

**FACIAL ATTRACTIVENESS PREFERENCES: A POSSIBLE MECHANISM
FOR UNDERSTANDING THE DIFFERENTIAL REPRODUCTION OF WOMEN
WITH AND WITHOUT ANDROPHILIC SONS**

JESSICA L. PARKER
Bachelor of Arts, University of Lethbridge, 2011

A Thesis
Submitted to the School of Graduate Studies
of the University of Lethbridge
in Partial Fulfillment of the
Requirements for the Degree

MASTER OF SCIENCE
Psychology

Department of Psychology
University of Lethbridge
LETHBRIDGE, ALBERTA, CANADA

© Jessica L. Parker, 2014

Facial Attractiveness Preferences: A Possible Mechanism for Understanding the Differential Reproduction of Women With and Without Androphilic Sons

JESSICA L. PARKER

Approved:

(Print name) (Signature) (Rank) (Highest Degree) (Date)

Supervisor

Thesis Examination
Committee Member

Thesis Examination
Committee Member

Chair, Thesis Examination
Committee

ABSTRACT

Facial Attractiveness Preferences: A Possible Mechanism for Understanding the Differential Reproduction of Women With and Without Androphilic Sons

Androphilia refers to sexual attraction and arousal to adult males, whereas *gynephilia* refers to sexual attraction and arousal to adult females. The Sexually Antagonistic Gene Hypothesis (SAGH) holds that a gene can be reproductively detrimental to one sex, but be selected for so long as it is reproductively beneficial to the other sex and this benefit offsets any costs. Consistent with the SAGH, cross-cultural research indicates that the female relatives of androphilic males exhibit elevated reproduction compared to those with no androphilic male relatives. A separate body of research demonstrates that certain male facial characteristics that vary along a masculinity-femininity dimension serve as signals that provide information about the underlying quality of a potential male mate. Males with more masculine facial features are thought to provide their female mates with both direct (i.e., resource) and indirect (i.e., genetic) benefits. However, these males also display a number of personality and partner traits that may be deleterious to the females who choose to partner with them. With this literature in mind, my thesis tests three hypotheses that attempt to address whether the mating psychology of women with androphilic sons differs from that of women with no androphilic sons. If differences in preferences for certain facial features do exist, this might help explain why the female kin of male androphiles produce more offspring compared to the female kin of male gynephiles. I found that women with and without androphilic sons did not differ in their preferences for a variety of male facial features, indicating that differences in mating

psychology (as assayed by preferences for face shape, skin colour, and facial hair) are not accounting for the differential reproduction of these two groups of women.

ACKNOWLEDGEMENTS

I would like to thank my supervisor, Dr. Paul Vasey, for his mentorship. I would also like to thank my other supervisory committee members, Drs. Shawn Bubel and Stephanie Hancock for their unwavering support. To my friends, I cannot express how important you all are to me. I would also like to thank Dr. Anthony Little for providing the composite images used in this thesis and Dr. Barnaby Dixson for allowing me to use the natural stimuli, without which this thesis never would have been possible. The Social Sciences and Humanities Council of Canada and the Lethbridge Public Research Interest Group provided financial support for this project and I am incredibly grateful. Additionally, I would like to thank the many people at the University of Lethbridge who were there to answer all of my questions, thank you so much Leanne Wehlage-Ellis and Dr. Rob Wood. And most importantly I would like to thank my parents, for everything.

TABLE OF CONTENTS

Title Page.....	i
Signature Page.....	ii
Abstract.....	iii
Acknowledgements.....	iv
Table of Contents.....	v
List of Tables.....	vi
List of Figures.....	vii
Chapter 1. Introduction.....	1
Chapter 2. Do women with and without androphilic sons differ in their preferences for male facial features?.....	19
Chapter 3. Implications for Future Research.....	51
References	62
Appendix A. Recruitment Advertisement.....	86
Appendix B. Informed consent form.....	88
Appendix C. Questionnaire: Part I.....	91
Appendix D. Questionnaire: Part II.....	96
Appendix E. Male model 3.....	158
Appendix F. Male model 6.....	160

LIST OF TABLES

Chapter 2.

