brier, & Kattari, 2017), it is of importance to improve access to healthcare for transgender people.

	Group Number	Mean Age (Standard Deviation)	Mean Income (SD)	Education Mean (SD)	Ethnicity % White	% from Europe & North America
Cisgender Women Attracted to Men	308	25.31 (8.01)	3.55 (1.74)	3.86 (.87)	76.6%	87%
Cisgender Women Attracted to women	553	22.69 (5.20)	3.19 (1.74)	3.68 (.84)	77.8%	90%
Transgender Men Attracted to women	256	24.60 (9.31)	3.30 (1.75)	3.49 (.95)	76.2%	90%
Transgender Men Attracted to men	1187	22.35 (5.89)	2.99 (1.72)	3.37 (.93)	81.5%	89%

Table 1. Shows the group numbers across the four participant groups, and the means (standard deviation) for the demographic variables of each group, and percentages for ethnicity. Higher numbers for income and education indicate higher levels reached of both.

	No transition steps taken	Socially transitioned	Socially transitioned and on hormones	Socially transitioned, hormones, and at least one surgery
Female-attracted Transgender Men	91 (36%)	36 (14%)	67 (26%)	62 (24%)
Male-Attracted Transgender Men	506 (43%)	214 (18%)	288 (24%)	176 (15%)

Table 2. Shows the breakdown of transgender men depending on sexual attraction, and transition stage. Numbers in transition stage are mutually exclusive, participants will only appear in one category.

Variables	Satisfaction with life		Depression		Anxiety	
	B [95% CIs]	β	B	β	B	β
Gender Identity	-.42 [-.50, -.34]	-.25***	1.35 [.73, 1.97]	.10***	.61 [-.05, 1.27]	.04
Sexual Attraction	-.04 [-.08, .01]	-.04	-.15 [-.51, .21]	.02	.04 [-.34, .43]	.01
Gender Identity x Sexual Attraction	.07 [.03, .12]	-.07*	-.28 [-.65, .08]	-.04	-.31 [-.70, .08].	-.04
Age	-.007 [-.02, .004]	-.03	-.13 [-.22, -.04]	-.07*	-.24 [-.34, -.15]	-.13***
Income	.12 [.08, .16].	.13***	-.60 [-.93, -.26]	-.08**	-.52 [-.87, -.16].	-.07*
Education	.35 [.27, .44].	.20***	-2.70 [-3.35, -2.04]	-.20***	-2.03 [-2.73, -1.33]	-.14***
Country	.11 [-.02, .24]	.04	-1.17 [-2.23, -.11]	-.05*	-.41 [-1.54, .73]	-.02

Table 3. Regression analyses for the predictor variables of gender identity (lower scores indicated being transgender), sexual attraction, and their interaction, on the wellbeing measures of satisfaction with life, depression, and anxiety. Demographic variables of age, income and education were included as covariates. With *p's <.05*, p <.001**, p <.0001***.*

Variables	Discrimination		Peer Rejection	
	B [95% CIs]	β	B	β
Gender Identity	.05 [.00, .09]	.04*	.08 [.04, .12]	.10***
Sexual Attraction	.006 [-.02, .03].	.01	-.02 [-.04, .006]	-.03
Gender Identity x Sexual Attraction	-.05 [-.08, -.02]	.08**	-.03 [-.05, -.004]	-.06*
Age	-.005 [-.01, .002]	-.03	.01 [.007, .02]	.11***
Income	-.07 [-.09, -.04]	-.12**	-.04 [-.06, -.02]	-.10***
Education	-.07 [-.12, -.02]	-.07*	-.06 [-.10, -.02]	-.07*
Country	.02 [-.05, .10]	.01	.07 [.005, .13]	.05*

Table 4. Regression analysis results for the predictor variables of gender identity (lower scores indicate being transgender), sexual attraction, their interaction, and the demographic variables of age, income, and education, with *p's < .05*, p <.001**, p <.0001***.*

