Influence of sex, sexual orientation, and hormonal cycles on attraction preferences of facial masculinity, femininity, and sex typicality

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Declaration

I declare that this thesis, *Influence of sex, sexual orientation, and hormonal cycles on attraction preferences of facial masculinity, femininity, and sex typicality* 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.

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Impact of the Covid-19 Pandemic on Thesis

I had planned to collect more data for the experimental studies in Chapters 4 and 5, however given the circumstances around the pandemic, it resulted in it becoming impossible to collect data in the lab in a foreseeable time, and subsequently in a high dropout rate of participants. I therefore had to be creative and adapt data collection methods, using a remote method instead of using the laboratories for the two experimental studies in Chapters 3 and 4. As the pandemic affected the conditions around which participants completed the data collection (less participants than planned, and these data collected remotely), I acknowledge that there may have been more extraneous variables than hoped for, which may have affected results. I will discuss how the Covid-19 Pandemic may have affected the results in the relevant discussion sections.

General Abstract

The present thesis investigated the influences of a person's sex, sexual orientation, and hormonal cycles on attraction preferences for facial masculinity and femininity and sex typicality. It explores whether there are evolutionary adaptive mechanisms involved in attraction preferences across sex and sexual orientation and whether these adaptive mechanisms are influenced by fertility (for women) and testosterone (for men). Chapter 1 gives a general overview of the literature and introduces the research questions. Chapter 2 focuses on whether similarities, or opposites, attract in terms of masculinity-femininity, or whether there is a preference for a match in sex-typicality across sex and sexual orientation. Study 1 uses 3D computer generated images to re-investigate these questions. Study 2 uses real-life computer manipulated images to re-investigate these questions and to counteract the limitations of Study 1. Findings from Study 1 and Study 2 suggest potential evidence for opposite attract, e.g., masculine men prefer feminine female faces, but this evidence was limited. Chapter 3 focuses on whether there is an evolutionary adaptive shift in women's attraction preferences across fertility levels or whether this shift is dependent on sexual orientation. Findings suggest no compelling evidence for the influence of fertility or sexual orientation on women's attraction preferences for target sex typicality. Chapter 4 focuses on whether there is an evolutionary adaptive shift in men's attraction preferences across testosterone levels or whether this shift is dependent on sexual orientation. Findings suggest no compelling evidence for the influence of testosterone or sexual orientation on men's attraction preferences for target sex typicality. Overall, there is no compelling evidence for evolutionary adaptive shifts in attraction preferences for facial sex-typicality in targets across sex, nor for shifts being dependent of sexual orientation, and no evidence that these mechanisms are influenced by hormonal changes.

Author Note

Chapters 2 through to 4 of this thesis were written as independent pieces of research, with the aim of being submitted as peer-reviewed manuscripts for publications. As a result of this there is some overlap between chapters. For example, the General Introduction gives an overview of the literature that motivated each study, and therefore overlaps strongly with parts of the introductions provided in each chapter (manuscript). Likewise, there are sections in each chapter's methods that are similar across chapters. Chapter 2, Chapter 3, and Chapter 4 are being prepared as manuscripts for submission to Archives of Sexual Behavior and Human Behavior and Evolution. Each of these journals conforms to APA formatting guidelines.

Chapter 1 General Introduction

1.0. Overview of Thesis

Sexual orientation and individual attraction preferences are major force in human sexual selection and reproduction (Bailey et al., 2016; Rahman & Wilson, 2003). Despite this relevance, individual attraction preferences across sex and sexual orientation together remains an understudied topic. This thesis aims to highlight whether there are evolutionary adaptive preferences in attraction preferences of facial masculinity-femininity and whether these are observed across sex and sexual orientation. This thesis will explore a) whether potential adaptive preferences for masculinity - femininity and sex typicality feed into sexual attraction patterns (Studies 1 and 2), b) whether adaptive attraction patterns within women can be highlighted by studying their menstrual cycle (Study 3), and c) whether adaptive attraction patterns within men can be highlighted by a study of their testosterone cycle (Study 4). Importantly, and uniquely, this thesis will investigate whether these mechanisms are not only evident in heterosexual men and women, but also in homosexual men and women.

1.1. Attractiveness Characteristics

Darwin believed that there are cultural and individual differences in preferences of attraction within the human species. This was seen not only in face and body shape but also in skin colour, hair, body fat, as well as lip ornamentation, teeth, and even elements such as foot size. Darwin (1871) stated ‘It is certainly not true that there is in the mind of many universal standards of beauty with respect the human ‘body’. Researchers in more recent years however argue that there is at least a high consistency between people’s judgements of facial attractiveness within and across cultures, suggesting there is a universal agreement about facial attractiveness within and between cultures (Langlois et al., 2000).

Scholars from evolutionary psychology, cognitive psychology, biological psychology and social psychology have long had an interest in the dynamics of such questions of beauty (Rhodes, Hickford & Jeffery, 2000). One view is that human beauty standards are set by an individual culture and such media linked to the environment in which a person explores such culture, and that beauty or attraction may have little functional significance (Rhodes, et al., 2000). For instance, Webster and Driskell (1983) proposed that attractiveness is produced by the structure of society. Attractiveness is a high-status cue in various cultural regards and for many holds the same criteria as race and sex. However, further evidence does suggest that perceptions of attractiveness may have biologically based mechanisms (Thornhill & Gangestad, 1999; Zebrowitz, 1997). These mechanisms show that different traits in males and females are preferred during various times in biological cycles. Evidence suggests that a women's menstrual cycle can affect the intensity of attraction preferences towards male facial characteristics (Gangestad & Thornhill, 2008), and men's testosterone levels can affect the intensity of attraction preferences towards female facial characteristics (Bobst & Lobmaier, 2014). Both biological cycles show preferences towards traits which signal a greater reproductive success at times when reproduction is biologically more likely.

The human mind has an astonishing ability to recognise, process shapes, and extract information from facial components. This ability has resulted in a great interest in beauty in recent years. Evidence suggests that there are strong correlations between first impressions of an individual and the impact impressions can make on perceptions of attractiveness (Lavater, 1880; Wills & Todorov, 2006). First impressions not only relate to facial or physical body attraction preferences but also to personality and social position of the target individual. Personality and social position were found to affect how attractive individuals are perceived, with greater desired personality traits and higher social position leading to a greater perception of attractiveness.

A growing body of research argues that attractiveness has a significant impact on an individual's life. A meta-analysis conducted by Langlois and colleagues in 2000 found that attractive people were more likely to be judged as competent in their job roles, they were also more likely to experience success such as promotions in their occupational professions and were more likely to be treated more favourably compared to those who were rated as unattractive individuals. Beauty is therefore known to hold many important social consequences, including, for women, that beauty is associated with economic mobility (Elder, 1969).

Not only does being seen as more physically attractive impact on an individual's life in terms of job success, but also in terms of securing a long-term relationship or even the prospect of marriage. Buss (1989) found that attractiveness matters when choosing a mate. In 37 countries it was found that both men and women rated attractiveness as a top trait they look for when choosing a long-term mate. Buss's study not only found that attractiveness was important for mating, but also found differences between men's and women's preferences in terms of what is seen as attractiveness. It was suggested that heterosexual women were more focussed on male wealth and social status cues, which were dependent upon cultural and environmental factors. Men however focus more attentively on instantaneous physical attractiveness and likelihood of coitally acceptable partners. These findings have been replicated in multiple studies since that time (Aharon, et al., 2001; Shackelford, Schmitt & Buss, 2005; Steward, Stinnett & Rosenfeld, 2000; Todd, et al., 2007).

Over recent years an extensive literature concerning possible physical traits involved in human mate choice decisions has developed (Currie & Little, 2009). The field of attractiveness psychology has made significant advances in the past 15 years especially regarding what individuals believe is attractive in a target and why these characteristic traits are preferred. Associations have been made between attractiveness and many characteristics

across culture, ethnicity, age, sex and sexual orientation (Little, Jones & DeBruine, 2011). Research by Dunn and Searle (2010) suggests that attractiveness factors include race, power, social status, occupation, facial features, and even car ownership. Empirical evidence found, on average, that although culture can play an important role in attractiveness (Wood & Eagly, 2007), men and women tend to prefer mates who will produce healthy offspring as well as those who display resource acquisition characteristics such as a social status, socioeconomic status and power, although the degree to which each of these are desired depend upon the perceiver (Chang, et al., 2011; Eastwick, et al., 2011; Hatfield & Sprecher 1995; Weiderman, 1993). Greitemeyer (2007) suggests that on average men prefer females with low socioeconomic status whereas women prefer males with a high socioeconomic status. Similar results are said to be evident when looking at power and its impacts on attractiveness (Keltner, Gruenfeld & Anderson, 2003). Research found that on average, high power in males is attractive to women because it offers protection and support, and in general high levels of power in males shows their ability to acquire resources and to produce strong and healthy offspring. It is suggested that perceived lack of power in females (often those who are younger or subordinate) is attractive to men because it signals a higher likelihood of being able to dominate the female and signals the females faithfulness. In short powerlessness in females increases the likelihood that the man is the father to any offspring (Keltner, Gruenfeld & Anderson, 2003).

In addition to the above, another factor which is said to influence attractiveness is quantity of financial resources. Resources include ‘good’ financial prospects, ‘good’ bank accounts, owning a house and car ownership. These preferences are especially evident within western societies (Back, et al., 2011; Greenless & McGrew, 1994; Lippa, 2007b) and are found to be more evident in women’s perceptions of male attractiveness over men’s perceptions of female attractiveness. Some research has also found that homosexual men

express he desire to be finally supported by a partner, thus showing a stronger preference for those with good financial resources (Lippa, 2007b). A strong attraction characteristic is the ownership of a prestige or luxury sports car, even if this car has been acquired on finance (Dunn & Searle, 2010). Women rated males who owned prestigious cars as significantly more attractive than those who owned a neutral car, likely because a prestigious car signified a male with a more money, higher social status, and a greater ability to provide resources for a family (Etcoff, 1994).

Although the above characteristics appear influential in whether someone is perceived as attractive or not, attractiveness is also attributed to a range of physical appearance characteristics which encompass both the face and the body. Some of those facial and bodily characteristics that are said to impact attractiveness of males and females include waist to chest ratio (WCR) (Braun & Bryan, 2006), waist to hip ratio (WHR) (Singh & Bronstad, 1997), shoulder to hip ratio (SHR) (Hughes & Gallup, 2002), Shoulder to waist ratio (SWR) (Bryan, Webster & Mahaffey, 2011), breast size (Manning, et al., 1997), nose size (Cunningham, et al, 1990, 1995) and even foot size (Fessler et al. 2005). Empirical evidence also suggests that characteristics such as muscularity (Frederick & Haselton, 2007), leg to body ratio (LBR) (Frederick et al., 2010), body mass index (BMI) (Smith, Cornelissen & Tovee, 2007), facial hair (Dixson & Brooks, 2013), facial symmetry (Grammer & Thornhill, 1994) and, importantly, facial masculinity-femininity (Patzer, 2006) influence attractiveness. Women's preferences of attractiveness have been proposed to also change based on the fitness cues of male's bodies, in particular muscularity. This thesis will now look more in-depth at sexual selection highlighting several theoretical models and how these can influence attraction, attractiveness, and mating. This thesis will be focusing on facial attractiveness more specifically facial masculinity and femininity and how that affects attractiveness preferences.

1.2. Sexual Selection

Over the last century, evolutionary biologists have questioned why each species is so choosey when finding suitable partners. The answers consistently throughout literature relate to sexual selection (a process of natural selection), which is specific to an individual's ability to obtain a mate and involve aspects of survival, security of resources, reproduction, and offspring genetic quality (Racevska & Roberts, 2018). There are two main sexual selection mechanisms; these are intrasexual selection and intersexual selection.

1.2.1. Intrasexual Selection

Intrasexual selection is when members of the same sex (within a species) compete to gain access to members of the opposite sex to allow them to mate. The most common example of this is where a man will compete against another man (physically or otherwise) for access to a female (Andersson, 1994; Geary, 2006; Racevska & Roberts, 2018). There is variance for success as a result of this selection process and therefore some invidiauls of one sex have greater reproductive success than others of the same sex.

1.2.2. Intersexual Selection

Intersexual selection is the process where women choose a mate of the opposite sex of the same species based on certain characteristics and traits known as ornaments (Chen & Chang, 2015). It is believed that the traits held by the male are not necessarily directly beneficial to the woman and may come with costs such as aggression, being more likely to be put in danger and poor suitability of a long-term partnership (Niu & Zheng, 2020a). However, evidence suggests that women prefer these traits as they are believed to signals

male dominance, genetic and adaptive ability to cope with danger and survival and stronger likelihood to be able to pass this genetic advantage onto any offspring (Kenrick et al., 1990; Krams et al., 2014; Niu & Zheng, 2020a; Puts, 2016; Skrinda et al., 2014). When a consistent preference for these traits is shown by women then these traits evolve due to selection and can become ever more exaggerated to have an even more desired effect (Racevska & Hyde-Roberts, 2018). The main reason that a woman is choosey is so that they do not waste energy and time on offspring, which do not have the evolved traits. In humans, one view is that these could include masculine facial and body characteristics (Puts, Jones & DeBruine, 2012; Dixson et al., 2010; Nettle, 2002; Pawlowski & Jasienska, 2005). However, not all research supports this view (Cunningham et al., 1990; Johnston et al., 2001; Glassberg, 2010;Zaidi et al., 2019). There are several models and theories which provide some explanation for the choosiness in human and animal mate selection, as I will review in the next sections.

1.2.3. Adaptive Models

One suggestion is that mate choice has evolved because there are benefits to choosing mates. These adaptive benefits are often described as either direct (material) or indirect (genetic). Direct benefits are those which increase the fitness of the choosing partner through material and tangible gains unlike indirect benefits. A choosey mate may often prefer a partner based on secondary sexual characteristics and traits which signal direct, material and fitness benefits. Evolutionarily, individuals prefer traits in a partner that signal kindness, fondness of children and parental investment commitment (Buss & Barnes, 1986; Bereczkei, et al., 1997; Li, et al., 2002), material advantages such as wealth and salary, education and occupation, social status, ambition and intelligence (Bereczkei et al., 1997; Buss, 1989;

Hopcroft, 2006; Li et al., 2002; Mare, 1991; Miller, 2000; Sprecher, Sullivan, & Hatfield, 1994).

Indirect benefits are benefits which provide an increase to genetic fitness. There are four evolutionary mechanisms which support indirect benefits. Firstly, Fisherian Runaway Process, a sexual selection mechanism developed by Fisher (1915) to account for the evolution of exaggerated male traits by female choice. Women gain an indirect genetic benefit by choosing males not because of their genetic quality but because they are attractive, and they will then have attractive sons and more attractive offspring than a woman with a less attractive male. Secondly, the good genes theory which proposes that women select males based on certain traits, which have indirect genetic benefits that are inherited by the offspring, which improves offspring genetic quality (Huk & Winkel, 2008). This theory suggests that traits women find attractive in males when selecting them as a mate are honest indicators of ability to provide good quality genetics, which will increase the survival and reproductive success of the women's offspring. Thirdly, the handicap principle relates to the good genes process described above and is used to explain how such honest cues and traits within males have evolved. This principle proposes that women prefer males with handicaps (mating traits that reduce survival chances) because these handicaps signal reliability and genetic quality (Zahavi, 1975). It also suggests that these cues of mate quality are costly to the male with the handicap because the cost is something that could not be upheld by an individual who did not possess the quality. The handicap hypothesis is not restricted to just genetic quality or indirect benefit, it also encompasses signals of direct benefits such as luxury cars, clothes or jewellery, tattoos and scars, high social status, voice, face shape and body shape (DeBruine et al., 2010; DeBruine et al., 2012; Griskevicius et al., 2007; Ludvico & Kurland, 1995; Sundie et al., 2011; Thornhill, Gangestad & Scheib, 1999). However, with ever-increasing use of credit card and finance plans, these types of cues have led to dishonest signalling. Hamilton

and Zuk (1982) proposed a specific version of the handicap principle known as the Hamilton-Zuk Hypothesis. This hypothesis focuses on a specific component of genetic variation, parasite resistance (Zuk & Simmons, 2018). They proposed that certain traits could be used as cues to indicate an improved state of health and fitness, such as being free from disease (immunocompetence) or an improved parasite resistance (Drickamer, Vessey & Meikle, 1996; Houde & Torio, 1992). This follows the idea that parasites and disease can affect the development and subsequent look of certain traits. Preferences for these traits are then developed by the opposite sex as they use them to determine the immunocompetence of a potential partner and how this could benefit them and their offspring. The idea is that the choosing partner will prefer the traits, which honestly signal immunocompetence in the opposite sex so that this will benefit them in the quality of their offspring. In humans, body markings such as tattoos have been predicted to be a way in which individual could attract mates. It is believed that scars on the body are viewed by mates as evidence that the individual has overcome parasites and is therefore more attractive (Ludvico & Kurland, 1995). Masculinity in societies with high levels of parasites or disease is seen as an immunocompetence trait. Females within that society often place an emphasis on masculinity in their mate preferences; they look for increased signs of masculinity in the voice, face and body shape of a male. The face is a very important area, which females use as a signal for immunocompetence it is said to hold the most cues to signal parasite resistance and is one of the most attractive traits in a male partner (DeBruine et al, 2010; DeBruine et al, 2012). More specifically research found that masculinity in male faces s highly correlated with actual health and immune system strength, however preference for these traits is weak (Moore et al., 2010; Rantala et al., 2012; Rhodes et al., 2003). It is important to note that some researchers have suggested that the principle could be interpreted differently. Some interpret it as opposed to high quality partners being able to afford the high cost linked to the honest signal,

high quality partners may just be more efficient at using their energy to improve their traits. Which would mean that they are able to invest in the honest signal they display without having to compromise in the signal or having to deal with any signalling costs (Getty, 2006; Sorensen et al, 2016). Finally, there is the genetic compatibility hypothesis, which refers to how well the genetics of both the choosing partner and the chosen partner complement each other to aid greater genetic variability in offspring (Zeh & Zeh, 1996, 1997). Women should choose genetically dissimilar males who will complement their own genetic makeup to allow their offspring to get both parents genetic variability. The compatibility hypothesis states that women have evolved mating preferences which prevent them from choosing a male which is genetically incompatible (Colegrave, Kotiaho & Tomkins, 2002).

1.2.4. Non-Adaptive Models

Converse to the adaptive model discussed above, mate choice is also argued to have evolved because of a non-adaptive model (Sefcek et al., 2007). This model suggests that mate attraction preferences and mate choice is made assuming that there is no benefit for the chooser. A specific trait may be favoured as incidental by-products of viability in selection, as they already seem to be an existing bias in that specie's mate choice. A model which supports this is the Sensory Bias. Sensory bias suggests that preferences for specific traits in the opposite sex initially evolve in a non-mating context. Once a preference in a non-mating context occurs, members of the species then evolve to take advantage of pre-existing sensory biases in the opposite sex to increase mating success. Research shows that humans have preferences for symmetry, irrespective of the stimuli and in a non-mating context, this preference is now also largely found for averageness in a mating context and preferences in

human faces (Halberstadt et al., 2013; Halberstadt & Rhodes, 2003; Koehler, Rhodes, & Simmons, 2002).

It is important to note that although there are distinct adaptive and non-adaptive models, direct and indirect benefits that attempt to explain mate preference, they do not operate separately or individually and often there will be several mechanisms used in order to make a mate choice. It may be that the relative importance of each of the models and theories explored may vary (Paul, 2002).

1.2.5. Sexual Orientation Limitations of Sexual Selection Theories

The adaptive models struggle to explain attraction preference differences for homosexual men and women and focus on heterosexual selection preferences. A non-adaptive model which could support a non-adaptive evolution-based view for homosexual individuals is that proposed by Ryan & Jetha (2010). They argue that modern attraction preferences are a result of moving from hunter-gatherer societies where individuals had to fend for themselves, fight for survival, share resources, childcare and sexual partners to more political and individual agricultural societies. This perspective suggests that as a result in the cultural change of societies functions, human motivation and relationships have also changed, into a society where same sex attraction preferences are more realized. Although this change is small, it is proposed that this is a cultural change. This issue will be explored in further detail below, discussing how evolutionary theories may explain homosexuality and how homosexuality may be evolutionarily adaptive in a non-obvious way.

1.3. Sexual Orientation

There is no universally agreed definition of 'sexual orientation' (Lehmiller, 2014). There are contrasting views as to whether it is related to sexual attraction, sexual behaviour or sexual orientation identification (heterosexual, homosexual, bisexual). Researchers often adopt the definition most suited towards their research direction. Sexual orientation is most commonly categorised into three main groups, heterosexual, homosexual, and bisexual.

Evolutionary theory would initially seem unable to explain homosexuality. As homosexuals are attracted to and engage in sexual behaviours with members of the same sex, the ability to enhance their reproductive success is not obvious. However, research has argued that homosexuality may be evolutionarily adaptive in a non-obvious evolutionary manner (Lehmiller, 2014). Several decades ago, Mayr (1982) suggested the 'gay uncle' hypothesis which argues that people who do not reproduce and provide offspring with their own genetic qualities may enhance the survival of their family's genetic quality by supporting and providing resources to their closest family's offspring, e.g., to their nieces, and nephews. Vasey and Vanderlaan (2010) showed support in Samoa for the gay uncle hypothesis, suggesting that gay men have been chosen throughout evolution to act as care givers and helpers, looking after nieces and nephews and increasing their own fitness indirectly. However, this theory has been questioned because, if homosexuality was an adaptive behaviour, it may be expected that homosexuality would have been socially supported as opposed to socially stigmatised throughout history, in contrast to more recently.

Other researchers have suggested that homosexuality in men may be an evolutionary result of high female fertility (Camperio, Corna & Capiluppi, 2004). This research found that homosexual men's maternal female relatives have a significantly higher number of offspring than heterosexual men's paternal female relatives. This research suggests that a higher level of female fertility is linked to a higher likelihood of having a homosexual son. One view is

that having a higher number of offspring would counterbalance the fact that not all of the offspring would reproduce and could account for why homosexuality has continued over time (Rieger et al., 2012).

Homosexual women's sexual behaviour has been explained in an evolutionary manner by the 'Alloparenting Hypothesis' (Kuhle & Radtke, 2013). This hypothesis suggests that women have evolved to engage in flexible sexual mating preferences between males and females. It is argued that having this flexibility to engage in mating with males or females was adaptive so that when the male was not around and did not engage in parenting duties the women could secure offspring support and survival resources by engaging in sexual behaviours with a female.

1.4. Sex Typicality

A key characteristic throughout attraction research is sex typicality, also referred to as sexual dimorphism. Sex-typicality is when a male or female displays characteristics typical of that sex. A female would be seen as sex typical if she displayed 'feminine' characteristics, thus a male would be sex typical if he displayed 'masculine' characteristics. Conversely, a female would be seen as sex atypical if she were to display 'masculine' characteristics, similarly, a male would be seen as sex atypical if he were to display 'feminine' characteristics (Rhodes et al., 2000). These characteristics can be evident through a person's personality as a child as well as an adult, body shape, body size and face. Research has been conducted into all of these characteristics and their effects on attraction preferences. However, one characteristic which receives particular attention when exploring men and women's attraction preferences is facial sex typicality (Komori, Kawamura & Ishihara, 2009). Sex-typicality in male and female faces is said to develop during puberty as a result of androgens and

oestrogens. High levels of testosterone are linked to the growth of sex-typical male (i.e., masculine) facial characteristics, high oestrogen is linked to the growth of sex-typical female (feminine) facial characteristics (Little et al., 2011; Mydlová, et al., 2015; Rhodes, 2006). Male facial sex typicality (masculinity) is characterised by the possession of large jawbones, prominent cheekbones, robust eyebrow ridges, longer and protruding facial bones and an increased lip size (Said & Tordorov, 2011). Female facial sex typicality is characterised by small chins, high eye width to face ratio, large lips, thin cheeks, smooth skin and a small nose (Cunningham et al., 1995). There has been a large body of research which has explored attraction to sex typical facial characteristics that has found differing results.

1.4.1. Heterosexual Women's Preferences for Sex Typicality

A number of studies have shown that heterosexual women have a stronger preference for sex-typical (masculine) male faces than sex-atypical (feminine) (DeBruine et al., 2006; Fink & Penton-Voak, 2002; Johnston et al., 2001; Little et al., 2008; Niu & Zheng, 2020b). Research argues that women need a mate who can provide resources and protection to her and her offspring. As women are most of seen as the choosier sex (Finkel & Eastwick, 2009), they are likely to prefer males who can exhibit characteristics which signal 'good genetic quality' and ability to provide genetically strong offspring over other males (Buss, 1989). In male faces, masculinity has been said to correlate to strength, physical health, genetic health, immunocompetence and ability to survive despite intrasexual competition (Alley & Cunningham, 1991; Ekrami, et al., 2020) as well as being positively linked to dominance and aggression (Mazur, Halpern, & Udry, 1994). Research also suggests that immunocompetence is a characteristic associated with masculine faces (Scott et al., 2014). This may be because testosterone is seen as an immunosuppressive and having high levels of this hormone is seen

as detrimental and costly to health, only those who are strong enough are able to survive through it (Scott et al., 2014).

Recently Stower et al. (2020) found that a women's preference was strongest for an average masculine face, followed by a strong masculine face, with feminine faces being least attractive. However, contrasting evidence has been found for the preference of sex-atypical (feminine) male faces. Penton-Voak et al. (1999) found a cross-cultural preference of feminised male faces, with a smaller than average lower jaw. Women's preferences can be driven by stereotypical personality traits based on appearance – highly masculinised faces were rated as more dominant, less warm, and less honest, and therefore may be less desirable than feminised male faces (Perrett et al., 1998). Conversely, masculine faces may not be desired as it could also be linked to lack of parental investment and unwillingness to invest care and resources into a partner.

Other research has found a mixture of both masculine features, such as prominent cheekbones and thick eyebrows, and feminine features, such as large eyes and a small nose, to be the most attractive and desirable in males (Cunningham et al., 1990). These inconsistencies in findings may be due to the method of generating the facial stimuli, which possibly over-exaggerates sex-typicality of faces. Feminising a male face also often leads to greater levels of facial symmetry, which may suggest that there is a preference for symmetry as opposed to the femininity of the faces (Johnston et al., 2001). Conversely, the discrepancies in women's ratings of male attractiveness may be due to hormonal influences of the menstrual cycle, which give support to the evolution and adaptive nature of such attractive features (Thornhill & Gangestad, 1999).

1.4.2. Heterosexual Men's Preferences for Sex Typicality

Research has consistently shown that heterosexual men prefer sex-typical females and that rate feminine faced females as more attractive than masculine faced females (Rhodes, 2006). Sex typicality (femininity) may signal youth and fertility and is often referred to as a 'Baby Face' (Gottschall et al., 2008). Because such qualities are evolutionarily beneficial, perceivers desire them in a mate (Puts et al., 2012).

Men search for a mate who shows signals of fertility and an ability to provide offspring. Female fertility peaks around the age of 20, and drastically begins to decline around the age of 35 (Homan, Davies & Norman, 2007), therefore men are attracted to females who appear youthful, as youth is a reliable indicator of a fertile mate (Buss, 1989). Hormone markers are also evident in female faces, as high levels of oestrogen in comparison to testosterone are linked to less prominent facial bone structure, larger eyes, a smaller mouth and nose, and greater fat deposition in the upper cheeks and lips (Thornhill & Grammer, 1999). Such feminine features are therefore considered to be more attractive to men, as they are considered to provide honest signals of high levels of fertility, associated with youth, and genetic quality (Fink & Penton-Voak, 2002; Law Smith et al., 2006) as well as for stimulating the feeling of maternal tendencies, caring and support (Berry & McArthur, 1985; Law Smith et al., 2012). There is little empirical evidence to support these assumptions, Law Smith et al (2006) was the first to investigate the relationship between high levels of fertility and ratings of femininity, attractiveness, and apparent health of a female's face. They found positive correlations between high fertility and rating of femininity, attractiveness, and health. Findings demonstrated that female feminine facial characteristics hold cues which signal reproductive health that are attractive by men. Perrett et al. (1998) have shown that more feminine female faces are considered as more attractive than neutral faces, not only by men, but also women raters.

Although research typically finds that men rate feminine female faces as more attractive than masculine female faces, some recent findings have suggested that there are several factors which may impact on this preference. Men rate feminine females more attractive when the female is linked to a short term as opposed to a long-term relationship (Little et al., 2014), if they perceived themselves as attractive (Little et al., 2014) and if they had higher levels of testosterone (Welling et al., 2008a). Marcinkowska et al. (2017) found that age was also a factor which contributed to men's preference for female faces. Their results showed that this preference was evidenced most strongly with men aged 20-35 and declined from that point. The main decline in preference for facial femininity began around the age of 40-45 but was most pronounced in men aged 60-73. Men's testosterone and sexual motivation (Bribiescas, 2006; Feldman et al., 2002; Harman et al., 2001) levels decrease with age and as such may mean that competition for such beneficial females is much more likely in younger men than in older men, and older men may weigh up the cost and benefit of fighting for a feminine female.

1.4.3. Homosexual Preferences for Sex Typicality

Research suggests that both homosexual men and women show a preference for sex-typical appearance of partners, more strongly than heterosexual individuals do. Homosexual men prefer more masculine males in terms of both appearance and behaviour, whereas homosexual women prefer females who describe themselves as having a feminine appearance, with no preference of sex-typical behaviour (Cohen & Tannenbaum, 2001). In personal advertisements, homosexuals are more likely to mention sex-typical traits, and request sex-typical partners than heterosexuals (Bailey et al., 1997). This is notable, as the majority of homosexuals are considered to be sex atypical in comparison to heterosexuals,

not only in appearance but in behaviour and interests (Rieger et al., 2011). In contrast to the women's preferences discussed, it is possible to hypothesise that homosexual men's preferences for masculine features may be more consistent, as they do not experience the influential hormonal changes during the menstrual cycle as females do. Contrary research into the effect of sexual orientation found that only those attracted to females – heterosexual men and homosexual women's - view more feminine faces as more attractive (Glassenberg et al., 2010). Similarly, researchers found that preference for femininity in females was higher among heterosexual men than it was homosexual men (Shiramizu, et al., 2020). Interestingly, Glassenberg et al. (2010) found that homosexual men had the strongest preference for masculine males compared with homosexual women, however homosexual women showed a stronger preference for sex-atypical male faces, compared to sex-typical male faces. A recent large-scale replication study by Shiramizu and colleagues (2020) also found that homosexual men had a strong preference for masculine male faces and this preference was much significantly stronger than heterosexual men's preferences. Additionally, Zheng (2019) found that homosexual men showed a stronger preference for masculine male faces, irrespective of relationship status and sociosexual orientation. Cassar et al. (2020) also found that homosexual men on average show a preference for masculine male faces compared to feminine male faces. This was also irrespective of their relationship status. Glassenberg at al. (2010) found that heterosexual women, heterosexual men, and homosexual women preferred masculine females more than heterosexual women do (Glassenberg et al., 2010). Welling et al. (2013) however, found homosexual men prefer feminine females and homosexual women preferred more feminine males and females. Importantly, the latter research on homosexual men and women's preferences have only included extremes of sex-typical stimuli (e.g., a masculine face and a feminine face), which could affect more general results about attraction

preferences (Glassenberg et al., 2008; Welling et al., 2013.). However contradictory, all findings do suggest that sexual orientation influences attraction preferences.

1.5. Similarities and Opposites Attract

It is feasible to assume that preference for masculinity, femininity and sex-typicality depends on the raters' own level of masculinity, femininity, and sex typicality. Three possible mechanisms which could explain this are: a) assortative mating, b) disassortative mating, and c) a preference for a match in sex typicality.

1.5.1. Assortative Mating

Assortative mating, also known as homogamy, is a sexual selection mating strategy where individuals choose to pair and mate with individuals who are similar to themselves more often than what would be expected by chance (Little, Burt & Perrett, 2006; Penton-Voak, Perrett & Peirce, 1999a; Watson et al., 2004; Zietsch, et al., 2011). A schematic to help explain preference patterns for assortative mating can be seen below in Table 1. Although assortative mating is the widest known and most consistent sexual selection strategy to date within human and animal mating, the underlying mechanisms are still not well understood. Whilst there is limited empirical evidence (Li et al., 2017), one assumption of this type of mating is that it occurs because of a link to a heightened genetic relatedness and the likelihood that 'good genes' are carried on through offspring (Alvarez, 2004; Hendrick, 2017). Mating with someone who has similar genetics to themselves means that their favoured genetics traits are more likely to be passed through to offspring. Assortative mating for a heritable trait leads to a higher likelihood of non-random distributions of genetic

variants that are important for the trait, as both individuals are more genetically similar than what is expected by chance (Vinkhuyzen et al., 2012). However, for humans, it can also be because of social environment and the changes in distribution of resources across societies, as well as the genetic landscape (Schwartz, 2013). More recently, there have been four mechanisms proposed to explain assortative mating in humans (Luo, 2017). Mechanism 1 suggest that the similarity of a potential partner would increase the likelihood of 'good genes' in offspring because more than half of their genetics will be passed on. Mechanism 2 suggests that similarity mating may occur because of other factors aside from choice (Xie, Cheng & Zhou, 2015) known as 'Mating Market', this is where individuals weigh up factors affecting their mate selection decision and find someone who is most matching to them (Hunt, Eastwick & Finkel, 2015; Little, Burt & Perrett, 2006). An individual may find someone physically attractive, but because of high competition for such an individual, they lower their expectations and mate with someone more of an equal and similar level to themselves. Mechanism 3 explores social homogamy and mate similarity, whereby individuals meet each other in a certain social setting, such as school or work and people who share these social settings and social backgrounds may share other characteristics such as attitudes and values. Finally, mechanism 4 example explores whether individuals grow to be more alike over time as a function of familiarity, interaction and routines. Thus, individuals are with someone who they are initially not similar to but become more similar as the relationship progresses over time (Caspi, Herbener & Ozer, 1992; Watson et al., 2004; Zietsch, et al., 2011).

Assortative mating occurs across a wide range of areas including, demographics, personality, societal, cultural, physical body and facial attractiveness and facial masculinity-femininity. Initial research into assortative mating focused on similarities in physical body characteristics and personality traits. However, researchers later found that facial attractiveness is also similar between perceiver and the target (Byrne, 1971; Hill, Rubin, &

Peplau, 1976; Newcomb, 1961; Thelen, Fishbein, & Tatten, 1985; Štěrbová et al., 2017, Murstein, 1972). In particular, evidence strongly suggests that similarity in masculinity and femininity affects attraction preferences for heterosexual and homosexual men and women Heterosexual men preferred females with faces that are like themselves especially when looking at self and partner facial masculinity or femininity compared to those opposite to themselves (Kocsor et al., 2011). Heterosexual women however showed no preference for similarity to themselves, showing a preference for the most attractive male and female faces (Kocsor et al., 2011). Todd, Penke, Fasolo and Lenton (2007) found a heightened preference for similarities in both heterosexual men and women's self-perceived and targets levels of cognitive masculinity-femininity. Antill's (1983) study of heterosexual couples showed evidence for the importance of similarity in terms of femininity in happiness of relationships: Relationships where both the male and female were feminine were much happier than couples where one was feminine, and the other was masculine. This was also similarly found for similarities in masculinity but not as strong. In another study Kocsor and colleagues (2011) found that heterosexual men preferred females with faces that are like themselves in terms of masculinity and femininity compared to those opposite to themselves. When men perceived themselves as masculine, they would find a masculine female face more attractive than a feminine female face. Bailey et al. (1997) found that homosexual men would generally prefer masculine partners; however, this preference was strongest among those who classify themselves as masculine over feminine. This would therefore mean that homosexual men who perceived themselves as masculine would find a masculine male more attractive than a feminine male. Findings from Boyden, Carroll and Maier's (1984) demonstrate that homosexual men have a higher desire for targets that are similar to them in terms of masculinity and femininity and find these targets as more attractive for longer periods. Boyden et al. (1984) showed that homosexual men who were high in femininity preferred a

male target high in femininity and those who were high in masculinity preferred male targets who were also high in masculinity.

Table 1

Graphic representation of assortative mating, showing similarity of masculinity/femininity attracts. The content in bold shows what would be expected if assortative mating were assumed across homosexual men for male targets, heterosexual men for female targets, heterosexual women for male targets and homosexual women for female targets.