Table 2.1	Descriptive statistics for biographic and reproductive variables by group.....	46
-----------	---	----

LIST OF FIGURES

Chapter 2.

Figure 2.1	Example of face shape stimuli.....	43
Figure 2.2	Example of facial skin colour stimuli.....	44
Figure 2.3	Example of facial hair stimuli.....	45
Figure 2.4	Bar graph depicting results of repeated measures ANOVA for group by face shape interaction.....	48
Figure 2.5	Bar graph depicting results of repeated measures ANOVA for group by facial skin colour interaction.....	49
Figure 2.6	Bar graph depicting results of repeated measures ANOVA for group by facial hair interaction.....	50

CHAPTER ONE

Introduction

Androphilia refers to predominate sexual attraction and arousal to adult bodied males, whereas *gynephilia* refers to predominate sexual attraction and arousal to adult bodied females. Behavioural genetics research has attempted to understand if male androphilia is familial, and if so, whether this is the result of environmental or genetic factors (Bailey, Dunne, & Martin, 2000). Research on twin and non-twin siblings strongly suggests that there is an underlying genetic component to male androphilia (Bailey & Bell, 1993; Bailey et al., 1999; Bailey et al., 2000; Kendler, Thorton, Gilman, & Kessler, 2000; Långström, Rahman, Carlström, & Lichtenstein, 2010; LeVay, 2010; Wilson & Rahman, 2005).

A number of studies demonstrate that androphilic probands have more androphilic brothers compared to gynephilic probands, which suggests that androphilia clusters within families (Bailey & Bell, 1993; Bailey et al., 1999; Pillard & Weinrich, 1986). For example, Bailey and Pillard (1991) demonstrated that the male siblings of androphilic male probands are 2-5 times more likely to be androphilic compared to the male siblings of gynephilic probands. Additional research suggests that male androphiles have an excess of androphilic brothers (Bailey & Bell, 1993). Subsequent work by Bailey et al. (1999) found that the rate of homosexuality among the brothers of androphilic males was roughly 7.3-9.7%, which is higher than the 2-3% population prevalence of male androphilia (Chivers, Rieger, Latty, & Bailey, 2004; VanderLaan, Forrester, Petterson, & Vasey, 2013).

Twin studies have also provided support for the finding that there is a genetic

component to male androphilia. One such study found that 52% of male monozygotic co-twins sampled reported either an androphilic or bisexual sexual orientation compared to 22% of male dizygotic co-twins (Bailey & Pillard, 1991). Additionally, work by Whitman, Diamond, and Martin (1993) demonstrated that 64.7% of male monozygotic co-twins were concordant for androphilia, whereas concordance for androphilia was 28.6% for male dizygotic co-twins. The above findings pertaining to the clustering of male androphilia among monozygotic, dizygotic, and sibling dyads suggests that as the strength of genetic relatedness increases, so too does the likelihood of male siblings being concordant for male androphilia, further demonstrating an underlying genetic component to male androphilia. It is important to note that these findings are unlikely to be the result of socialization as research has demonstrated that monozygotic twins recall being treated less alike by their parents compared to their dizygotic counterparts (Evans & Martin, 2008). In addition to clustering with sibling dyads, male androphilia has been shown to cluster within families (Bailey & Bell, 1993) and over generations, which suggests that specific parenting styles cannot account for the familial clustering of male androphilia (LeVay, 2010).

With respect to the specific genes involved in the expression of male androphilia, Hamer, Hu, Magnuson, Hu, and Pattatucci (1993) found that androphilic males had more androphilic uncles and androphilic male cousins on the maternal side of the family than on the paternal side, indicating a pattern of X-linked chromosomal inheritance. Further, Hamer et al. (1993) performed linkage analyses on families with two androphilic brothers and found a similar expression of alleles on the distal region of Xq28, which was significantly higher than the rates one would expect to see in fraternal brothers (50%). Hu

et al. (1995) also found significant linkage to genetic markers on Xq28. However, Rice, Anderson, Risch, and Ebers (1999) did not find Xq28 linkage. More recent work by Sanders et al. (2012) employed a much larger sample than previous studies and found strong linkage at both the pericentromeric region of chromosome 8 and Xq28. These authors suggest that genetic variation at both of these regions contributes, at least in part, to the development of male sexual orientation.