Variables	Satisfaction with life		Depression		Anxiety	
	B [95% CIs]	β	B	β	B	β
Discrimination	-.38 [-.45, -.30]	-.23***	4.04 [3.49, 4.59]	.33***	3.82 [3.24, 4.41]	.29***
Peer Rejection	-.32 [-.42, -.23]	-.15***	2.39 [1.67, 3.10]	.15***	2.87 [2.11, 3.63]	.17***
Age	-.001 [-.01, .01]	-.006	-.15 [-.23, -.07]	-.08*	-.29 [-.38, -.21]	-.15***
Income	.09 [.05, .13]	.10***	-.21 [-.51, .08]	-.03	-.11 [-.42, .20]	-.02
Education	.36 [.28, .43]	.21***	-2.30 [-2.86, -1.74]	-.17***	-1.47 [-2.07, -.87]	-.11***
Country	.09 [-.03, .22].	.03	-1.25 [-2.17, -.32]	-.05*	-.47 [-1.46, .52]	-.02

Table 5. Regression analysis results for the predictor variables of discrimination, peer rejection, and the demographic variables of age, income, and education, with *p's <.05*, p <.001**, p <.0001***

Step 1	Satisfaction with Life	Depression	Anxiety
Variables	B β	B β	B β
Gender Identity	-.42 [-.50, -.34] -.25***	1.35 [.73, 1.97] .10***	.61 [-.05, 1.27] .04
Sexual attraction	-.04 [-.08, .01] -.04	-.15 [-.51, .21] . 02	.04 [-.34, .43] .01
Gender Identity x attraction	.07 [.03, .12] -.07*	-.28 [-.65, .08] -.04	-.31 [-.70, .08] -.04
Age	-.007 [-.02, .004] -.03	-.13 [-.22, -.04] -.07*	-.24 [-.34, -.15] -.13***
Income	.12 [.08, .16] .13***	-.60 [-.93, -.26] -.08**	-.52 [-.87, -.16] -.07*
Education	.35 [.27, .44] .20***	-2.70 [-3.35, -2.04] -.20***	-2.03 [-.2.73, -.1.33] -.14***
Country	.11 [-.02, .24] .04	-1.17 [-2.23, -.11]. -.05	-.41 [-1.54, .73] -.02
Step 2			
Variables	B β	B β	B β
Gender Identity	-.38 [-.45, -.31] -.22***	.99 [.42, 1.56] .08**	.19 [-.42, .80] .01
Sexual attraction	-.04 [-.08, -.003] -.04	-.12 [-.45, .20] -.02	.08 [-.27, .43] .01
Gender Identity x attraction	.05 [.01, .1] .05*	-.07 [-.40, .26] -.01	-.09 [-.45, .27] -.01
Age	.01 [-.02, .005] -.02	-.14 [-.22, -.06] -.08*	-.27 [-.36, -.18] -.14***
Income	.08 [.04, .12] .09**	-.18 [-.49, .12] -.03	-.09 [-.42, .24]. -.01
Education	.31[.23, .39] .18**	-2.26 [-2.86, -1.65] -.17***	-1.57 [-2.21, -.92] -.11**
Country	.12 [-.007, .25] .04	-1.27 [-2.24, -.29]. -.06*	-.53 [-1.58, .52] .-.02
Everyday discrimination	-.39 [-.46, -.31] -.24***	4.13 [3.55, 4.71] .33***	3.86 [3.23, 4.49] .29***
Peer rejection	-.24 [-.34, -.15] -.12***	2.13 [1.348 2.89] .13***	2.92 [2.10, 3.73] .17***

Table 6. Step 1 and Step 2 multiple regression analyses results for the predictor variables of gender identity and sexual attraction, and their interaction in Step 1, and mediator variables of discrimination and peer rejection in Step 2, with *p's <.05*, p <.001**, p <.0001****.