Sex of Target	Sex of Perceiver: Men	Sex of Perceiver: Women
Male	**Masculine perceiver/ Masculine target**	**Feminine perceiver/ Feminine target**
	Masculine perceiver/ Feminine target	Feminine perceiver/ Masculine target
Female	**Masculine perceiver/ Masculine target**	**Feminine perceiver/ Feminine target**
	Masculine perceiver/ Feminine target	Masculine perceiver/ Feminine target

1.5.2. Disassortative Mating

Converse to the preference for similarity, there is evidence to suggest that individuals seek out those who are dissimilar. Disassortative mating, also known as heterogamy, is where individuals choose to pair and mate with individuals who are dissimilar to them more often than what would be expected by chance and random mating (Table 2). This mating strategy suggests that individuals tend to seek and find more attractive targets that hold traits that are more dissimilar from themselves. There are a vast number of traits which can influence this type of mating; however, the most common are body shape, personality, facial characteristics, demographic characteristics, attitudes, social influence, facial attractiveness and facial masculinity and femininity. Disassortative mating reduces the likelihood of mating with a partner that is too similar which may help avoid individuals that have a genetically too

similar major histocompatibility complex (MHC) (Dandine-Roulland et al., 2019; Penn & Potts, 1999). Researchers suggest that women use body odour as a cue for genetic compatibility. In an experiment, males were asked to wear a t-shirt for two nights to create a scent (Wedekind, et al, 1995). Women were asked to rate the odours of the males, some which had similar MHC and some which has dissimilar MHC. Results from this study found that women showed a preference for the odour of the males who were dissimilar to them in terms of MHC genes. These findings were further supported by a study in which found that women were indecisive about attraction preference when presented with odours of males who had MHC similar to their own (Jacob et al, 2002). Whilst odour is the most widely accepted mechanism related to MHC and mate preferences, there is speculation around how MHC genotype may also be perceived in visual traits such as the face (Ober et al., 1997). Human facial preference has been shown to link with MHC similarity and MHC dissimilarity (Havlicek & Roberts, 2009). Research found that women are more likely to prefer a male with dissimilar MHC when they are looking for a short-term relationship (Roberts et al, 2005). MHC and other genetic markers appear to correlate with women's preference for male facial characteristics (Thornhill et al, 2003; Coetzee et al, 2007).

An example of disassortative mating is complimentary of sex roles. Most commonly found in heterosexual men and women relationships, men are the resource provider and exhibit masculine characteristics, while women are the homemaker and display feminine traits and characteristics (Seyfried & Hendrick, 1973). Opposition in sex roles is also found in homosexual men and women, with homosexual women who take on the resource provider role (masculine characteristics and traits) pairing with a female who is the homemaker and caregiver (feminine characteristics and traits).

Bem's (1996) Exotic Becomes Erotic theory (EBE) also represents a form of disassortative mating that seeks to explain the occurrence of homosexuality. EBE states that

individuals become most erotically attracted to the sex that they felt less like when they were children which in adulthood becomes their focus of erotic target. Thus, if a heterosexual man feels most similar to males, he would be most likely to find females who are feminine as most attractive, conversely if they felt more similar to a female, they may find a female who is masculine as most attractive. Alternatively, if a homosexual man feels most like males, he would be most likely to find males who are feminine as most attractive. Bem (1996) found that most homosexual men, as children, spent time with females and therefore males were unfamiliar and become eroticised, therefore it may also be the case that if a homosexual man feels most like females, then a masculine male would be more attractive to them.

Table 2

Graphic representation of disassortative mating, showing opposite of masculinity/femininity attracts. The content in bold shows what would be expected if disassortative mating were assumed across homosexual men for male targets, heterosexual men rating female targets, heterosexual women for male targets and homosexual women for female targets.

Sex of Perceiver

Sex of Target	Men	Women
Male	Masculine perceiver/ Masculine target	Feminine perceiver/ Feminine target
	Masculine perceiver/ Feminine target	**Feminine perceiver/ Masculine target**
Female	Masculine perceiver/ Masculine target	Feminine perceiver/ Feminine target
	Masculine perceiver/ Feminine target	**Masculine perceiver/ Feminine target**

1.5.3. Match in Sex Typicality

There is also evidence to suggest that individuals' mate for a match in sex typicality. It is suggested that attraction to sex-typicality depends on the perceivers' own sex typicality. That is regardless of sex or sexual orientation, if a perceiver rates themselves sex typical, they

are more likely to find a sex-typical target of their preferred sex more attractive (Johnston & Tassinary, 2007; Johnston et al., 2001). A match in sex typicality is distinctive from assortative mating which proposes similarities between perceiver and target in either masculinity or femininity attract. The distinct importance is that if assortative mating were true, masculine homosexual men would prefer masculine males, and masculine homosexual women would prefer masculine females (similarity in levels of masculinity); however, if a match in sex-typicality is true, then masculine homosexual men will prefer masculine males, and feminine homosexual women prefer masculine females (Table 3). Bailey et al. (1997)'s research shows support for this as they found that homosexual men who rated themselves as sex typical (masculine) were more likely to prefer a target who were also sex typical (masculine). Further research also provides support for a match in sex-typicality within homosexual men and women, with sex-typical homosexual men preferring sex-typical males and sex-typical homosexual women preferring sex-typical females (Bergling, 2001; Cohen & Tannenbaum, 2001; Smith & Stillman, 2002).

Not every study supports the match in sex-typicality hypothesis in preferred sex targets. More recently, Kandrik and DeBruine (2012) explored self-rated sex typicality and attraction preferences for sex-typicality in opposite sex and same sex faces. They found a novel relationship between self-perceived sex typicality and a preference for sex-typicality in same sex but not opposite sex individuals. Heterosexual men and women who perceived themselves as sex typical had a greater attraction preference for sex-typical faces of individuals from the same sex. Therefore, sex-typical heterosexual women showed a greater attraction preference for sex-typical females over sex-atypical females and heterosexual sex-typical men showed a greater attraction preference for sex-typical males over sex-atypical males. No significant differences were found for the opposite sex individuals. Altogether there is some evidence which supports the hypothesis of match in sex typicality, where a

perceiver rates themselves sex typical, they are more likely to find a sex-typical target of their preferred sex more attractive (Johnston & Tassinary, 2007; Johnston et al., 2001), however it is limited.

Table 3

Graphic representation of match in sex typicality mating, showing a match, in terms of sex typicality attracts. The content in bold shows what would be expected if a match in sex typicality were assumed across homosexual men for male targets, heterosexual men rating female targets, heterosexual women for male targets and homosexual women for female targets.

Sex of Target	Sex of Perceiver: Men	Sex of Perceiver: Women
Male	**Masculine perceiver/ Masculine target**	Feminine perceiver/ Feminine target
	Masculine perceiver/ Feminine target	**Feminine perceiver/ Masculine target**
Female	Masculine perceiver/ Masculine target	**Feminine perceiver/ Feminine target**
	Masculine perceiver/ Feminine target	Masculine perceiver/ Feminine target

1.6. Menstrual Cycle

Not only does masculinity and femininity have an influence on attraction preferences, so does biological hormones. The menstrual cycle is argued as one of the main contributors in changes in women's attraction preferences towards males (Gangestad & Thornhill, 2008). Grammer (1993) reported that women were more attracted to the metabolite of testosterone (Androsterone) that is present during sweating, in the fertile days of the menstrual cycle. Women rated Dragoco-smelling-pads with dried androsterone odour more favourably when they were in their fertile phase of the menstrual cycle compared to others phases of the menstrual cycle. Subsequently in 1998, Gangestad and Thornhill found that women were ore

attracted to the scent of men during their fertile compared to non-fertile days of the menstrual cycle. Since then, many researchers have dedicated their time to exploring the effects of the menstrual cycle on attraction preferences of males for a range of characteristics such as facial masculinity, body masculinity, hair, clothing, personality, symmetry, and more. It is argued that women show a preference for a more facially masculine male during the more fertile days of the menstrual cycle compared to the rest of the cycle. The hormonal changes in the menstrual cycle are suggested to signal a woman's biological readiness to reproduce. The woman would then choose a male mate which signalled the qualities needed to successfully reproduce. Facial masculinity in males is said to signal better genetic quality as well as a survival, resource provider and importantly, greater reproductive success (Gildersleeve, et al., 2014). Mostly these changes in hormones and preferences have been interpreted as evidence for evolutionary adaptations and natural selection. However, even with early research support for the effects of menstrual cycle on attraction preferences, there are still debates to this day over whether such changes in cycle and attraction preferences exist and to what extent (Arslan et al., 2018; Wood et al., 2014). Although it appeared that fairly strong evidence historically showed that preferences for facial masculinity in males is related to a woman's menstrual cycle and fertility level, over more recent years this has become controversial. Jones et al. (2018) conducted the largest longitudinal study to date (*N=684*) which explored the effects of the menstrual cycle on attraction preferences towards facial masculinity in males. They found no compelling evidence that preferences for facial masculinity were related to heterosexual women's hormone levels during the menstrual cycle nor that oral contraceptive decreased preferences towards facial masculinity. Importantly, however, they did find that in general women preferred facially masculine over feminine faces. Other recent replication research has explored the effects of the menstrual cycle on preference for, short-term and long term-relationships with 'manly men' (Jünger et al., 2018a; Wood et al., 2014),

'manly' behaviours (Stern, Gerlach & Penke, 2020), upper body strength, masculine bodies, and 'manly' voices (Jünger et al., 2018a, Jünger et al., 2018b; Marcinkowska et al., 2018). Findings from this research suggests a very minimal effect of menstrual cycle on women's attraction preferences.

Each menstrual cycle consists of four phases: menstrual phase, follicular phase, ovulation phase and the luteal phase. During the follicular and ovulatory phase, follicle-stimulating hormones (FSH) are secreted and stimulate the ovaries to prepare an egg. The rising levels of estrogen during the follicular phase trigger the pituitary gland to release luteinising hormone (LH) which starts ovulation. During this time the body would be classed as in the fertile phase and the LH surge can be detected through urine samples. Ovulation then normally happens around day 14 for a woman with an average 28-day cycle and lasts for around 24 hours (Ditzen et al., 2017; Haselton & Gangestad, 2006; Jones, et al., 2018; Jones et al., 2008; Little et al., 2010; Lukaszweski & Roney, 2009; Wood et al., 2014).

For nearly all female mammals, the high-fertile window is the only time in the menstrual cycle when a female can conceive. Research has found that heterosexual women have different preferences for a potential male mate when in their high fertile as opposed to their low fertile phase of the menstrual cycle. These patterns have previously been observed across both heterosexual women humans and many non-human female mammals such as orangutans, chimpanzees, capuchins and vervet monkeys (Pieta, 2008; Stumpf, Thompson & Knott, 2008; Stumpf & Boesch, 2005). Two theories within evolutionary psychology to explain the effects of menstrual cycle on women's attraction preferences is The Ovulatory Shift Hypothesis and The Dual Mating Strategy Hypothesis.

1.6.1. The Ovulatory Shift Hypothesis

The ovulatory shift hypothesis proposed originally by Gangestad and Thornhill in 1998 states that women have evolved to optimise their reproductive success by having a mixed mating strategy to increase reproduce fitness. Women are more attracted to males who will invest in offspring during the non-fertile phases of the menstrual cycle and are more attracted to partners with 'good genes' to provide healthy offspring during the fertile phases of the menstrual cycle (Gildersleeve, et al., 2014). This shift is an evolved ability to ensure a women's likelihood of passing on 'good genetic quality' to their offspring. The traits often associated with this are symmetry, masculinity, and dominance (Flowe, Swords & Rocky, 2012; Little et al., 2007; Little et al., 2007a; Little & Jones, 2012; Puts, 2006). It is also suggested that a woman's attraction to genetic quality in males is mild or absent when they evaluate attraction to a male based on a long-term relationship. If, during the high fertile phase of the menstrual cycle, the woman did not engage in high rates of sex with the male who displayed the 'good genetic quality' or had more engagement with them in non-sexual events, the shift would not be associated with higher reproductive success. Importantly, regardless of the relationship context, women are less attracted to the characteristics which suggest 'good parenting quality' on high fertile days of the menstrual cycle compared to the low fertile days of the menstrual cycle. A woman's preference for masculine characteristics will be absent during non-fertile days of their menstrual cycle as, during this time the woman will be more concerned with male traits which show cues of reliability and trust or would result in the woman engaging in a range of non-sexual behaviours such as friendship.

1.6.2. The Dual Mating Strategy Hypothesis

The Dual Mating Strategy hypothesis (Gangestad & Thornhill 1998; Pillsworth et al., 2004) differs from the Ovulatory Shift Hypothesis as it states that women have evolved to develop two overlapping strategies when choosing mates, employing both short-term and long-term mating strategies simultaneously as opposed to a mixed mating strategy focused on optimising reproductive success. The Dual Mating Strategy Hypothesis suggests women secure a male who is likely to be reliable and invest time and resources in offspring for long term gain, while securing a male who is high in physical attractiveness and shows good genetic quality for a short-term gain during ovulation (Gangestad & Thornhill 1998; Pillsworth et al., 2004, Weisber & Kim, 2018). Research has found a stronger preference for masculine males when in the high-fertile phase of the menstrual cycle but this finding is most pronounced when the women rated them on a hypothetical short term as opposed to a long term mating potential (Gangestad & Simpson, 2000; Gildersleeve, Haselton, Fales, 2014; Grammer, et al., 2003; Johnston et al., 2001; Jones, et al., 2008; Little et al., 2011; Penton-Voak et al., 1999a; Pillsworth & Haselton, 2006).

The association between menstrual cycle and women's preferences in men is widely influential, however, as aforementioned, some more recent work exploring the effects of facial masculinity, beardedness, body masculinity, symmetry and vocal masculinity using hormone measures have failed to observe any changes or effects of fertility regardless of short-term or long-term relationship potential (Dixson, et al, 2018; Jünger, et al., 2018b; Marcinkowska, et al., 2016; Marcinkowska, et al., 2018). An alternative model to accommodate the recent challenges to the dual mating strategy hypothesis is the 'Estrous' model (Jones, Hanh & Debruine, 2019). The Estrous model suggests that the high fertile phase of the menstrual cycle is characterised by increased sexual motivation and an increase in women's general sexual desire and interest in sex with men regardless of whether they

know them (Arslan et al., 2018; Blake et al., 2017; Jones et al., 2018a; Roney & Simmons, 2013; Roney & Simmons, 2017). Some versions of this model argue that the preference change during the fertile phase is not linked to reproductive success but either vestigial (not selected for any longer but a residual trait from a past ancestor) (Gangestad & Thornhill, 2008), or motivational, not having sex when conception is not possible, allowing time to be freed up for other resources and priorities such as gathering food (Roney & Simmons, 2017). Whilst the Estrous model makes no specific prediction about changes in attraction preferences (Jones et al., 2019), it could help to explain patterns and changing preferences found in women during their menstrual cycle as it suggests that changes may not be as a result of the direct need to reproduce. These strategies will not be directly tested in this thesis but may be explored as a result of the patterns explored for the ovulatory shift hypothesis.

1.6.3. Facial preferences across menstrual cycle

Research has largely shown that women have a stronger attraction preference towards masculine male faces during the fertile phase of the menstrual cycle and a preference for less masculine faces during the non-fertile phases of the menstrual cycle (Ditzen, et al., 2017; Durante et al., 2012; Feinberg et al., 2006; Frost, 1994; Gangestad et al., 2005; Gangestad, et al., 2010; Johnston et al., 2001; Little et al., 2007a; Penton-Voak & Perrett, 2000; Penton-Voak et al., 1999; Puts, 2006). An increased preference for facial masculinity during the high fertile phase signals an ability to maximize genetic benefits and inheritable immunity to infectious disease and minimise associated costs. A preference for less masculine male faces during the low fertile phase of the menstrual cycle suggests a preference for paternal investment (Jones et al., 2008; Penton-Voak et al., 2003; Perrett et al., 1998), with benefits of social, and material support and reduced risk of disease (Peters, Simmons, Rhodes, 2009).

Most of the research to date has been conducted with heterosexual women and their preferences for males, however, one study by Jones et al. (2005) found that women's preferences for male and female faces changes across the menstrual cycle. Findings demonstrated that women had an increased preference for feminine male faces and feminine female faces during the non-fertile phase of the menstrual cycle. These findings suggest that during the fertile phase of the menstrual cycle women have an attraction preference for a masculine individual, who displays characteristics which signal an increased likelihood of producing genetically strong offspring and during the low fertile phase of the menstrual cycle have increased attraction to individuals of any gender who displays femininity which could provide care and support (Jones et al., 2008).

It is important to note that over the last few years there has been controversy surrounding the effects of menstrual cycle and fertility level in attraction preferences for facial masculinity and femininity. Even though for 30 years substantial empirical and pseudo-replicated evidence has supported the changing attraction preferences for masculinity and femininity across the menstrual cycle, those same researchers are now conducting studies to refute such results. Jones et al. (2018), after conducting the largest longitudinal study, found no compelling evidence for changes in preference across menstrual cycle. However, they did find that women in general have a preference towards a masculine male face, especially during short term relationship options (this will be discussed in more detail in Chapter 3, Study 3). Additionally, in another longitudinal study of German heterosexual women, van Stein, et al. (2019) also found no shifts in mate preference across menstrual cycle for masculinity.

Research has suggested that the use of contraception can influence attraction preferences to masculine males as it affects a women's hormonal cycle as well as fertility level. Some types of contraception can stop the menstrual cycle completely, thus stopping the

cycles of high and low fertility. Some research argues that heterosexual women who use oral contraceptives shown a weaker preference for masculine males than females who do not use oral contraceptives (Feinberg et al., 2008; Little et al., 2013). Conversely there has also been research which has argued that the use of oral contraceptives can increase preferences for masculine males than those who do not use oral contraceptives (Cobey, Little & Roberts, 2015; Jones et al., 2018). However, a recent large-scale study has found no evidence that oral contraceptives effect women's attraction preferences for facial masculinity in males (Marcinkowska et al., 2019). This study showed there was no statistically significant difference between heterosexual women who use oral contraception or those who do not use oral contraception on attraction preferences for male facial masculinity. These findings provide support that oral contraceptives do not have an influence on attraction preferences of male facial masculinity (Marcinkowska et al., 2019). This research only explores oral contraceptives such as the pill and does not explore the effects of other non-oral contraceptives. The potential influence of contraceptives in women's attraction preferences is something which needs to be accounted for when carrying out menstrual cycle related data collection, this will be discussed further in Chapter 3, Study 3, in relation to determining fertility level.

1.7. Testosterone Cycle

Testosterone is a major sex hormone which is said to modulate various evolutionary related behaviours such as human survival and sexual reproduction. In men a higher level of testosterone is associated with being likely to engage in risky behaviours, show higher status and dominance and pursue potential mates with exaggerated effort (Archer, 2006) but also with a higher likelihood of wanting to engage in reproductive behaviours. Testosterone is also

very strongly associated with the regulations of sexual behaviours in humans (Van Anders, 2012; Vignozzi et al., 2005). In men an increased level of salivary testosterone is associated with higher need to participate in sexual activities with others (Al-Dujaili & Sharp, 2012; Puts et al., 2015). Testosterone levels influence behaviour (Dreher et al., 2016; Rupp & Wallen, 2007) and levels of testosterone are affected by behaviour (van Anders et al., 2015), by childhood environment (Magid et al., 2018) and by smoking, nutritional habits and alcohol consumption (Yeap et al., 2020). Research has found that when men are put into competitive conditions, they have an increased salivary testosterone than those in non-competitive conditions when around females (Fales, Gildersleeve, & Haselton, 2014). For heterosexual men, research has found that even just being around a female they find attractive can increase their testosterone level (Ronay & Van Hippel, 2010; Van der Meij, et al., 2008).

Importantly, testosterone levels within men have a 24-hour cycle, known as the circadian variation, where they have periods of high testosterone and periods of low testosterone. Research has found that testosterone levels are highest in the mornings (AM) most likely a short time after the man has woken up and are lowest during the late evening (PM). These findings are based on healthy men and not for men who are taking testosterone supplements (Bribiescas & Hill, 2010). A few studies over the past 20 years have explored the effects of testosterone on heterosexual men's attraction preferences for females and has found that men's testosterone levels can affect attraction preferences however limited research to date has explored the effects of testosterone on preferences for femininity or masculinity in female faces.

1.7.1. Male preferences across testosterone cycle

Although there is a plethora of research to date which explores the links between testosterone and sexual behaviours, as well as research which supports men's preferences for female facial femininity as a cue to health and fertility, there has been little research to date which explores the links between men's testosterone levels, the testosterone cycle and their attraction preferences to female facial femininity (Bird et al., 2016). A review of the literature revealed only two studies which examine the variation in heterosexual men's testosterone levels (high and low) and the effect this has on attraction preferences for femininity in female faces (Bird et al., 2016; Welling et al., 2008a). Only one of these studies used non manipulated levels of testosterone based on the daily cycle (high in the AM and low in the PM) (Welling et al., 2008a). Although slightly different studies, results from these studies showed that men report a greater preference for femininity in female faces when their testosterone levels are high, compared to when testosterone levels are relatively low. This will be discussed in more detail in Chapter 4, Study 4.

1.8. Thesis Summary

This is a broad background on attraction and attractiveness; my thesis will focus on impacts of sex, sexual orientation, facial masculinity and femininity, sex-typicality, and hormonal influences on attraction preferences. Chapter 2 (Studies 1 and 2) will explore whether similarities or opposites attract by examining the impacts of self-perceived sex-typicality on attraction preference towards a target's facial masculinity and femininity. It will also explore whether a match in sex typicality attract by exploring self-perceived sex typicality and target facial sex typicality. Preferences will be looked at across both sex and sexual orientation for both male and female targets. Chapter 3 (Study 3) will be looking at the

impacts of a sexual orientation and fertility levels on women's attraction preferences to facial masculinity and femininity in male and female targets. Finally, Chapter 4 (Study 4) will look at the impacts of sexual orientation and testosterone levels on men's attraction preferences to facial masculinity and femininity in male and female targets.

Chapter 2 Do similarities, opposites or matches attract? Masculinity, femininity, sex typicality and attractiveness: A comparison across sex and sexual orientation

2.0. Abstract

Masculinity-femininity and sex-typicality of both perceiver and target affect attraction preferences of both men and women. Previous work has focused on heterosexual attraction preferences towards masculinity-femininity of a target. However, limited research explores simultaneously the effects of both perceiver and target masculinity-femininity or sex-typicality on attraction preferences, or the effects of sexual orientation on those preferences. I therefore assessed how self-perceived masculinity-femininity of both heterosexual and homosexual men and women affects attraction preferences of targets with varied levels of facial masculinity-femininity. I hypothesized whether similarities attract, or opposites attract in terms of masculinity-femininity, or whether there is a preference for a match in sex typicality. Study 1 explored self-perceived level of masculinity-femininity and assessed using ratings of 3D computer generated images. Study 2 explored self-perceived level of masculinity-femininity and assessed attraction preferences using real life computer manipulated images. Study 1 found no statistically significant effects, but a trend in homosexual women's and heterosexual men's preferences: where masculine homosexual women and masculine heterosexual men showed a greater preference for feminine female targets. Study 1 shows support for opposites in masculinity-femininity attract. Study 2 found a statistically significant effect for heterosexual men, where masculine men showed a higher preference for more feminine females. Study 2 shows support for opposites in masculinity-femininity attract but may also show support for a match in sex typicality attracts. Further studies should continue to explore perceiver and target masculinity-femininity and sex typicality simultaneously but consider other hormonal influences as variables in attraction preferences.

2.1. Introduction

As explored in the general introduction, for decades, questions have been raised throughout research on both human and animal sexual selection and mating preferences as to what makes a partner attractive (Gottschall et al., 2008; Rhodes et al., 2000). Some studies have argued that mating is random; however other research has deemed this as very unlikely, and partners are chosen for a highly adaptive purpose (Alvarez et al., 2004). A perceiver's preferences of a target's attractiveness are dependent upon a range of factors (Halberstadt & Rhodes, 2000). These factors include body shape (for example, waist to hip ratio), social status, power and wealth, as well as facial factors such as symmetry and averageness (Chang, Wang, Shackelford & Buss, 2011; Dunn & Searle, 2010; Long, Pichedda, Stewart & Rice, 2009). Another characteristic which has been found to influence sexual attraction patterns consistently across cultures, is level of facial masculinity and femininity (sex typicality) (Fink & Penton-Voak, 2002; Johnston et al., 2001; Little et al., 2011; Mogilski & Welling, 2017; Welling et al., 2017).

This chapter will explore whether rater level of sex typicality impacts on attraction preferences to masculinity-femininity and sex typicality and whether attraction preferences fall under the mechanisms of assortative mating (similarity in masculinity-femininity), disassortative mating (opposites in masculinity-femininity) or a match in sex typicality. Sex-typicality refer to whether the target or perceiver is typical of their sex, thus for both the perceiver and the target, women/females they would be feminine and for men/males they would be masculine. Therefore, this chapter will explore whether perceivers prefer a target which matches their own level of masculinity-femininity or sex typicality.

Research argues that mating is a highly organised evolutionary adaptive process (Alvarez, 2004). If such adaptive mechanisms in preferences for sex-typicality are robust, the same patterns of attraction should be observed across sex and sexual orientation. Therefore,

what sets the following three studies apart from previous studies on facial masculinity-femininity, sex-typicality and attraction is that it is exploring both heterosexual and homosexual men and women's attraction preferences alongside self-perceived levels of sex typicality.

2.1.1. Masculinity, Femininity, Sex Typicality and Attractiveness

Pronounced sex-typicality (masculinity in male faces and femininity in female faces) is deemed more attractive when rating a target by both heterosexual men and women across cultures (Hu et al., 2018; Muñoz-Reyes et al., 2015; Rhodes, 2006). This is observed especially when femininity in females is judged, and less so, on average, when masculinity in males is judged (Hu et al., 2018; Krzysztof, 2007; Little et al., 2014; Patzer, 2006; Rhodes, 2006).

Pronounced sex-typicality emerges at puberty as the face size and shape change, a feminine face often referred to as 'baby face' include features such as, large eyes, soft jaw line and a small nose (Cunningham et al., 1995). A masculine face includes features such as large jawbones, prominent cheekbones, robust eyebrow ridges, longer and protruding facial bones and an increased lip size (Said & Tordorov, 2011). In females, sex typicality possibly indicates youthfulness, higher levels of fertility, and reproductive success (Law Smith et al., 2006). In males, it possibly indicates strength, dominance, good reproductive success, and offspring genetic quality (Racevska & Roberts, 2018). A male is seen as sex typical if he is relatively masculine compared to other males, and a female is seen as sex typical if she is relatively feminine compared to other females (Rieger et al., 2011). Research agues this attraction preference has an evolutionary survival purpose, signifying youth and fertility in females, and health, immunocompetence and dominance in males (Gangestad & Scheyd,

2005). However, more recent work suggests that women show no preferences for sex-typicality, facial masculinity in males. Findings show that facial masculinity is not correlated with immunocompetence (greater health, genetic quality, immune health) and show no support for the notion that facial masculinity is an evolved trait for use in human mating and attraction preferences (Nowak et al., 2018; Marcinkowska et al., 2018; Rantala et al., 2013).

Masculine male faces are, on average, more attractive than feminine male faces to heterosexual women perceivers (Rennels, Bronstad & Langlois, 2008; Lui & Zheng, 2020). However, there is variability to this average finding; for example, some research highlights that male faces which are more feminine than the average face, are preferred (Komori et al., 2009). More recent work has found that women's attraction preference was strongest for average facial masculinity, followed by masculine and then feminine being least attractive (Stower et al., 2020). In males sex typicality possibly signals good health, a strong immune system with the ability to fight off disease, as well as a higher level of testosterone. Masculine males possibly possess 'good genes' and therefore are more likely to transfer these genes to their offspring (Ekrami et al., 2020). Masculine males may also be perceived as more attractive as they may be more able than feminine males to support and defend a partner and their offspring (DeBruine et al., 2006).

Most men are heterosexual and, thus, attracted to females, and most women are heterosexual and attracted to males. For this, much past work which has focused on heterosexual perceivers, cannot parse out if attraction to femininity in females is dependent on the perceiver being a man or the target being female. Likewise, it cannot parse out whether attraction to masculinity in males is dependent on the perceiver being a woman or the target being male. By exploring attraction patterns of both heterosexual and homosexual men and women, it may be possible to separate this complexity.

If the perceiver's sex and not the target's sex were the driving force for the sex differences in attraction patterns, it can be assumed that homosexual men and women would have the same patterns as heterosexual men and women. Thus, despite heterosexual and homosexual perceivers of the same sex are attracted to different sex targets, heterosexual men and homosexual men may show stronger preferences to sex-typical targets than heterosexual women and homosexual women. Other research has suggested that attraction preferences may show sex perceiver differences but not sexual orientation differences. Thus, men of either sexual orientation may show a stronger preference in a target's attractiveness than women of either sexual orientation – these differences may also be found for preferences towards sex typicality (Rieger et al., 2011).

If the target's sex and not the perceiver's sex is the driving factor for attraction patterns, it may mean that heterosexual men and homosexual women show the same preferences towards sex-typicality for female targets. Conversely, heterosexual women and homosexual men show the same preferences for sex-typicality towards male targets (Rieger et al., 2011).

Glassenberg and colleagues (2010) directly compared sex and sexual orientation differences in attraction to facial masculinity and femininity. They found that homosexual men demonstrated a stronger preference for masculine male faces compared to homosexual women and heterosexual men and women. Homosexual women have a stronger preference for masculine female faces compared to heterosexual women rating female faces. Overall, the heterosexual and homosexual masculinity-femininity preferences are not identical; however, the presentation of their results make it somewhat difficult to comprehend to what degree perceivers of the same sex, but of different sexual orientations, have similar preferences for sex-typical targets (e.g., feminine female faces for a heterosexual man as compared with masculine males for a homosexual man). A replication study by Shiramizu et al. (2020)

supported Glassenberg (2010) in relation to heterosexual and homosexual men' preferences. Their results suggested that homosexual men have a stronger preference for masculine male faces. Results also suggested, consistent with adaptation for mate choice, that heterosexual men show a stronger preference for feminine female faces than homosexual men. This is further supported by Zheng (2019) and Cassar et al. (2020) who found homosexual men preferred masculinity in male faces regardless of relationship status. These findings suggest that sexual orientation influences male facial preferences for both male and female targets. The present research studies explicitly address potential sex and sexual orientation differences in attraction to facial sex typicality.

2.1.2. Masculinity, Femininity and Sex Typicality of both Perceivers and Targets

It is possible to assume that the general preference for sex-typicality depends on the perceiver's own level of masculinity-femininity or sex typicality. Three possible mechanisms could explain such link: a) assortative mating, b) disassortative mating, and c) a preference for a match in sex typicality.

2.1.3. Assortative Mating

Regarding assortative mating, it is argued that individuals prefer targets who are similar to themselves and rate them as more attractive that those dissimilar to themselves (Alvarez, 2004; Byrne, 1971; Hill et al., 1976; Little et al., 2006; Murstein, 1972; Penton-Voak, Perrett & Peirce, 1999; Thelen et al., 1985). This similarity preference is linked to the likelihood that shared 'good genes' in both individuals will successfully be passed on to offspring (Alvarez, 2004).

Evidence strongly suggests that similarity in perceiver and target masculinity and femininity affects attraction preferences, across sex and sexual orientation. Antill's (1983) study of heterosexual couples found that preferences for partner's femininity was dependent upon own level of femininity, with similarity in femininity being important in happiness of relationships. Heterosexual men have been shown to prefer females with faces that are similar to themselves in terms of masculinity and femininity (Kocsor et al., 2011). Thus, if men perceived themselves as masculine, they would find a masculine female face more attractive than a feminine female face. Bailey et al. (1997) found in general homosexual men prefer masculine partners; however, this preference was strongest among those who classify themselves as masculine over feminine. Boyden, Carroll and Maier's (1984) demonstrated that homosexual men have a higher desire for targets that are similar to them in terms of masculinity and femininity (masculine men have stronger attraction preferences to a masculine male) and find these targets as more attractive for longer periods of time compared to those who are dissimilar.

2.1.4. Disassortative Mating

Regarding disassortative mating, it has been suggested that perceivers find targets that hold more dissimilar traits from themselves as more attractive (opposite attract). In regards level of masculinity-femininity, men and women who see themselves as masculine would prefer a partner who is feminine, conversely, men and women who see themselves as feminine would prefer a partner who is masculine (Dandine-Roulland et al., 2019).

Avoidance of mating with a partner that is similar may help avoid individuals that have a genetically too similar major histocompatibility complex (MHC) (Penn & Potts, 1999; Thornhill et al., 2003). It may also be based on complimentary of sex roles. Most commonly

evident in heterosexual men and women pairings, heterosexual men are the ones who display the masculine characteristics (resource provider) and heterosexual women displaying the feminine characteristics (homemaker) (Seyfried & Hendrick, 1973). However, it is also evident with homosexual women, those who take on the masculine role, finds a feminine female more attractive, thus if a homosexual woman takes on a feminine role, they find a masculine female more attractive (Bailey et al., 1997).

Bem's (1996) Exotic Becomes Erotic (EBE) theory argues that individuals become most erotically attracted to the sex that they felt less similar to when they were children, which in adulthood becomes their focus of erotic target. Thus, if a heterosexual man felt most similar to women, he will find feminine females most attractive, if a homosexual man feels most similar to men, he will find feminine males most attractive. It is also expected that these preferences would be observed across heterosexual and homosexual women. Although it has been argued that disassortative mating may have an evolutionary, adaptive strategy, there is limited empirical research to support this mating pattern (Meyer & Pepper, 1977; O'Leary & Smith, 1991). The present research aims to explore whether patterns of disassortative mating, and attraction preferences are evident across both sex and sexual orientation.

2.1.5. Match in Sex Typicality Attracts

Regarding preferences for a match in sex-typicality, where a female displays feminine characteristics and a male displays masculine characteristics, it has been proposed that across sex and sexual orientation, targets are seen as more attractive if they are sex-typical of their categorised sex in terms of both movements and appearance (Johnson & Tassinary, 2007; Johnston et al., 2001). Additionally, these patterns of attraction to sex typicality are believed to be enhanced by the perceivers' own sex typicality. That is regardless of sex or sexual

orientation, if a perceiver rates themselves as sex typical (femininity in women and masculinity in men), they are more likely to find a target of their preferred sex more attractive if they are sex typical also. It important to mention that there is a distinct difference between a match in sex typicality and assortative mating (similarities attracting). If assortative mating (similarity) were true masculine homosexual men would prefer masculine males, and feminine heterosexual women would prefer feminine males. If a match in sex typicality is true, it would also be the case that masculine homosexual men find masculine males most attractive, and feminine heterosexual women would also find masculine males most attractive. It would be expected that these patterns would be observed across heterosexual men for females and homosexual women for females also (Rieger et al., 2011). Research has provided support to show a preference for sex-typicality in same sex targets for homosexual men and women, where masculine men and feminine women raters showed a preference for a masculine male and a feminine female target respectively (Kandrik & DeBruine, 2012). Research has also shown that homosexual men who rated themselves as sex typical (masculine) were more likely to prefer a target who was also sex typical (Bailey et al., 1997). There is limited research to date to support preferences for the opposite sex and more importantly there is no research to date which explores simultaneously the idea of a preference for a match in sex-typicality across both sexes and sexual orientation.

2.1.6. Significance

Sexual attraction and sexual orientation are driving forces for humans to reproduce and survive this world (Rahman & Wilson, 2003). Even though sexual orientation has been regarded as a contributing factor to the human mating game it remains a notoriously under-researched topic area. As previous research has proved insufficient in its ability to explore

cross-sexual orientation; this research thesis will be unique in its field. The major significance and uniqueness of this research is that it simultaneously tests three competing hypotheses against each other, and it uses participants of both sexes and sexual orientations. Especially in the homosexual men community where there is a strong variability in sex typicality (Bailey et al., 1997) and, hence, by including homosexual participants into this research it could make the correspondence of own and partner's sex typicality on attraction patterns more obvious.

In this chapter two studies were conducted to ensure findings for the impact of sexual orientation on attraction preferences and patterns is accurate; Study 1 looked at the above significance factors of the importance of sexual orientation, self-perceived level of masculinity and femininity (sex typicality) and attraction preferences to masculine or feminine targets, using 3D computer generated images. A post-hoc manipulation check failed to show support for the 3D computer-generated images correctly displaying the masculine and feminine composites at the correct level therefore Study 1 results are to be taken with caution. Study 2 was carried our looking at the same aspects as Study 1, however employing slightly different data collection methods to Study 1, using an online survey tool as opposed to an experimental method. Study 2 aimed to see whether results are the same or different to what was found in Study 1, using computer manipulated faces, as opposed to computer generated faces.