Research on the physiological correlates of sexual arousal strongly suggests that sexual orientation in most adult human males is categorical, not continuous. An overwhelming majority of males exhibit exclusive genital arousal to adult females (these males exhibit a gynephilic sexual orientation), whereas a very small minority (approximately 2-3%) exhibit exclusive genital arousal to adult males (these males exhibit an androphilic sexual orientation) (Chivers et al, 2004). Work by Rieger, Chivers, and Bailey (2005) demonstrated that few human males (<1%) exhibit genital arousal to both adult males and females.

Due to this overwhelming categorical specificity in human male sexual arousal, it is not surprising that male androphiles reproduce at a fraction of the rate of male gynephiles (Bell & Weinburg, 1978; King et al., 2005; Saghir & Robins, 1973; Schwartz, Kim, Kolundzija, Rieger, and Sanders, 2010; van de Ven, Rodden, Crawford, & Kippax, 1997; Vasey, Parker, & VanderLaan, 2014; Yankelovich, 1994). Specifically, early research found that USA androphilic men's reproductive output is roughly 20% that of gynephilic men's (Bell & Weinburg, 1978). More recent work demonstrated that out of a sample of 235 Samoan transgendered androphilic males, not one produced an offspring (Vasey, Parker, & VanderLaan, 2014). This research by Vasey and colleagues (2014)

suggests that in certain populations androphilic males have zero direct fitness.

Given that gynephilic males have disproportionate reproductive success compared to androphilic males, the genes associated with male androphilia should have long since disappeared from the population and been replaced with the genes that contribute to male gynephilia. In spite of this, evidence of male same-sex sexual activity is present in both prehistoric rock art and pottery, which suggests that this behaviour as existed for millennia (Gebhard, 1970; Nash, 2001; Yates, 1993). Specifically, in the Gothenburg regions of Sweden, prehistoric petroglyphs depict male-male genital contact (Yates, 1993). In addition, elaborate ceramic water vessels from the prehistoric Moche culture of Peru depict explicit male-male anal intercourse (Gebhard, 1970). Furthermore, graves containing male skeletal remains buried with female-typical artifacts suggest that transgendered males existed in the past (Hollimon, 1997). Given what we know about the exclusive androphilic orientation of most transgendered males from comparable populations (Harrington, 1948), archaeological indicators of such individuals are once again suggestive of the presence of male androphilia in human antiquity. When considered together, this evidence indicates that male androphilia has a genetic component and has existed for millennia despite the findings that male androphiles reproduce at a fraction of the rate that gynephilic males do. For this reason, the existence of male androphilia has been repeatedly characterized as one of the outstanding paradoxes of evolutionary biology.

The Sexually Antagonistic Hypothesis and the Evolution of Male Androphilia

Sexually antagonistic selection is a type of balancing selection that occurs when

the genetic factors that produce fitness costs in one sex result in fitness benefits in the opposite sex. This type of selection has been applied to the understanding of male androphilia and is commonly referred to as the Sexually Antagonistic Gene Hypothesis (SAGH) for male androphilia. This hypothesis posits that the genes associated with the development of androphilia will result in decreased reproduction in male carriers, but the same genes will result in increased reproduction in female carriers (i.e., mothers, as well as maternal and paternal grandmothers, aunts, female cousins, and sisters; for more a more general discussion see Zeh & Zeh, 2005). As a result, this hypothesis is sometimes known as the “Fertile Female Hypothesis” or the “Female Fecundity Hypothesis” for male androphilia.

In line with the SAGH, given that kin share a large proportion of their genes, the female kin of androphilic males should experience, on average, higher reproductive output compared to the female kin of gynephilic males. Theoretically speaking, the fitness benefit associated with increased reproduction in the female kin of androphilic males should offset the fitness cost of decreased reproduction associated with male androphilia. As a result, natural selection should favour these sexually antagonistic genes due to the fitness enhancing effects evident in the women who carry them. Selection for these sexually antagonistic genes in the female kin of male androphiles results in an evolutionary by-product, namely, male androphilia. Consequently, sexually antagonistic genes associated with male androphilia persist in populations over evolutionary time, regardless of the fact that they reduce the overall fitness of male carriers. Using the theoretical framework of the SAGH for male androphilia, it follows that the female kin of male androphiles (maternal and paternal grandmothers, mothers, aunts, sisters, and

female cousins) should produce more of their own biological children compared to the female kin of male gynephiles.