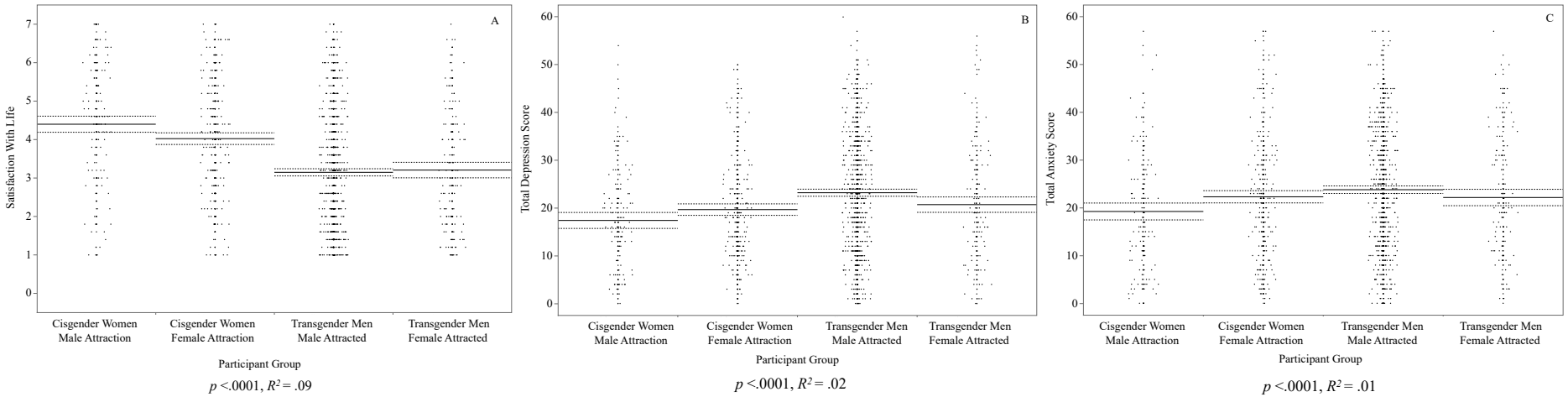

Figure 6 (A). Satisfaction with life for each participant group. The y-axis represents self-reported satisfaction for life, 1 is the least satisfied and 7 is the most satisfied score. Solid lines represent group means and dotted lines are the 95% confidence intervals. **Figures 6 (B-C).** Self-reported depression and anxiety scores for each participant group. The y-axis in Figure 6B represents the total depression score of participants, and the y-axis in Figure 6C represents the total anxiety score for each participant. Scores for each range from 0-60 with 0 being no symptoms and 60 being the maximum score of symptoms. Solid lines present the mean for each group, and dotted lines are the 95% confidence intervals.