2.2. Study 1 Overview

As well as level of self-perceived masculinity and femininity, this study examined whether men and women across sexual orientation find a target attractive, based on targets facial femininity-masculinity. Study 1 employs an experimental data collection method and uses 3D computer generated images with various masculine and feminine facial composites.

2.3. Research Hypotheses

This study tested three competing hypotheses regarding attraction patterns to masculinity-femininity and sex typicality. Depending on the sex and sexual orientation of the perceivers, these hypotheses suggest distinct patterns of attractions. Tables 1 to 3 below visualize the differences in predictions.

Hypothesis 1. Similarity in masculinity – femininity (Assortative Mating): Perceivers of both sexes and sexual orientations are sexually attracted to targets who display similar characteristics to them in terms of masculinity or femininity (Table 4). Regarding attraction to males, homosexual men who are more masculine (than feminine) will be attracted to males who are more masculine, and heterosexual women who are more feminine will be attracted to males who are more feminine. Regarding attraction to females, homosexual women who are more masculine will be attracted to females that are more masculine and heterosexual men who are more masculine will be attracted to females who are more masculine.

Table 4

Graphic representation of hypothesis 1, showing similarity of masculinity/femininity attracts. The content in bold shows what would be expected if assortative mating were assumed across homosexual men for male targets, heterosexual men for female targets, heterosexual women for male targets and homosexual women for female targets.

Sex of Target	Sex of Perceiver: Men	Sex of Perceiver: Women
Male	**Masculine perceiver/ Masculine target**	**Feminine perceiver/ Feminine target**
	Masculine perceiver/ Feminine target	Feminine perceiver/ Masculine target
Female	**Masculine perceiver/ Masculine target**	**Feminine perceiver/ Feminine target**
	Masculine perceiver/ Feminine target	Masculine perceiver/ Feminine target

Hypothesis 2. Opposites in masculinity – femininity (Disassortative Mating): Perceivers of both sexes and sexual orientations are sexually attracted to targets who display opposite characteristics to them in terms of masculinity or femininity (Table 5). Regarding attraction to males, homosexual men who are more masculine will be attracted to males who are more feminine, and heterosexual women who are more feminine will be attracted to males who are more masculine. Regarding attraction to females, homosexual women who are more masculine will be attracted to females that are more feminine and heterosexual men who are more masculine will be attracted to females who are more feminine.

Table 5

Graphic representation of hypothesis 2, showing opposite of masculinity/femininity attracts. The content in bold shows what would be expected if disassortative mating were assumed across homosexual men for male targets, heterosexual men rating female targets, heterosexual women for male targets and homosexual women for female targets.

Sex of Target	Sex of Perceiver: Men	Sex of Perceiver: Women
Male	Masculine perceiver/ Masculine target	Feminine perceiver/ Feminine target
	Masculine perceiver/ Feminine target	**Feminine perceiver/ Masculine target**
Female	Masculine perceiver/ Masculine target	Feminine perceiver/ Feminine target
	Masculine perceiver/ Feminine target	**Masculine perceiver/ Feminine target**

Hypothesis 3. Match in sex typicality: Perceivers of both sexes and sexual orientations are sexually attracted to targets who display a match in terms of sex typicality (Table 6). Regarding attraction to males, homosexual men who are more masculine will be attracted to males who are more masculine, and heterosexual women who are more feminine will be attracted to males who are more masculine. Regarding attraction to females, homosexual women who are more feminine will be attracted to females that are more feminine and heterosexual men who are more masculine will be attracted to females who are more feminine.

Table 6
Graphic representation of hypothesis 3, showing a match, in terms of sex typicality attracts. The content in bold shows what would be expected if a match in sex typicality were assumed across homosexual men for male targets, heterosexual men rating female targets, heterosexual women for male targets and homosexual women for female targets.

Sex of Perceiver

Sex of Target		Men	Women
	Male	**Masculine perceiver/ Masculine target**	Feminine perceiver/ Feminine target
		Masculine perceiver/ Feminine target	**Feminine perceiver/ Masculine target**
	Female	Masculine perceiver/ Masculine target	**Feminine perceiver/ Feminine target**
		Masculine perceiver/ Feminine target	Masculine perceiver/ Feminine target

2.4 Methods

2.4.1 Participants

Participants were recruited via purposive sampling through a range of methods including an advertisement onto a range of social networking sites, group mailing lists, around the Ipswich and Colchester town centres as well as The University of Essex campus. I was not sure on the effect size needed to run a power calculation for sample size, so I modelled numbers on those similar in relevant literature and collected as much as data as possible. Purposive sampling was used, recruiting participants based on intent and to serve purpose to a specific element of the research (Merriam, 2009). This sampling was most relevant for this research as I was studying selected groups, homosexual and heterosexual men, and women (Bernard, 2000).

Eighty participants completed the survey and were included in the analyses. Overall age ranged from 18-60 years old (*M* age = 32.84, *SD* = 11.84). Within the sample 20 men (*M*

age = 30.9 years, *SD* = 12.79) and 20 women (*M* age = 32.2 years, *SD* = 12.32) identified themselves as heterosexual and 20 men (*M* age = 32.4years, *SD* = 11.1) and 20 women (*M* age = 35.85 years, *SD* = 11.42) identified themselves as homosexual. There were no specific screening procedures in place to arrive at this sample, however advertisements specifically asked for heterosexual and homosexual men and women. I wanted to try and have equal numbers within each of the subgroups for analysis so tailored advertisements where needed during data collection. Ages did not significantly differ between sexes (F (1, 78) = .80, p = .37; β = .10) or between sexual orientations (F (1, 78) = .95, p = .33; β =.11). Eighty-nine percent of participants classified themselves as white and 11 percent classified themselves as non-white. Ethnicity did not significantly differ across sex χ^2 (4, N = 80) = 6.49, p = .17 or between sexual orientations χ^2 (4, N = 80) = 6.15, p = .19. Differences in age and ethnicity did not statistically affect analyses reported below and are therefore not further discussed.

2.4.2. Self-Report Measures

Sexual Orientation. A Kinsey-type scale was used to assess both sexual orientation and sexual attraction (Kinsey, Pomeroy & Martin, 1948). The scale ranged from 0 = exclusive orientation/attractions to opposite sex, to 3 = equal orientation/attractions to both sexes, to 6 = exclusive orientation/attractions to same sex. I conducted various correlation analyses. In both men and women the correlation between sexual orientation and sexual attraction was 0.9 or higher and because of this I averaged them into one composite score. As a result of this an overall average score was created between the sexual orientation and sexual attraction variables, these were then set into categories of heterosexual (1) and homosexual (2) for use in the main analysis. Based on the scores from the Kinsey scale anyone who was between 0 and 2 were heterosexual and 4 and 6 were homosexual.

In both men and women the correlation between sexual orientation and sexual attraction was 0.9 or higher and because of this I averaged them into one composite score.

Sex Typicality. The questionnaire was adapted from Rieger et al. (2008). The main function of the self-reported measures questionnaire was to gain knowledge of participants' self-reported levels of childhood and current life masculinity and femininity, and these measures were used for further exploratory analyses.

Childhood sex typicality was assessed using the Childhood Gender Nonconformity Scale with eight questions (Bailey, Finkel, Blackwelder, & Bailey, 1996; Rieger et al., 2008). An example of a female version item is, "As a child I assumed that most people saw me as less masculine than other girls" and an example of a male version item is, "As a child my mannerisms were more masculine than those of most boys of my age". Adulthood sex typicality was assessed using the Continuous Gender Identity Scale with seven questions tailored for each sex (Bailey et al., 1996; Rieger et al., 2008). An example of a male version item is, "I assume most people see me as more masculine than other men" and an example of a female version item is, "I consider myself to not be very masculine in my behaviours and interests". Questions were answered using a 7-point Likert scale (1 = Strongly Disagree to 7 = Strongly Agree).

A reliability analysis using multivariate correlation was conducted on both men and women's childhood sex typicality and current life sex typicality question items. Strong reliability was found for all childhood and adulthood measures, Cronbach's α exceeded 0.8. Averaged measures for childhood and adulthood sex typicality were correlated in men, $p < .0001$, $r = .91$ and women, $p < .0001$, $r = .79$. As a result of this an overall average score was created between the two variables for use in the main analysis. All items were averaged in a way that higher scores mean higher sex typicality (masculinity in males, femininity in females).

2.4.3. Facial Stimuli

Stimuli were 3D computer generated images, created, and manipulated using a computer programme, FaceGen. FaceGen is produced by Singular Inversions (http://www.facegen.com/index.html). FaceGen allows for creation of average faces alongside manipulation of characteristics such as masculinity and femininity of both male and female faces (Figure 1). It also allows for fine tuning of various facial components such as eye and lip colour, nose shape and size, eye slant, cheek shape and jaw structure. Similar minipulations of 3D computer generated faces have been used in previous research using this software (Balas & Tonsager, 2014).

Overall, there were 40 images generated, 20 females and 20 males. Each gender had five different faces that included four slight changes in facial characteristics (super masculine, masculine, feminine and super feminine) of each of these faces. This slight change in facial characteristic is known as 'tweening' Faces were created by first choosing the ethnicity then selecting the 'set average' button as an average attractiveness composite of both the male and female faces (Figure 2).

Each of the images was tweened by 15% and then 30%. Female faces were set at female/female (feminine face) and moved 15% up and down, then 30% up and down, from there to create four tweens; male faces were set at male/male (masculine face) and moved 15% up and down, then 30% up and down, from there to create four tweens (https://facegen.com/modeller35_help.htm#tween).

Images were created with no hair on their head or facially, nor did they have any facial expression. This decision was based on the literature which suggested that hair on a facial image can create attraction biases, where some people may prefer a certain colour or style (Cunningham, Barbee & Pike, 1990). Literature also suggested that there are links

between higher levels of attraction for certain emotions felt from facial expressions, thus the exclusion eliminated any bias (Mueser, Grau, Sussman & Rosen, 1984).

Figure 1

Computer generated image within FaceGen, characteristic and face changing section within the programme, allowing masculinity and femininity to be manipulated.

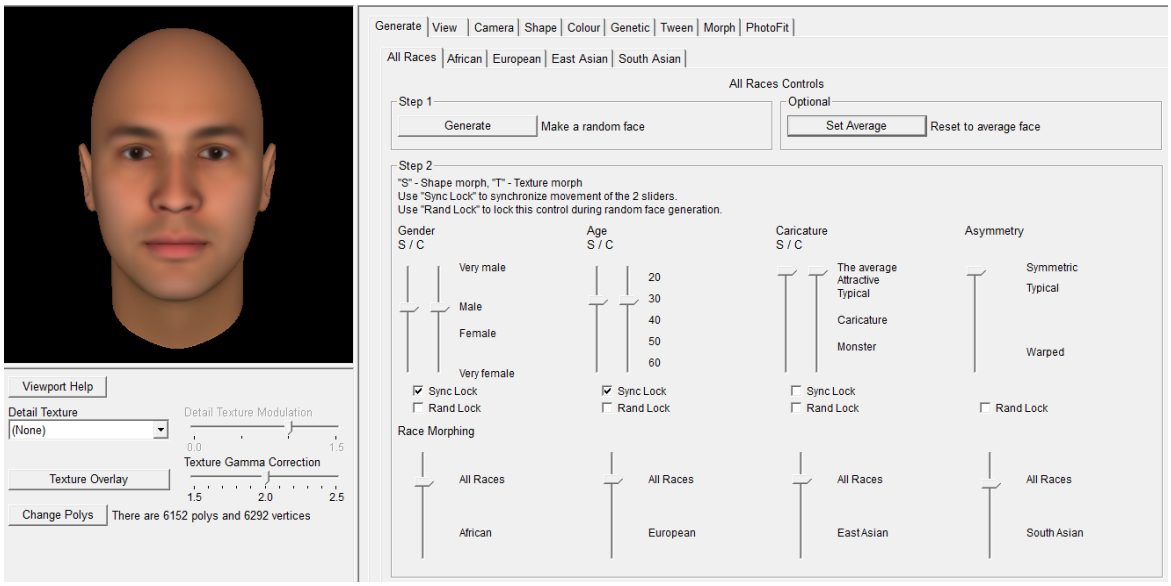
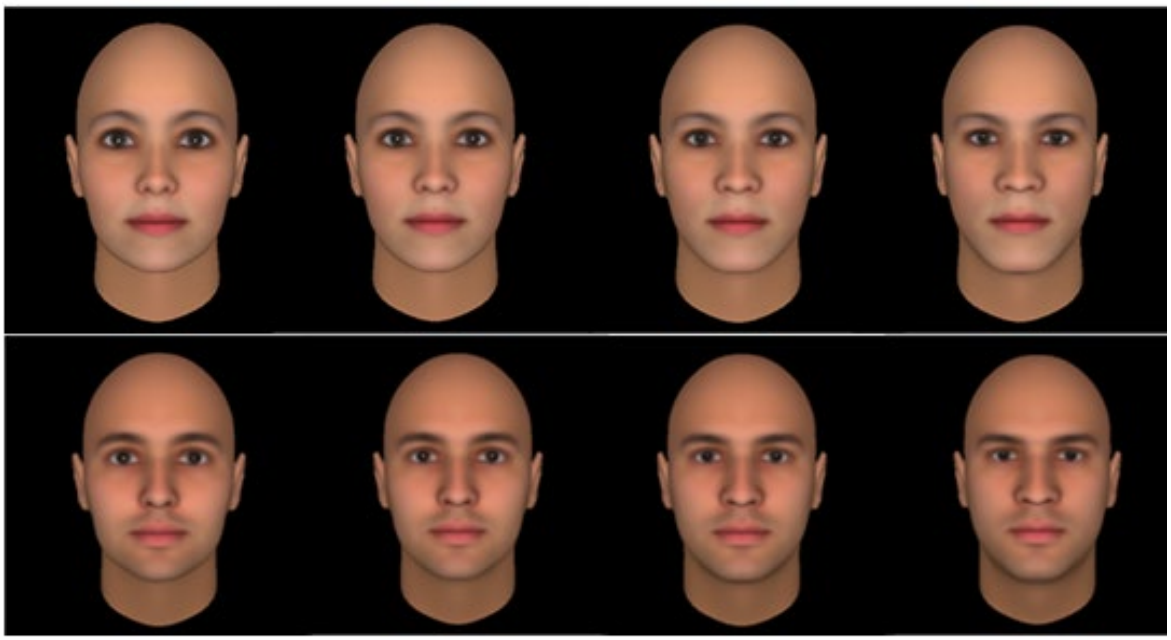


Figure 2

3D computer generated images using FaceGen, four levels of masculinity and femininity. Top line shows a female face tween and bottom line shows a male face tween at, super feminine, feminine, masculine, and super masculine respectively.



2.4.4. Procedure

Participants volunteered for the research by responding via email to an advertisement. Participants were not paid; however, they did receive a dairy milk chocolate bar at the end of the study for appreciation of participation. Data collection took place in a quiet location that had access to Wi-Fi. All data was collected on one Laptop computer which had secured password protected access to the data files.

Participants provided written informed consent before the study started and were issued an ID number. The participants firstly had to complete an online Qualtrics survey; they were instructed not to think too hard, to give first reaction answers and to fill in all sections of the questionnaire relevant to their gender assignment including demographic information, sexual orientation and childhood and current life masculinity or femininity. The second part of the study used the computer programme E-prime; produced by Psychology software tools.

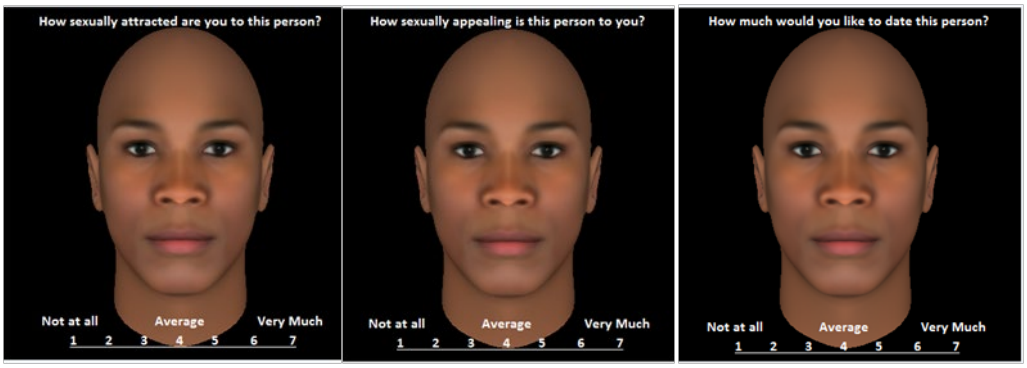
Participants then entered their ID number into the E-Prime experiment, and were introduced to the welcome page, instruction, and information screen. Participants were made aware of the variation in questions for each image, and to use the keys (1-7) on the keyboard to respond to the questions. They were made aware of the scale at the bottom of the image for the corresponding attractiveness rating ranging from ‘not at all’ to ‘average’ to ‘very much’. Stimuli were created and presented on an HP Pavillion g series laptop computer with a 60 Hertz, 15.6-inch laptop screen resolution of 1366 x 768 and colour depth of 32 Bit. Faces stood on the computer screen at 160 mm x 90mm.

Stimuli were presented in two blocks. Female stimuli were always shown first; however, stimuli within each sex block are in random order. This was due to the set-up constraints within E-Prime in relation to block randomisation. Stimuli were presented on a black background, each image was shown three times, sequentially, with a different question on

each, how sexually attractive they found the person, how sexually appealing they found the person and how much they would like to date the person. This was rated on a 7-point Likert scale with 1 = not at all to 7 = very much. Each one of the three questions were situated above the stimuli image and the rating scale was situated at the bottom (Figure 3). Throughout all of the groups of rater's (heterosexual and homosexual men and women) the three ratings used for assessing target attractiveness were found to have a strong reliability and were all highly correlated, all Cronbach's α's exceeded 0.9 and all r's exceeded 0.7. As a result of this the three ratings were averaged to one overall component of attractiveness.

In-between the presentation of each facial stimulus a white crosshair was presented in the middle of the screen to give a central focus. Halfway through there was a break-screen that informed the participants that they would next be rating male facial stimuli. Images were in the same format and answered in the same way as that of the first set, with all three questions for that image being shown sequentially. Presentation of each trial took as long as the participant required, the total procedure took, on average 15 minutes.

Figure 3
One facial image (African female super masculine) with the corresponding three questions on top and Likert scale on the bottom.



2.5. Results

Although both homosexual and heterosexual men and women rated both the males and female targets, present hypotheses are focused on ratings of the preferred sex (e.g., heterosexual men rated females). Results for ratings of the less preferred sex (e.g., females for homosexual women) did not reveal meaningful patterns, relevant for present hypotheses, and are not further considered.

Main analyses were based on the three hypotheses that 1) similarities in masculinity-femininity attract, 2) opposites in masculinity-femininity attract and 3) match in sex typicality attracts.

2.5.1. Simple Regression

In a first set of regression analyses I focused on the simple relationships between attraction ratings to masculine versus feminine targets (of the preferred sex) and the perceivers' own masculinity-femininity. A contrast score of attraction to super-masculine male faces versus super-feminine male faces was computed. This contrast score was regressed against the degree of sex-typicality of raters who evaluated male faces (heterosexual women and homosexual men). Correspondingly, a contrast score of attraction to super-feminine female faces versus super-masculine female faces was computed. This contrast score was regressed against the degree of masculinity-femininity of raters who evaluated female faces (heterosexual men and homosexual women). Contrast scores of attraction to masculine versus feminine and feminine versus masculine male and female faces were also created but because they did not reveal anything beyond the below result, I did not want to complicate the results and therefore did not further explore these.

For neither homosexual men, nor heterosexual women, was their attraction to preferred sex target category stimuli (males) related to their self-reported sex typicality. That is, with respect to male targets, there were no significant correspondence or trend between perceivers' and targets' degree of sex-typicality found for homosexual men's rating of males B = -.13, SE = .23, p = .57, β = -.13 or heterosexual women's rating of males B = -.10, SE = .18, p = .59, β = -.12. Thus, for male targets, the results show no support for any of the three hypotheses, because there was no indication, that either similarities attract, opposites attract, or that a match in sex typicality (masculinity in males, femininity in females) was most attractive. Homosexual men and heterosexual women, regardless of their self-perceived masculinity or femininity showed no preference at all for masculine or feminine males (Figure 4A & 4B.)

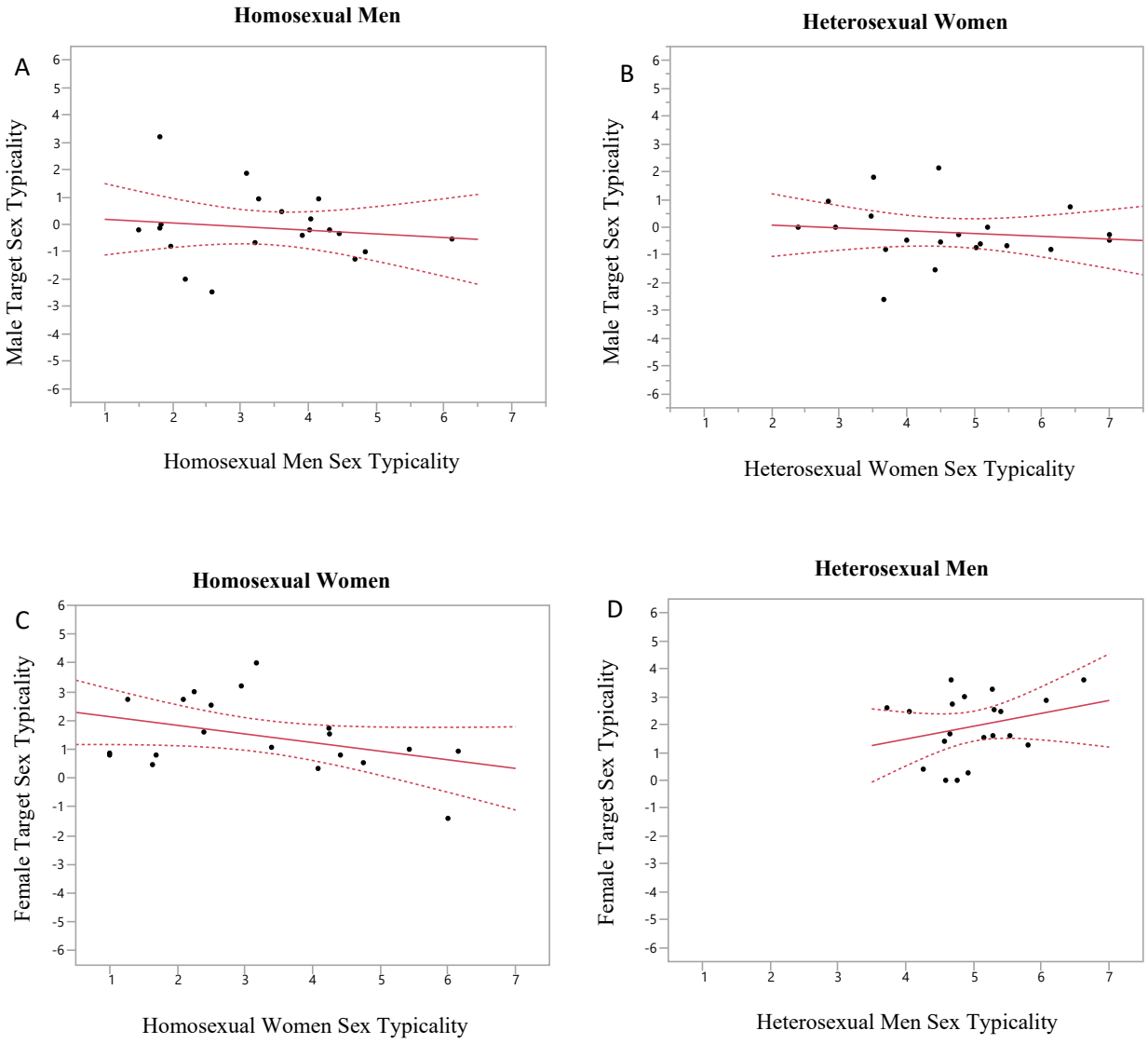
For homosexual women their attraction to preferred sex target category stimuli (females) related to their self-reported sex typicality when they self-reported as sex atypical (masculine) but not sex typical (feminine). That is, homosexual women who self-reported as more masculine (sex-atypical) rated females who are more feminine (sex-typical) as more attractive; the confidence intervals of the regression coefficient were above zero, although this effect was not significant, B = -.29, SE = .18, p = .09, β = -.38. Thus, even though no hypotheses were confirmed for homosexual women rating female targets, findings provide limited support for Hypothesis 2, that opposites attract in masculinity-femininity. Homosexual women, who reported themselves as sex atypical (masculine) showed a preference for sex typical (feminine) females (Figure 4C).

Results found heterosexual men who self-reported as very feminine (compared to other men) (i.e., those low on sex typicality) had no preference for masculine or feminine faces. Although not significant, a trend was found showing heterosexual men who are high on sex typicality (more masculine) found a higher preference for more feminine female faces, B

= .46, *SE* = .37, *p* = .24, *β* = .27 (Figure 4D). Thus, even though no hypothesis were confirmed for heterosexual men rating female targets, findings were consistent with the Hypothesis 2, that opposites attract in masculinity-femininity.

Figure 4

Attraction to sex-typical targets related self-reported sex typicality. Panel A shows homosexual men, Panel B shows heterosexual women, Panel C shows homosexual women and Panel D shows heterosexual men's responses to preferred sex target. Y axes represent the attraction to the targets level of sex typicality where -6 represents low sex typicality and 6 represents high sex typicality. X axes reflect rater level of sex typicality with 1 representing low sex typicality and 7 representing high sex typicality. The lines represent regression coefficients with 95% confidence intervals. Dots represent participants' average scores.



2.5.2. Mixed-Factorial Regression Analyses

Data were further investigated by conducting set of mixed factorial regression analyses. The outcome variable was the rated attractiveness of targets. Targets and raters were treated as random effect (Zar, 1999). This approach represents a repeated measures design where each rater repeatedly evaluated the attractiveness of targets, each target was repeatedly evaluated by raters. Independent variables included the degree of sex-typicality of raters, and the degree of sex-typicality of targets (that is, each created face had four levels of sex typicality). A further predictor of attractiveness evaluations was the interaction of the raters' and targets' sex typicality. With this interaction I tested whether attractiveness was affected by a combination of the raters' and the targets' sex typicality. For example, if more sex-typical raters are more attracted than less sex-typicality raters to more sex-typical targets, a significant interaction should be detected. Analyses were conducted separately for each rater group (heterosexual and homosexual men and women raters) with respect to their preferred target sex (male targets for heterosexual women and homosexual men raters; female targets for heterosexual men and homosexual women raters).

I first considered results for male targets. No significant interactions between rater sex typicality and target sex typicality were found for homosexual men rating males $B = .04$, $SE = .05$, $p = .39$ or heterosexual women rating males $B = -.02$, $SE = .05$, $p = .62$. That is, the combination of the raters' sex typicality with the targets' sex atypicality did not relate the raters' attraction to targets in any predicted way.

Corresponding analyses were conducted for female targets. Results showed that homosexual women were most attracted to feminine over masculine female faces if they perceive themselves as sex atypical, masculine. The interaction was significant and negative, $B = -.09$, $SE = .04$, $p = .01$. Results provided support for the Hypothesis 2, that opposites in

masculinity-femininity attract was confirmed but only for a specific subset, masculine homosexual women for feminine female faces. Heterosexual men showed a preference for most feminine over masculine female faces if they perceived themselves as sex typical, masculine; this interaction showed a trend in this direction $B = .18$, $SE = .09$, $p = .06$. Across homosexual women and heterosexual men rating female targets, these findings provide support for the Hypothesis 2, that opposites in masculinity-femininity attract.

Overall results indicated a preference for opposites attracting when considering masculinity-femininity, but only when homosexual women and heterosexual men rated female targets. Homosexual women, who perceived themselves as sex atypical, masculine, were most attracted to feminine females. Heterosexual men, who perceived themselves as sex typical, masculine, were more attracted to feminine females, although this result was not significant it does show a trend in this direction.

2.6. Discussion

This research generated three hypotheses: Hypothesis 1, perceivers of both sexes and sexual orientations are sexually attracted to targets who display similar characteristics to them in terms of masculinity or femininity; Hypothesis 2, perceivers of both sexes and sexual orientations are sexually attracted to targets who display opposite characteristics to them in terms of masculinity or femininity and Hypothesis 3, perceivers of both sexes and sexual orientations are sexually attracted to targets who display a match in sex typicality. Results for this research found no significant results for homosexual men or heterosexual women when rating male targets. This was irrespective of whether both the homosexual men and heterosexual women rated themselves as sex typical or sex atypical. There were no preferences found for a male target that was similar or opposite to them in terms of

masculinity or femininity, or a match in terms of sex typicality. However, results provided limited support for Hypothesis 2, opposites attract in terms of masculinity-femininity regarding attraction to female targets in homosexual women. Showing that homosexual women who rated themselves as masculine indicated a preference for female facial femininity to masculinity. Similarly, heterosexual men who rated themselves as more masculine indicated a preference for more feminine over masculine female faces.

These research results support disassortative mating which proposes that perceivers prefer female targets that are opposite to them in terms of masculinity- femininity (Bailey et al., 1997; Moskowitz, Rieger & Roloff, 2008). This research highlights the implications of self-perceived sex-typicality when evaluating female targets' attractiveness. Reasons for this could be that relationships take on the idea of role-play, those who see themselves as the masculine partner the role of the 'husband' are seeking a target that signifies the feminine role of the 'wife'. This feminine target is said to signal fertility, youth, and ability to reproduce (Law Smith et al., 2006). This could be the factor that the masculine perceivers find attractive in their desired sex which could be the case for both heterosexual and homosexual mating preferences. However, our results show that it is not simply about good mating qualities of the target but these preferences in attraction are also dependent upon the characteristics of the rater. The preference of a target could be dependent upon how raters perceive the role they would play in an attraction relationship; it may be a preference for someone who has the opposite characteristics that the rater holds. For example, homosexual women, who see themselves as sex atypical and take on the role of the masculine partner, are therefore likely to seek a target that is able to take on the relationship role of the female, thus as our results showed are likely to have a higher attraction preference for feminine targets. A possible limitation of this finding could be order effect, as female targets were always

presented first (*as disucssed in the methods section*) however this seems realistic given that I did not find much within this study.

In summary, this is one of the first studies to address both homosexual and heterosexual men and women's preferences of attraction simultaneously using the three hypotheses set out. It is also, one of the first studies to incorporate both self-perceived level of sex-typicality with attraction to targets level of sex-typicality for both sexes and sexual orientations. It appears from our results that both homosexual women and heterosexual men who perceive themselves as masculine find opposite targets (feminine females) most attractive, even though some of the supporting findings only edged on significance. No clear patterns were confirmed for those attracted to males.

2.7. Limitations

2.7.1. Sample Size

As expressed previously, I was unsure on the effect size needed to run a power calculation for sample size, I modelled sample size numbers on those similar in relevant literature and collected as much as data as possible. Our sample size ended up reaching 80. This research also used two groups of participants which are seen as underrepresented - homosexual men and homosexual women, which made recruitment and participation in the research by those groups harder. There were equal numbers of participants in each of the groups and therefore an even sample size, however in the future it may be beneficial to recruit for longer and gain a larger sample size.

2.7.2. Computer Generated Images

A limitation and a possible explanation for discrepant results in this research may be the use of 3D computer-generated images with changing levels of masculinity or femininity as opposed to photographic real-life images. Although previous researchers (Kruger, 2006; Perrett et al., 1998; Smith et al., 2009) have also used computer generated stimuli, critics argue that these images may not have accurately captured the real-life variations of masculinity or femininity that can appear in human faces (Thompson & O'Sullivan, 2013). It has been argued that further research is needed to demonstrate the applicability of computer-generated images and to find the discrepancies between these images and those of real-life computer manipulated images (photographs). Although using computer generated images in this researched allowed for manipulation and controlling of factors such as body hair and facial expression, it may not allow for natural, un-controllable features that occur in humans in real life to be shown.

2.7.3. Manipulation Check

Because many results were not significant and no hypothesis was strongly confirmed, a post-hoc manipulation check was carried out to establish whether the computer-generated manipulations of sexual dimorphism (masculinity and femininity) of the stimuli were correctly identified by raters. Thus, whether raters correctly identified super-feminine faces as super-feminine, feminine female faces as feminine, masculine faces as masculine and super-masculine faces as super-masculine for both male and female faces., and whether this influenced perceptions of attraction in the predicted way. Thus, whether raters correctly identified super-feminine faces as super-feminine, feminine faces as feminine, masculine faces as masculine and super-masculine faces as super-masculine for both male and female faces. Twenty participants completed the survey (these participants were separate from the

main study). Twenty participants completed the survey. Within the sample there were 10 men (M = 38.1, SD = 16.51) and 10 women (M = 41.6, SD = 18.65). Overall ages ranged from 18 -73 (M = 39.85, SD = 17.24). The manipulation check was carried out using a paper form questionnaire which was distributed to those who were willing to take part. Consent and four demographics were asked at the start of the questionnaire for descriptive purposes. Participants viewed three images at a time on one page; these images were randomised and were not in masculinity-femininity order. Overall participants rated all male and female images, including each of the four manipulations (tweens), Super-feminine, feminine, masculine, and super-masculine (N = 40) on their perceived level of masculinity and femininity using two scales. For the female images scale one ranged from 1 = Not at all Feminine – 7 = Very Feminine, scale two ranged from 1 = Very Masculine – 7 = Not at all Masculine. For male's scale one ranged from 1 = Not at all Masculine – 7 = Very Masculine, scale two ranged from 1 = Very Feminine – 7 = Not at all Feminine.

An average score from the two scales were generated and then added together to give an overall image masculinity-femininity score, sex-typicality average. Analyses were conducted to see whether participants had correctly identified each of the masculine and feminine composite faces. Results suggested that stimuli did not all differ in perceived masculinity-femininity in the expected direction. For female stimuli none of the four manipulations were correctly identified as, feminine (M = 4.32, SD = 1.42), masculine (M = 4.04, SD = 1.65), super feminine (M = 3.94, SD = 1.40) or super masculine (M = 3.71, SD = 1.18), F (3, 16) = 0.16, p = 0.10. For male stimuli three of the manipulations were not correctly identified as feminine (M = 4.32, SD = 1.42), masculine (M = 4.04, SD = 1.65) or super feminine (M = 3.94, SD = 1.40). There was a statistical significance for correct identification for super masculine faces (M = 3.10, SD = 1.18), F (3, 16) = 9.34, p = 0.0008. Thus, this

manipulation check was not that satisfying and hence, results from this study need to be taken with caution.

2.8. Conclusion

Overall, the findings from this study provide an insight into the differences in preference for attractiveness across both sexes and sexual orientations. For female targets, it provides a trend in the direction and some support for Hypothesis 2, that opposites attract in masculinity-femininity; when homosexual women and heterosexual men perceive themselves as masculine, they show a greater preference for female targets who are more feminine. However, as stated above, due to an unsatisfying manipulation check of the masculinity and femininity of the faces, results should be examined with caution, and it may be that results do not reflect true findings. In order to assess whether these results are reliable, it is essential to rerun the study but this time using a larger sample size and an a-priori manipulation check (correctly identified as masculine and feminine) real life computer manipulated images.

2.9. Study 2 Overview

Study 2 advanced on Study 1, exploring preferences across both sexes and sexual orientations, looking at perceiver and target level of masculinity and femininity. Study 2 will however be employing an online survey method instead of an experimental method for data collection. Most importantly it will be using computer manipulated real life images proposed as opposed to 3D computer generated images used in Study 1. The use of computer manipulated real life images in Study 2 is due the unsatisfying post-hoc manipulation checks on the computer-generated images used in Study 1. The manipulation check for the computer manipulated real life images showed men and women correctly identified as masculine and feminine, female, and male composite faces. It is anticipated that the changes made will help to determine whether the findings from Study 1 are reliable or if they are a result of the use the of 3D computer generated facial stimuli.

2.10. Research Hypotheses

This study tested three competing hypotheses regarding attraction patterns to masculinity-femininity. Depending on the sex and sexual orientation of the perceivers, these hypotheses suggest distinct patterns of attractions. See Tables 7-9 below to visualize the differences in predictions.