Empirical support for the SAGH for male androphilia comes from research conducted in both Western and non-Western populations. The majority of Western research has been carried out by Andrea Camperio-Ciani and his colleagues at the University of Padua in Italy. In a low-fertility Italian population, Camperio-Ciani, Corna, and Capiluppi (2004) found that the maternal female kin of androphilic males had a significantly higher reproductive output than did the maternal female kin (i.e., mothers, aunts, but not grandmothers) of gynephilic males. More specifically, the maternal female kin of androphilic males gave birth to approximately one-third more offspring compared the maternal female kin of gynephilic males. This differential reproduction was not found in the paternal relatives of either androphilic or gynephilic males. Furthermore, Camperio-Ciani and colleagues (2004) demonstrated that androphilic males had more androphilic male relatives in the maternal family line than they did in the paternal family line. Additional work by Iemmola and Camperio-Ciani (2009) replicated the previous findings of Camperio-Ciani et al. (2004) using a different Italian sample. More recently, Camperio-Ciani and Pellizzari (2012) studied three Western populations (Italy, Spain, and France) and found that the maternal aunts of androphilic males produced significantly more offspring compared to the maternal aunts of gynephilic males. However, this effect was not evident for either the maternal or paternal grandmothers of both androphilic and gynephilic males.

Additional support, though more limited than the above Italian findings, comes from Britain. Rahman et al. (2008) demonstrated that the maternal aunts of Caucasian

androphilic males had higher reproductive output than the paternal aunts of these males. In addition, however, Rahman et al. (2008) found that within their non-Caucasian sample, the mothers and paternal aunts of gynephilic males had significantly more offspring than those of non-Caucasian androphilic males, which runs contrary to the predictions of the SAGH. Given that these results are the opposite of what one might expect, LeVay (2010) has proposed that Rahman et al.'s (2008) non-Caucasian sample might have potentially been comprised of British immigrants who come from larger families, whose definition of "family" might be more inclusive, and who might also be less accepting and open about homosexuality. These cultural factors could have resulted in a biased sample and might explain the different findings across the Caucasian and non-Caucasian British samples. A number of older studies also provide support for the SAGH (Bailey et al., 1999; McKnight & Malcolm, 2000; Turner, 1995). These studies indicate that male androphiles have more maternal aunts than do gynephilic males.

However, other studies employing Western populations have not demonstrated similar matrilineal effects. In Britain, King et al. (2005) found that androphilic males had significantly more paternal, but not maternal, aunts, uncles, and cousins, which suggests that the paternal grandmothers and possibly the paternal aunts of androphilic males have a higher reproductive output compared to their maternal counterparts. Data pertaining to the reproductive output of both paternal aunts and paternal uncles were grouped together as "paternal cousins" and, as such, the results of King et al. (2005) cannot be used to speak to the individual reproductive outputs of paternal aunts versus paternal uncles. In a study conducted in the USA, the mothers and paternal grandmothers of androphilic males had a higher reproductive output compared to those of gynephilic males (Schwartz et al.,

2010). This study also found no differences in the reproductive output of the maternal grandmothers of androphilic males compared to those of gynephilic males.