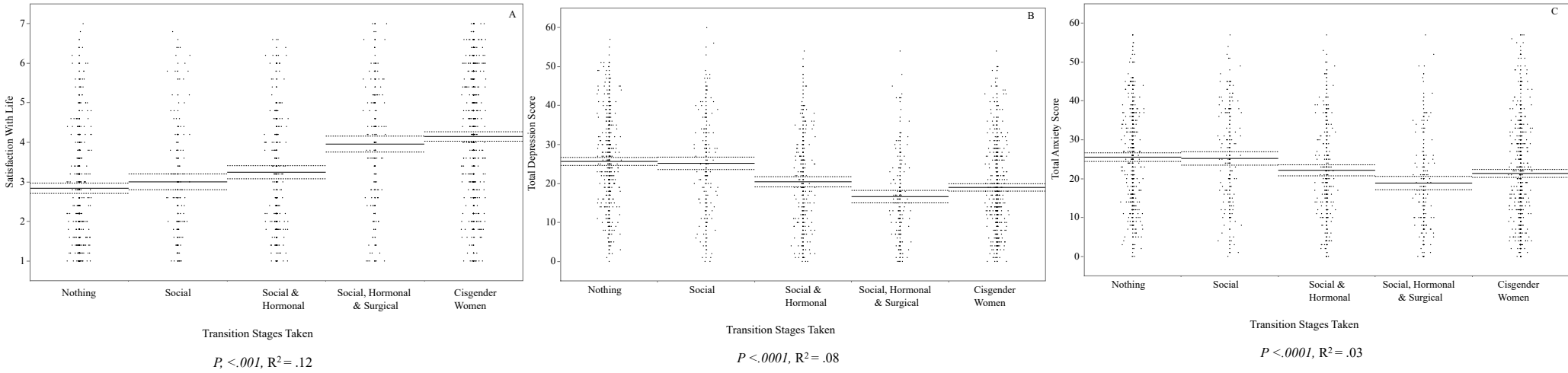

Figure 7 (A). Satisfaction with life for each transition stage group, no transition steps taken (nothing), socially transitioned only (social), socially transitioned and on hormone replacement therapy (social & hormonal), socially transitioned, on hormones, and had at least on transition related surgery (social, hormonal, & surgical), and cisgender women. The y-axis represents self-reported satisfaction with life, 1 is the least satisfied and 7 is the most satisfied score. Solid lines represent group means and dotted lines are the 95% confidence intervals. **Figure 7 (B-C).** Self-reported depression and anxiety scores for each transition stage group, no transition steps taken (nothing), socially transitioned only (social), socially transitioned and on hormone replacement therapy (social & hormonal), and socially transitioned, on hormones, and had at least on transition related surgery (social, hormonal, & surgical). The y-axis in Figure 7B represents the total depression score for participants, and the y-axis in Figure 7C represents the total anxiety score for each participant. Scores for each range from 0-60 with 0 being no symptoms and 60 being the maximum score of symptoms. Solid lines represent group means and dotted lines are the 95% confidence intervals.

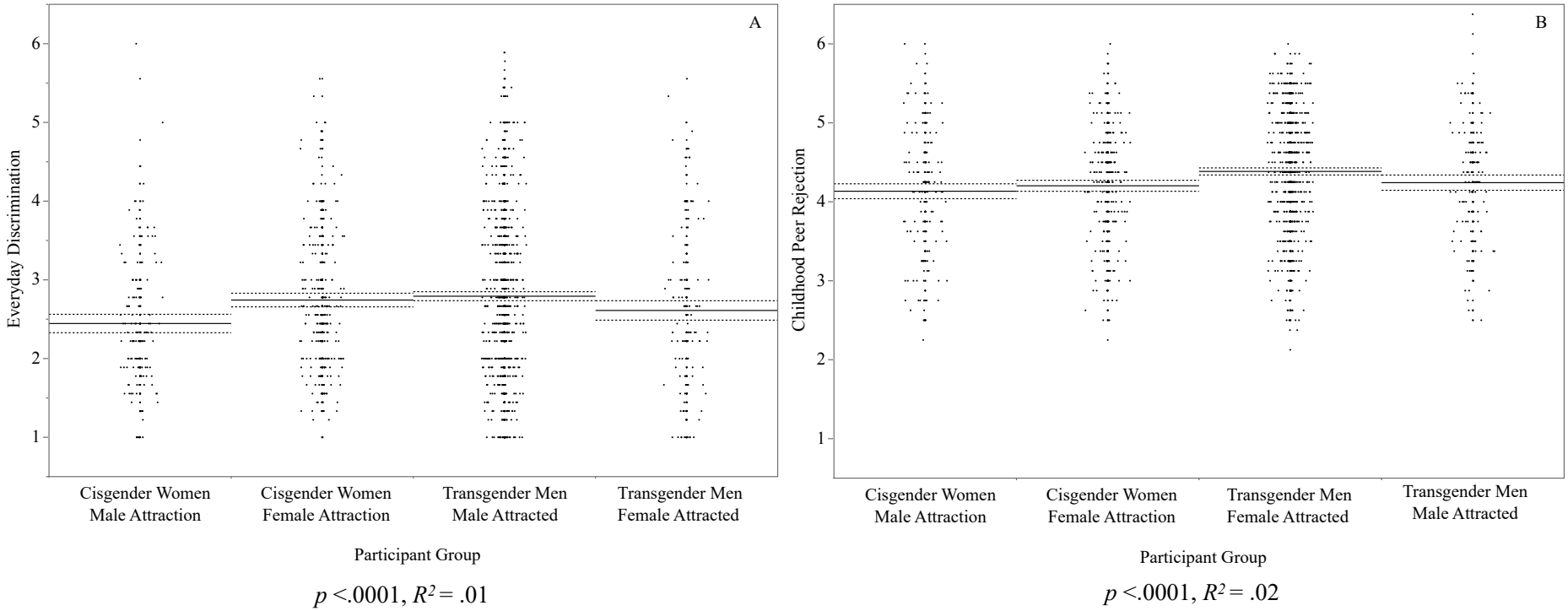

Figure 8 (A-B). Discrimination and peer rejection for each participant group. In Figure 8A the y-axis represents self-reported everyday discrimination felt by participants, with 1 being the lowest amount of felt discrimination and 6 being the most. In Figure 8B, the y-axis represents self-reported childhood peer rejection, with 1 being the lowest reaction score, and 6 being the highest. Solid lines represent group means and dotted lines are the 95% confidence intervals.