Hypothesis 1. Similarity in masculinity – femininity (Assortative Mating): Perceivers of both sexes and sexual orientations are sexually attracted to targets who display similar characteristics to them in terms of masculinity or femininity (Table 7). Regarding attraction to males, homosexual men who are more masculine (than feminine) will be attracted to males who are more masculine, and heterosexual women who are more feminine will be attracted to males who are more feminine. Regarding attraction to females, homosexual women who are

more masculine will be attracted to females that are more masculine and heterosexual men who are more masculine will be attracted to females who are more masculine.

Table 7

Graphic representation of hypothesis 1, showing similarity of masculinity/femininity attracts. The content in bold shows what would be expected if assortative mating were assumed across homosexual men for male targets, heterosexual men for female targets, heterosexual women for male targets and homosexual women for female targets.

Sex of Perceiver

Sex of Target		Male	Female
	Male	**Masculine perceiver/Masculine target**	**Feminine perceiver/Feminine target**
		Masculine perceiver/Feminine target	Feminine perceiver/Masculine target
	Female	**Masculine perceiver/Masculine target**	**Feminine perceiver/Feminine target**
		Masculine perceiver/Feminine target	Masculine perceiver/Feminine target

Hypothesis 2. Opposites in masculinity – femininity (Disassortative Mating): Perceivers of both sexes and sexual orientations are sexually attracted to targets who display opposite characteristics to them in terms of masculinity or femininity (Table 8). Regarding attraction to males, homosexual men who are more masculine will be attracted to males who are more feminine, and heterosexual women who are more feminine will be attracted to males who are more masculine. Regarding attraction to females, homosexual women who are more masculine will be attracted to females that are more feminine and heterosexual men who are more masculine will be attracted to females who are more feminine.

Table 8

Graphic representation of hypothesis 2, showing opposite of masculinity/femininity attracts. The content in bold shows what would be expected if disassortative mating were assumed across homosexual men for male targets, heterosexual men rating female targets, heterosexual women for male targets and homosexual women for female targets.

Sex of Target	Sex of Perceiver: Men	Sex of Perceiver: Women
Male	Masculine perceiver/ Masculine target	Feminine perceiver/ Feminine target
	Masculine perceiver/ Feminine target	**Feminine perceiver/ Masculine target**
Female	Masculine perceiver/ Masculine target	Feminine perceiver/ Feminine target
	Masculine perceiver/ Feminine target	**Masculine perceiver/ Feminine target**

Hypothesis 3. Match in sex typicality: Perceivers of both sexes and sexual orientations are sexually attracted to targets who display a match in terms of sex typicality (Table 9). Regarding attraction to males, homosexual men who are more masculine will be attracted to males who are more masculine, and heterosexual women who are more feminine will be attracted to males who are more masculine. Regarding attraction to females, homosexual women who are more feminine will be attracted to females that are more feminine and heterosexual men who are more masculine will be attracted to females who are more feminine.

Table 9
Graphic representation of hypothesis 3, showing a match, in terms of sex typicality attracts. The content in bold shows what would be expected if a match in sex typicality were assumed across homosexual men for male targets, heterosexual men rating female targets, heterosexual women for male targets and homosexual women for female targets.

Sex of Perceiver

Sex of Target	Men	Women
Male	**Masculine perceiver/ Masculine target**	Feminine perceiver/ Feminine target
	Masculine perceiver/ Feminine target	**Feminine perceiver/ Masculine target**
Female	Masculine perceiver/ Masculine target	**Feminine perceiver/ Feminine target**
	Masculine perceiver/ Feminine target	Masculine perceiver/ Feminine target

2.11. Methods

2.11.1. Participants

Participants were recruited via purposive sampling through a range of methods including an advertisement onto a range of social networking sites including via group mailing lists, on university websites throughout the UK, and a range of LGBT organisations in Suffolk, Essex and Norfolk. This research was also advertised on the Psychological Research on the Net website (http://psych.hanover.edu/research/exponnet_submit.html). I was unsure on the effect size needed to run a power calculation for sample size, so I modelled our sample size numbers on those similar in relevant literature and collected as much as data as possible. Purposive sampling was the recruitment method used, recruiting participants based on intent and to serve purpose to a specific element of the research (Merriam, 2009). This sampling was most relevant for this research as I was studying selected groups,

homosexual and heterosexual men and women (Bernard, 2000). Data collection methods included self-report measures, questionnaire, and a facial stimuli experiment.

Three hundred and sixty-four participants completed the survey, however, after initial data sorting there were three hundred and two suitable data sets for analysis. Exclusions were made for data from participants who were below 18 years of age as well as data sets which had not been completed (this means answering all adulthood and childhood sex typicality questions as well as rating all facial images).

Within the sample 50 men and 171 women identified themselves as heterosexual and 40 men and 41 women identified themselves as homosexual. Overall ages ranged from 18-72 (M = 29.26, SD = 12.66). Ages did not statistically differ between sex, (Men, M = 31.61, SD = 14.41) (Women, M = 28.26, SD = 11.73) t (141.37) = 1.95, p = .05, MD = 3.35), or sexual orientation (Heterosexual, M = 28.86, SD = 12.58; Homosexual, M = 30.36, SD = 12.89), t (139.40) = -.90, p = .37; MD = -1.49.

2.11.2. Self-Report Measures

Sexual Orientation. A Kinsey-type scale was used to assess both sexual orientation and sexual attraction (Kinsey, Pomeroy & Martin, 1948). The scale ranges from 0 = exclusive orientation/attractions to opposite sex, to 3 = equal orientation/attractions to both sexes, to 6 = exclusive orientation/attractions to same sex. I conducted various correlation analyses. In both men and women the correlation between sexual orientation and sexual attraction was 0.9 or higher and because of this I averaged them into one composite score. As a result of this an overall average score was created between the two variables, these were then set into categories of heterosexual (1) and homosexual (2) for use in the main analysis. Based on the scores from the Kinsey scale anyone who was between 0 and 2 were heterosexual and 4 and 6 were homosexual.

Sex Typicality. The questionnaire was adapted from Rieger et al. (2008). The main function of the self-reported measures questionnaire was to gain knowledge of participants self-reported levels of childhood and current life masculinity and femininity.

Childhood sex typicality was assessed using the Childhood Gender Nonconformity Scale with eight questions (Bailey, Finkel, Blackwelder, & Bailey, 1996; Rieger et al., 2008). An example of a female version item is, "As a child I assumed that most people saw me as less masculine than other girls" and an example of a male version item is, "As a child my mannerisms were more masculine than those of most boys of my age". Adulthood sex typicality was assessed using the Continuous Gender Identity Scale with seven questions tailored for each sex (Bailey et al., 1996; Rieger et al., 2008). An example of a male version item is, "I assume most people see me as more masculine than other men" and an example of a female version item is, "I consider myself to not be very masculine in my behaviours and interests". Questions were answered using a 7-point Likert scale (1 = Strongly Disagree to 7 = Strongly Agree).

A reliability analysis using multivariate correlation was conducted on both male and female childhood sex typicality and current life sex typicality question items. Strong reliability was found for all childhood and adulthood measures, Cronbach's α exceeded 0.8. Averaged measures for childhood and adulthood sex typicality were correlated in men, $p <$. 001 $r = .76$ and women, $p <$. 001, $r = .71$. As a result of this an overall average score was created between the two variables for use in the main analysis. All items were averaged in a way that higher scores mean higher sex typicality (masculinity in males, femininity in females).

2.11.3. Facial Stimuli

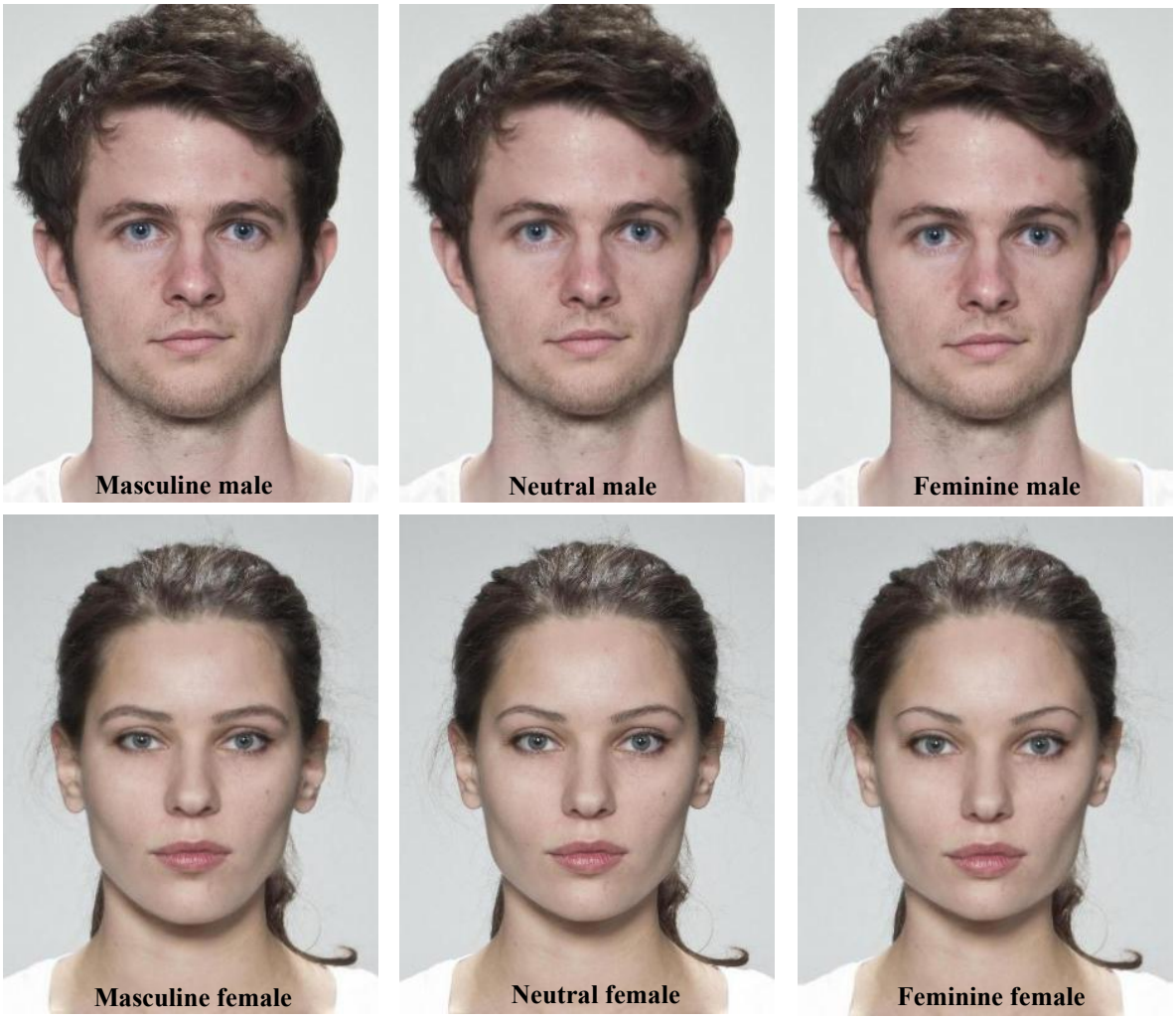
Stimuli were real life computer manipulated images, and were created using the publicly available website, FaceResearch.org which is owned and run by DeBruine and Jones (http://www.faceresearch.org/demos/transform). The stock images are real life images, the majority of the images have been manipulated into averages using Dr Bernard Tiddeman's (2015) PsychoMorph programme. PsychoMorph is available for download (http://users.aber.ac.uk/bpt/jpsychomorph/) and can also be used online (http://psychomorph.psy.gla.ac.uk/). Overall, there were 87 images generated, 48 for females and 39 for males, with three composites for each the 16 female and 13 male faces. Of the female images, 11 were real (not averaged) faces and 5 were ethnicity averaged faces. Of the male faces, 7 were real faces (not averaged), and 5 were ethnicity averaged faces, and 1 was an emotion average. First, we used an unmanipulated (neutral) version of each of these faces. Using the 'Face Transformer' images were then manipulated using the 'Transform dimension' function at a +50% which displayed the masculinized composite and then by -50% which displayed the feminized composite. Figure 5 shows the manipulation of the composite faces. This process created three images of each face, with each differed in sexual dimorphism (sex typicality) a) neutral, b) masculine and c) feminine. All the faces were colour image files and were cropped to the same size. Figure 6 shows an example of the composites used in this study.

Figure 5

Computer manipulated images displayed on the FaceResearch org website. Image on the left is the average (neutral face), image on the right shows the feminine and masculine tweens respectively. Setting box allows a for masculinity and femininity composites to be manipulated -50% and +50%.

Figure 6

Real life, computer manipulated images created using FaceResearch org website. Three composite manipulations are displayed. Top line shows a male face manipulation and bottom line shows a female face manipulation at, masculine, neutral and feminine composites, respectively.



2.11.4. Manipulation Check

A manipulation check was carried out on the computer-manipulated stimuli. The group of raters used for the manipulation check was a set of 328 participants, different to the raters of the main group who participated in the study. For each of the images shown, participants gave a rating of 1 – 7, with one corresponding to very masculine and seven to very feminine, based on their perceived masculinity-femininity. Individual scores for level of masculinity and femininity were then averaged for each participant (regardless of sex or

sexual orientation), producing an overall rating. Results indicated that feminine female faces were rated as significantly more feminine than masculine version of these female faces, M = 0.6, SD = 0.89, t = 9.85, p <.0001 and that masculine male faces were rated significantly more masculine than feminine version of these male faces M = 0.82, SD = 0.64, t = 17.57, p <.0001.

2.11.5. Procedure

Participants opted to take part in the study by clicking onto the survey link and participants were not paid. Data collection took place anywhere that the participants was able to access the survey link, on any electronic device, in a location that had access to the internet.

At the start of the survey an information sheet was displayed where the participants provided a form of informed consent and were asked to create a Unique ID number. Participants were instructed not to think too hard, to give first reaction answers and to fill in all section of the questionnaire. Firstly, participants had to complete some demographic questions, including gender, sex, sexual orientation and self-perceived childhood and current life masculinity or femininity (sex typicality). Once completed they moved onto rating the attractiveness images, which were presented in two blocks. The order of the blocks were randomised and the images within each block were randomised. Participants were instructed to answer all three questions for each image by selecting the corresponding box to their level on the scale. Stimuli were presented on a white background and stood in the centre of the screen; this was regardless of the device used to complete the survey at approximately 100mm x 750mm. Presentation of each image stayed on the screen for as long as the

participant needed and would only move onto the next image when the participant submitted their answer.

For each target sex, all images and their compositions were shown in random order. All participants saw all three composites (masculine, neutral, feminine) of both male and females faces, instructions were given at the start to remind participants that they may think that they see the same face more than once but to rate each face independently. The presentation of images was randomised, and image stayed for as long as the participant needed to respond to questions. After each image, both sexes were asked three questions around attractiveness for both male and female images regardless of sex or sexual orientation. The three questions asked for attractiveness were: How sexually attracted are you to this person? How sexually appealing is this person to you? How much would you like to date this person? The questions were answered using a 7-point Likert scale ranging from 1 = not at all, to 7 = very much. The survey took on average 10 minutes.

Throughout all of the groups of raters (heterosexual and homosexual men and women) the three ratings used for assessing target attractiveness were found to have a strong reliability and were all highly correlated, all Cronbach α's exceeded .90 and all *r's* exceeded .70. Because of this the three ratings were averaged to one overall component of attractiveness.

2.12. Results

Although both homosexual and heterosexual men and women rated both the males and female targets, present hypotheses are focused on ratings of the preferred sex (e.g., female for heterosexual men). Results for ratings of the less preferred sex (homosexual men

for female, heterosexual men for male, homosexual women for male and heterosexual women for female) did not reveal meaningful patterns, relevant for present hypotheses, and are not further reported.

Main analyses were based on the three hypotheses that, 1) similarities in masculinity-femininity attract, 2) opposites in masculinity-femininity attract and 3) match in sex typicality attracts.

2.12.1. Simple Regression

In a first set of regression analyses I focused on the simple relationships between attraction ratings to masculine versus feminine targets (of the preferred sex) and the perceivers' own sex-typicality. A contrast score of attraction to masculine male faces versus feminine male faces was computed. This contrast score was regressed against the degree of sex-typicality of raters who evaluated male faces (heterosexual women and homosexual men). Correspondingly, a contrast score of attraction to feminine female faces versus masculine female faces was computed. This contrast score was regressed against the degree of sex-typicality of raters who evaluated female faces (heterosexual men and homosexual women).

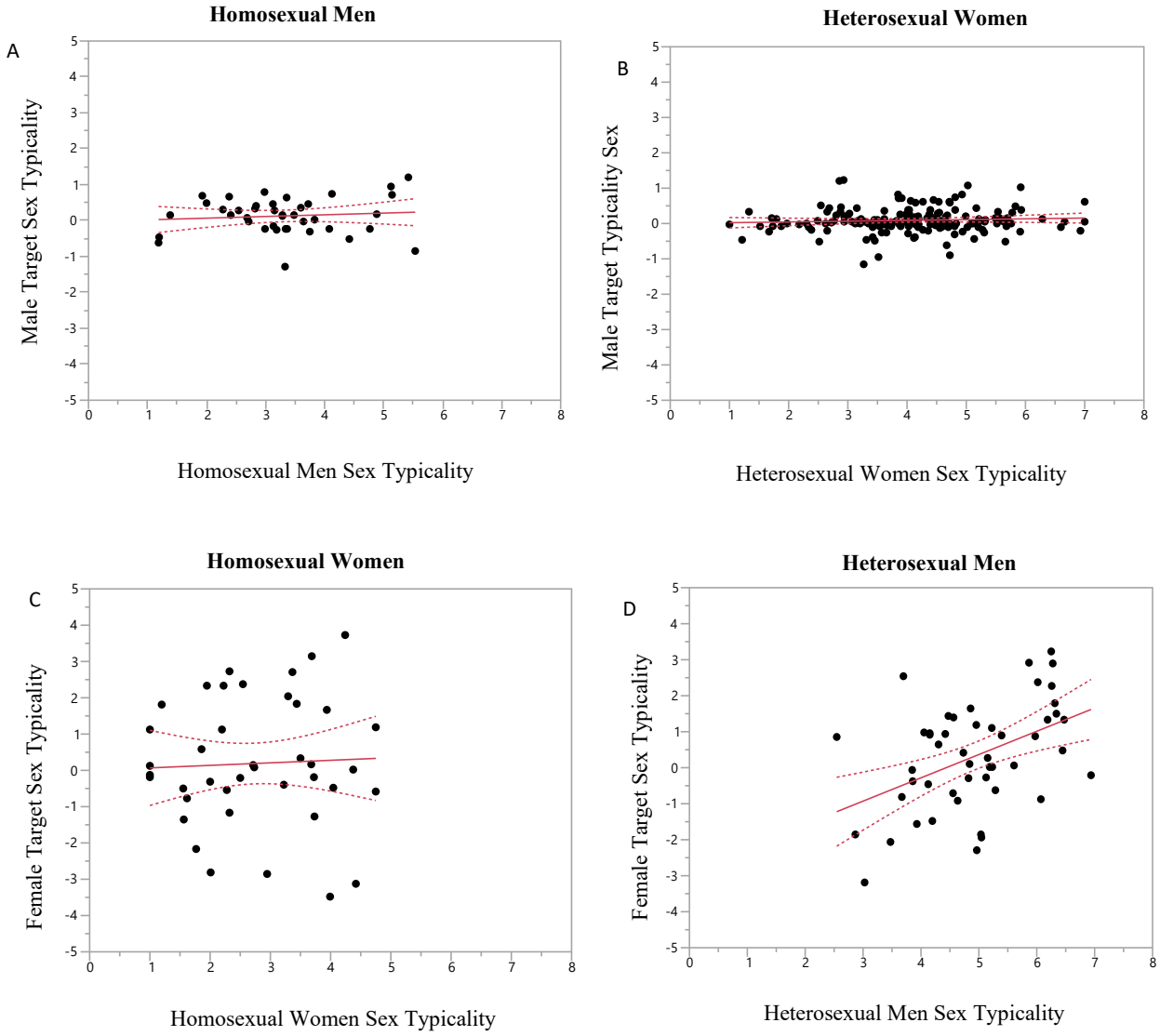
For neither homosexual men, nor heterosexual women, nor homosexual women, was their attraction to sex-typical targets related to their self-reported sex typicality. That is, there were no statistically significant effects found from homosexual men's rating of males, $B = .05$, $SE = .08$, $p = .54$, $\beta = .10$, heterosexual women's rating of males, $B = .02$, $SE = .02$, $p = .34$, $\beta = .07$, or homosexual women's ratings of females, $B = .07$, $SE = .25$, $p = .78$, $\beta = .04$. Thus, the results show no support for any of the three hypotheses, because there was no

indication that either similarities attract, opposites attract, or that a match in sex typicality (masculinity in males, femininity in females) was most attractive (Figures 7 A, B, & C).

The only significant effect found was for heterosexual men rating female targets. Those heterosexual men who were more masculine (and less feminine) had a higher preference for more feminine female faces. This difference made the overall correspondence of males self-reported sex typicality (masculinity) and their preference for sex-typical (feminine) female faces significant, $B = .65$, $SE = .18$, $p = .001$, $\beta = .46$ (Figure 7D). This finding supported, for heterosexual men only, Hypothesis 2, that opposites in masculinity-femininity attract. However, since this pattern was only found within heterosexual men raters it could also support the Hypothesis 3 that a match in sex-typicality attracts (i.e., masculinity of heterosexual men corresponding with a preference for femininity of female partners).

Figure 7

Attraction to sex-typical targets related self-reported sex typicality. Panel A shows homosexual men, Panel B shows heterosexual women, Panel C shows homosexual women and Panel D shows heterosexual men's responses to preferred sex target. Y axes represent the attraction to the targets level of sex typicality where -5 represents low sex typicality and 5 represents high sex typical. X axes reflect rater level of sex typicality with 0 representing low sex typicality and 8 representing high sex typicality. The lines represent regression coefficients with 95% confidence intervals. Dots represent participants' average scores.



2.12.2. Mixed-Factorial Regression Analyses

Targets and raters were treated as random effect (Zar, 1999). This approach represents a repeated measures design where each rater repeatedly evaluated the attractiveness of targets, each target (which had a masculine, neutral, and feminine composite) was repeatedly evaluated by raters. Predictor variables included the degree of sex-typicality of raters, and the degree of sex-typicality of targets (that is, each created face had three levels of sex typicality). A further predictor of attractiveness evaluations was the interaction of the raters' and targets' sex typicality. With this interaction I tested whether attractiveness was affected by a combination of the raters' and the targets' sex typicality. For example, if more sex-typical raters are more attracted than less sex typical raters to more sex-typical targets, a significant interaction should be detected. Analyses were conducted separately for each rater group (heterosexual and homosexual men and women raters) with respect to their preferred target sex (male targets for heterosexual women and homosexual men raters; female targets for heterosexual men and homosexual women raters).

I first considered results for male targets. No significant effects were found. This included that no interactions between rater sex typicality and target sex typicality were found, neither for homosexual men rating males B = -.02, SE = .03, p = .44, nor for heterosexual women rating males B = -.01, SE = .01, p = .30. That is, heterosexual women and homosexual men raters who differed in their sex typicality, did not have significant preferences for more or less sex-typical male targets.

Corresponding analyses were conducted for female targets. No significant main effects or interactions between rater sex typicality and target sex typicality were found for homosexual women's ratings of females. For this, homosexual women raters who differed in sex typicality, did not have significant preferences for more or less sex-typical female targets.

A significant interaction (but no significant main effects) was found in heterosexual men raters, B = -.32, SE = .08, $p < .001$. This interaction indicated that heterosexual men preferred feminine faces if they reported themselves as sex typical, masculine. This finding supports Hypothesis 2 that opposites in masculinity-femininity attract; however, again since this pattern was only found within heterosexual men raters it could also support Hypothesis 3 that a match in sex-typicality attracts (i.e., masculinity of heterosexual men corresponding with a preference for femininity of female partners.

2.13. Discussion

This research investigated three hypotheses; Hypothesis 1 investigated whether perceivers of both sexes and sexual orientations are sexually attracted to targets who display similar characteristics to them in terms of masculinity or femininity. Hypothesis 2 investigated whether perceivers of both sexes and sexual orientations are sexually attracted to targets who display opposite characteristics to them in terms of masculinity or femininity. Hypothesis 3 investigated whether perceivers of both sexes and sexual orientations are sexually attracted to targets who display matched characteristics to them in terms of sex typicality. These hypotheses were not confirmed for homosexual men or heterosexual women when rating male targets, or for homosexual women rating females. However, heterosexual men that were more masculine indicated a preference for more feminine female faces. This finding confirmed Hypothesis 2, namely that opposites attract. However, since no other effects were significant in this study, it made a full confirmation of any hypothesis inconclusive. Hence, this finding could also support the Hypothesis 3, which concerned an attraction to related levels of sex typicality (masculinity of males and femininity of females).

If one assumes that this research confirms an attraction to opposites, then it would support disassortative mating which proposes that perceivers prefer targets that are opposite to them in terms of sex typicality (Seyfried & Hendrick, 1973). For example, heterosexual men who see themselves as sex-typical and take on the role of the masculine partner, are therefore likely to seek a target that is able to take on the relationship role of the female, thus as our results showed are likely to have a higher attraction preference for feminine targets. This feminine target is said to signal fertility, youth and ability to reproduce. Our findings, however, do not support previous research which proposes that heterosexual women find masculine faces males more attractive (Cunningham et al., 1995; Johnston et al., 2001; Patzer, 2006; Penton-Voak et al., 2001).

If I were to assume that attraction preferences of sex-typicality were based on target sex, I would expect to find heterosexual men and homosexual women showing the same preference for female targets and heterosexual women and homosexual men showing the same preferences for male targets. Conversely, if I were to assume that attraction preferences of sex-typicality were based on perceiver sex then I would have expected to see that heterosexual men and homosexual men would show the same preferences, and heterosexual women and homosexual women would show the same preferences (Rieger et al., 2011). Findings do not provide full support for either the influence of perceiver sex or target sex on preference for sex typicality. Interestingly, regarding sexual orientation, results from this study show that regardless of sex, or sex typicality, there is no preference for masculine or feminine male targets and therefore no evidence which shows either opposites attract, similarities attract, or match in sex-typicality for male targets.

In summary, this is one of the first studies (aside from study 1 above) which addresses both homosexual and heterosexual men and women's preferences of attraction simultaneously using the three hypotheses set out. It is also, one of the first studies to

incorporate both self-perceived level of sex-typicality with attraction to targets level of sex-typicality for both sexes and sexual orientations. It appears from our results, consistent with Study 1, heterosexual men who perceive themselves as masculine find opposite targets (feminine females) most attractive.

2.14. Limitations

2.14.1. Sample Representation

Although I recruited a large number of participants for this study, more than that of Study 1, there were not equal numbers of participants in each of the four subgroups, heterosexual men, heterosexual women, homosexual men, and homosexual women, as there were in Study 1. Also, although the overall sample was much bigger than study 1, for three of the four analyses, the sample only doubled or so. In the future it may be beneficial to recruit for longer and adapt advertisement and recruitment methods to try and gather a more equal representation of homosexual and heterosexual men and women alongside larger numbers, for use in the analysis.

2.14.2. Number of stimuli composites

The number of stimuli composites used in this study was three – masculine, neutral and feminine. This was based on the stimuli used for the manipulation check. The use of only 3 stimuli composites (neutral, masculine, feminine), may have been contributing factor to the change in findings from study 1 to this study. More specifically, it may have contributed to the change in trend findings for self-perceived masculine homosexual women and a preference for feminine female targets. Study 1, although computer generated, employed the

use of 4 stimuli composites – super masculine, masculine, and feminine and super feminine. It may be beneficial in future studies to continue to use real life computer manipulated images but use a larger number of stimuli composites.

2.15. Overall Conclusions and Future Research

In summary, these are two of few studies to address attraction patterns of all homosexual and heterosexual men and women perceivers. It is also, one of the first studies to incorporate both self-perceived level of sex-typicality with attraction to targets level of sex typicality. It appears from our results, consistent with previous research (Kandrik & DeBruine, 2012), that heterosexual men who were most masculine found feminine females most attractive. Conversely, those heterosexual men who classified themselves as more feminine had a less strong preference for feminine female faces. There appeared, however, to be no findings to support a preference for sex-typicality in any male targets regardless of how the rater perceived themselves, nor anything from homosexual women for their preferred sex target (female). This research highlights the potential that other factors are involved in attraction patterns, as no conclusive confirmation for any of our hypotheses were found across the perceivers' sex or sexual orientation.

Further research will continue investigating the characteristics, patterns and mechanisms involved in attraction and attractiveness, examining both sexes and sexual orientations. It will combine the methods and design used in both studies 1 and 2, as well as taking into consideration the limitations from these studies also. Research will now look closer at the influence of hormonal changes on level of attraction to masculinity or femininity for homosexual and heterosexual women of both preferred and non-preferred sex targets. Based on findings from this research, in relation to ovulation, further research will endeavour

to explore whether attraction patterns and hormonal changes are the same independent of sex and sexual orientation or whether these effects vary across the groups. For women, ovulation phase and level of fertility should be examined using a biological method to determine more accurately the ovulation phase. Research should encompass knowledge from Study 1 and Study 2 regarding number of stimuli and type of stimuli to inform data collection methods.

Chapter 3 Influence of fertility cycle on attraction preferences of sex-typicality in heterosexual and homosexual women

3.0. Abstract

A hypothesis is that during peak times of women's fertility, they show increased attraction to masculine males. In the past this has been examined in heterosexual women. However, if this is an evolutionary robust pattern, then such an increased preference for male masculinity during peak fertility could also happen in homosexual women, even if homosexual women prefer, on average, female femininity over male masculinity. I assessed across both heterosexual (N = 20) and homosexual (N = 20) women their attraction to masculine and feminine male and female faces. I did this twice, during times of high and low fertility (by using a home test kit to detect high levels of urinary luteinizing hormone). as an indicator of ovulation). Heterosexual women preferred masculine male faces more so than homosexual women but, unexpectedly, heterosexual women's preference for masculine male faces was stronger during times of low fertility. Homosexual women preferred in some analyses feminine female faces more so than heterosexual women; however, women in general, and heterosexual women in particular, showed decreased attraction to feminine female faces during high fertility. Overall, results did not suggest that fertility increases women's attraction to male masculinity, regardless of their sexual orientations, nor was there compelling evidence that women's fertility increases any preferences based on sexual orientation.

3.1. Introduction

There is a large amount of evidence which suggests that heterosexual women have higher attraction preferences for males with sex typical (masculine) faces as opposed to sex atypical (feminine) faces (DeBruine et al., 2006; Ekrami, et al., 2020; Fink & Penton-Voak, 2002; Johnston et al., 2001; Little et al., 2008; Niu & Zheng, 2020b). Sex-typicality in male facial features (masculinity) is characterised by prominent features such as prominent chins, eye brown and cheek bones (Little et al., 2010; Penton-Voak et al., 1999; Penton-Voak & Perrett, 2000). Masculinized faces are commonly linked to higher levels of testosterone which promotes the growth of sexual characteristics deemed as more dominant, physically stronger. Males with more masculinised faces are reported to have a greater health and stronger immune systems than those males with more feminine faces (Ditzen et al., 2017). Conversely however characteristics relating to higher testosterone are also linked to negative attributes such as lack of provision and support postproduction of offspring as well as aggression and reduced commitment (Oosterhof & Todorov, 2008). Overall, the positive influences of male sex-typicality on women's attraction patterns have been more thoroughly studied than the negative effects and have been more closely linked to other influences of women's attraction preferences for males.

Alongside general heterosexual women's preferences for male sex typicality (masculinity in males), several studies have demonstrated cyclic hormonal variation in women's attraction preferences (Gangstead & Thornhill, 2008; Gildersleeve et al., 2014; Jones et al., 2008; Johnston et al., 2001). An innate drive that may be accountable for attraction preferences in heterosexual women is the menstrual cycle; with research identifying that fertility levels are positively associated with heterosexual women's attraction preferences for male sex typicality. That is, heterosexual women report a greater preference for sex-typicality in male faces when they are most fertile (during the ovulatory phases of the

menstrual cycle), compared to when fertility levels are relatively low (Ditzen et al., 2017; Frost, 1994; Harris, 2013; Haselton & Gangestad, 2006; Johnston et al., 2001; Jones et al., 2005, Jones at al., 2008; Little et al., 2008; Little et al., 2010; Lukaszweski & Roney, 2000; Penton-Voak et al., 1999; Penton-Voak & Perrett, 2000; Vaughn et al., 2010; Welling et al., 2008b; Wood et al., 2014). Similar results have also been found for heterosexual women's preferences for sex-typicality in male voices (deeper pitch), body shape (build), height (taller), gait (body movement) and facial hair (beards) during the fertile phase of the menstrual cycle (Puts et al., 2012).

For evolutionary psychologists, the theories around heterosexual women's attraction preference changes across menstrual cycle levels has received an increased amount of attention over the last 20 years. The variation in heterosexual women's attraction preferences across fertility cycle was termed by Gangestad, Thornhill and Garver-Apgar (2005) as the Ovulatory Shift Hypothesis. This hypothesis suggests that women are attracted to masculine characteristics which signal high genetic quality males who would provide genetically superior offspring on high-fertility days (follicular) as opposed to low fertility days. Largely it is argued that preference changes for masculinity across the fertility cycle are a result of sexual selection and human mating (Fink & Penton-Voak, 2002; Grammer et al., 2003), and that links between fertility and women's attraction preferences to male sex typicality, may be an evolutionary adaptive behaviour, as it is likely to increase offspring survival and success, and is only effective during times of ovulation (Buss & Schmitt, 2011; Gangstead & Thornhill, 2008; Kenrick, Maner & Li, 2005). Penton-Voak and colleagues (1999) argue that women have evolved mechanisms which lead them to find sex-typicality in male faces more attractive at their peak fertility phase. They argue that changes in preference towards masculine male faces during levels of high fertility is potentially an adaptive shift women have adopted in order to function in a way which increases their likelihood to conceive and

produce superior offspring at the appropriate time during their reproductive cycle. It can be assumed that women's fertility shifts in preference for male sex typicality ensures women have an advantage in selecting the most suitable partner. Thus, when in high fertility, when the likelihood of conception is high, women prefer sex-typical males who signal high-quality traits and intra-sexual competitiveness (Ditzen et al., 2017). Conversely, when a woman may have already conceived or is less likely to conceive, they show a preference for a male who is sex atypical and signals support, and high investment in offspring (Jones et al., 2008). These behaviours are also in support of the Dual Mating Strategy Hypothesis which argues heterosexual women are more likely to prefer a male target who display cues of reproductive fitness (sex typicality) when in high fertility, as it increases quality offspring likelihood (Batres et al., 2020; Jones et al., 2005; Penton -Voak et al., 1999) but when in low fertility prefer males displaying cues of pro-sociality (sex atypicality), as it increases likelihood of males who invest in resources and time with offspring (Jones et al., 2005; Weisberg & Kim, 2018).

Although there is a plethora of research to date which supports the Ovulatory Shift Hypothesis for heterosexual women's preference for male facial sex typicality during high fertility, a handful of more recent research with large sample sizes, shows contradictory evidence (Harris, 2013; Marcinkowska et al., 2016; van Stein et al., 2019). Findings from these studies suggest there is no significant influence of hormonal cycles on women's preferences for male masculinity, and thus fertility level on women' preferences for male facial sex typicality. However, it has been argued by Jones et al. (2018) that these results were not conclusive and could have been a result of the design of the studies, as opposed to there being no effect of menstrual cycle and fertility on preferences, all but one of these studies employing a between-subjects, as opposed to a within-subject, study design. However, the one study which did employ a within-subjects design (van Stein et al., 2019)

also found contradictory evidence, with findings showing no support for a preference for male masculinity during the high fertile phase of the menstrual cycle (van Stein et al., 2019, this study and its findings are discussed in more depth in the *Determining fertile level* section below).