Work conducted on the island nation of Samoa has garnered some support for the SAGH for male androphilia in a non-Western population. The expression of male androphilia varies cross-culturally (Murray, 2000). This expression typically takes one of two forms: 1) *sex-gender congruent* male androphilia or 2) *transgendered* male androphilia. In most Western populations, male androphilia is most frequently expressed in the sex-gender congruent form. Sex-gender congruent male androphiles present in a gendered manner typical of their sex; these males behave in a relatively masculine fashion and identify as “men”. Transgendered male androphiles most commonly behave in a more effeminate fashion and often occupy a “third” gender category rather than identifying as either “men” or “women”. In Samoa, male androphilia is expressed in the transgendered form. In this population, androphilic males are referred to as “*fa’afafine*”, which means “in the manner of a woman”. *Fa’afafine* seek out and engage in sexual activity with more masculine “men”. Research carried out by Vasey and VanderLaan (2007) found that mothers of *fa’afafine* had significantly more offspring than the mothers of gynephilic males. Further work by VanderLaan and Vasey (2011) replicated this finding. More recent findings indicate that the maternal and paternal grandmothers of Samoan *fa’afafine* have higher reproductive output compared to those female kin of gynephilic males (VanderLaan, Forrester, Petterson, & Vasey, 2012).

Taken together, research demonstrates that the female kin of androphilic males experience increased reproduction compared to those of gynephilic males, although more research is needed to precisely determine the exact categories of female kin that have

higher reproductive output. In spite of this research, limited work has been conducted looking at the mechanisms that could potentially underlie this differential reproduction between the female kin of androphilic and gynephilic males. One study investigated the reproductive physiology and health of both the mothers and maternal aunts of androphilic and gynephilic males (Camperio-Ciani et al., 2012). Camperio-Ciani and colleagues (2012) found that the mothers and maternal aunts of androphilic males had significantly more offspring, had fewer gynaecological and pre-parturition problems, and experienced fewer complication pregnancies. These findings elucidate important differences in the reproductive health of these women.

Camperio-Ciani et al. (2012) also found that the mothers and maternal aunts of androphilic males were significantly less concerned with the importance of having children and they were more extraverted compared to the female relatives of gynephilic males. Moreover, they were more likely to be divorced or separated. These results raise the possibility that the female relatives of androphilic and gynephilic males differ psychologically from one another. Moreover, these psychological differences may extend to the realm of their mating psychology. If such group differences in mate preferences (i.e., the characteristics they find attractive in a potential mate) exist, then they may help to account for the differential reproduction seen between the female relatives of androphilic males and those of gynephilic males, allowing researchers to better understand how it is that the genes for male androphilia are maintained in the population over time.

Mating Psychology in Humans

Compared to males, females invest more heavily in their offspring. Females are

solely responsible for the gestation of a fetus and nursing of an infant (Eibl-Eibesfeldt, 1989), which can last up to four years in some societies (Shostak, 1981). Moreover, females provide more parental care than males do in all known societies (Hewlett, 1992). Due to heavy female parental investment, females reproduce much more slowly than do males, which, in turn, results in male-male competition for female mates and female choice for potential male mates (Trivers, 1972). Both male-male competition for female mates and female choice of male mates are mechanisms by which sexual selection occurs. Sexual selection is a process that occurs because individuals differ in their ability to acquire mates as a result of these mechanisms. Sexual selection favours any trait (morphological, behavioural, etc.) that increases an individual's ability to obtain reproductive opportunities. Often this process results in the evolution of elaborate secondary sexual characteristics in males (Andersson, 1994) that attract females or allow males to compete, directly or indirectly, with same-sex individuals for access to females (Puts, Jones, and DeBruine, 2012).

The research conducted for this thesis focuses on sexual dimorphism in the face. Facial sexual dimorphism is evident in a variety non-human primates (Ravosa, 1991; Taylor, 2006; Wood, Li, & Willoughby, 1991), and it appears that sexual selection is a cause of such facial differences between sexes (Delgado, 2006; Mitani, 1985; Waite et al, 2003). In humans, the sexes differ in their facial skeletal structure (Enlow & Hans, 1996), ability to grow facial hair, and their skin tone. On average, males have a more pronounced jaw line and a squarer chin, more prominent brow ridges and cheekbones, and an overall longer lower face compared to females (Enlow, 1982). In addition, males are capable of growing facial hair to a degree to which females typically cannot.

Furthermore, males tend to have a darker skin colour than women do cross-culturally (Jablonski, 2006). These features can be attended to very quickly and provide important information about an individual.