Chapter 5 General Discussion

5.1 General Overview

The present thesis set out to expand current knowledge of transgender men, whether they are developmentally or physiologically similar to their gender of male or their birth sex of female, and how their wellbeing may be affected. This was achieved by comparing transgender men to cisgender groups on sex atypicality from childhood onward, by examining their physiological genital arousal, and, factors that may impact their wellbeing.

Researching transgender people is of importance due to the nature in which they are perceived within society, and the validity of their gender identity is consistently debated (Fisher, 2018; Winter et al., 2016). Transgender people face a social environment of anti-transgender prejudice and stigma (Norton & Herek, 2013) and are at a 3-4 times higher risk of suicide compared to cisgender populations (Wiepjes et al., 2020). It is important to help reduce this stigma and negative wellbeing of transgender groups, and a key part of this is to increase knowledge and understanding, so as to support and help the transgender community better. Therefore, despite making up a small percentage of the population, around 0.3% to 1.3% (Zucker, 2017), it is still necessary to increase the knowledge of transgender people, their development, and wellbeing. Behavioural research in the form of sex atypicality studies can inform us of transgender people's gender behavior starting in childhood, potentially highlighting the existence of non-social influences on gender development. Physiological sexual arousal can show potential similarities between transgender people and cisgender people of the same gender (i.e., transgender men and cisgender men), these similarities could indicate biological components of being transgender. The purpose of investigating the factors of sexual arousal and sex

atypicality among transgender men is not to validate their identities, even if genital arousal and sex atypicality among this group had been female-typical it would not take away from their gender as man. Its purpose however is to explore the separate influences that a person's gender and birth sex may have over various processes, including the biological one of genital arousal and the behavioural one of sex atypicality, and how their development and responses on each correlate with cisgender groups. Finally, wellbeing is of key importance, and identifying factors that may explain why transgender people experience poorer wellbeing than cisgender people, will further help to protect this vulnerable group within society.

5.2 Summary of Findings

The first study in the present thesis, discussed in Chapter 2, investigated the sex atypicality of transgender men and cisgender women, to identify potential similarities or differences in behavioural development between these two groups with the same birth sex. Sex atypicality was measured using observer ratings of photographs from participants childhood into adulthood, on a scale of feminine to masculine. Transgender men were, on average, rated as more sex atypical (more masculine) starting from around age 3 in childhood and continuing into adulthood, as compared to cisgender women. This difference was largest between cisgender women attracted to men and transgender men attracted to women. For both transgender men and cisgender women, increased sex atypicality preceded greater attraction to women over men. Transitioning, in the form of coming out as transgender and taking medical steps to physically transition, had minimal effects on sex atypicality differences between transgender and cisgender groups, with transgender men still being rated as significantly more masculine. Overall, both gender identity and sexual attraction appear to be independently predicted by childhood atypicality, but being transgender

was linked to highest sex atypicality. These findings were also confirmed in participants self-reported sex atypicality, with transgender men reporting higher atypicality than cisgender women.

The next study, contained in Chapter 3, investigated the genital arousal of transgender men compared to cisgender men and women, as well as genital arousal measurement device use in transgender men, depending on surgical status. Genital arousal was measured with either a vaginal plethysmograph or penile strain gauge. This included that for transgender men, depending on surgical status, some used the vaginal probe, and others used the penile strain gauge. Cisgender men and cisgender women showed the expected sex differences in the specificity of their arousal. With men typically showing significant arousal only to their preferred gender (category-specific), and woman typically showing arousal to both genders regardless of self-reported attractions (category non-specific). Across measures, transgender men's arousal was more male-typical, as they responded to their preferred gender more strongly than the other gender. However, they still showed arousal to both genders, which is a more female-typical arousal response. Overall, this suggested a possible influences of gender identity on sexual arousal patterns, and that the penile strain gauge was a valid measure of arousal responses in post-operative transgender men. This indicated non-social influences on gender development due to the strength of male-typical arousal found in transgender men, despite transgender men being socialised as female for at least part of their childhoods, and a majority in the present study using the same genital arousal measure as cisgender women.