More recently, Jones et al. (2018) conducted the largest-ever longitudinal study (*N = 584*) exploring hormonal correlates of heterosexual women's preferences for male facial sex typicality, using a within-subjects design. Participants completed three blocks of test sessions, with each of these blocks consisting of five weekly test sessions. Hormone levels were determined by a saliva sample via passive drool for each test completed. They used real life computer manipulated photos of males and morphed them at a 50% more feminine and 50% more masculine than the average protype face. Women completed two face-preference tests, one for short-term relationship attractiveness preferences (single date, spur of moment, affair or one-night stand), and another for long-term relationship attractiveness preferences (move in with, would leave current partner for, someone you would want to marry). In each of the two face-preference tests women were shown 10 pairs of male faces, consisting of masculine and feminine version of each image. They had to indicate which image in the pair they had a preference for and showing the strength of that preference by selecting from the options, "slightly more attractive," "somewhat more attractive," "more attractive," and "much more attractive". Face-preference test order was randomised in each session and face presentation in each test session was also randomised. Results showed no significant evidence that women's preferences for facial masculinity were associated to changes in women's hormonal status (Jones et al., 2018).

Despite study design changes (being longitudinal, using a large sample size, and employing the use of a within-subjects study design) (Jones et al., 2018), these results were consistent with more recent research which, for instance, found no evidence that oral

contraception decreases a women's preferences for male masculinity (Marcinkowska et al., 2019). Interestingly, women's changes in general sexual desire but not their desire for uncommitted sexual relationships, were correlated with changes in their hormonal status. It was also confirmed that women showed a strong preference for male sex typicality when attractiveness was assessed for a short-term relationship as opposed to a long-term relationship (Jones et al., 2018). Thus, highlighting the potential influence of hormonal shifts in heterosexual women's mating and mating preferences, and potential evidence for adaptive shift mechanisms. However, this recent research could not conclude that women's hormonal shifts relate to an increase in preferences for male masculinity in any predicted direction.

Moreover, it is unknown whether this shift in preference, is an adaptive behaviour just for heterosexual women, or whether it could also happen in homosexual women and if so, if it happens in an adaptive or non-adaptive direction. That is, perhaps homosexual women shift to a stronger attraction preference towards male sex typicality (masculinity) in their fertile phase (even if they have a general preference for females) which is potentially adaptive as it could increase the likelihood of their mating success. However, it is also possible that during their fertile phase, homosexual women increase their attraction to the sex-typicality of their preferred sex (stronger attraction to feminine females) which would enhance the effect of their sexual orientation, but not be evolutionarily adaptive. Glassenberg et al. (2010) explored homosexual women preferences towards both male and female target sex typicality in general, but they did not test for hormonal influences. Results showed that homosexual women had a significantly stronger preference for sex-typicality (femininity) in female faces, than sex-atypicality (masculinity) in female faces. Sex-typicality in female facial features is characterised by tall, wide eyes, full lips, thick eyebrows and high cheek bones as well as small chins (Cunningham et al., 1995; Johnston, 2006; Johnston & Franklin 1993; Lee et al., 2013; Little et al., 2007b; Marcinowska et al., 2014; Perrett, May & Yoshikawa, 1994;

Welling et al., 2008a). These characteristics are preferred over sex-atypical female faces (masculine) as they signal females who are healthy, fertile, good nurturers and have a high reproductive success (Gangestad & Scheyd, 2005; Marcinkowska et al., 2017).

Glassenberg et al., (2010) however also showed that homosexual women have a significantly stronger preference for sex-atypicality (femininity) in male faces, compared to sex typicality (masculinity). Although this is the converse finding to the most widely known ideology that facial sex-typicality in males is preferred, a women's preference for feminine male faces has also been demonstrated for heterosexual women (Perrett et al., 1998; Penton-Voak et al., 2003). Male facial sex atypicality (femininity) is characterised by smaller jawbone, smaller nose, shortened and softened facial bones, larger eyes and smaller lips (Penton-Voak et al., 1999). A preference for male sex atypicality could be driven by the possibility that sex-typical male faces could also signal disadvantages to the woman, including that sex-typical males are too dominant, aggressive, less honest, and less likely to invest in offspring, and thus less desirable (Ditzen et al., 2017). Feminine male faces, however, could signal positive traits such as honesty, less dominance, more enthusiasm, and more investment in offspring and parental care (Perrett et al., 1998). Thus, it is a possibility that not only femininity in femles, but also femininity in males, may signal features that indicate mate quality, and mate desirability. Overall, however, according to past research, once in a high fertile phase, women tend to shift towards male sex typicality (masculinity) and not male sex atypicality (femininity).

To my knowledge, there are no studies to date that explore the influences of fertility cycle shifts on attraction preferences towards male targets across women of different sexual orientation (i.e., homosexual women' preferences for male targets has not been explored). Nor are there any studies which explore the impacts of the fertility cycle shifts for preferred sex targets for homosexual women – thus preferences for female targets. That is, across

existing studies the research exploring fertility levels and attraction preferences has focused on heterosexual women, and their preferred sex (male) only, whilst homosexual women and their preferred sex (females) remain unexplored (Ditzen et al., 2017; Frost, 1994; Harris, 2013; Haselton & Gangestad, 2006; Johnston et al., 2001; Jones et al., 2005; Jones at al., 2008; Jones et al., 2018; Little et al., 2008; Little et al., 2010; Lukaszweski & Roney, 2009; Marcinkowska et al., 2016; Muñoz-Reyes et al., 2014; Penton-Voak et al., 1999; Penton-Voak & Perrett, 2000; Vaughn et al., 2010; Wood et al, 2014; Scott et al., 2014; Welling et al., 2008b; Zietsch et al., 2015). It is unknown whether the women's menstrual cycle, fertility levels, and attraction pattern shifts are observed independent of sexual orientation, and whether hormones and attraction pattern preferences are a potentially adaptive behaviour for women who identify as homosexual or just for those who identify as heterosexual. Therefore, it is important to explore whether high and low fertility levels effect preferences for sex-typicality in preferred sex targets (males for heterosexual women and females for homosexual women) in addition to attraction patterns towards less preferred sex targets (females for heterosexual women, males for homosexual women).

3.1.1. Determining fertile level

Most research to date, exploring menstrual cycle effects on women's behaviours, use only self-report (forward and reverse cycle day method and average length of menstrual cycle) to determine high and low fertile phases in the menstrual cycle. However, researchers have questioned the strength in empirical evidence for menstrual cycle changes in attraction preferences as findings appear inconsistent. Researchers argue whether the inconsistent findings are a result of inadequate methods of determining when a woman is in the high and low fertile phase of her menstrual cycle (Blake et al., 2016; Gangestad et al., 2016; Jones et

al., 2016; Thomas et al., 2021). Researchers exploring the validity of self-reporting measures for menstrual cycle have found that women have memory biases in reporting of cycle length and menstruating, natural variations in observed cycle length across and within women over time, as well as influences of contraception. There appears to be a general inaccuracy in women reporting menstrual cycle length and days menstruating, which varies across age, relationship status and economic status too (Blake et al., 2016; Jukic et al., 2008; Small, Manatunga & Marcus, 2007). Blake et al. (2016) proposed to standardize the way in which the fertile point was measured in a menstrual cycle, by using urinary tests which detected luteinizing hormone (LH). There were no specific details on the length of time between LH surge detection (high fertility) and completion of a study suggested by Blake et al. (2016). However, more recently research has explored the importance of time when using LH surge to determine a woman's fertility and influence on study data (Lobmaier & Bachofner, 2018). It is believed that if a woman completes a study too late (i.e., after 14 hours) after an LH surge is detected, there is a strong chance that the fertile window has already closed as each women's window of fertility varies and the accuracy of the impact of the high fertility on the study is reduced (Alliende, 2002; Alliende, 2013; Direito et al., 2013; Scarpa, Dunson & Giacchi, 2007). Therefore, in order to see an accurate reflection of the effects of the menstrual cycle and high fertility in attraction preferences, women should be tested as soon as possible after the detection of the LH surge (within 12-14 hours of surge detection test) (Lobmaier & Bachofner, 2018).

Two studies have employed the use of both the self-report method to determine menstrual cycle point and urinary tests to detect LH surge (Durante, Griskevicius, Simpson, Catú & Li, 2012; van Stein et al., 2019). Durante et al. (2012) explored heterosexual women's attraction preferences and perceptions of male characteristics (attractiveness, charismatic, reliable, nice, dominant, adventurous, charming) and their likelihood of being

committed and devoted future fathers. Participants took part in the study once the researcher had confirmed that they had a positive result of an LH surge. Results showed an effect of high fertility on attraction preferences and preference behaviours in potential fathers. Women in high fertility showed a preference for charismatic, dominant, adventurous, and attractive characteristics as signals of likelihood of males being committed and devoted future fathers, but no preference for reliable or nice characteristics. Van Stein et al. (2019) carried out a longitudinal study of the effects of the ovulatory shift in heterosexual women human sexuality, sexual desire, body image, sociosexual orientation and mate preference (preference for male characteristics which signal good gene traits (GGT). Data were only included for those who took the questionnaire on the day of a positive LH surge. Support was found for the effects of high fertility in sexual desire, self-perceived body image. During high fertility women had the strongest level of sexual desire and a significant increase in perception of body image. However, no support was found for the effects of high fertility for sociosexual orientation or for mate preferences of masculine male characteristics (GGT). This supports the argument by Roney and Simmons (2013), where high fertility was linked to more a more general motivation towards an increased level sexual activity when chances of conception are likely.

Alongside the importance of timings between high LH/LH surge detection and taking part in research (to ensure that the cycle point is accurate and thus interpretations of the effects of the menstrual cycle on behaviours are accurate) there is a debate as to whether just testing for LH alone is enough to accurately detect the high fertility phase of the menstrual cycle. It is also important to consider the use of other hormonal measurements which can affect menstrual cycle such as the changes in estradiol and not just LH alone (Marcinkowska, 2020). Although aware of the importance of this, for practicality and financial limitations, this study only tested for high LH/LH surge.

At the time of writing of this thesis chapter, patterns have only been explored with heterosexual women's fertility levels and attraction preferences towards sex-typicality (masculinity) in males faces, whilst homosexual women remain unexplored. To our knowledge, the most recent research (discussed above), has controversially highlighted that women's preferences for facial sex-typicality in males is not related to fertility cycles. This is providing contradictory evidence to the previous widely known belief that high fertility predicts a stronger preference for sex-typical male faces (Jones et al., 2018). This contradictory evidence could be due to the potential failings in previous work, as in the past, fertility status was only usually gathered using self-report (Blake et al., 2016; Gangestad et al., 2016; Little & Jones, 2012; Scott et al., 2014).

The current study therefore aimed to counteract the issues raised by Jones et al. (2018) as well as concerns around the use of self-report menstrual cycle methods and employed a sample of heterosexual and homosexual women, tested on two occasions using urinary LH surge, to determine fertility level. The present study also addresses the concerns raised by Libmaier and Bachofner (2018) regarding the critical timing between LH surge, positive ovulation test (high fertility) and taking part in a survey (as discussed above), as participants take the survey straight after a positive ovulation test and LH surge detection (further details provided in the methods section).

Moreover, this study is the first empirical research to date which explores whether there is an adaptive shift in both heterosexual and homosexual attraction preferences across the menstrual cycle, and whether there is an influence of fertility levels on women's preference for sex-typicality in preferred sex targets (males for heterosexual women and females for homosexual women) in addition to shifts in preferences for less preferred sex targets (females for heterosexual women and males for homosexual women).

3.2. Research Hypotheses

This study tested two hypotheses, exploring levels of fertility and attraction patterns to female and male targets. It examined whether changes in fertility levels and attraction preferences are adaptive in all women, independent of sexual orientation, or whether hormonal shifts depend on sexual orientation and are influenced by sexual orientation. The following hypotheses were formalised.

Hypothesis 1. Adaptive shift independent of sexual orientation: Heterosexual women will show an increased attraction to masculine males during high fertility compared to low fertility. Homosexual women would also show an increased attraction to masculine males during high fertility compared to low fertility. If Hypothesis 1 were confirmed, and attraction preferences were adaptive, I would not expect there to be a shift in preference towards femininity in females across either heterosexual or homosexual women.

Table 10
Graphic representation of hypothesis 1, showing adaptive shift independent of sexual orientation.

			Sexual Orientation of Perceiver	
		Sex of Target	**Heterosexual**	**Homosexual**
Fertility Level	**High**	**Female**	No shift in preference for femininity	No shift in preference for femininity
		Male	Increased attraction to masculinity	Increased attraction to masculinity
	Low	**Female**	No predicted preference	No predicted preference
		Male	No predicted preference	No predicted preference

Hypothesis 2. Shift dependent on sexual orientation not adaptive behaviours: Heterosexual women would still show an increased attraction to masculine males during high fertility compared to low fertility. However, homosexual women would show an increased attraction to feminine females during the high fertility compared to low fertility. If Hypothesis 2 were confirmed, I would not expect a shift in attraction preference for either heterosexual or homosexual women towards sex-typicality of the less preferred sex, during high or low fertility.

Table 11
Graphic representation of hypothesis 1, showing adaptive shift dependent of sexual orientation not adaptive behaviours.

			Sexual Orientation of Perceiver	
		Sex of Target	**Heterosexual**	**Homosexual**
Fertility Level	**High**	**Female**	No shift in preference for femininity	Increased attraction to femininity
		Male	Increased attraction to masculinity	No shift in preference for masculinity
	Low	**Female**	No shift in preference for femininity	No predicted preference
		Male	No predicted preference	No shift in preference for masculinity

Although not hypothesised, I further explored the three mating mechanisms discussed in Chapter 2, Studies 1 and 2, which focus on the influence of perceiver's level of masculinity or femininity. The proposed mechanisms suggest that attraction to a target is affected by self-reported level of masculinity and femininity, and include three competing hypotheses: similarities attract, opposites attract and a match in sex typicality attracts. As these three competing hypotheses are complex, especially in addition to proposed hormonal influences

(which were the main focus of the present study), I did not phrase specific hypotheses around them in the present study, but rather, considered them in additional exploratory analysis.

3.3. Methods

3.1.1. Participants

Participants were recruited via purposive sampling, through a range of advertising methods on a social networking sites, via email to various universities including the University of Essex, Anglia Ruskin University and University of East Anglia and a range of LGBT organisations in Suffolk, Norfolk and Essex. Purposive sampling was the recruitment method used, recruiting participants based on intent and to serve purpose to a specific element of the research (Merriam, 2009). This sampling was most relevant for this research as I was studying selected groups, heterosexual and homosexual women (Bernard, 2000). Data collection methods included self-report measures, questionnaire, and a facial stimuli experiment.

There was not sufficient information in the literature on the effect size needed to run a meaningful power calculation for sample size, so I modelled our sample size numbers on those similar in relevant literature (Ditzen et al., 2017 *(N = 48)*; Haselton & Gangestad, 2006 *(N =38)*) and collected as much as data as possible.

Forty women completed the survey. Within the sample 20 women identified themselves as heterosexual and 20 women identified themselves as homosexual. Advertisements specifically asked for heterosexual and homosexual women. I wanted to try and have equal numbers in each of the two groups for analysis so tailored advertisements where needed during data collection. When the participant expressed an interest in taking part I would ask them to reread the advertisement to check they fit with the requirements provided

and if so they could continue. Overall ages ranged from 19-48 (M = 28.43, SD = 7.54). Ages did not statistically differ between sexual orientation, (Heterosexual women, M =29.50, SD = 7.29) (Homosexual women, M = 27.35, SD = 7.81), t (37.83) = .89, p = .37; MD = 2.15.

Due to focus of fertility levels in women, exclusions during recruitment included those who were post-menopausal, pregnant, had known fertility irregularities and those who were self-classified as a transgendered woman or a transgendered man. The exclusion for transgendered women was in place because these individuals were male at birth and therefore do not have ovaries or a uterus and do not ovulate. The exclusion for transgendered men was in place because these individuals are often involved in hormone therapy. Hormone therapy for transgendered men involved taking supplements such as exogenous testosterone, which can suppress ovulation and alter ovarian histology (Cheng et al., 2019).

Restrictions on ages during recruitment were in place, the lower limit of 18 was essential for the purposes of consent. The upper age limit of 50 was in place due to levels of fertility and menstrual cycles. The average age of menopause in the UK is 51 (NHS, 2021), therefore age was asked and pre-screened. Individuals above 50, or those going through perimenopause or menopause did not take part.

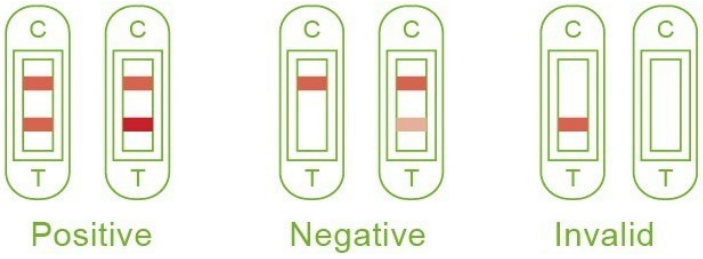
3.3.2. Fertility Level Measure

Fertility measures consisted of a biological experimental method with urinary ovulation tests (Blake et al., 2016; Durante et al., 2012; van Stein et al., 2019). To determine a biological level of fertility and point in the menstrual cycle, luteinizing hormone (LH) was determined via urinary sample and a surge detection device (ovulation test). Low LH means the woman is not in a fertile phase of the menstrual cycle, high LH means the woman is in a

high fertile phase of the menstrual cycle, a detection of LH surge means the woman is in the peak fertile phase of the menstrual cycle. Level of LH was assessed by using Home Health UK Ovulation Test Kit, Midstream Sticks (https://homehealth-uk.com/, 2021).

A laboratory test has shown the ovulation tests to be over 99% accurate in detecting the LH surge (high fertility). The sensitivity of the LH detection in Home Health UK Ovulation Test Kit, Midstream Sticks is 20mIU/ml (high sensitivity) measured against the standard for urinary LH and FSH for Bioassay. It is noted that laboratory bioassay measurements may be more sensitive, but this was not an option due to financial constraints. Evidence does show high accuracy for highly sensitive (20mIU/ml) urinary ovulation test kits (Leiva et al., 2017). When the LH surge is present there are two lines present, the "Test" (T) line (lower of the two lines in the white area) will be almost as dark as or darker than the "Control" (C) line (upper line in the white area). If a light line was present in the “Test” window, then this would show a low fertile phase of the menstrual cycle. Finally, if there were no lines present in the “Test” window or the “Control” window this means the test is invalid and the participant would need to take the test again (Figure 8).

Figure 8
Home Health UK One Step Midstream Ovulation test results. Image obtained from, http://homehealth-uk.com/all-products/ovulation-midstream-tests/#tab_description



Further to this, there is no consensus as to the influence of oral contraception on women's attraction preferences to sex-typical (masculine) males (as discussed in Chapter 1 - General Introduction). As oral contraception changes a women's menstrual cycle, they could in theory change preferences in a way that reflect change in fertile phase. Previous research has shown highly conflicting patterns with oral contraception: weakening preference of sex-typicality in males (Little et al., 2002; Feinberg et al., 2008), strengthening preference for sex-typicality in males (Cobey et al., 2015), or having no effect on preference of women's attraction to sex-typicality in males (Jones et al., 2018; Marcinkowska et al., 2019). Therefore, by using a biological urinary method of determining fertility level (LH surge), the influence of contraceptive use and any effects on hormones and fertility cycles can be captured.

3.3.3. Self-Report Measures

Sexual Orientation. A Kinsey-type scale was used to assess both sexual orientation and sexual attraction (Kinsey, Pomeroy & Martin, 1948). The scale ranges from 0 = exclusive orientation/attractions to opposite sex, to 3 = equal orientation/attractions to both sexes, to 6 = exclusive orientation/attractions to same sex. In both heterosexual and homosexual women the correlation between sexual orientation and sexual attraction was 0.6 or higher, because of this I averaged them into one composite score. From this an overall average score was created between the two variables, these were then set into categories of heterosexual (1) and homosexual (2) for use in the main analysis. Based on the scores from the Kinsey scale anyone who was between 0 and 2 were heterosexual and 4 and 6 were homosexual.

Sex Typicality. The questionnaire was adapted from Rieger et al. (2008). The main function of the self-reported measures questionnaire was to gain knowledge of participants self-reported levels of childhood and current life masculinity and femininity.

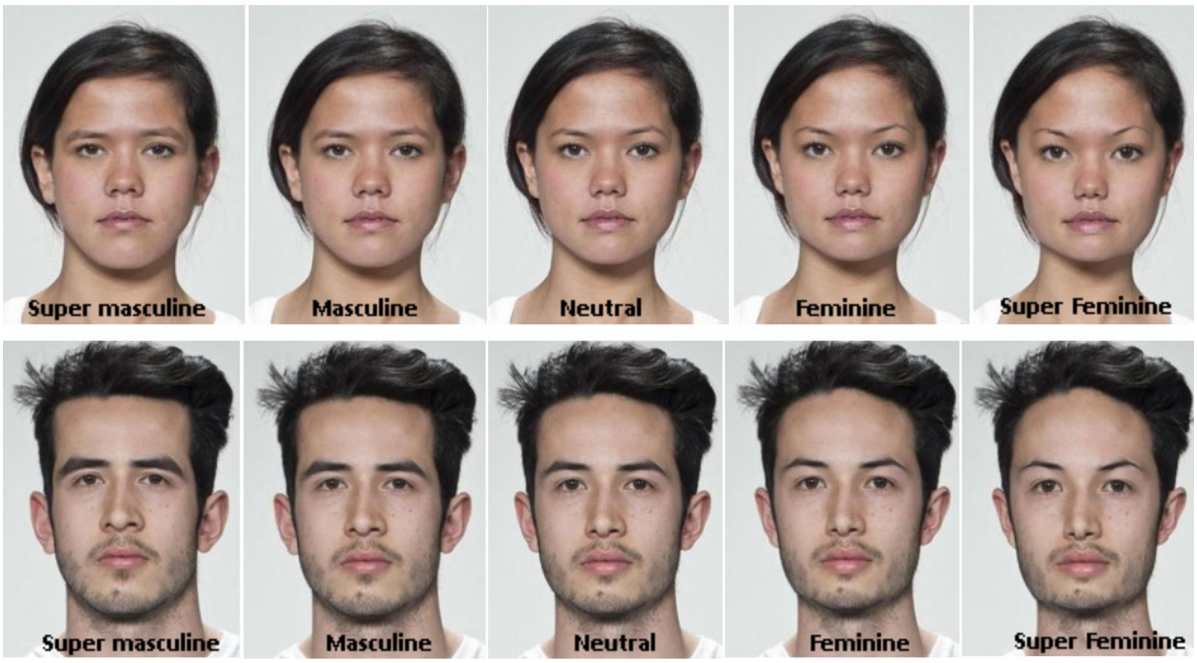
Childhood sex typicality was assessed using the Childhood Gender Nonconformity Scale with eight questions (Bailey, Finkel, Blackwelder, & Bailey, 1996; Rieger et al., 2008). An example of a female version item is, "As a child I assumed that most people saw me as less masculine than other girls" and an example of a male version item is, "As a child my mannerisms were more masculine than those of most boys of my age". Adulthood sex typicality was assessed using the Continuous Gender Identity Scale with seven questions tailored for each sex (Bailey et al., 1996; Rieger et al., 2008). An example of a male version item is, "I assume most people see me as more masculine than other men" and an example of a female version item is, "I consider myself to not be very masculine in my behaviours and interests". Questions were answered using a 7-point Likert scale (1 = Strongly Disagree to 7 = Strongly Agree).

A reliability analysis using multivariate correlation was conducted on childhood sex typicality and current life sex typicality question items. Strong reliability was found for all childhood and adulthood measures, Cronbach's α exceeded 0.75. Averaged measures for childhood and adulthood sex typicality were correlated across heterosexual women, $p < .001$ $r = .72$ and homosexual women, $p < .001$, $r = .73$. As a result of this an overall average score was created between the two variables for use in the main analysis. All items were averaged in a way that higher scores mean higher sex typicality (femininity in females).

3.3.4. Facial Stimuli

Stimuli were real life computer manipulated images, and were created using the publicly available website, FaceResearch org which is owned and run by DeBruine and Jones (http://www.faceresearch.org/demos/transform). The stock images are real life images, the majority of the images have been manipulated into averages using Dr Bernard Tiddeman's (2015) PsychoMorph programme. PsychoMorph is available for download (http://users.aber.ac.uk/bpt/jpsychomorph/) and can also be used online (http://psychomorph.psy.gla.ac.uk/). Overall, there were 120 images generated, 65 for females and 55 for males. These 120 images were made up of five composites for the 13 available female faces and five composites for the 11 available male faces. First, I used an unmanipulated (neutral) version of each of these faces. Using the 'Face Transformer' images were then manipulated using the 'Transform dimension' function at a +50% which displayed the masculinized composite, +100% which displayed the super masculinized composite, at a -50% which displayed the feminized composite and -100% which displayed the super feminizes composite. This process created five images of each face, with each differed in sexual dimorphism (sex typicality), a) super-masculine, b) masculine, c) neutral, d) feminine, and e) super -feminine). All the faces were colour image files and were cropped to the same size. Figure 9 shows an example of the composites used in this study.

Figure 9
Real life, computer manipulated images created using FaceResearch org website. Five composite manipulations are displayed. Top line shows a female face manipulation and bottom line shows a male face manipulation at, super-masculine, and masculine, neutral, feminine, and super-feminine composites respectively.



3.3.5. Manipulation Check

A manipulation check was carried out on the computer-manipulated stimuli. The group of raters used for the manipulation check was a set of 328 participants of both sexes and varied sexual orientations, different to the raters of the main group who participated in the study. For each of the images shown, participants gave a rating of 1 – 7, with one corresponding to very masculine and seven to very feminine, based on their perceived masculinity-femininity. Individual scores for level of masculinity and femininity were then averaged for each stimulus and across participants (regardless of their sex or sexual orientation), producing an overall rating. Results indicated that feminine female faces were rated as significantly more feminine than masculine version of these female faces, $M = 0.6$,

SD = 0.89, *t* = 9.85, *p* <.0001 and that masculine male faces were rated significantly more masculine than feminine version of these male faces *M* = 0.82, *SD* = 0.64, *t* = 17.57, *p* <.0001.

3.3.6. Procedure

All participants opted in to take part in the study by responding via email to advertisements. Data collection for the initial 15 participants took place in the Psychology Lab at the University of Suffolk. Participants would use the bathroom facilities to complete the ovulation test (to detect high or low fertile point). The subsequent session and survey completion would occur when the participant detected the opposite fertile point to what they displayed the first session. If the participant displayed low fertility the first time, they would be invited back to test for high ovulation 10-14 days after the first day of their last period. If high fertility was not detected, they would come back every day to test until high was shown. If they showed high the first session, they would come back the week later, to complete a test to ensure low fertility and then complete the survey. Due to Covid-19, after the initial 15 participants, all subsequent data collection occurred at the participant's home address. Ovulation tests were sent to participants home address, the participants let the researcher know once they had arrived and once they had taken an ovulation test. Photos of the test were sent to the researcher to ensure correct interpretation of the test and to record the results. Participants completed the first survey regardless of level of fertility shown and then the subsequent survey when they detected the opposite fertility level to the first session.

At the start of the Qualtrics survey an information sheet was displayed where the participants provided informed consent and was asked to create a Unique ID number. Participants then had to complete some demographic questions, including gender, sex, sexual

orientation and self-perceived childhood and current life masculinity or femininity (sex typicality). Male and female images were separated into two blocks. The order of the blocks was randomised and the images within each block were randomised. Stimuli were presented on a white background and stood in the centre of the screen; this was regardless of the device used to complete the survey at approximately 100mm x 750mm.

For each target sex, all images and their compositions were shown in random order. All participants saw all five composites (super masculine, masculine, neutral, feminine, super feminine) of both male and females faces. Instructions were given at the start of each block to remind participants that they may think that they see the same face more than once but to rate each face independently. After each image, participants were asked three questions around attractiveness for both male and female images. It was stressed that they need to answer these questions even if they are not attracted to a specific target sex. The three questions asked for attractiveness were: How sexually attracted are you to this person? How sexually appealing is this person to you? How much would you like to date this person? The questions were answered using a 7-point Likert scale ranging from 1 = not at all, to 7 = very much. The survey took on average 20 minutes.

In both groups of raters (heterosexual women and homosexual women) the three ratings used for assessing target attractiveness were found to have a strong reliability and were all highly correlated, all Cronbach α's exceeded .90 and all *r's* exceeded .80. Because of this the three ratings were averaged to one overall component of attractiveness for each participant and each target.

3.4. Results

Main regression analyses were based on the two hypotheses that, 1) Adaptive shift in attraction preferences across fertility level, independent of sexual orientation and 2) Shift in attraction preferences across fertility level, dependent on sexual orientation not adaptive behaviours.

Raters and targets were treated as random effect (Zar, 1999). This approach represents a repeated measures design where each rater repeatedly evaluated the attractiveness of targets, and each target (which had a super-masculine, masculine, neutral, feminine, and super-feminine composite) was repeatedly evaluated by raters.

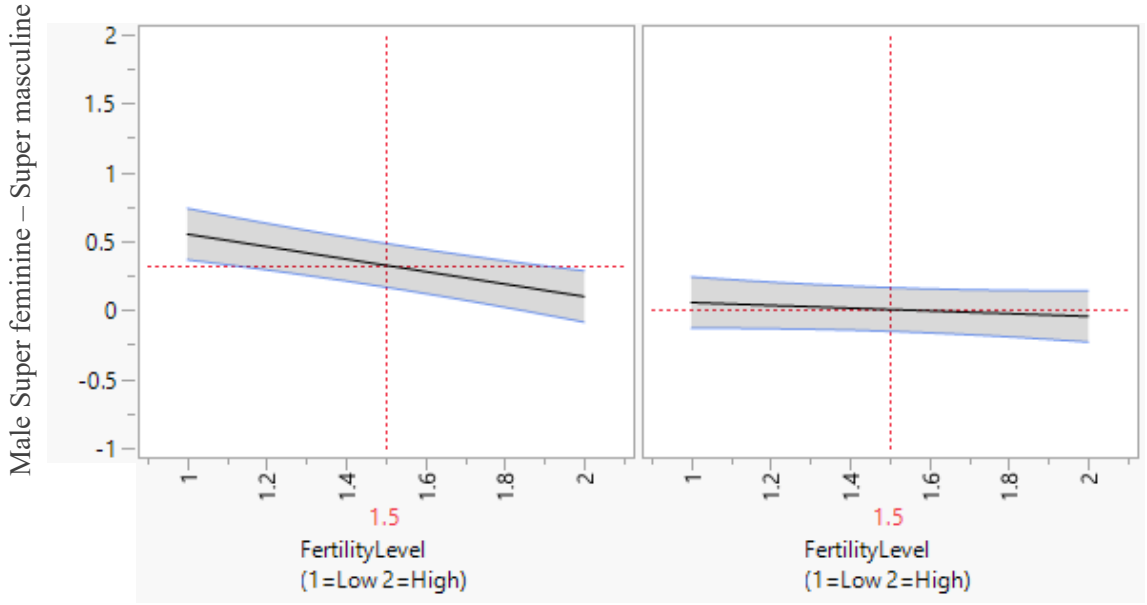
For male targets, a contrast score of attraction to super-masculine male faces versus super-feminine male faces was computed and a contrast score of attraction to masculine male faces verses feminine male faces was computed. The two separate contrast scores allowed for analysis comparing the 'super' stimuli as well as the 'medium' stimuli. For the contrast scores for male targets, masculine is positive and feminine is negative. Correspondingly, for female targets, a contrast score of attraction to super-feminine female faces versus super-masculine female faces was computed and a contrast score of attraction to feminine female faces versus masculine female faces was computed. Again, the two separate contrast scores allowed for analysis comparing the 'super' stimuli as well as the 'medium' stimuli. For the contrast scores for female targets, feminine is positive and masculine is negative. These contrast scores for rated attractiveness of targets were used as the outcome variables in the regression analyses. Predictor variables included raters' sexual orientation and fertility level (high and low). A further predictor of attractiveness evaluations was the interaction of the raters' sexual orientation and fertility level. With this interaction I tested whether attractiveness was affected by a combination of the raters' sexual orientation and fertility

level. For example, if heterosexual women are more attracted to masculine male faces than homosexual women during high fertility, a significant interaction should be detected. Analyses were conducted separately for male and female targets and were conducted separately for each contrast score. Thus, there were four analyses conducted overall (super-feminine versus super-masculine female targets, feminine versus masculine female targets, super-masculine versus super-feminine male targets and masculine versus feminine male targets).

I first considered results for male targets (super-masculine versus super-feminine and masculine versus feminine). For super-masculine versus super-feminine male targets, there was a main effect of sexual orientation, B = -.32, SE = .11, p = .01. Figure 10 indicates that, on average, heterosexual women show a preference for super-masculine over super-feminine male faces, whereas homosexual women did not show a strong preference. There was a main effect of fertility B = -.28, SE = .07, p = .0005. This meant that across heterosexual and homosexual women there was a preference for super-masculine male faces during low (rather than high) fertility. These main effects were qualified by a significant interaction of sexual orientation with fertility level, B = .35, SE = .14, p = .02. This interaction indicated that heterosexual women, more so than homosexual women, preferred super-masculine over super-feminine males faces in low fertility compared to high fertility (Figure 10).

Figure 10

Attraction to Super-masculine versus Super-feminine male faces for low and high fertility across heterosexual and homosexual women. Graph on the left shows heterosexual women and the graph on the right shows homosexual women's responses to Super-masculine versus Super-feminine male targets. Y axes represent the attraction rating to masculinity – femininity of the target, where minus represents super-feminine and positive represents super-masculine. X axes reflects level of fertility at time of rating, where 1 represents low fertility and represents high fertility. The line represents the change in attraction rating from point of low (1) to high (2) fertility.



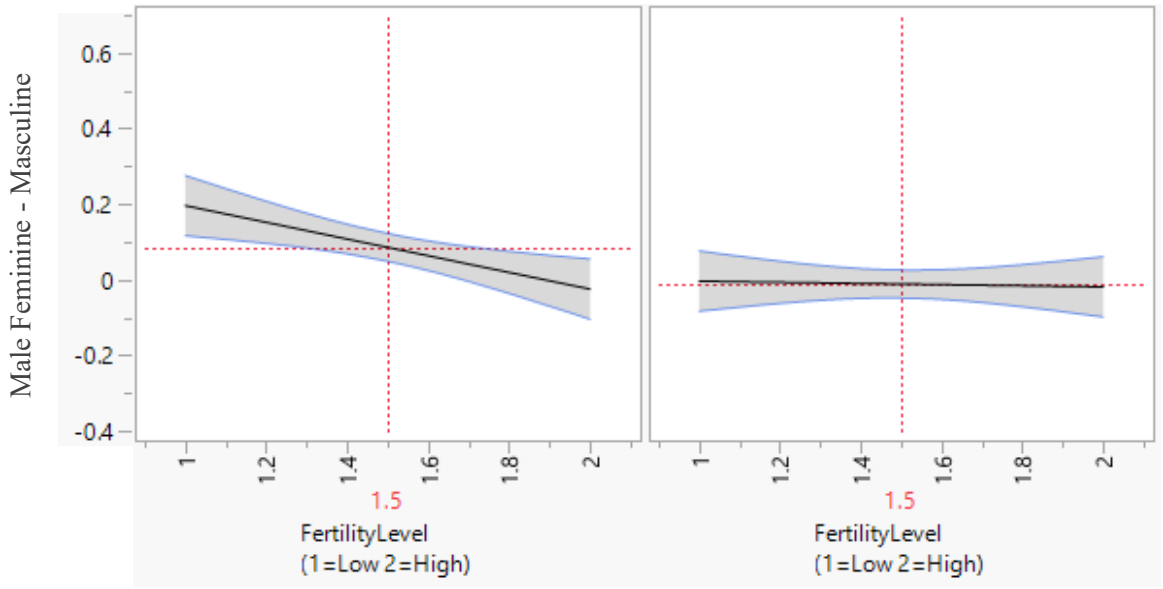
Heterosexual women Homosexual women

For masculine versus feminine male targets there was a main effect of sexual orientation, B = -.09, SE = .03, $p < .0001$. Figure 11 indicated that on average, heterosexual women showed a preference for masculine feminine over feminine male faces more so than homosexual women. There was also a main effect of fertility B = -.12, SE = .05, $p = .02$. This meant that across heterosexual and homosexual women, there was a preference for masculine over feminine male faces during low fertility rather than high fertility. These main effects were qualified by a significant interaction of sexual orientation and fertility level B = .21, SE = .10, $p = .05$. This interaction indicated that heterosexual women, in particular, showed a preference for masculine over feminine males faces in low fertility compared to high fertility, whereas homosexual women's preferences did not shift with fertility. Thus, findings for male

targets provide no support for either Hypothesis 1, an evolutionary adaptive shift, or Hypothesis 2, that preference across fertility is dependent upon sexual orientation (Figure 11). Findings for heterosexual women across menstrual cycle were converse to those predicted.