Evolutionary research on the human face is a well-established and diverse area of scientific inquiry. One of the most active and quickly changing domains of face research is concerned with the role facial features play in mate choice. Preferences for particular facial features may partially function as a means for identifying appropriate mate-worthy opposite-sex partners (Thornhill & Gangestad, 1999; Little, Jones, & DeBruine, 2011). This is because the magnitude with which certain facial characteristics are elaborated can potentially signal a number of relevant underlying qualities (i.e., health, paternal investment, developmental stability, age, etc.) about an individual.

Many sexually dimorphic traits arise due to the differing levels of testosterone found in human males and females (Bardin & Catterall, 1981; Bulygina, Mitteroecker, P, & Aiello 2006; Enlow & Hans, 1996; Tanner, 1990). In males, circulating testosterone and masculine face shape both increase during adolescence (Enlow & Hans, 1996). Specifically, pubertal development produces a sex difference in human mandible shape and size (Srael, 1969) and this difference depends, at least partially, on an increase in testosterone (Verdonck, Gaethofs, Carels, & de Zegher, 1999). A number of studies have investigated the relationship between testosterone levels and masculine face shape in adult males. Some have found a relationship between levels of circulating testosterone and masculine face shape (Penton-Voak & Chen, 2004; Pound, Penton-Voak, & Surridge, 2009; Roney, Hanson, Durante, & Maestipieri, 2006) while others have not (Neave, Laing, Fink, & Manning, 2003; Peters, Simmons, & Rhodes, 2008). However, as

Scott, Clark, Boothroyd, and Penton-Voak (2012) note, Pound, Penton-Voak, and Surridge (2009) were the only researchers to use an objective, quantifiable (differences in face shape) measure of masculine face shape rather than a subjective, participant rating. These authors found a positive relationship between masculine face shape and testosterone, providing strong evidence that levels of facial masculinity are correlated with exposure to testosterone. Additionally, testosterone and dihydrotestosterone are crucial in a male's ability to grow facial hair (Farthing, Mattei, Edwards, & Dawson, 1982).

Masculine face shape in males. Elaborate androgen-dependent, masculine skeletal facial features have been hypothesized to be signals of an individual's long-term health, or "health proneness" (Folstad & Karter, 1992; Rhodes et al., 2003; Tybur & Gangestad, 2011). In addition, some studies have demonstrated that masculine face shape is positively correlated with facial symmetry (Gangestad & Thornhill, 2003; Little et al., 2008), which is an indicator of long-term health in both humans and non-human primate populations, while others have not found this correlation (Koehler, Simmons, Rhodes, & Peters, 2004). Furthermore, males with masculine face shape report fewer incidences and shorter durations of infections and less frequent antibiotic use (Thornhill & Gangestad, 2006), and a stronger response to the hepatitis B vaccine (Krams, Rantala, & Krams, 2010). On the basis of this work, it has been argued that facial masculinity provides cues of health and, as such, is thought to indicate high genetic quality. Accordingly, any offspring sired by such males would inherit their father's "good genes". In addition, male facial masculinity is positively correlated with physical strength (Fink, Neave, & Seydel, 2007; Windhager, 2011) and dominance rank (Hill et al., 2013; Mueller & Mazur, 1997),

which would contribute to success during inter-sexual competition. A masculine male's success in intra-sexual competition may result in benefits to his females mate(s) in the form of high quality resources (Wong & Candolin, 2005), which could, in turn, produce a female preference for masculine males (Dixson, Tam, Ormsby, & Dixson 2014; Gangestad & Eaton, 2013; Hill et al., 2013; Scott et al., 2012;).