The final study, as discussed in Chapter 4, investigated wellbeing differences depending on sexual attraction and gender identity, and potential influences on wellbeing. Transgender men and cisgender women were compared on their overall

wellbeing, depression, and anxiety. On average, transgender men scored lowest in wellbeing and reported higher anxiety and depression than cisgender women. Sexual attraction to males or females also had some impact on wellbeing, mostly among cisgender women, but the effect was much smaller than that of being transgender. Transgender men also reported experiencing more discrimination, which related to their wellbeing; however, it did not explain (mediate) the link of being transgender and lower wellbeing. Taking hormones and/or having transition related surgery, was linked to improved wellbeing of transgender men, with those who had taken these steps, being higher in wellbeing than those who had not.

Overall, the present thesis suggested that there are some behavioural and physiological differences between transgender men and cisgender women, and similarities between transgender men and cisgender men, indicating potential early influences of gender identity on behavioural development that continues into adulthood, as well as an influence of gender on the biological process of genital arousal. Finally, being transgender links to a significant negative effect on wellbeing as compared to being cisgender, but access to medically transitioning might potentially improve the wellbeing of transgender men.

5.3 Limitations

Within the sex atypicality study, no transgender women or cisgender men were included. The inclusion of these groups would allow for a more broad insight into the behavioural development of transgender people, as well as allowing the investigation of similarities or differences between transgender groups and cisgender groups with the same gender identities (e.g., transgender women and cisgender women), and not just the present differences or similarities that were investigated based on birth sex. Although present findings indicate differences between

transgender men and cisgender women, it is not known how similar transgender men are to cisgender men in their gendered behaviour. There were also a limited number of photographs provided per person across the different age groups, with an average of between 3-6 photographs being provided per participant for their childhood years of 0-15 of age. This mean that for each participant there were not photographs that covered all childhood ages.

The method itself of using ratings of photographs has limitations itself, including selection bias from participants and a potential lack of relevant information to base ratings on. It is not unfeasible that participants self-selected photographs that represented themselves in a way preferable to themselves, for example, transgender men may have selected photographs that depicted them as more masculine. Finally, photographs provide a limited amount of information, that is only static in nature, about a person and give little information about more nuanced behaviours such as mannerisms, that could have potentially led to larger sex atypicality differences between transgender men and cisgender women. The use of video footage may help provide more in-depth information about participants for ratings to base their ratings on.

Limitations of the sexual arousal study included a lack of transgender men as participants, and the distribution across sexual attractions for this group. There was a small number of transgender men (N = 25) as compared to cisgender men (N = 145) and cisgender women (N = 178), and the largest sexual attraction group of transgender men was bisexual (N = 16). Although this sample size of transgender men is notable given the small population size of transgender people, it is still important to replicate the present arousal study with a larger group of transgender men with equal distributions of their sexual attractions. Sample size was also part of a

further limitation because the majority of transgender men were taking testosterone supplements. Due to a lack of pre-testosterone participants, we were unable to determine if testosterone had an effect on the arousal of transgender men. Because testosterone does have an effect on libido and sexual behaviours for a majority of transgender men (Dadasovich et al., 2017), it is possible it could have an effect of the pattern of sexual arousal. Moreover, transgender women were not part of the present arousal study, and it is important to include them as a participant group in future transgender arousal studies using a larger sample size at varying transitional stages.

A primary limitation of the present wellbeing study was imbalanced participant groups, and an unrepresentative sample size, and distribution of sexual attractions, among cisgender women. Due to an unforeseen outcome of the recruitment method focusing on transgender participants, the sample of cisgender women was smaller than that of transgender men, and most were attracted to women. This gave an unrepresentative sample as compared to population numbers of each group. Another present limitation is the lack of causality as the method of the study was purely correlational, meaning a link between being transgender and transitioning can be shown, but no directional causation within this link can be evidenced. Likewise, there was no information as to whether, for example, transitioning over time was linked to an improvement in wellbeing of individual participants, but just that overall, participants who were further along in their transition had increased wellbeing. This leaves the causation of this difference more open to confounding variables than if the study had a within participants methodology. Finally, as with the rest of the present thesis, due to the focus on transgender men, no transgender women were included in this research.