Figure 11

Attraction to Masculine versus Feminine female faces for low and high fertility across heterosexual and homosexual women. Graph on the left shows heterosexual women and the graph on the right shows homosexual women's responses to Masculine – Feminine male targets. Y axes represent the attraction rating to masculinity – femininity of the target, where minus represents feminine and positive represents masculine. X axes reflects level of fertility at time of rating, where 1 represents low fertility and represents high fertility. The line represents the change in attraction rating from point of low (1) to high (2) fertility.



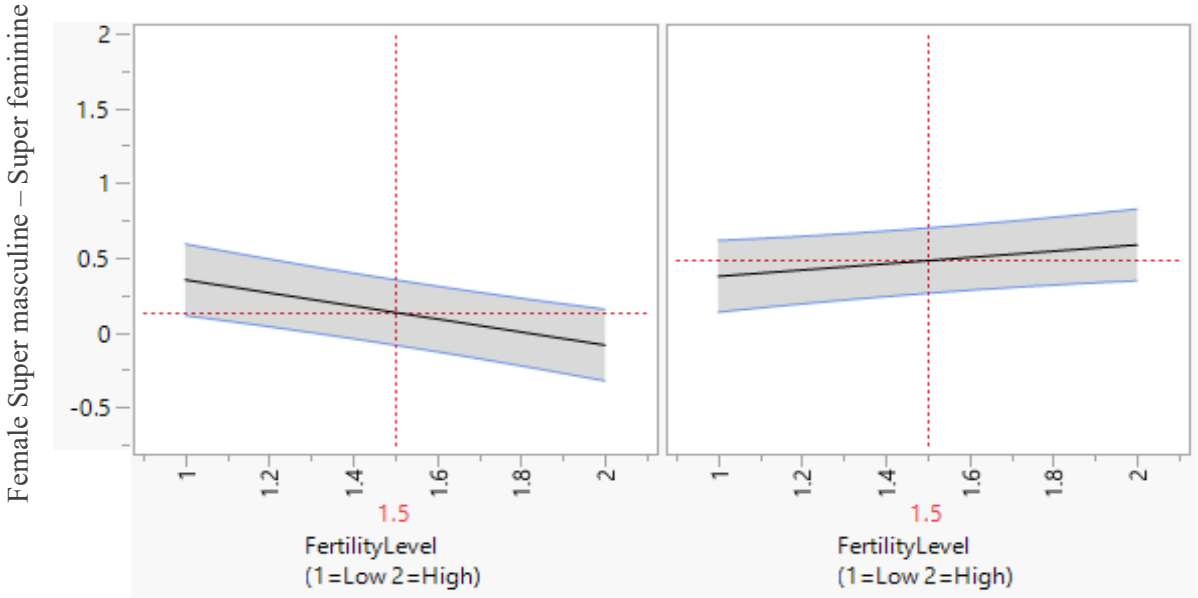
Heterosexual women Homosexual women

Corresponding analyses were conducted for female targets (super-feminine versus super-masculine and feminine versus masculine). For super-feminine versus super-masculine female targets, there was a main effect of sexual orientation, B = .35, SE = .15, p = .03. That is, in average, homosexual women had a stronger preference than heterosexual women for super-feminine female targets. There was no main effect of fertility, B = -.11, SE = .07, p = .13. That is, fertility level had no effect on attractiveness ratings across super-feminine

versus super-masculine female faces. A significant interaction was found for sexual orientation and fertility level, B = .65, SE = .15, $p < .0001$. This interaction indicted that heterosexual woman in particular, prefer super-feminine over super-masculine female faces more when they are in low compared to high fertility, whereas homosexual women preferred super-feminine faces more during high fertility, even though this preference was not strong (Figure 12). These findings show some limited support for Hypotheses 2, with homosexual women, that shifts in attraction preferences across fertility level, depend on sexual orientation and not being adaptive. Thus, findings suggest that preferences shift with respect to sexual orientation preferences, thus it enhances preference for preferred sex, specifically for homosexual women.

Figure 12

Attraction to Super-feminine versus Super-masculine female faces for low and high fertility across heterosexual and homosexual women. Graph on the left shows heterosexual women and the graph on the right shows homosexual women's responses to Super-feminine versus Super-masculine female targets. Y axes represent the attraction rating to femininity-masculinity of the target, where minus represents super-masculine and positive represents super-feminine. X axes reflects level of fertility at time of rating, where 1 represents low fertility and 2 represents high fertility. The line represents the change in attraction rating from point of low (1) to high (2) fertility.

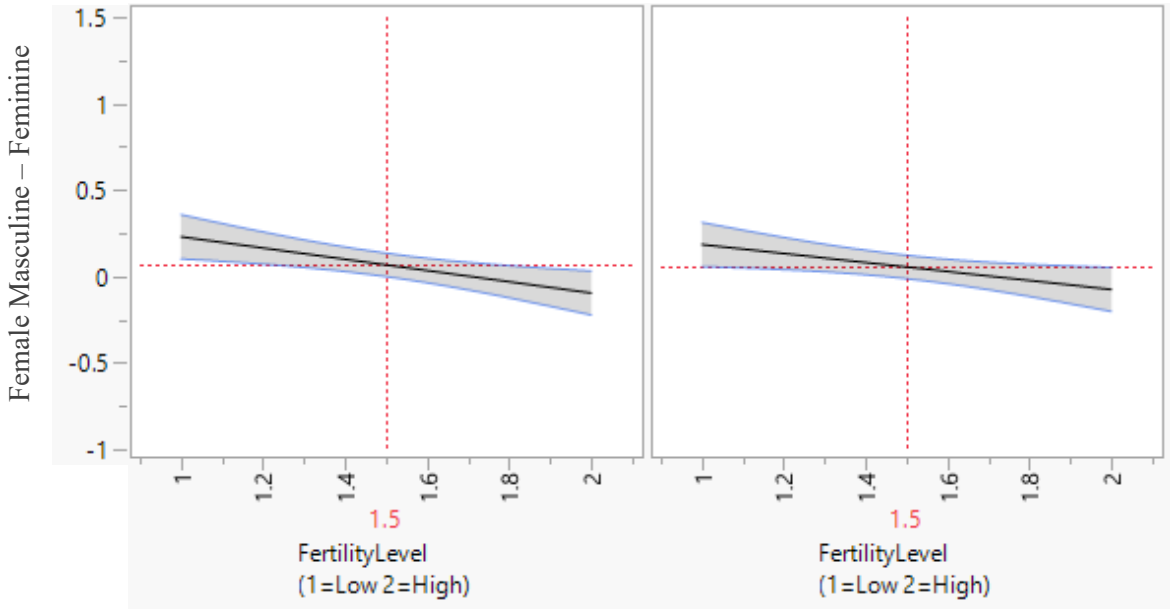


Heterosexual women Homosexual women

For feminine versus masculine female targets, there was no main effect of sexual orientation, B = -.01, SE = .05, p = .80. That is, sexual orientation had no significant effect on attraction ratings across feminine versus masculine female faces. There was a significant main effect of fertility, B = -.29, SE = .08, $p < .0005$. That is, across sexual orientations, there was a preference for more feminine rather than masculine female faces during low (rather than high) fertility. No significant interaction was found for sexual orientation and fertility level, B = .06, SE = .15, p = .67. These findings did not support either of the hypotheses, as there were no predicted shifts to enhance the effect of sexual orientation, nor was there any adaptive patterns (Figure 13).

Figure 13

Attraction to Feminine versus Masculine female faces for low and high fertility across heterosexual and homosexual women. Graph on the left shows heterosexual women and the graph on the right shows homosexual women's responses to Feminine –Masculine female targets. Y axes represent the attraction rating to femininity-masculinity of the target, where minus represents masculine and positive represents feminine. X axes reflects level of fertility at time of rating, where 1 represents low fertility and 2 represents high fertility. The line represents the change in attraction rating from point of low (1) to high (2) fertility.



Heterosexual women Homosexual women

3.4.1. Exploratory Regression Analysis

Regression models for additional exploratory analyses were computed with the same main effects and interactions as the main analysis detailed above but further included the rater's on level of sex atypicality as a main effect, plus all interactions of rater's own sex typicality with sexual orientation, fertility level, and their combination. None of these interactions of raters' sex typicality with other variables were significant, with *p* values ranging from .29 to .98 and B values ranging from .00 to -.14. This meant that raters' own sex typicality did not further affect their attractiveness ratings.

3.5. Discussion

This study investigated two hypotheses: Hypothesis 1 investigated whether there is an evolutionary adaptive shift in women's preference across fertility level, where high fertility enhances attraction to masculinity in males, regardless of women's sexual orientations. Hypothesis 2 investigated whether shifts in attraction preferences are dependent on sexual orientation and thereby not necessarily adaptive, with fertility enhancing sexual orientation preferences, and thus towards masculine males for heterosexual women and towards feminine females for homosexual women. Neither of these hypotheses were conclusively supported in the present study. Instead, the results unexpectedly showed that heterosexual women's preference for masculine male faces, was stronger during low, rather than high, fertility. Furthermore, even though homosexual women showed a weak preference for feminine female faces during high fertility in some analyses, the more robust finding was that women in general showed decreased attraction to feminine female faces during high fertility.

The results of the current study therefore did not support previous adaptive shift hypotheses (Ovulatory Shift Hypothesis). This hypothesis suggests women have an evolved mechanism where they find sex-typicality in male faces (masculinity) more attractive at their peak fertility phase (Fink & Penton-Voak, 2002; Gangestad et al., 2005; Grammer et al., 2003; Jones et al., 2005; Penton -Voak et al., 1999). This mechanism is considered beneficial as it would increase likelihood to conceive and produce superior offspring at the appropriate time during a reproductive cycle (Buss & Schmitt, 2011; Ditzen et al., 2017; Gangstead & Thornhill, 2008; Jones et al., 2005; Kenrick, Maner & Li, 2005).

The present findings, however, are in line with recent research, showing no compelling evidence that fertility cycle has an impact on heterosexual women's preference for male facial masculinity (Harris, 2013; Jones et al., 2018; Lipa, 2006; Lippa, 2007a; Marcinkowska et al., 2018; Muñoz-Reyes et al., 2014; Scott et al., 2014; van Stein et al., 2019; Zietsch et al., 2015). The original rationale of previous research was that the hormone-linked changes in women's preferences is because men's facial masculinity is seen as a cue of their reproductive fitness (Ditzen et al., 2017; Jones et al., 2005; Weisberg & Kim, 2018). However, in the light of newer evidence it may be that male facial masculinity, instead of being a cue of reproductive fitness, is a primary cue of men's intrasexual competitiveness, dishonestly, aggression, dominance and lower likelihood to invest in offspring (Ditzen et al., 2017; Jones et al., 2018; Puts, 2010).

Even though not clearly evident in the present research, it was also suggested by Glassenberg et al. (2010) that both heterosexual and homosexual women show a preference for feminine male faces. It may be that facial femininity is a primary cue of a man's positive intrasexual traits such as honesty, less dominance, more enthusiasm, and greater investment in offspring and parental care (Penton-Voak et al., 2003; Perrett et al., 1998). Therefore, it is

possible that today femininity in males, may signal features that indicate mate quality, and mate desirability.

The present study also carried out additional exploratory analyses on the three mating mechanisms discussed in Chapter 2, which focus on the influence of perceiver's level of masculinity or femininity. These include three competing hypotheses: similarities attract, opposites attract, and a match in sex typicality attracts. Exploratory analyses found no significant interactions of raters' sex typicality with other variables; therefore, raters' own sex typicality did not further affect their attractiveness ratings.

In summary, this is the first study to address heterosexual and homosexual women's preferences in male and female targets across high and low fertile points in the menstrual cycle. As well as being the first to explore them in the way this thesis has, it also looked into whether these shifts are a result of an adaptive behaviour independent of sexual orientation or whether they are dependent on sexual orientation. It appears from the results, that there is no strong evidence for attraction preferences of masculinity, femininity, and sex typicality to shift across fertility level in an adaptive nature or dependent on sexual orientation.

3.6. Limitations

3.6.1. Sample Size

It was hoped data would have been collected from a larger number of participants (this study recruited 20 heterosexual females and 20 homosexual women). However, as expressed at the start of this thesis, there was a significant impact on the ability to collect data because of the Covid-19 Pandemic. Although I did successfully recruit a similar number of

participants in line with that of previous research within this field (Ditzen et al., 2017 *(N = 48)*; Haselton & Gangestad, 2006 *(N =38)*), it would be beneficial in future research to try and gather more participant data for use in the analysis.

3.6.2. Measure of Fertility

It was hoped that by using an objective biological method to measure fertility, the findings would be more robust than using self-report measures. Also, by determining fertility and collecting data straight after in a laboratory setting the results would be more accurate. However, as expressed at the start of this thesis, there was a significant impact on the ability to collect data within the laboratories because of the Covid-19 Pandemic. Thus, raising a possible limitation around the measure of fertility used and validity of the measurement in relation to time between measurement and data collection. For this study fertility level was determined by luteinizing hormone (LH) via urinary sample and a surge detection device (ovulation test). This was to counteract the issues around self-report measures (forward and reverse cycle day method and average length of menstrual cycle) to determine high and low fertile phases in the menstrual cycle (Blake et al., 2016; Gangestad et al., 2016; Jones et al., 2016; Thomas et al., 2021). Research has found that self-reporting issues include memory biases, contraception influences in variation in observed cycle length, natural variation in observed cycle length, and inaccuracy in reporting menstrual cycle length and days menstruating (Blake et al., 2016; Jukic et al., 2008; Small, Manatunga & Marcus, 2007). The ovulation tests used in this research are CE and FDA approved and are supplied to, and used by, the NHS. The ovulation test is over 99% accurate in detecting an LH surge (high fertility), it has a high sensitivity level of 20mIU/ml measured against the standard for urinary LH and FSH for bioassay, where medium sensitivity is 30mIU/ml and low sensitivity is

40mIU/ml. This study used measures of fertility using urinary LH surge employed by two previous studies within the field of sexuality and sexual desire (Durante et al., 2012; van Stein et al., 2019). Thus, it can be determined that the measure of fertility (urinary ovulation test) used within this research is valid and carried less than a 1% chance of error in results.

Importantly, I am confident that participants completed the survey during high and low fertility. Participants had to complete the survey once for data collected during high fertility and once for data collection during low fertility. In line with suggestions by researchers on length of time between LH surge detection and study participation (Alliende, 2002; Alliende, 2013; Direito et al., 2013; Lobmaier & Bachofner, 2018; Scarpa, Dunson & Giacchi, 2007), participants would take the survey after an ovulation test result was determined, meaning that the data collected would be at the point of low fertility and at the point of high fertility. When data was collected in the labs participants would take the ovulation test and hand it to the researcher to determine the fertility level. I am certain that for the data collected in the labs women completed the survey straight after they received a high or low fertility level result. During the remote data collection (*as a result of the Covid-19 Pandemic*) participants would take the test and send a photo to the researcher to determine the fertility level. I am also confident, that for the data collected remotely, women completed the survey straight after they received a high or low fertility level result. This is because, participants would take the ovulation test and show the researcher the result to record, they would then complete the survey. The researcher did ensure, by checking the time stamp on the survey in Qualtrics, that the survey was completed once the participant had said they had completed it after a high or low fertility detection. For any woman who did not have a survey recorded for when they had their fertility level result recorded, the researcher requested that they retest their ovulation the next month and complete the survey straight after.

More recently two studies employed the use of saliva samples to detect hormone levels during menstrual cycles testing for estradiol (not LH surge). In Marcinkowska et al. (2016), women collected daily morning saliva samples from the first day of menstruation to the day prior to the next menstrual bleeding. Jones et al. (2018), had women provide saliva sample via passive drool in each test session, taken at the same time each day to minimize effects of daily changes in hormone levels (there were five test sessions for each participant). These studies, much like the present research, found no support for the hypothesis that women's attraction to male facial masculinity increased during the fertile phase. Research using different methods for determining fertility found similar results to this thesis suggesting that the present method, the use of urinary ovulation tests, was not a reason for the fact that the hypothesis was not supported.

3.6.2. Stimuli

As discussed in *Chapter 2, Study 1 – Limitations* there are problems with the use of 3D computer-generated images, around facial hair, blemishes, face shape, and realness of the images (Thompson & O'Sullivan, 2013). To counteract these issues, I therefore used real-life, averaged, and computer manipulated images. These images have more of the facial blemishes of real faces and also employ the use of hair. Stimuli were created using FaceResearch org which is owned and run by DeBruine and Jones. The stock images are real life images, the majority of the images have been manipulated into averages using Dr Bernard Tiddeman's (2015) PsychoMorph programme. These images have been used in a considerable number of relevant research studies (Johnston et al., 2001; Little & Jones, 2012; Penton-Voak et al., 1999; Penton-Voak & Perrett, 2000; Welling et al., 2007), as well as in studies which found

results similar to the current research (Harris, 2013; Jones et al., 2018; Marcinkowska et al., 2016; Muñoz-Reyes et al., 2014; Scott et al., 2014; Zietsch et al., 2015).

Importantly I ran a manipulation check on the computer-manipulated stimuli. Results indicated that female feminised face composites, were perceived by both men and women as significantly more feminine than the masculine female faces and masculinised female faces were also rated as significantly less feminine than the feminised faces. They also show for male faces that masculinised male faces were perceived as significantly more masculine than feminine female faces, and masculinised male faces would be rated the most masculine and feminised faces as the least masculine. Thus, highlighting the validity of the images in relation to masculine and feminine composites.

I also counteracted the limitation proposed in *Chapter 2, Study 2 – Limitations* regarding the number of stimuli composites used. I suggested that the use of only 3 stimuli composites (neutral, masculine, feminine), may be a factor affecting attraction preference results. Therefore, in the current study, I used 5 composites (super-masculine, masculine, neutral, feminine, and super-feminine) to catch the more extremes of the super feminised and super masculinised faces.

Conversely, has been shown that computer-manipulated averaged faces are not as effective at producing an accurate attraction response as real-life images. Alley and Cunningham (1991) suggest that the issues surrounding computer generated images (facial imperfections, facial shape, and unusual symmetry) are still evident in images which have been averaged and computer manipulated. As such, it is hard to determine whether this research would have found stronger results if it removed the use of 'average' attractive faces and employed the use of real-life computer manipulated images (manipulated into various masculine-feminine composites). Overall, as these images have been very widely employed

by relevant research with similar findings (Harris, 2013; Jones et al., 2018; Marcinkowska et al., 2016; Muñoz-Reyes et al., 2014; Scott et al., 2014; Zietsch et al., 2015) this suggests that the images I used are valid and reliable for our analysis and the results I found.

3.7. Overall Conclusions and Future Research

In summary, to my knowledge, this is the first study to date that has explored the influences of fertility cycle shifts on attraction preferences towards facial masculinity, femininity, and sex-typicality for male targets across women of different sexual orientations. It appears from the results that, converse to the predicted findings based on previous research (Buss & Schmitt, 2011; Ditzen et al., 2017; Fink & Penton-Voak, 2002; Gangstead & Thornhill, 2008; Gangestad, Thornhill and Garver-Apgar, 2005; Grammer et al., 2003; Jones et al., 2005; Kenrick, Maner & Li, 2005; Penton -Voak et al., 1999; Weisberg & Kim, 2018), heterosexual women, in fact, showed a stronger preference for feminine male faces during high fertility; and for homosexual women there were no strong patterns, depending on fertility, to conclusively support either hypothesis. Thus, there appeared to be no support for either the influence of fertility on attraction preferences in an adaptive shift behaviour nor in a sexual orientation dependent manner.

Further research within this field would benefit from a longitudinal approach, exploring attraction preferences and patterns across age, situational, and life factors (e.g., partner length - short term/long term, sexual partner, romantic partner), as well as fluctuating menstrual cycles. It could also encompass the use of eye tracking which would help to explore the unconscious/subconscious objective measures of attraction preferences using eye gaze and pupil dilation (Attard-Johnson et al., 2021).

Chapter 4 Influence of the daily Testosterone cycle on attraction preferences of sex-typicality in heterosexual and homosexual men

4.0. Abstract

It is suggested that men's elevated testosterone increases their attraction to feminine females (Bird et al., 2016; Welling et al., 2008a). In the past this has been examined in heterosexual men. However, if this is an evolutionary robust pattern, then such an increased preference for female femininity during elevated testosterone levels could also happen in homosexual men, even if homosexual men prefer, on average, male masculinity over female femininity. I assessed across both heterosexual ($N = 11$) and homosexual ($N = 16$) men their attraction to feminine and masculine female and male faces. I did this twice, during times of high and low testosterone (by collecting self-report data in the morning as a proxy for high testosterone and in the evening for low testosterone). Heterosexual men preferred feminine female faces more so than homosexual men, and heterosexual men's preference for feminine female faces increased with elevated testosterone. Homosexual men preferred masculine male faces more so than heterosexual men, but homosexual men's preferences did not change with testosterone levels. Overall, results suggest that testosterone enhances, if anything, preferences based on sexual orientation, but elevated testosterone shows no increase in preference for female femininity, regardless of men's sexual orientation.

4.1. Introduction

There is a large amount of evidence which suggests that heterosexual men have higher attraction preferences for females with sex typical (feminine) faces as opposed to sex atypical (masculine) faces (Bird et al., 2016; Lee et al., 2013; Marcinkowska et al., 2014; Welling et al., 2008a). Sex-typicality in female facial features is characterised by tall, wide eyes, full lips, thick eyebrows and high cheek bones as well as small chins (Cunningham et al., 1995; Johnston, 2006; Johnston & Franklin 1993; Lee et al., 2013; Little et al., 2007b; Marcinowska et al., 2014; Perrett, et al., 1994; Welling et al., 2008a). Feminised faces are commonly linked to higher levels of oestrogen (compared to levels of testosterone) which promote the growth of sexual characteristics (that signal higher levels of fertility, associated with youth, and genetic quality (Fink & Penton-Voak, 2002; Thornhill & Grammer, 1999; Law Smith et al., 2006) as well as for stimulating the feeling of caring and support (Berry & McArthur, 1985).

Alongside a men's general preference for female facial sex typicality, some studies have also demonstrated cyclic hormonal variation in men's attraction preferences (Archer, 2006; Al-Dujaili & Sharp, 2012; Bird et al., 2016; Bribiescas & Hill, 2010; Puts et al., 2015; Ronay & Van Hippel, 2010; Van der Meij et al., 2008; Van Anders, 2012; Vignozzi et al., 2005; Welling et al., 2008). An innate drive that may be accountable for attraction preferences in heterosexual men is the daily testosterone cycle (sex-hormone cycle); with research identifying that testosterone levels are positively associated with heterosexual men's attraction preferences for female sex typicality. That is, heterosexual men report a greater preference for sex-typicality in female faces, when their testosterone levels are high, compared to when testosterone levels are relatively low (Ankarberg & Norjavaara, 1999; Bird et al., 2016; Diver et al., 2003; Welling et al., 2008a). Testosterone has been linked to the modulation of behaviour for several evolutionarily driven domains such as human

survival and sexual reproduction (Archer, 2006; Carré et al., 2009; Sellers et al., 2007). A large body of research links testosterone to modulating factors in men's dominance which includes but is not limited to competitiveness, aggression, survival and mating success (Archer, 2006; Carré & McCormick, 2008; Caswell et al., 2014; Sellers et al., 2007; Slatcher et al., 2011). Evolutionary theorists argue that links between hormones, in this case testosterone, and attraction preferences for sex-typicality in females is due to an evolutionary adaptive shift (Buss & Schmitt, 2011; Gangestead & Thornhill, 2008). These evolutionary adaptive shifts in testosterone levels and sex-typicality preferences, serve as a purpose for men to enable and enhance their mating success (Welling et al., 2008a). Research shows a link between heterosexual men's testosterone levels and general sexual interest in females, where high testosterone showed an increased interest in female sexual stimuli (Rupp & Wallen, 2007). In addition, high testosterone has been shown to increase mating-related behaviours such as competitive behaviours towards other men, thus increasing the likelihood of mating success (Gould & Ziegler, 2007).

Studies have also shown that heterosexual men's sex drive is higher when testosterone levels are also high, thus suggesting that when heterosexual men are in hormonal states where their interest in sex is highest (high testosterone), they prefer females who show signals of mating success (Klimas et al., 2019). Research shows that heterosexual men have a preference for sex-typical female features during the high testosterone – high sex drive phase, as sex-typical females provide signals of health, and an enhanced readiness to reproduce (highly fertility), resulting in more reproductive success (Gangestad & Scheyd, 2005; Marcinkowska et al., 2017; Welling et al., 2008a). Therefore, changes in preferences across testosterone cycle toward a sex-typical female face has potentially been adopted to function in a way which is likely to increase ability to produce offspring, so that during times of highest sex drive (high testosterone), they seek out a female partner who signals offspring

readiness. Interestingly, research has shown that heterosexual men have a daily testosterone cycle, where they show a preference for female facial sex typicality during levels of high testosterone, in the morning (AM) compared to when they are in low levels of testosterone, later in the day (PM) (Ankarberg & Norjavaara, 1999; Diver et al., 2003; Welling et al., 2008a).

Although there is a plethora of research to date which explores the links between testosterone and sexual behaviours, as well as a large body of research which supports men's preferences for female facial sex typicality as a cue to health and fertility, there has been little research to date which explores the links between men's testosterone levels, the testosterone cycle and their attraction preferences to sex-typical female faces (Bird et al., 2016; Welling et al., 2008a). Both studies examined the variation in male testosterone levels (high and low) and the effect this has on attraction preferences for femininity in female faces (Bird et al., 2016; Welling et al., 2008a). However, only one of these studies used non manipulated methods to determine levels testosterone (natural fluctuations in testosterone levels) (Welling et al., 2008a). Although slightly different studies, as discussed below, results from these studies showed that men report a greater preference for femininity in female faces when their testosterone levels are high, compared to when testosterone levels are relatively low.

Welling et al. (2008a) was the first empirical research, and find an association for, men's testosterone levels and ratings of female's facial attractiveness. This is the only research to date which has examined testosterone and heterosexual men's preferences to femininity in both male and female faces. To examine these changes, they used a within-subjects design, testing 29 heterosexual men once during high testosterone and once during low testosterone. Testosterone level was determined using salivary assay. They used real life computer manipulated photos of males and females and morphed them at a 50% more feminine and 50% more masculine than the neutral original face. They were shown both the

male and the female images and these images were presented in sex pairs (e.g., two females, or two males) and were asked to rate which one they considered more attractive from the pair. They also had to rate the extent to which the image they had chosen was more attractive by selecting either 'slightly more attractive' or 'much more attractive'. Results from this study found that heterosexual men showed a much stronger preference for femininity in a female face in the high testosterone condition than in the low testosterone condition. Surprisingly, attraction to femininity in male faces did not differ during high or low testosterone levels. The researchers suggest this shows that the effect of testosterone on attraction preferences of female's faces is not due to a general response bias to feminine faces in general (Welling et al., 2008a).

Bird et al. (2016) argued that the results by Welling et al. (2008a) are not conclusive, and that researchers could not be sure whether testosterone is the cause for the changes in preferences for femininity in female faces or whether these preferences are as a result of them determining testosterone level by observation (through salivary assay) only and not manipulation of testosterone, or whether it is due to other variables present but not tested for during high testosterone. Bird and colleagues (2016) carried out similar studies looking at men's preference for femininity in female faces for short term and long-term relationships. They used direct manipulation to determine testosterone level and testosterone level was recorded using blood drawn samples. They tested the men twice, once after administering testosterone and once after administering a placebo. Testosterone and placebo administration were via a topical gel (AndroGel® or placebo equivalent) applied to both upper arm and shoulder. Assignment to receiving testosterone administration or placebo first was randomised. They found that men's preference for female facial femininity is stronger when they are administered testosterone (high testosterone), however this finding was stronger for -ratings in the short-term context as opposed to long term context. There was no difference

found when a placebo was administered in preference for female facial femininity across mating contexts.

It is unknown whether the men's testosterone cycle and attraction pattern shifts are observed independent of sexual orientation, and whether this hormone and attraction pattern is robust, and potentially adaptive for men who identify as homosexual or just for those who identify as heterosexual thus, overriding any effects of sexual orientation in men. Three studies to date have provided evidence that homosexual men show a strong preference for sex-typical male faces in general (Cassar et al., 2020; Shiramizu et al., 2020; Zheng, 2019). Sex-typical male faces (masculine) are characterised by large jawbones, prominent cheekbones, robust eyebrow ridges, longer and protruding facial bones and an increased lip size (Said & Tordorov, 2011). These characteristics are preferred over sex-atypical male faces (feminine) due to their inferred correlations with health and genetic quality (Ekrami, et al., 2020). Hence, not only femininity in females, but also masculinity in males, may signal features that indicate mate quality, and those oriented towards males might benefit from increased attraction to them. Therefore, it is important to explore whether high and low testosterone levels effect preference for sex-typicality in preferred sex targets (females for heterosexual men and males for homosexual men) and not just the preferences of heterosexual men to female targets.

Importantly, to my knowledge, there are no studies to date that explore the impacts of testosterone and the testosterone cycle for preferred sex targets for homosexual men – thus preference for male targets. Nor are there any studies to date which explore the impact of testosterone and the cycle on attraction preferences towards female targets across men of different sexual orientation (i.e., homosexual men's preferences for female targets have not been explored). That is, across existing studies (Bird et al., 2016; Welling et al., 2008a), the research exploring testosterone levels and attraction preferences has focused on heterosexual

men, and their preferred sex (female) only, whilst homosexual men and their preferred sex (males) remain unexplored.

Studying homosexual men in addition to heterosexual men is informative as it will provide evidence as to whether testosterone and attraction preference shifts are adaptive across sexual orientation in all men, or whether these shifts are influenced by sexual orientation and are non-adaptive across all men. This study is the first empirical research to date which explores whether there is an adaptive shift in both heterosexual and homosexual attraction preferences across the daily testosterone cycle, and whether there is an influence of testosterone levels on men's preference for sex typicality in preferred sex targets (females for heterosexual men and males for homosexual men) in addition to shifts in preferences for less preferred sex targets (males for heterosexual men and females for homosexual men).

4.2. Research Hypotheses

This study tested two hypotheses, exploring levels of testosterone and attraction patterns to female and male targets. It examined whether changes in testosterone levels and attraction preferences are adaptive in all men, independent of sexual orientation, or whether hormonal shifts depend on sexual orientation and are influenced by sexual orientation. The following hypotheses were formalised.

Hypothesis 1. Adaptive shift independent of sexual orientation: Heterosexual men would show an increased attraction to feminine females during high testosterone compared to low testosterone. Homosexual men would also show an increased attraction to feminine females during high testosterone compared to low testosterone. If Hypothesis 1 were

confirmed, and attraction preferences were adaptive, we would not expect there to be a shift in preference towards masculinity in men across either heterosexual or homosexual men.

Table 12
Graphic representation of hypothesis 1, showing adaptive shift independent of sexual orientation.

			Sexual Orientation of Perceiver	
		Sex of Target	**Heterosexual**	**Homosexual**
Testosterone Level	**High**	**Female**	Increased attraction to femininity	Increased attraction to femininity
		Male	No shift in preference for masculinity	No shift in preference for masculinity
	Low	**Female**	No predicted preference	No predicted preference
		Male	No predicted preference	No predicted preference

Hypothesis 2. Shift dependent on sexual orientation and not on adaptive behaviours: Heterosexual men would still show an increased attraction to feminine females during high testosterone compared to low testosterone. However, homosexual men would show an increased attraction to masculine males during the high testosterone compared to low testosterone. If Hypothesis 2 were confirmed, I would not expect a shift in attraction preferences for either heterosexual or homosexual men towards sex typicality of the less preferred sex during high or low testosterone.

Table 13
Graphic representation of hypothesis 1, showing adaptive shift dependent of sexual orientation not adaptive behaviours.

		Sexual Orientation of Perceiver: Heterosexual	Sexual Orientation of Perceiver: Homosexual
Testosterone Level: High	Sex of Target: Female	Increased attraction to femininity	No shift in preference for femininity
	Sex of Target: Male	No shift in preference for masculinity	Increased attraction to masculinity
Testosterone Level: Low	Sex of Target: Female	No predicted preference	No shift in preference for femininity
	Sex of Target: Male	No shift in preference for masculinity	No predicted preference

Although not hypothesised, I further explored the three mating mechanisms discussed in Chapter 2, Studies 1 and 2, which focus on the influence of perceiver's level of masculinity or femininity. The proposed mechanisms suggest that attraction to a target is affected by self-reported level of masculinity and femininity, and include three competing hypotheses: similarities attract, opposites attract, and a match in sex typicality attracts. As these three competing hypotheses are complex, especially in addition to proposed hormonal influences (which were the main focus of the present study), I did not phrase specific hypotheses around them in the present study, but rather, considered them in additional, exploratory analysis.

4.3. Methods

4.3.1. Participants

Participants were recruited via purposive sampling, through a range of advertising methods on social networking sites, via email to various universities including The

University of Essex, Anglia Ruskin University and University of East Anglia and a range of LGBT organisations in Suffolk, Norfolk and Essex. Purposive sampling was the recruitment method used, recruiting participants based on intent and to serve purpose to a specific element of the research (Merriam, 2009). This sampling was most relevant for this research as I was studying selected groups, heterosexual and homosexual men (Bernard, 2000). Data collection methods included self-report measures, questionnaire, and a facial stimuli experiment.

There was not sufficient information in the literature on the effect size needed to run a meaningful power calculation for sample size, so I modelled our sample size numbers on those similar in relevant literature (Bird et al., 2016 (*N=24);* Welling et al., 2008a (*N=29*)) and collected as much as data as possible.

Seventy men took part in the study. After initial data sorting exclusions were made for data where the participant only completed the AM survey (N = 17), or only completed the PM survey (N = 26). Twenty-seven men completed both the AM and the PM surveys and were suitable for analysis. Within the sample 11 men identified themselves as heterosexual and 16 men identified themselves as homosexual. Overall ages ranged from 19-46 (M = 30.19, SD = 7.05). Ages did not statistically differ between heterosexual men (M = 30.73, SD = 7.24) and homosexual men (M = 29.81, SD = 7.14) t (21.45) = .32, p = .75; MD = .91).

Due to the focus on testosterone levels in men, exclusions during recruitment included those who those who were self-classified as a transgendered woman or a transgendered man, and those taking testosterone hormone supplements. The exclusion for transgendered women was in place because these individuals are often involved in hormone therapy. Hormone therapy for transgendered women involves taking supplements such exogenous estrogen which supresses testosterone levels and affect testosterone cycles. The exclusion for

transgendered men was in place because these individuals are often involved in hormone therapy. Hormone therapy for transgendered men involved taking supplements such as exogenous testosterone, used to increase testosterone levels but can have an effect on daily testosterone cycles depending on the individual and where they are in their assigning process (Unger, 2016). Restrictions on ages (18 – 50 years old) during recruitment were in place, the lower limit of 18 was essential for the purposes of consent. The upper age limit was in place due to levels of testosterone and the daily testosterone cycle, men above this age are likely to go through the male menopause, also known as andropause. As men reach aged 40, testosterone begins to drop approximately 1-2% a year, by the age of 50 and beyond, levels can drop significantly, leading to low levels of testosterone, as well as irregular daily cycles (reduced and varied peak and drops in testosterone). This reduction in T results in changes in sexual drive and desires (Crawford et al., 2007; Health Line, 2018;). Therefore, there was an age limit condition placed on the study advert which stated participants had to be aged below 50 and not on testosterone supplements.

4.3.2. Testosterone Measures

Testosterone exhibits a diurnal rhythm (variation over a 24-hour period) where testosterone is, on average, highest in the morning and lowest at night (Ankarberg & Norjavaara, 1999; Crawford et al., 2007; Crawford et al., 2015; Diver et al., 2003). Evidence suggests that peak concentrations of testosterone are at approximately 6am – 8am, with high levels generally being detected in early morning and troughs at approximately 5pm - 8pm, with low levels generally detected in the evening (Crawford et al., 2007; Crawford et al., 2015; Guay, Miller & McWhirter, 2008). This study assumed testosterone level based on the evidence for high in AM and low in PM, requiring participants to complete two surveys: -

one in the morning, between 6am and 10am and another in the evening between 5pm and 10pm. The wider windows of survey completion outside of the proposed peak levels, allowed for the variations in individual cycles as well as times participants may wake up and get home from work or go to bed. Participants were asked to have at least 24 hours in between completing the AM and PM surveys (thus not on the same day for AM first, and not the morning after for PM first) to control for testing effects of condition order.