Given these theorized genetic and resource-based benefits, one might predict that females, on average, should prefer males who display traits associated with masculine face shape. However, early research demonstrated the exact opposite with females preferring morphed masculine male faces less than feminine ones (Perrett et al., 1998; Rhodes, Hickford, & Jeffery, 2000). Subsequent research has produced mixed findings. Studies using similar methodologies have found further preferences for femininity (Little, Jones, Penton-Voak, Burt, & Perrett, 2002; Penton-Voak et al., 1999, 2003; Perrett et al., 1998; Rhodes, Hickford, & Jeffery, 2000; Welling et al., 2007; Welling, Jones, & DeBruine, 2008, Study 1). However, preferences for masculinity have also been observed (DeBruine et al., 2006; Feinberg, DeBruine, Jones, & Little, 2008; Johnston, Hagel, Franklin, Fink, & Grammer, 2001; Little, Cohen, Jones, & Belsky, 2007; Little, Jones, DeBruine, & Feinberg, 2008). Other studies have found no significant differences in preferences for either masculinity or femininity (Cornwell et al, 2004; Swaddle & Riersen, 2002; Welling, Jones, & DeBruine, 2008, Study 2). There have also been mixed results for facial preferences within individuals (Little, DeBruine, & Jones, 2011; Little & Mannion, 2006; & Penton-Voak et al., 1999), between individuals (DeBruine, Jones, Tybur, Lieberman, & Griskevicius, 2010; Smith et al., 2009), and across populations (DeBruine, Jones, Crawford, Welling, & Little, 2010; Penton-Voak, Jacobson, & Trivers,

2004). Thus, on the basis of these studies, the role of male masculine facial shape in female mate choice is equivocal.

Trade-off theory (Gangestad & Simpson, 2000) has been used to explain the variation in female's preferences, or lack thereof, for either masculine or feminine male face shapes. Trade-off theory proposes that a female's preference for masculine traits will vary depending on the costs and benefits associated with those traits (for comprehensive reviews see Fink & Penton-Voak, 2002; Gangestad & Simpson, 2000; Jones et al., 2008; & Little et al., 2011). While males with a masculine face shape might be of higher genetic quality and health as well as more capable at outcompeting rival males, they might also have certain personality characteristics that make mating with them costly. Indeed, women rate facially masculine males as less caring and cooperative, and of lower parental quality than their facially feminine counterparts (Boothroyd, Jones, Burt, & Perrett; 2007; Kruger, 2006; Perrett et al., 1998). Facially masculine males are also rated as having (Kruger, 2006), and report having, more short-term relationships compared to more facially feminine males (Rhodes, Simmons, & Peters, 2005). It appears that facially masculine males might provide high levels of genetic quality but low levels of partner/parental quality. Trade-off theory would predict that contextual factors such as menstrual cycle phase and pathogen levels in the environment might have some influence on the degree to which a female will prefer certain facial features (DeBruine, 2013).

Recent work on this topic (Scott et al., 2012; Scott, Pound, Stephen, Clark, & Penton-Voak, 2010) argues that masculine male face shape has little, if any, bearing on female mate preferences. Scott and her colleagues note that evidence supporting female preferences for masculine male face shape is weak and that there are substantial concerns

regarding whether or not women's preferences support the trade-off theory of facial preferences (for a thorough review see Scott et al., 2012). In earlier work, Scott and colleagues (2010) posit that rather than stable facial traits (e.g., masculine face shape), cues of current condition (e.g., skin colour and skin homogeneity) might be more salient to female attractiveness preferences. Empirical evidence has demonstrated that a male's current health has an influence on his attractiveness (Jones, 2001; Jones, Little, Penton-Voak, & Perrett, 2004; Rhodes, 2006; Rhodes et al., 2007; Shackelford & Larsen, 1999). On the basis of Scott and colleagues (2010, 2012), I predict that the mothers of androphilic males and gynephilic males will not differ in their attractiveness ratings of facial stimuli morphed to be either more masculine or more feminine.

Facial skin colour in males. Research demonstrates that within ethnic populations (e.g., Caucasian, Southeast Asian, etc.), males have, on average, darker skin colour than do women (Edwards & Duntley, 1939; van den Berghe & Frost, 1986) and this finding persists in populations where individuals are very dark-skinned and the colour difference is difficult to detect (Frost, 1988; Jablonski & Chaplin, 2000). Male skin colour continues to darken until the late teen years (Jablonski, 2006).

The relationship between testosterone and skin darkness is not well studied, but early work demonstrated that castrated males had reduced levels of melanin and hemoglobin, which resulted in lightening of the skin. In contrast, administering a dose of testosterone resulted in the subsequent darkening of the skin in castrated males (Edwards, Hamilton, Quimby Duntley, & Hubert, 1941). These researchers found that the administration of testosterone resulted in an increase of melanin content, but that this response was slow and of a small degree. They also found that the administration of

testosterone produced an increase in local blood volume and possible cutaneous blood flow, which could also have some darkening effect on the skin.