5.4 Future Directions

Future directions for this research should address above limitations and involve the inclusion of transgender women. The present thesis focused on transgender men, in part to maximise participant numbers as this was a group accessible to me through social media presence. There also is typically less focus on transgender men, including in media and research, as they are a group that is generally not as visible as transgender women. But in order to gain a broader understanding of transgender groups, it is important to include more than just one group in future studies. Transgender women have lower psychological wellbeing than transgender men (Warren et al., 2016), as well as differing patterns of physiological arousal relating to gender (Lawrence et al., 2005). There are therefore potential differences between different transgender groups, making it relevant to include both transgender men and transgender women within the same studies.

Specifically, within each study of the present thesis, future directions for sex atypicality research involving transgender participants, should aim to compare transgender men to cisgender men and transgender women to cisgender women, to look for similarities in gendered behaviours from early childhood on, as well as the differences investigated presently. Further longitudinal work, as already conducted in sex atypical children (Rae et al., 2019) and LGB cisgender groups (Li et al., 2017), would be informative to be carried on throughout childhood into adulthoods, comparing transgender and cisgender groups of differing sexual attractions. This longitudinal method would also address the present limitation of using photographs with respect to selection bias and limited information. Using supplementary video footage and even parental reports of childhood and adulthood behaviour could also

address some of the methodological limitation of photograph ratings, whilst still avoiding the expense and length of a longitudinal study.

Future sexual arousal research should include a larger sample of transgender participants, with more equal groups based on sexual attraction, as the current sample had smaller groups of transgender men attracted to men and those attracted to women, as compared to those with mixed attractions. There should also be the aim to research the potential impacts of hormones on sexual arousal, as due to a small sample of pre-testosterone transgender men, these effects could not be fully determined presently.

Further investigating the sexual arousal of transgender participants could also be informative in the context of broader mechanisms of arousal. The Information Processing Model (IPM) (Janssen, Everaerd, Spiering, & Janssen, 2000) describes a mechanism where different levels of cognitive processes (automatic and controlled) can have different effects on subjective arousal and physiological arousal. Findings investigating this model indicate toward the role of automatic processes on physiological arousal specifically. Cisgender women consistently show increased non-specific genital arousal, and this is reflected in non-specificity in their automatic stimulus processing, and more specificity in their controlled stimulus processing (Chivers, 2017). This could go some way to explaining their non-specific pattern of genital arousal and the lower correlation between genital and subjective arousal (Rieger et al., 2015). Investigating the arousal of transgender men in the context of the IPM, including the specificity of their automatic and controlled stimulus processing, could expand our knowledge of the model, particularly with regards to the specificity differences between cisgender groups, and the influence of gender versus assigned birth sex on arousal.

Finally, future wellbeing research should again aim to achieve more balanced samples between transgender and cisgender groups, with differing sexual attractions, as well as investigating the influence of gender dysphoria on transgender wellbeing, specifically in relation to transitioning. Gender dysphoria is the diagnosis that generally accompanies identifying as transgender and includes having feels of incongruence between one's gender identity and birth sex (American Psychiatric Association, 2013), with feelings of gender dysphoria being linked to poorer wellbeing (Rabito-Alcón & Rodríguez-Molina, 2016). Medically transitioning can alleviate these dysphoric feels (Gorin-Lazard et al., 2013), indicating that alleviation of gender dysphoria could explain the positive effect of transitioning on wellbeing. Therefore, gender dysphoria should be investigated as a potential mediator between being transgender and poorer wellbeing outcomes. Potential causality of transitioning on effecting wellbeing should also be studied, this could be achieved through longitudinal research following transgender people through the different stages of their transitions and recording their wellbeing throughout these stages.

5.5 Conclusions of Thesis

Transgender men differ to cisgender women, and therefore differ to typical expectations of their birth sex, in terms of sex atypicality from early childhood onwards, and adulthood physiological sexual arousal. Due to the early onset of sex atypicality in transgender men, non-social factors may influence this behaviour. Another indicator of this influence is due to an at least partially male-typical sexual arousal patterns being found in transgender men, that are stronger than the slight male-typical patterns sometimes displayed by cisgender women attracted exclusively to women. Both factors evidence similarities between transgender men and cisgender

men. Wellbeing is also overall lowest within groups of transgender men, but despite them reporting increased discrimination, this did not explain the decrease in wellbeing due to being transgender. Transitioning among transgender groups linked to better wellbeing, with wellbeing increasing the further along a participant was in their transition.

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