A more objective measure to test for testosterone was considered (saliva assay samples), however, financial constraints did not permit the research using this method. This is further discussed in the limitations section.

4.3.3. Self-Report Measures

Sexual Orientation. A Kinsey-type scale was used to assess both sexual orientation and sexual attraction (Kinsey, Pomeroy & Martin, 1948). The scale ranges from 0 = exclusive orientation/attractions to opposite sex, to 3 = equal orientation/attractions to both sexes, to 6 = exclusive orientation/attractions to same sex. In both heterosexual and homosexual men the correlation between sexual orientation and sexual attraction was 0.9 or higher, because of this I averaged them into one composite score As a result of this overall average score was created between the two variables, these were then set into categories of heterosexual (1) and homosexual (2) for use in the main analysis. Based on the scores from the Kinsey scale anyone who was between 0 and 2 were heterosexual and 4 and 6 were homosexual.

Sex Typicality. This self-report measure was the same as in Chapter 3. The reliability analysis was the same as in Chapter 3.

Strong reliability was found for all childhood and adulthood measures, Cronbach's α exceeded 0.8. Averaged measures for childhood and adulthood sex typicality were correlated across heterosexual men, $p < .001$ $r = .88$ and homosexual men, $p < .001$, $r = .82$. As a result of this an overall average score was created between the two variables for use in the main analysis. All items were averaged in a way that higher scores mean higher sex typicality (masculinity in males).

4.3.4. Facial Stimuli

The same stimuli were used as in Chapter 3.

4.3.5. Manipulation Check

The manipulation check was the same as in Chapter 3.

4.3.6. Procedure

Participants opted to take part in the online study by using the links provided to the Qualtrics surveys on the study advertisement. There was one Qualtrics link for participants to click to complete the AM (high testosterone) online survey and another separate Qualtrics link the PM (low testosterone) online study. A question was provided within the survey for participants to clarify the time of day they are completing the survey (AM/PM). Participants had to complete an identical survey both two times, once in the morning (the AM survey), when they were in a high testosterone (morning) phase of the daily testosterone cycle, and once when they were in a low testosterone phase of the daily testosterone cycle (evening, the PM survey). Participants were asked to have at least 24 hours in between completing the AM

and PM surveys (thus not on the same day for AM first, and not the morning after for PM first) to control for testing effects of condition order. Participants would be sent both links and asked to click on the morning link when they are completing the survey in the morning and evening link for when they are completing the survey in the evening. At the start of the Qualtrics survey an information sheet was displayed where the participants provided informed consent and was asked to create a Unique ID number. Firstly, participants had to state whether they were taking part in the study in the AM or PM. The time of day in which the participant was taking part in the experiment was recorded by asking 'Time of Day' with the options of 'AM' or 'PM'. To cross-check validity of time taken the survey, the online survey automatically recorded he time of day in which the participant took part in the study alongside the question participants answered. Participants then complete some demographic questions, including gender, sex, sexual orientation, self-perceived childhood and current life masculinity or femininity (sex typicality). Male and female images were separated into two blocks. The order of the blocks were randomised and the images within each block were randomised. Stimuli were presented on a white background and stood in the centre of the screen; this was regardless of the device used to complete the survey at approximately 100mm x 750mm.

For each target sex, all images and their compositions were shown in random order. All participants saw all five composites (super-masculine, masculine, neutral, feminine, super-feminine) of both male and females faces. Instructions were given at the start of each block to remind participants that they may think that they see the same face more than once but to rate each face independently. After each image, participants were asked three questions around attractiveness for both male and female images. It was stressed that they need to answer these questions even if they are not attracted to a specific target sex. The three questions asked for attractiveness were: How sexually attracted are you to this person? How

sexually appealing is this person to you? How much would you like to date this person? The questions were answered using a 7-point Likert scale ranging from 1 = not at all, to 7 = very much. The survey took on average 20 minutes.

Throughout both groups of raters (heterosexual men and homosexual men) the three ratings used for assessing target attractiveness were found to have a strong reliability and were all highly correlated, all Cronbach α's exceeded .90 and all *r's* exceeded .70. Because of this the three ratings were averaged to one overall component of attractiveness for each participant and each target.

4.4. Results

Main analyses were based on the two hypotheses that, 1) adaptive shift in attraction preferences across testosterone level, independent of sexual orientation and 2) shift in attraction preferences across testosterone level, dependent on sexual orientation rather than adaptive behaviours.

Raters and targets were treated as random effects (Zar, 1999). This approach represents a repeated measures design where each rater repeatedly evaluated the attractiveness of targets, and each target (which had a super-masculine, masculine, neutral, feminine, and super-feminine composite) was repeatedly evaluated by raters.

For male targets, a contrast score of attraction to super-masculine male faces versus super-feminine male faces was computed and a contrast score of attraction to masculine male faces verses feminine male faces was computed. For the contrast scores for male targets, masculine is positive and feminine is negative. The two separate contrast scores allowed for analysis comparing the 'super' stimuli as well as the 'medium' stimuli. Correspondingly, for

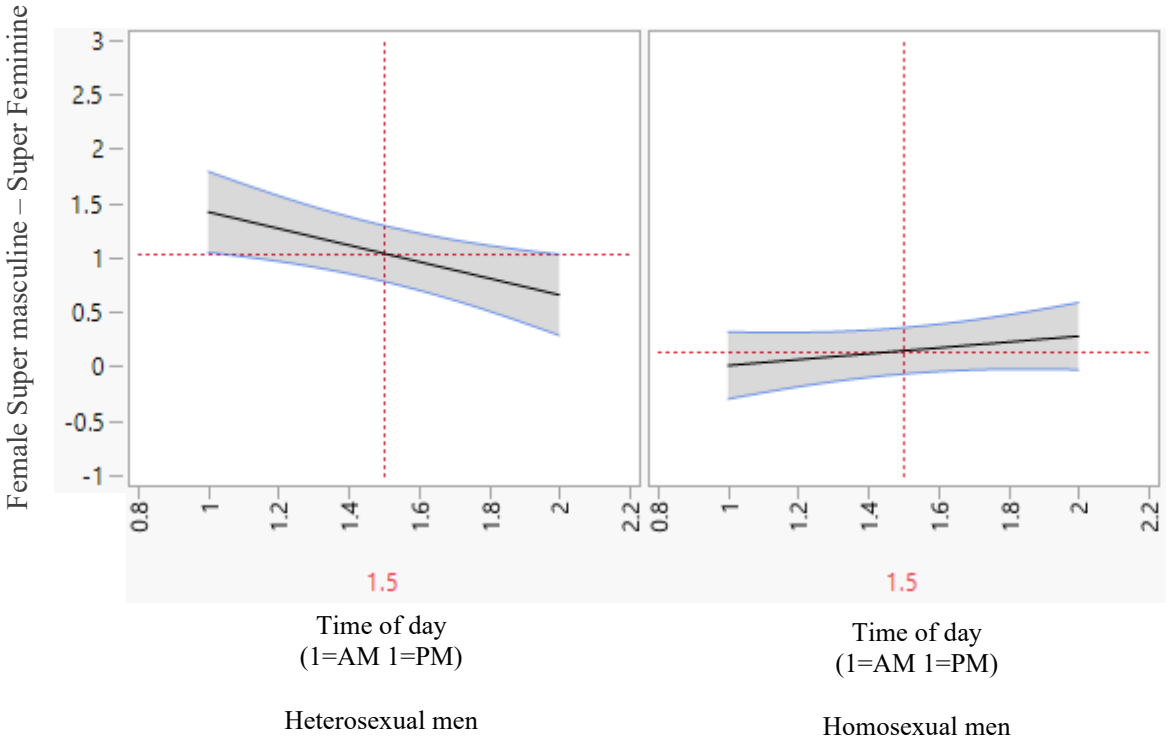
female targets, a contrast score of attraction to super-feminine female faces versus super-masculine female faces was computed and a contrast score of attraction to feminine female faces versus masculine female faces was computed. For the contrast scores for female targets, feminine is positive and masculine is negative. Again, the two separate contrast scores allowed for analysis comparing the 'super' stimuli as well as the 'medium' stimuli. These contrast scores for rated attractiveness of targets were used as the outcome variables in the regression analyses. Predictor variables included raters' sexual orientation and testosterone level (high and low). A further predictor of attractiveness evaluations was the interaction of the raters' sexual orientation and testosterone level. With this interaction I tested whether attractiveness was affected by a combination of the raters' sexual orientation and testosterone level. For example, if heterosexual men are more attracted to feminine female faces than homosexual men during high testosterone, a significant interaction of sexual orientation with testosterone level should be detected. Analyses were conducted separately for male and female targets and were conducted separately for each contrast score. Thus, there were four analyses conducted overall (super-feminine versus super-masculine female targets, feminine versus masculine female targets, super-masculine versus super feminine male targets and masculine versus feminine male targets). Throughout the results section testosterone level will be referred to as 'time of day' to aid clarity. High testosterone will be referred to as AM and low testosterone will be referred to as PM (*this is discussed in the methods section*).

For super-feminine versus super-masculine female targets there was a main effect of perceivers' sexual orientation, B = -.89, SE = .16, $p < .0001$. Inspecting Figure 14, on average heterosexual men show a stronger preference for super-feminine female faces over super-masculine female faces, homosexual men did not show much of a preference. There was no main effect of time of day, B = -.15, SE = .18, $p = .39$. That is time of day had no direct effect on attractiveness ratings across super-feminine versus super-masculine female faces. A

significant interaction was found for sexual orientation and time of day, B = 1.03, SE = .36, *p* = .01. This interaction indicated that heterosexual men have a stronger preference for super-feminine female faces during the AM compared to PM. Homosexual men show a slight preference for super-masculine female faces during the AM compared to PM, even though, given the distribution of the effect's 95% confidence intervals, in homosexual men, unlike in heterosexual men, this preference was not significant (Figure 14).

Figure 14

Attraction to Super-feminine versus Super-masculine female faces for time of day (AM, PM) across heterosexual and homosexual men. Graph on the left shows heterosexual men and the graph on the right shows homosexual men's responses to Super-feminine versus Super-masculine female targets. Y axes represent the attraction rating to femininity-masculinity of the target, where positive represents Super-feminine and minus represents Super-masculine. X axes reflects time of day at time of rating, where 1 represents AM and 2 represents PM. The line represents the change in attraction rating across time of day from point of AM (1) to PM (2) testosterone.

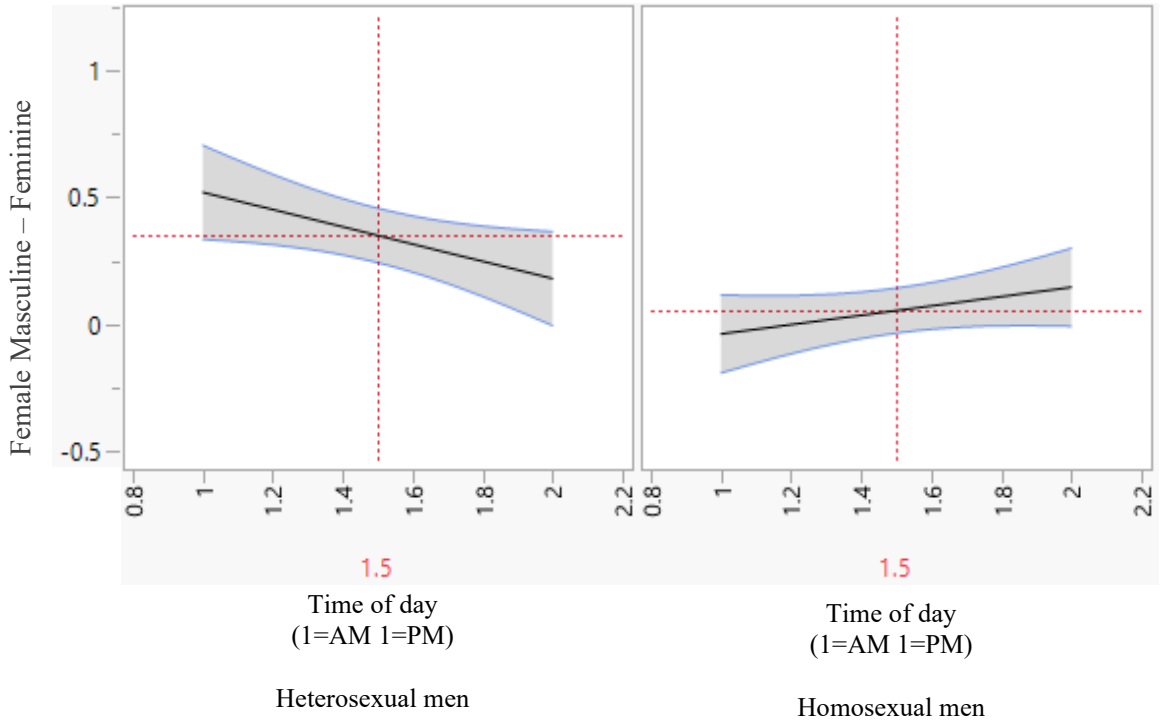


For feminine versus masculine female targets there was a main effect of sexual orientation, B = -.29, SE = .07, $p < .0003$. Inspecting Figure 15, heterosexual men show a stronger preference for feminine female faces over masculine female faces, whereas

homosexual men do not show a strong preference, on average. There was no main effect of time of day, B = -.03, SE = .09, p = .76. That is, time of day had no direct effect on attractiveness ratings across super-feminine versus super-masculine female faces. A significant interaction was found for sexual orientation and time of day level, B = .52, SE = .19, p = .01. This interaction indicated that heterosexual men have a stronger preference for feminine female faces during the AM compared to PM. Homosexual men show a slight preference for masculine female faces during the AM compared to PM, even though, given the distribution of the effect's 95% confidence intervals, in homosexual men, unlike in heterosexual men, this preference was not significant (Figure 15).

Figure 15

Attraction to Feminine versus Masculine female faces for time of day across heterosexual and homosexual men. Graph on the left shows heterosexual men and the graph on the right shows homosexual men's responses to Feminine –Masculine female targets. Y axes represent the attraction rating to femininity-masculinity of the target, where minus represents masculine and positive represents feminine. X axes reflects time of day at time of rating, where 1 represents AM and 2 represents PM. The line represents the change in attraction rating across time of day from point of AM (1) to PM (2) testosterone.

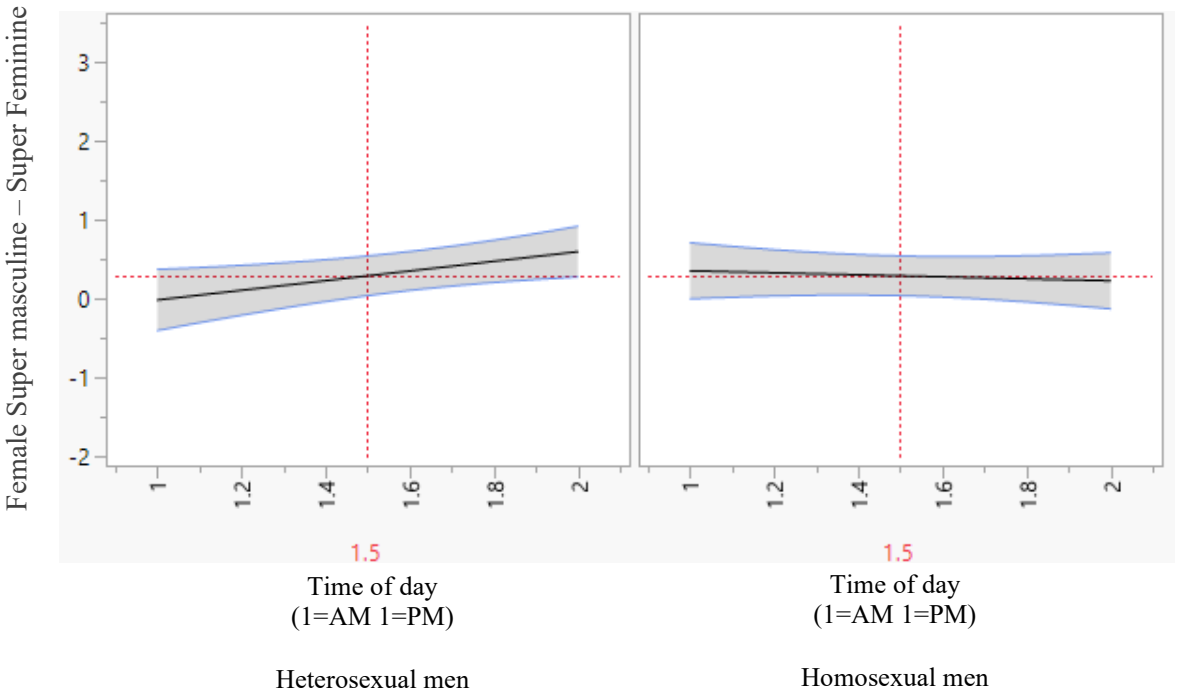


Findings for female targets (super-feminine versus super-masculine and feminine versus masculine) show support for Hypothesis 2, that shifts in testosterone level (time of day) enhances sexual orientation attraction preferences, even though only in heterosexual men raters. Still, findings suggest preferences are based on sexual orientation and not adaptive evolutionary behaviours, as for the latter I would have expected to see both heterosexual and homosexual men with a stronger preference for super-feminine compared to super-masculine during times of high testosterone (AM) compared to low testosterone (PM).

Corresponding analyses were conducted for male targets (super-masculine versus super-feminine, masculine versus feminine). For super-masculine versus super-feminine male targets there was a main effect of sexual orientation, B = 0.61, SE = .21, p = .01. Figure 16 shows that, on average, homosexual men show a stronger preference for super-masculine over super-feminine male faces, whereas heterosexual men showed no strong preference. There was no main effect of time of day, B = -.19, SE = .28, p = .49. That is time of day had no direct effect on attractiveness ratings across super-masculine versus super-feminine male faces. No significant interaction was found for sexual orientation and time of day level, B = -.78, SE = .57, p = .19. Even though this interaction was not significant, it was in the predicted direction with homosexual men, being more into super-masculine male faces during the AM than PM, and more so compared to heterosexual men (Figure 16).

Figure 16

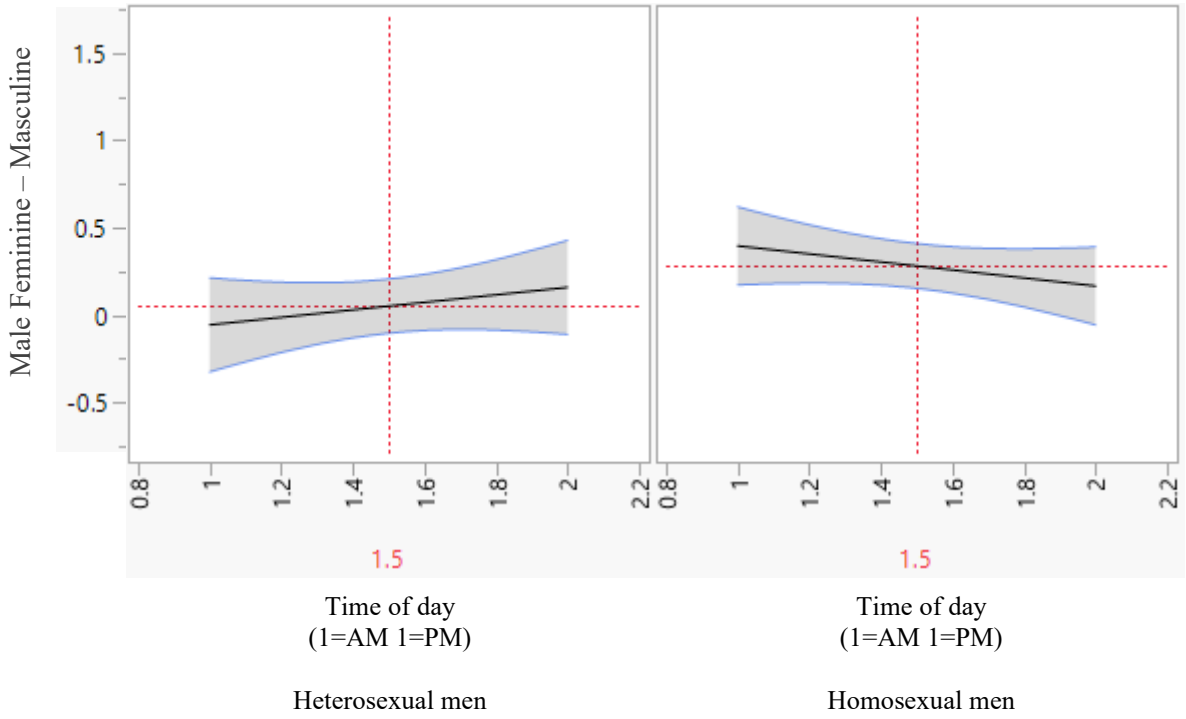
Attraction to Super-masculine versus Super-feminine male faces for time of day across heterosexual and homosexual men. Graph on the left shows heterosexual men and the graph on the right shows homosexual men's responses to Super-masculine versus Super-feminine male targets. Y axes represent the attraction rating to masculinity versus femininity of the target, where minus represents super-feminine and positive represents super-masculine. X axes reflects time of day at time of rating, where 1 represents AM and 2 represents PM. The line represents the change in attraction rating across time of day from point of AM (1) to PM (2) testosterone.



For masculine versus feminine male targets there was a main effect of sexual orientation, B = 0.23, SE = .09, p = .03. Figure 17 shows that homosexual men had a stronger preference for masculine over feminine male faces, whereas heterosexual men showed no preference. There was no main effect of time of day, B = -.05, SE = .14, p = .73. That is time of day had no direct effect on attractiveness ratings across masculine versus feminine male faces. No significant interaction was found for sexual orientation and time of day level, B = -.44, SE = .29, p = .13. Even though not significant, this interaction was in the predicted direction with homosexual men being more into masculine male faces the AM than PM, more so compared to heterosexual men (Figure 17).

Figure 17

Attraction to Masculine versus Feminine male faces for time of day across heterosexual and homosexual men. Graph on the left shows heterosexual men and the graph on the right shows homosexual men's responses to Masculine – Feminine male targets. Y axes represent the attraction rating to masculinity – femininity of the target, where minus represents feminine and positive represents masculine. X axes reflects time of day at time of rating, where 1 represents AM and 2 represents PM. The line represents the change in attraction rating across time of day from point of AM (1) to PM (2) testosterone.



Findings for male targets (super-masculine versus super-feminine and masculine versus feminine) show, if anything, support for Hypothesis 2, that shifts in testosterone level (time of day) enhances sexual orientation attraction preferences in homosexual men; however, these effects were not significant. Hence, if anything, findings suggest preferences are based on sexual orientation, and do not suggest adaptive evolutionary behaviours, as homosexual men showed a stronger preference for super masculine and masculine male faces than heterosexual men did.

4.4.1. Exploratory Regression Analysis

Regression models for additional exploratory analyses were computed with the same main effects and interactions as the main analysis detailed above but further included the rater's on level of sex atypicality as a main effect, plus all interactions of rater's own sex typicality with sexual orientation, testosterone level, and their combination. None of these interactions of raters' sex typicality with other variables were significant, with *p* values ranging from .10 to .82 and B values ranging from -.02 to .46. This meant that raters' own sex typicality did not further affect their attractiveness ratings.

4.5. Discussion

This study investigated two hypotheses: Hypothesis 1 was that there is an evolutionary adaptive shift in men's preference across testosterone level, where high testosterone enhances attraction to femininity in females, regardless of men's sexual orientations. Hypothesis 2 was that shifts in attraction preferences are dependent on sexual orientation and thereby not necessarily adaptive, where testosterone enhances sexual orientation preferences, and thus towards feminine females for heterosexual men and towards masculine males for homosexual men. Neither of these hypotheses were conclusively supported in the present study, even though there was some level of support for Hypothesis 2, with the sexual preferences being enhanced by high levels of testosterone. This was most evident for heterosexual men rating feminine female targets. There was also some indication that homosexual men are more attracted to masculine males during high testosterone than low testosterone compared to heterosexual men, however these findings were not significant. Hence, most of the analyses provide support only for sexual orientation in-itself affecting

attractiveness, but across sexual orientations there was no consistent evidence that these preferences are influenced by testosterone levels.

The results of the current study therefore did not support previous adaptive shift research which suggests that men have an evolved mechanism where they find sex-typicality in female faces (femininity) more attractive at their high testosterone (high sex drive phase) (Ankarberg & Norjavaara, 1999; Bird et al., 2016; Diver et al., 2003; Klimas et al., 2019; Welling et al., 2008a). This mechanism is considered beneficial as it would increase the likelihood of reproducing with a female who is healthy and more likely to have reproductive success at the appropriate time during the reproductive cycle (Gangestad & Scheyd, 2005; Marcinkowska et al., 2017; Welling et al., 2008a).

For heterosexual men, the present findings are in line with relevant research (Bird et al., 2016; Welling et al., 2008a) which showed heterosexual men had a stronger preference for femininity in female faces during high testosterone compared to low testosterone. The present findings also showed, in line with Welling et al, (2008a) that preferences for femininity in male faces did not differ during high or low testosterone levels. The findings from the current study therefore supports the argument by Welling et al. (2008a) which suggested that testosterone is only a modulating factor which effects preferences towards a female face and not a general response bias to all target faces (male and female). In heterosexual men, their testosterone only affected attraction to female femininity, and not male femininity. Thus, for heterosexual men, testosterone appears to be a mechanism of enhancing true attraction to preferred sex targets, rather than just a general response bias, based on testosterone levels. For homosexual men, the present findings are in line with relevant research (Cassar et al., 2020; Gangestad et al., 2006; Shiramizu et al., 2020; Zheng, 2019) which showed homosexual men had a stronger preference for masculine male faces, in

general. This highlights a potential preference in male characteristic which signals health and genetic quality, because these qualities are linked to males who are more likely to have greater reproductive success, greater societal dominance, and be physically stronger (Ditzen et al., 2017). Within the present study homosexual men's preferences for masculine male faces shifted with high levels of testosterone compared to low levels of testosterone, however, this was not significant. Findings from homosexual men may show testosterone as a modulating factor in preferences towards preferred sex target sex typicality as opposed to a general response bias to male and female faces across sexual orientations. In homosexual men, their testosterone only affected attraction to male masculinity, but not to female femininity, thus it appears to be a mechanism of enhancing true attraction to preferred sex targets, rather than just a general response bias, based on testosterone levels.

The present study also carried out additional exploratory analyses on the three mating mechanisms discussed in Chapter 2, which focus on the influence of perceiver's level of masculinity or femininity. These include three competing hypotheses: similarities attract, opposites attract, and a match in sex typicality attracts. Exploratory analyses found no significant interactions of raters' sex typicality with other variables; therefore, raters' own sex typicality did not further affect their attractiveness ratings.

In summary, this is the first study to address heterosexual and homosexual men's preferences to male and female targets across high and low testosterone levels. This was the first study to explore these mechanisms, it also investigated at whether these shifts are adaptive, independent of sexual orientation, or whether they are dependent on sexual orientation. It appears from the results, that there is no conclusive evidence for preferences towards masculinity or femininity to shift across testosterone level, either because of an adaptive mechanism or dependent on sexual orientation.

4.6. Limitations

4.6.1 Sample Size

It was hoped data would have been collected from a larger number of participants (this study used data from 11 heterosexual men and 16 homosexual men), however, as expressed at the start of this thesis, there was a significant impact on the ability to collect data because of the Covid-19 Pandemic. Although I did successfully recruit a number of participants similar to the number in previous, related research (Bird et al., 2016 (*N=24*); Welling et al., 2008a (*N=29)*), it would be beneficial in future research to try and gather more participant data for use in the analysis.

4.6.2. Measure of Testosterone

For this study testosterone level was determined based on the diurnal rhythm variation over a 24-hour period, where between 6am-8am testosterone is at its peak and between 5pm-8pm at its trough with lowest levels detected in the evening. Participants had to complete the survey once between 6am-10am for data collected during high testosterone level and once between 5pm and 10pm for data collected during low testosterone. It was hoped that a more objective measure for testosterone could have been used (saliva assay samples), however as explained in the methods, financial constraints did not permit this. Previous relevant research used salivary assay sample to determine testosterone level (Welling et al., 2008a), and suggested that based on previous studies, salivary assay is valid measure for testosterone level based on an extremely high correlation between the results obtained between two separate labs. Results for heterosexual men from our study were consistent with the findings from both the self-report and saliva assay methods by Welling et al. (2008). However, the use

of daily cycle and salivary assay samples for measures of testosterone were critiqued by Bird et al. (2016). This was because the researchers could not be sure whether testosterone is the sole cause for the changes in preferences or whether these preferences are as a result of only determining testosterone level by observation only (through salivary assay) and not direct manipulation of testosterone (directly changing testosterone levels). Nor could they be sure whether the changes were due to other variables present but not tested for during high testosterone. Consequently, Bird et al. (2016) directly manipulated testosterone level by administering testosterone using a topical gel and measured testosterone level using blood drawn samples. Despite these different methods, results for heterosexual men from our study, alongside those by Welling et al. (2008a) were consistent with the findings by Bird et al. (2016). Bird, et al also found that heterosexual men or high levels of testosterone were more attracted to female femininity. Thus, although it is important to obtain objective measures of testosterone for use in analysis, results from our study were consistent with relevant studies which employed two methods of objective measures.

4.6. Overall Conclusions and Future Research

To my knowledge, this is the first study to date that has explored the influences of testosterone cycle shifts on attraction preferences towards facial masculinity and femininity of female and male targets across men of different sexual orientations. It appears from the results, in support of previous research, that heterosexual men prefer feminine female and this preference increased with elevated testosterone (Ankarberg & Norjavaara, 1999; Bird et al., 2016; Diver et al., 2003; Welling et al., 2008a). Homosexual men preferred masculine male faces more so than heterosexual men, but homosexual men's preferences did not change with testosterone levels. Overall, results suggest that testosterone enhances, if anything,

preferences based on sexual orientation, but there were no strong patterns, depending on testosterone, to conclusively support either hypothesis.

Further research within this field would benefit from a longitudinal approach, exploring attraction preferences and patterns across age, situational, cultural, and life factors (e.g., partner length - short term/long term, sexual partner, romantic partner), as well as more robust measures of testosterone and higher numbers of participants. It could also encompass the use of eye tracking which would help to explore the unconscious/subconscious objective measures of attraction preferences using eye gaze and pupil dilation (Attard-Johnson et al., 2021).

Chapter 5 General Discussion

5.0 Summary of Findings

Four studies were presented in this thesis across Chapters 2, 3 and 4. Chapter 2 of this thesis presented the first and second study. They investigated the influence of self-reported masculinity-femininity of both heterosexual and homosexual men and women on attraction preferences towards male and female targets with varied levels of facial masculinity-femininity. Both studies explored whether similarities attract, or opposites attract in terms of masculinity-femininity, or whether there is a preference for a match in sex typicality across sex and sexual orientation. Study 1 employed the use of 3D computer generated images. Study 2 employed the use of real-life computer manipulated images. Study 1 found no compelling evidence to support any of the three hypotheses. Study 2 indicated that masculine heterosexual men showed a stronger preference for feminine female targets. Since this was the only significant finding, it was not clear whether it supported the "opposites in masculinity-femininity attract" or "match in sex typicality attract" hypothesis.

The third study in this thesis in Chapter 3, investigated whether there is an evolutionary adaptive shift in women's attraction preferences across fertility levels. It checked whether high fertility levels enhance attraction to masculinity in male targets, independent of sexual orientation. Furthermore, it examined whether shifts in attraction preferences are dependent on sexual orientation and thus are not necessarily adaptive: in such a scenario, fertility enhances preferences for preferred sex targets, thus masculinity in males for heterosexual women and femininity in females for homosexual women. Study 3 found no compelling evidence for either of my proposed hypotheses. Converse to predictions, results show heterosexual women had a stronger preference for masculine male faces during low fertility as opposed to high fertility, and homosexual women, in general, showed a decreased attraction to feminine female faces during high fertility. Results showed therefore no

evidence for an adaptive shift in preferences, nor for the nor did it indicate that a shift in preferences were influenced by sexual orientation.

The fourth and final study in this thesis in Chapter 4, investigated whether there is an evolutionary adaptive shift in men's attraction preferences across testosterone levels: high testosterone levels could enhance attraction to femininity in female targets, independent of sexual orientation. However, if shifts in attraction preferences are dependent on sexual orientation and thus not necessarily adaptive, testosterone would enhance men's preferences for preferred sex targets. Thus, it would enhance heterosexual men's attraction to femininity in female targets and homosexual men's attraction to masculinity in male targets. Study 4 found no compelling evidence for either of the proposed hypotheses. Heterosexual men have a stronger preference for super-feminine female targets during high testosterone compared to low testosterone and therefore, if anything, this finding suggests that testosterone levels enhance attraction based on sexual orientation. There was some indication that homosexual men have a stronger preference for masculine male targets during high testosterone than during low testosterone, compared to heterosexual men, however these findings were not significant. Results showed no support for an adaptive shift in preferences. In combination, these findings indicate that testosterone could increase attraction to preferred sex targets, but only when heterosexual men judge female targets.

Overall thesis findings for heterosexual and homosexual women showed no evidence for similarities attract, opposites attract or match in sex typicality attract and no compelling evidence for adaptive shifts (independent of sexual orientation) or non-adaptive shifts (dependent on sexual orientation) across fertility level in attraction preferences. For heterosexual men there was evidence of opposites attract or match in sex typicality attract, where masculine men show a stronger preference for feminine female targets. For heterosexual and homosexual men there was no compelling evidence for adaptive shifts

(independent of sexual orientation) across testosterone level in attraction preferences. For heterosexual men limited evidence suggested a non-adaptive shift (dependent on sexual orientation) across testosterone level in attraction preferences super-feminine female targets.

5.1. Implications from the Present Research

Below I will discuss the implications of the present research on the main perspectives, identified in the General Introduction. I will summarise what each of the perspectives propose, discuss what was found in this thesis and then discuss what the thesis findings mean in relation to those perspectives.

5.1.1. Assortative Mating

Assortative mating proposes that individuals are more attracted to targets who are like themselves compared to those dissimilar to themselves (similarities attract) (Alvarez, 2004; Byrne, 1971; Hill et al., 1976; Little et al., 2006; Murstein, 1972; Penton-Voak, Perrett & Peirce, 1999a; Thelen et al., 1985). Evidence suggests that similarity in perceiver and target masculinity and femininity affect attraction preferences for heterosexual and homosexual men and women (Antill, 1983; Bailey et al, 1997; Boyden et al., 1984; Kocsor et al., 2011; Todd, Penke, Fasolo & Lenton, 2007). Thus, if as man or woman perceived themselves as masculine, they would have a stronger attraction preference for a masculine preferred sex target. Conversely if a man or woman perceived themselves as feminine, they would have a stronger attraction preference for a feminine preferred sex target. Evolutionary theorists suggest that this type of mating occurs due to a link to genetic relatedness (matching) and the likelihood that 'good genes' are carried through offspring (Alverez, 2004). It could also be linked to sharing of other characteristics aside from masculinity and femininity such as

religious and political attitudes and values, education, intelligence and emotional experience and expression (Caspi, Herbener & Ozer, 1992; Watson et al., 2004; Zietsch, et al., 2011).

This thesis found no evidence of assortative mating. There was no evidence of similarities attracting with relation perceiver sex typicality and target sex typicality. If this null finding were correct, what could be a reason for it? Mating with a target with genetics too similar the perceiver could lead to inbreeding where offspring could receive accumulated harmful recessive alleles, resulting in reduced fitness or autosomal recessive disorders (Johnston, Keats & Sherman, 2019). Therefore, there may be an innate evolutionary mechanism, inbreeding avoidance, which discourages perceivers being attracted those who display too similar characteristics and genetics to themselves (Laeng, Vermeet & Sulutvedt, 2013; Rantala & Marcinkowska, 2011).

5.1.2. Disassortative Mating

Disassortative mating proposes that individuals are more attracted to targets who are dissimilar themselves (opposites attract). Evidence suggests that complementarity in perceiver and target masculinity and femininity affect attraction preferences for heterosexual and homosexual men and women (Bailey et al., 1997; Seyfried & Hendrick, 1973). With respect to level of masculinity and femininity, heterosexual and homosexual men and women who perceive themselves as masculine would show a stronger preference for a preferred sex target who is feminine. Conversely, heterosexual and homosexual men and women who perceive themselves as feminine would show a stronger preference for a preferred sex target who is masculine (Dandine-Roulland et al., 2019). From an evolutionary perspective, disassortative mating reduces the likelihood that an individual would mate with a target who is too genetically similar to themselves, plus, increases the chance that you get qualities from

a mate partner that the person himself or herself does not carry. This strategy could reduce the genetic similarity within a family and increase genetic diversity (Dandine-Roulland et al., 2019; Penn & Potts, 1999); for example, gene similarity within the major histocompatibility complex (MHC) region on chromosome 6 (Wedekind et al., 1995). It could allow for the more choosey sex (usually females) to ensure there is an optimal number of different alleles and genes in offspring (Milinski, 2006). In addition to above genetic mechanisms, it may also be that individuals become attracted to the sex they felt less like then they were children (usually, but not always, the opposite sex), which becomes the focus of attraction preferences during adulthood. This could result in masculine men being attracted to feminine women, for instance. This mechanism is suggested to occur across both sexes and different sexual orientations (Bem, 1996).

There was some limited evidence for a disassortative mating within Study 2, where masculine heterosexual men showed a stronger preference for feminine female targets. However, as this was the only significant finding within Study 2, there is no clear evidence as to whether there is strong support for disassortative mating (opposites in masculinity and femininity attract). No other evidence was found within the thesis which supported a disassortative mating.

Therefore, this thesis does not provide clear evidence of disassortative mating, that opposites attract with respect to masculinity and femininity. If this null finding (or not conclusive finding) were correct, it could be because disassortative mating is a rarer form of mating strategy (Jiang, Bolnick & Kirkpatrick. 2013; Janicke et al. 2019), plus, that the evolutionary mechanisms behind the strategy remain unclear (Dandine-Roulland et al., 2019). It may be that the ecological conditions enabling the adaptive use of disassortative mating could be more complex than previously thought (Maisonneuve et al., 2021). For instance, it could be that the role of disassortative mating strategies in attraction preferences of

masculinity and femininity in targets is context dependent. It may be more evident in social contexts where there are no constraints over mate choice (more freedom to choose ideal mate partner), and less evident in social contexts where there are more constraints over mate choice (limited people to choose from) (Dandine-Roulland et al., 2019; Maisonneuve et al., 2021).

5.1.3. Match in Sex Typicality

It is proposed that attraction preferences are based on a match in sex typicality between perceiver and target. Thus, regardless of sex or sexual orientation a perceiver that is sex typical would prefer a sex-typical target of their preferred sex (Johnson & Tassinary, 2007; Johnston et al., 2001). Thus, for masculine homosexual men and feminine heterosexual women they would be more attracted to masculine male targets. For masculine heterosexual men and feminine homosexual women, they would be more attracted to feminine female targets (Bergling, 2001; Cohen & Tannenbaum, 2001; Johnson & Tassinary, 2007; Johnston et al., 2001; Rieger et al., 2011; Smith & Stillman, 2002).

There was some inconclusive evidence for a match in sex-typicality within Study 2, where masculine heterosexual men showed a stronger preference for feminine female targets. However, as this was the only significant finding within Study 2, there is no clear evidence as to whether there is strong support for match in sex typicality or for opposites in masculinity - femininity attract (disassortative mating). No other evidence was found within the thesis which supported a match in sex typicality.

5.1.4. Menstrual Cycle

It is largely proposed that for women, the menstrual cycles modulate evolutionary related behaviours linked to attraction preferences (Gangstead & Thornhill, 2008;

Gildersleeve et al., 2014; Jones et al., 2008; Johnston et al., 2001). Evolutionary theorists suggest the link between menstrual cycle and attraction to male targets are a result of adaptive shifts (*Ovulatory Shift Hypothesis*) and mating strategies (*Dual Mating Strategy Hypothesis).*

5.1.4.1. Ovulatory Shift Hypothesis

This hypothesis proposes that women have evolved to optimise reproductive success by having a mixed mating strategy (Gangestad & Thornhill, 1998). Women show a stronger preference for sex-typical male targets (more masculine) during high fertile phases and less sex-typical male targets (more feminine) during the low fertile phases. The shifts in male target sex typicality preference across menstrual cycle serves as an evolutionary adaptive purpose to enhance the likelihood of reproducing with a male who has good genetic quality, more likely to enhance survival, provide resources and increase reproductive success (Gildersleeve, et al., 2014) during times of high fertility, whereas the less genetically fit male could be a better care taker and father, raising children who are not his own. Thus, preference for sex-atypical male targets during low fertility serve as an evolutionary purpose to enhance likelihood of engaging with a male who provides cues of parental investment, social and material support, reliability, trust and a reduced risk of disease (Johnston et al., 2001; Jones et al., 2008; Penton-Voak et al., 1999; Peters, Simmons, Rhodes, 2009).

It was unknown whether the menstrual cycle and attraction pattern shifts are observed across sexual orientation. Thus, if the adaptive shift is robust enough to override sexual orientation homosexual women would also show a higher level of attraction to sex-typical male targets during high fertility. If this shift is independent of sexual orientation and fertility enhances sexual orientation preferences to preferred sex target sex typicality, it would be

expected that homosexual women would show a stronger preference for sex-typical female targets.

This thesis found no compelling evidence that the ovulation cycle and attraction to male target sex typicality is a result of an evolutionary adaptive shift. There no was compelling evidence that shifts are dependent on sexual orientation and fertility enhances preferred sex target sex typical preferences. Converse to thesis predictions based on previous research, heterosexual women showed a stronger preference for masculine male faces during low as opposed to high fertility.

Therefore, this thesis did not provide support for adaptive shift preferences across menstrual cycle. There was no support provided for the Ovulatory Shift Hypothesis. The findings from this thesis are in line with more recent work which argue that there is no compelling evidence that shifts in attraction preference are influenced by menstrual cycle (Harris, 2013; Jones et al., 2018; Marcinkowska et al., 2016; Muñoz-Reyes et al., 2014; Scott et al., 2014; van Stein et al., 2019; Zietsch et al., 2015). If this unpredicted finding were accurate, what could be the reason? In contemporary society where there is reduced need for evolutionary mechanisms around reproduction, the influence of shifts in fertility level on attraction to sex typicality may no longer be required. Considering more contemporary evidence, it may be that male facial sex typicality is no longer a cue of reproductive fitness but a cue of intersexual competitiveness, dishonesty, aggression and lower likelihood to invest in offspring (Ditzen et al., 2017; Jones et al., 2018; Puts, 2010). It may be in that today's society women desire partners who display facial femininity cycle as it signals positive traits in a male such as honesty, less dominance, more enthusiasm, and greater investment in offspring and parental care (Penton-Voak et al., 2003; Perrett et al., 1998).

5.1.4.2. Dual Mating Strategy Hypothesis

This hypothesis proposes that women have evolved to develop two overlapping mating strategies (Gangestad & Thornhill 1998; Pillsworth et al., 2004, Weisber & Kim, 2018). The short-term strategy is where women prefer a male who displays cues of good genetics and will increase likelihood of quality offspring (Jones et al., 2005; Penton -Voak et al., 1999). This strategy will more commonly be used during high fertility where reproductive success in the short term is more likely. The long-term strategy where a woman prefers a male who displays cues of pro-sociality and likelihood to invest resources in offspring (Jones et al., 2005; Weisberg & Kim, 2018). This strategy will more commonly be used during low fertility where survival, parental investment and long-term needs are more important.

I did not test this hypothesis directly within this thesis. I did not directly check for short term versus long term mating strategies, but since no predicted patterns associated with ovulatory shift were found, I also indirectly did not find support for this hypothesis.

5.1.5. Testosterone

It is proposed that for men testosterone modulates evolutionarily related behaviours such as survival and reproduction (Archer, 2006; Carré et al., 2009; Sellers et al., 2007). Increased levels of salivary testosterone are linked to a higher need for engagement in sexual activity with others (Al-Dujaili & Sharp, 2012; Klimas et al., 2019; Puts et al., 2015). For heterosexual men increased levels of testosterone are linked to a stronger preference for female target sex typicality (feminine) (Bird et al., 2016; Welling et al., 2008a). Evolutionary theorists suggest the link between testosterone and attraction to female target sex typicality is a result of an adaptation (Buss & Schmitt, 2011; Gangestead & Thornhill, 2008). This

adaptation serves as a purpose of men to be able to enhance their mating success during levels of high testosterone (when they are more likely to want sex) by engaging with females who signal traits of fertility and high reproductive likelihood (Gangestad & Scheyd, 2005; Marcinkowska et al., 2017; Welling et al., 2008a). It was unknown whether the testosterone cycle and attraction pattern shifts are observed across sexual orientation. Thus, if the adaptive shift is robust enough to override sexual orientation homosexual men would also show a higher level of attraction to sex-typical females targets during high testosterone. If this shift is independent of sexual orientation and testosterone enhances sexual orientation preferences to preferred sex target sex typicality, it would be expected that homosexual men would show a stronger preference for sex-typical male targets.

This thesis found no evidence that testosterone and attraction to female target sex typicality is a result of an evolutionary adaptive shift. There was no compelling evidence that shifts are dependent on sexual orientation and testosterone enhances preferred sex target sex typical preferences. Heterosexual men showed some evidence of a stronger preference for sex-typical female targets during high compared to low testosterone. Homosexual men showed a stronger preference for sex-typical male faces in high compared to low but only compared to heterosexual men, this was not significant. Thus, findings provided some indication that testosterone could increase attraction to sex in preferred sex targets, but there was no consistent evidence for this across sexual orientation.

Therefore, this thesis did not provide significant support for the evolutionary adaptive shift proposal which suggests men have an evolutionary adaptive mechanism to find sex-typicality in female faces more attractive during high compared to low testosterone (Ankarberg & Norjavaara, 1999; Bird et al., 2016; Diver et al., 2003; Klimas et al., 2019; Welling et al., 2008a). Nor was there any conclusive evidence for preferences towards sex typicality shifting across testosterone dependent on sexual orientation. Therefore, testosterone

may influence preferences differently across heterosexual and homosexual men. It may be a more complex interaction between testosterone, sexual orientation, and attraction preferences across male and female targets. In contemporary society where there is reduced need for evolutionary mechanisms around survival and reproduction, the influence of testosterone on attraction to sex-typical male and females may have altered.

5.1.6. Non-Adaptive Models of Mating

Overall, within this thesis, there appears to be no compelling evidence for the influence of proposed adaptive models of mating across sex and sexual orientation for male and female targets varied in femininity and masculinity (*as outlined above*). Nor is there compelling evidence to suggest that there are influences of hormones (fertility and testosterone) or sexual orientation in attraction preferences (*as outline above*). It may be that mating choices and attraction preferences are more of a product in contemporary society of non-adaptive models, where preferences are made assuming there is no direct benefit for the chooser. It may be that preferred traits in attractiveness are incidental biproducts of variability in selection, an existing bias in species mating choices. It may be that in contemporary society adaptive and non-adaptive models do not work independently but alongside one another to develop mechanisms for a more comprehensive mate choice strategy. When demands within the mating context change, so too may the evolutionary demands and the adaptive and non-adaptive mechanisms individuals need to employ to have a successful mating experience.

5.2. Limitations and Future Considerations

Below are considerations for future research within this field. These are factors which should be considered in future research to encompass individual differences more comprehensively in attraction preferences and mating behaviours.

5.2.1. Sample Sizes

I am aware that sophisticated power analysis using G*Power (Faul et al., 2009) may have given a more useful guide to sample. To determine the sample size in this thesis I modelled sample size numbers on previous related research and aimed to collect as much as data as possible. As previously expressed, there was a significant impact on the ability to collect data for Study 3 and Study 4 because of the Covid-19 Pandemic. Further research could benefit from employing the use of a power analysis to determine sample size and to gather more participant data for use in analysis. Post-hoc power analyses for non-significant results have been conducted using G*Power (Faul et al., 2009) for all four studies. Across studies, the power analyses suggested that I would have needed between 100 and 350 participants for making non-significant effects that were in the predicted directions significant. That said, some (significant) effects were not even as predicted and, if accurate, adding more participants would not result in making them significant in the hypothesised direction.

5.2.2. Hormonal Measures

For women and their fertility measures, this thesis used urinary ovulation tests which detected a surge in luteinizing hormone (LH). These are known to be very highly accurate (99%) and very sensitive in detection (20mIU/ml) for the LH surge. Other relevant research, which found similar results to this thesis used saliva samples to detect estradiol (Jones et al.,

2018; Marcinkowska et al., 2016). Thus, suggesting that the present hormonal measures used was not a limitation in the findings. However, future research could employ the use of the combination of detection for LH surge and estradiol surge through saliva samples or urinary ovulation tests to gather additional measures. Future research should also ensure that data collection occurs in a laboratory setting to control for the time between surge detection and survey completion for the most accurate results (Lobmaier & Bachofner, 2018).

For men, this thesis used the 24hour diurnal rhythm variation cycle to determine testosterone level. This method does rely on self-report and specific time points during the day for data collection. This method is based on previous evidence that testosterone levels peak between 6am – 8am and trough between 5pm – 8pm (Crawford et al., 2007; Crawford et al., 2015; Guay, Miller & McWhirter, 2008). Although my research found results consistent with some relevant research (Bird et al., 2016; Welling et al., 2008), I acknowledge that future research could employ the use of an objective biological method, salivary assay sample to determine testosterone level for the most accurate results. Future research which employs the use of salivary assay, should get to attend a laboratory at least twice for saliva assay sample collection (for high and low testosterone) and to complete the survey.

5.2.3. Measures of Attraction

Self-reporting measures are limited because they require the self-awareness of an individual and their willingness to provide truthful answers as opposed to socially desirable responding (providing answers believed to be favourably by others) (Bogner & Landrock, 2016; Krumpal, 2013). There may also be an element of extreme response style where individuals provide answers which are exaggerated extremes of preferences using scale points at the lowest and highest ends (Bogner & Landrock, 2016; Lavrakas, 2008), as well as moderacy bias, where people automatically opt for the mid-point scale response – these occur

regardless of the content within the question (Bogner & Landrock, 2016). Using objective measures, such as eye tracking equipment to measure pupillary response in future research to determine level of attraction to a target, could provide an objective physiological measure of sexual arousal and attraction preference to masculinity-femininity or sex typicality. Objective measures are preferred over self-report because they are a non-invasive, instant, and provide unconscious responses which remove the interference of self-awareness, biases, and response styles (Attard-Johnson et al., 2021; Finke et al., 2017; Liao, Kashino & Shimojo, 2020; Rieger & Savin-Williams, 2012). Importantly, as with attraction preferences, sexual orientation is most often determined by a subjective measure such as the Kinsey scale (Kinsey et al., 1948), used in this thesis, which also relied on self-awareness and the ability to be truthful when answering. Pupillary response patterns and physiological measures of arousal in men correlate strongly with their self-reported sexual orientation, however this not always as strong with women (Rieger & Savin-Williams, 2012; Rieger et al., 2015). A meta-analysis examined whether pupillary response provide a consistent measure of sexual orientation in heterosexual and homosexual men and women (Attard-Johnson et al., 2021). For heterosexual and homosexual men, pupillary response was consistent with sexual orientation, where heterosexual men showed greater pupil dilation to female targets and homosexual men a greater pupil dilation to male targets. Heterosexual women showed a trend of larger pupil dilation to male targets, but the effect size was small and not significant. Homosexual women showed greater pupil dilation to male targets (Attard-Johnson et al., 2021). This suggests potential shortcomings in any research that solely uses self-report measures of sexual orientation which could have implications during analysis and could impact findings. Thus, by using an objective measure such as pupil response to determine unconscious target sex attraction preferences, this would allow us to differently assess sexual orientation for men and women. In future research sexual orientation would be determined

first, and then an exploration of preferences for facial masculinity–femininity or sex-typicality across male and female targets. However, Eye tracking and pupil dilation measurements are not without their limitations. Eye tracking and pupil dilation studies can be highly time consuming, and the measurement rate and reliability is dependent upon technology used and methodology employed. Pupil dilation can be subject to spontaneous cognitive interference and measurements can be influenced by environmental factors such as lighting (pupil light reflex) and external noises (Attard-Johnson et al., 2021). Therefore, future research could benefit from using both subjective self-report measures, alongside the automatic measures for attraction preferences and sexual orientation to determine preferences more accurately across sex and sexual orientation towards male and female facial masculinity-femininity.

5.2.4. Attraction Context

This thesis did not specifically explore attraction context, as in, whether participants were assessing attractiveness of a target based on a short-term relationship (single date, spur of the moment fling, affair within a long-term relationship, one night stand) or a long-term relationship (someone to move in with, leave current partner for, someone you would want to marry or marriage equivalent). Men and women have developed separate sexual mating strategies that are used depending on short-term or long-term relationship context (Buss & Schmitt, 2019). Women emphasise resource for long-term relationships but more heavily depend on physical attractiveness and genetic desirability in short-term relationships (Li, Valentine & Patel, 2011). Short term mating is more common in men than in women (Buss & Schmitt, 2019). Men show a stronger preference for female facial femininity during the short-term context as opposed to long term contexts. For women in particular, hormonal effects on preferences for masculinity in males might be stronger when assessing for short-term but not

long-term relationships (Jones et al., 2018). Homosexual men also have context dependant preferences, with evidence suggesting a greater preference for muscular and lean men for short-term relationships (Varangis et al., 2012). Therefore, future research could benefit from considering and assessing attractiveness preferences across short-term and long-term relationships. This may help to understand whether masculinity or femininity in males and females are most desired by heterosexual and homosexual men and women, and potential reasons for this.

5.2.5. Sexual Fluidity

Historically, sexual orientation has been conceptualised into three distinct categories, heterosexual, bisexual, and homosexual (Institute of Medicine, 2011). However, this view of sexual orientation has been challenged by scholars who argue that sexual orientation is on a continuum (Batres, Jones, & Perrett, 2020; Diamond, 2008, Diamond et al., 2020; Vickberg & Deaux, 2005). More recently it is argued that individuals experience unexpected changes in sexual attraction desires across their life often due to situational or interpersonal factors (Diamond, 2021). This is now known as sexual fluidity. Sexual fluidity is the capacity for a situation dependent sexual flexibility where an individual may change their desire for same-sex or other sex targets (Diamond, 2016). This may be for a short-term or a long-term period. Sexual fluidity may or may not align with biological sex, sexual behaviour or actual sexual orientation. Therefore, there are some individuals who engage in same-sex sexual behaviours but do not categorise themselves as homosexual but as open to those experiences (Diamond, 2008; Savin-Williams, 2017; Ward, 2015)

Whilst evidence does show that sexual fluidity is prevalent in both men and women, (Batres et al., 2020; Rupp et al., 2014; Vrangalova & Savin-Williams, 2012), it generally

suggests that sexual fluidity is more prevalent in women than it is in men (Apostolou, 2018; Aramburu AlegrÍa, 2013; Bailey et al., 2016; Diamond, 2008; Diamond, 2003; Diamond, 2016; Katz-Wise & Hyde, 2014; Katz-Wise et al., 2016; Mock & Eibach, 2011; Notman, 2002; Ott et al., 2011). Women have lower concordance between sexual attitudes and behaviours (Baumister, 2000) and are more likely than men to report more than one sexual orientation. Empirical research found that over six-year period, and compared to men, women show more fluidity in sexual orientation identity and define their orientation as non-specific (Savin-Williams et al., 2012). From an evolutionary standpoint. From an evolutionary standpoint, the alloparenting hypothesis (*discussed in the General Introduction 1.3. Sexual Orientation*) may help to account for sexual fluidity in women (Kuhle & Radtke, 2013). This hypothesis proposes that women have evolved to engage in flexible sexual preferences between males and females. Having the flexibility to prefer males or females is seen as adaptive so that when the male was not around and did not engage in parenting duties the women would secure offspring support and survival resources by engaging in sexual behaviours with a female. For men, it is theorised that there is a dichotomy between their self-identity and their actual sexual orientation (Ward, 2015). Empirical evidence suggests that self-reported orientation does not always necessarily correlate to their sexual activity preferences, thus engaging in sexual behaviour with same-sex individuals but maintaining a heterosexual identity (Katz-Wise et al., 2016; Kinsey et al., 1948; Ward, 2015).

Empirical evidence for sexual fluidity is limited to self-report and therefore may also fall foul to report biases (Diamond, 2021). However, evidence does show that experimentally elicited sexual arousal patterns diverge from self-report sexual orientation (Chivers, 2017; Chivers & Bailey, 2005; Chivers et al., 2004; Peterson et al., 2010; Rieger & Savin-Williams, 2012; Savin-Williams et al., 2012; Savin-Williams et al., 2017). This is more commonly known as non-specificity; however, it does necessarily overlap with the notion of sexual

fluidity. Thus, while in my thesis, sexual orientation and sexual attraction were asked each time before a participant rated the images, it may be the individual preferences had changed but not enough for them to identify as a different sexual orientation in the self-report method, or the self-report and the actual physical attraction to a stimulus is non-coherent. It could be, that if a woman identified as heterosexual and prefers feminine males, this could be in part due to a sexual attraction to women. It is important to note that whilst evidence of sexual fluidity is increasing, some longitudinal work has suggested that stability of sexual orientation is more common than change (Savin-Williams et al., 2012). Thus, sexual fluidity may be down to individual differences across age, sociocultural factors and life experiences as opposed to gender-wide characteristics (Ott et al., 2011).

Future research could encompass sexual fluidity to fully explore the continuum of sexual orientation on attraction preferences of facial masculinity and femininity (Batres et al., 2020). Given the limitations of sexual fluidity reporting, it may be that sexual orientation would also benefit from an objective data collection method alongside self-report (*disucssed above in 5.2.3. Measures of Attraction*).

5.2.6. Sex Drive

Historical theories believed that higher levels of drive, in general (such as third, hunger, need for warmth), increases the likelihood that dominant behaviours will occur and decrease likelihood of non-dominant behaviours occurring (Hull, 1943; Spence, 1956; Zajonc, 1965). When applied to sexual behaviour, research has predicted that higher levels of sex drive are associated with increases in men and women's dominant sexual attraction towards male and female perceivers (Beaumeister, 2000; Lippa, 2006; Lippa, 2007a; Welling et al., 2008b). Thus, the prediction is that heterosexual men and women with high sex drive

would show a stronger preference to other-sex and not-same sex targets, homosexual sexual men and women would show a stronger preference to same-sex but not other-sex targets (Lippa, 2006; Lippa, 2007). Research found this to be the case for heterosexual men, where sex drive is correlated with attraction to females and homosexual men, where sex drive was correlated with attraction to males. However, contrarily to the above prediction, evidence has shown that higher sex drive lead to gender nonspecific attractions (towards both males and females) in heterosexual women. In contrast, it linked to gender specific attractions (towards females) in homosexual women (Lippa, 2006; Lippa, 2007).

Whilst evidence shows that men in general have a higher sex drive than women (Baumeister, 2000; Baumeister et al., 2001; Gerressu et al., 2008; Kinsey et al., 1948) some of the results by Lippa (2006) suggests that homosexual women may have a higher sex drive than heterosexual women. Therefore, it could be that heterosexual men, homosexual men and homosexual women show male typical patterns in sex drive and attraction preferences because all three groups have higher sex drive levels (Lippa, 2006; Lippa, 2007; Singh et al., 1999). The role of sex drive in attraction preferences, particularly for heterosexual women can be linked to sexual fluidity (*as discussed above in 5.2.5.*) whereby higher sex drive leads to more sexually fluid, (Apostolou, 2018; Aramburu AlegrÍa, 2013; Bailey et al., 2016; Diamond, 2008; Diamond, 2003; Diamond, 2016; Katz-Wise & Hyde, 2014; Katz-Wise et al., 2016; Mock & Eibach, 2011; Notman, 2002; Ott et al., 2011) and the evolutionary alloparenting hypothesis (*as disucssed above in 5.2.5.)* (Kuhle & Radtke, 2013). It has also been proposed that women have a more malleable and milder sex drive than men in response to potential sociocultural and situational factors (Beaumeister, 2000). Furthermore, research has found that for heterosexual women, their sex drive is positively associated with preferences for masculine male faces and feminine female faces (Welling et al., 2008)This has not been explored in homosexual women, heterosexual men, or homosexual men.

Future research should explore sex drive and sexual desire on attraction preferences of masculinity and femininity of male and female targets. It should encompass men and women of all sexual orientations, considering sexual fluidity, to investigate individual differences in preferences across time in sex drive and sexual desires.

5.3. Wider Theoretical Application

This thesis examined attractiveness using, in part, an evolutionary theoretical standpoint. However, it is important to note that the examination of these theories is not the only reason why the study of attraction and attractiveness is relevant. Attraction and attractiveness affect the lives, actions, and behaviours of people daily. Several contemporary applications of attractiveness and attraction are discussed briefly below (this list is not exhaustive), to acknowledge these as important social and psychological influencers in attraction preferences and potential mate preferences in contemporary society.

5.3.1. Personality

Personality has been found to influence attractiveness and attraction preferences for both men and women (Lewandowski, Aron & Gee, 2007). A theory which aims to explain the influence of personality on attractiveness and attraction preferences is the 'Halo Effect' (Lucker, Beane & Helmreich, 1981). This theory suggests that people have a tendency for positive characteristics and impressions of a person to positively influence their opinions about other areas of that person. An individual may perceive someone as more attractive once they have been provided with positive personality traits of that person such as well groomed, assertive, stable, trustworthy. Conversely, an individual may rate someone as more trustworthy, kind and intelligent if they perceive them as more attractive from the outset.

There is a strong correlation between the role of attractiveness and perceptions of life success and personality (Wade & DiMaria, 2003). Furthermore, people believe that those who are more attractive possess more socially desirable personality traits than any other people (Pound et al., 2007; Zhang et al., 2014). A study using both heterosexual men and women college students examined the effect of personality information on attraction ratings (Lewandowski et al., 2007). They provided participants initially with just photos of the opposite-sex, then secondly the photos again but with personality information. Results showed that provision of the personality information significantly changed ratings of physical attractiveness. They also showed when desirable and positive personality traits are provided alongside a photo of a person, the more they were rated as physically attractive. Further support for the role of the Halo Effect and personality influences in attraction rating was a study conducted by Zhang and colleagues (2014). They examined the influence of personality manipulation on female facial attractiveness preferences. They rated a set of images when presented with no personality information, and then two weeks later presented the same images but with positive, negative or no personality information. Results showed that positive personality traits can increase ratings of facial attractiveness. For some of this link of personality to attractiveness there could be an evolutionary explanation (Buss & Hawley, 2010; Buss & Penke, 2015; Penke, Denissen, & Miller, 2007).

Attraction to some of the more widely known personality traits (agreeableness, neuroticism, contentiousness, extraversion,) has been linked to evolutionary advantages (Nettle, 2006; Ozer & Benet-Martinez, 2006; Roberts et al., 2007). Contentiousness has been linked with longevity and higher survival rates (Deary, Weiss, & Batty, 2010). Thus, an attractive trait as it would ensure own survival and an increase likelihood of survival for offspring. Agreeableness is linked to co-operation and building alliances (Graziano & Tobin, 2009) and neuroticism has been linked to higher levels of social acceptance and an ability to

notice signs of social exclusion (Denissen & Penke, 2008). These would be attractive traits as they increase likelihood of survival but are also good traits to pass on to future offspring. Conscientiousness is linked with an increased ability to negotiate (Deary et al., 2010). This is an attractive trait as it is linked to an ability to ensure security of resources such as food, land, health care and sexual partners. Extraversion is the most widely considered and studied core dimension of human personality which has an evolutionary basis in attractiveness (Ashton, Lee, & Paunonen, 2002; Haysom et al., 2015). Extraversion is linked to traits such as energetic, adventurous, impulsive, open, inspired, competitive, ambitious, talkative, and assertive (Wilt & Revelle, 2017). Extraversion is linked to individuals having higher levels of fitness, being physically stronger and being more aggressive (von Borell et al., 2019). Extraverted people are more likely to engage in frequent sex, have more sexual extrapair sexual encounters and a larger number of sexual partners overall (Heaven et al., 2003; Heaven et al., 2000; Nettle, 2006). Extraversion personality traits are believed to enhance an individual's ability to increase benefits from others and inflict some cost on others (Social Exchange Theory) (Haysom et al., 2015), but others can also benefit from mating with an extroverted person. From an evolutionary view, extraversion would be an attractive personality type as it would, increase an individual's likelihood of producing many offspring with good genetic quality and increase survival rates and resources (an asset most desired by women). A model developed to explore the evolutionary link between personality traits and increased attractiveness is the 'Facultative Personality Calibration' (FPC). FPC suggests that personality traits are not directly inherited but adapt in response to other genetic variability a person has including physical strength, intelligence, and attractiveness (Haysom et al., 2015; Lukaszewski & Roney, 2011; Sell, Tooby & Cosmides, 2009; von Borell et al., 2019). Overall, personality traits are important when exploring attractiveness as most appear to link to evolutionary mechanisms and advantages. If certain personality traits portray good genetic

quality, increased fitness, and increased survival, they are possibly more desired by a mate partner.

5.3.2. Politics

Largely, what is most influential in political leader preference is personality (confidence, reliability, honesty) (Koppensteiner & Stephan, 2014), however, some evidence suggests that physical appearance of a politician can also help to shape political leader preferences (Ahler et al., 2017; Ballew & Todorov, 2007; Berinsky, Chatfield & Lenz, 2019; Olivola & Todorov, 2010; Poutvaara, Jordahl, & Berggren, 2009). In 2010, Verhulst, Lodge and Levine, found that facial attractiveness and baby facedness are strong predictors of political leader decisions. Similar research has also found that when asking about the personality of the candidate alongside attractiveness of the candidate, those who were perceived as more attractive were also perceived as more knowledgeable and persuasive. These candidates were also more likely to be the people that individuals trust in their political information and views (Palmer & Peterson, 2015). The Halo effect (*outlined in the section above*) can provide an explanation for these findings (Lucker et al., 1981). Those candidates who provide a positive impression for the individual in one area, positively influences the perception of them in another. Thus, if a candidate is seen as attractive, this will positively influence an individual's perception of the candidate's personality traits. Conversely, if an individual holds a positive impression of a candidate's personality traits this could positively influence their perceptions of the candidate's attractiveness.

Facial shape and facial attractiveness have an important effect on choice of political leader. Differences in face shape of potential political candidates alone can predict who would win or lose and election. Varying the information on whether the candidate is

supportive of war or peace, when presented with these faces can also affect which candidate is preferred (Little et al., 2007c). Further research has demonstrated that individuals prefer political candidates who possess dominant facial features during both times or war and peace (Berinksy et al., 2019). This could be because a dominant characteristic is linked to a positive outcome, especially when linked to a politician who has status and power.

5.3.3. Dating Apps

Dating apps and online dating are fast becoming the most common ways for individuals to seek out a potential partner. Online dating has appeared to get ever successful over the years with Match.com proposing that in 2012 one in six marriages started from an online dating app (Ramirez et al., 2015). Physical attractiveness has been seen to be the most valued characteristic in online dating and the perceptions of preference for a potential partner when looking at dating app profiles. Attractiveness has been found to be the strongest predictor for an initiation of an online relationship (Finkel at al., 2012). This highlights the importance of personal pictures and personal profiles online. It has implications for how people portray themselves through photographs, selfies and how they make themselves appear to be the best version of themselves for the perception of others (Whitty & Carr, 2006). Dating apps have always been criticised for their exaggerated emphasis on physical attractiveness, as well as being very biased towards initial impression formation; however, physical appearance and physical attractiveness is primarily the initial driver for communication and engagement behaviours in a face-to-face context also (Arias & Punyanunt-Carter, 2018). Importantly, research found that online dating success and overall individual attractiveness is not purely down to profile photos and physical attractiveness (although they are important components) but also additional components such as the self-

written personality profile, and free-text component of the profile. The fixed choice aspect of the profile – which every individual has to fill out, was not related to overall individual attractiveness (Fiore et al., 2008). Research into dating profiles and potential partner links found that men have a higher likelihood of using the apps to find partners whom they can engage in casual sex, and women are more likely to use them for a personal attractiveness affirmation and to feel more positive about themselves (Botnen et al., 2018).

5.3.4. Advertising

It has long been accepted in the advertising world that 'what is beautiful is good' and advertisers have used this to their advantage by using attractive celebrities, spokespeople and models in their adverts (Brumbaugh, 1993). A physically attractive person in an advert increases advert believability, willingness to purchase, attitude towards the product being advertised (Kamins, 1990; Kahle & Homer 1985; Petroshius & Crocker, 1989) and then an actual purchase of a product (Caballero & Solomon, 1984). This is the case for both the use of attractive male and female models for print adverts, displays, and endorsements. Furthermore, attractive models in advertisements do increase a product appeal but only on first impression of the advert. When people have longer to think about the advert and what it is trying to portray, physical attractiveness is less influential. Moreover, Trampe et al. (2010) acknowledged that physically attractive models in advertisements can have an influence on the consumer's self-perception of their physical attractiveness, and therefore further affect their body satisfaction. Xiao and Ding (2014) investigated the effects of faces in advertisements and attitudes towards the advertisement and product. Results showed that model faces do effect people's perceptions of an advertisement, their belief in a brand and

their intention to purchase the product and that these effects were mediated by facial attractiveness, trustworthiness and competence.

5.3.5. Familiarity Principle

Finally, a preference for interpersonal attraction and facial attractiveness is correlated with familiarity. Familiarity principle, also known as the mere exposure effect, proposes that people prefer people and objects merely because they are more familiar with them (Miller, Perlman & Breham, 2006). When exploring interpersonal attraction (when attraction leads to a relationship) the more a person is exposed to someone, the more attractive they find them. Support for this was provided by Moreland and Beach (1992) and Peskin and Newell (2004) who demonstrated that an increased exposure to a face increased the attractiveness rating of that face. However, exposure does not always increase level of attraction to a person and influences such as similarity and complementarity (whether the person is similar or complementary to themselves) and social allergy (growing annoyed to idiosyncrasies over time) may also play a part in attraction preferences (Cunningham et al., 2005; Heine, Foster & Spina, 2009; Nowicki & Manheim, 1991).

5.4. Conclusion of Thesis

In sum, this thesis provided limited support that either opposites attract, or that a match in sex typicality attracts, because masculine heterosexual men showed a stronger preference for a feminine female target. Furthermore, this thesis suggests that women do not appear to show adaptive shift in preferences for masculine males across fertility level, and there is no evidence that fertility increases attraction preferences based on sexual orientation to preferred sex targets. Likewise, men do not appear to show an adaptive shift in preference

for feminine females across testosterone levels, but there was some limited evidence which suggests that testosterone may enhance preferences based on sexual orientation.

The very fact that many of the present findings were null findings or counter to the predicted makes implications of this present research difficult. Null findings in-themselves are important to report, as many previously published findings may be biased towards reporting only significant and expected findings, whereas null findings tend to remain unreported. That is, any findings, positive or negative, can provide additional knowledge into the effects of sex, sexual orientation and hormonal influences on attraction patterns, mating, and mating choices. Findings could influence current knowledge around societal norms and stereotype ideas regarding choices for mating, partner choice and sexual orientation. The findings may also impact advertising on products and services for gender and sexual orientation specific individuals. The findings of this thesis could serve as a contributor to understand how dating apps advertise and send out alerts to members searching for a potential partner and to help to inform policy and social support for heterosexual and homosexual relationships and marital decisions. Finally, the findings from this research may have an impact on evolutionary based theories which have long standing support for attraction preferences being observed due to mating mechanisms based on a reproductive need. Findings may give rise to an argument that attraction preferences are now no longer a mechanism associated with of our need to reproduce but other factors more specific to contemporary society. In a new and evolving world where survival and reproduction may no longer be at the top of everyone's priority lists, attraction preferences may have evolved to be suited to an individual's life need.

In sum, this thesis has contributed to our understanding of attraction preferences for facial masculinity and femininity, even if confirmed predictions were limited in numbers. It showed support for the notion that for heterosexual men rating females, masculinity-

femininity matters as a predictor of attraction patterns. However, it showed no compelling evidence (like other recent research in the field) that attraction preferences shift with hormonal cycles, nor that hormonal shifts are enhanced by sexual orientation.

Based on the results of this thesis future work shall investigate the influences of attraction patterns in modern cultures. Future work could thereby develop alternative proposals to the long-standing evolutionary hypotheses for attraction preferences and mating behaviours in contemporary society.

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