High melanin levels have been demonstrated to increase skin yellowness and decrease skin lightness (Stamatas, Zmudzka, Kollias, & Beer, 2004), which may result in a darker skin colour. As is the case with testosterone-dependent traits such as masculine face shape, there are costs and benefits associated with melanin. Depending on levels of sunlight, melanin protects against sunburn and skin cancer in addition to preventing the photolysis of folate (a naturally occurring form of the vitamin B₉), which can protect against neural tube defects (i.e., openings in the spinal cord or the brain; Branda & Eaton, 1978). In line with these findings, Jablonski (2006) notes that darker skin colour in males might assist in the optimization of folate, which could protect the process of sperm production, as it depends on folate for DNA synthesis. Melanin also contributes to immune defense (Burkhart & Burkhart, 2005). In contrast to these benefits, melanin impedes the photoproduction of vitamin D, which can result in defective bone mineralization (Murray, 1934).

Cues such as skin colour and homogeneity have been demonstrated to accurately signal current condition in both non-human animals and humans (Fink, Grammer, & Matt, 2006; Jones, Little, Burt, & Perrett, 2004; Stephen, Law Smith, Stirrat, & Perrett, 2009). Additionally, skin colour information has been shown to influence ratings of attractiveness (Fink et al., 2006; Matts, Fink, Grammer, & Burquest, 2007) and health (Matts, Fink, Grammer, & Burquest, 2007; Stephen, 2009; Stephen, Coetzee, Law Smith, & Perrett, 2009), and may be a more reliable signal used for sex discrimination than face shape (Hill, Bruce, & Akamatsu, 1995).

In light of this literature and the previous argument by Scott et al. (2010) regarding the importance of current condition in judgments of attractiveness, it could be the case that some women attend to cues of current skin condition more so than other women, and by doing so they are the recipients of the benefits that accompany males who have darker facial skin colour. It might be the case that the female kin of male androphiles attend to this facial characteristic more so than do the female kin of male gynephiles, and therefore reap some fitness benefit that could account for these women's increased reproductive output. Therefore, I predict that the mothers of androphilic males will prefer darker skinned male models more so than the mothers of gynephilic males. In addition, I predict that all women will prefer darker skin colour more than lighter skin colour.

Beardedness in males. The ability to grow a beard is influenced by androgens (Farthing, Mattei, Edwards, & Dawson, 1982) and varies among men (Randall, 2008). Masculine facial features that develop due to higher testosterone levels have been proposed to be honest indicators of good genetic quality (Thornhill & Gangestad, 1993). Given that facial hair is sexually dimorphic, one might predict that it is implicated in sexual selection and, as such, play some role in either female choice or male intrasexual competition.

There is no consensus regarding the role beardedness may play in female-mate choice. With respect to personality characteristics, bearded men are seen in both positive and negative lights. Bearded men have been rated by women as high on measures of self-confidence, enthusiasm, courage, generosity, sincerity, strength, and industriousness (Hellstrom & Tekle, 1994; Kenny & Fletcher, 1973; Pellegrini, 1973). However, they

have also been rated as more aggressive, dominant, and less socially appealing (Addison, 1989; Muscarella & Cunningham, 1996; Neave & Shields, 2008). Beards have also been shown to play a role in women's perceptions of men's maturity and masculinity (Addison, 1989; Neave & Shields, 2008). In terms of the attractiveness of beards, some studies have found that full beards increased attractiveness (Hatfield & Sprecher, 1986; Pellegrini, 1973; Reed & Blunk, 1990), while others find that they do not (Dixson & Vasey, 2012; Feinman & Gill, 1977; Muscarella & Cunningham, 1996; Wogalter & Hosie, 1991). These mixed findings may be the result of the diverse methodologies employed by these researchers (for a review see Dixson & Brooks, 2013; Neave & Shields, 2008). Additionally, research indicates that males with light stubble were rated as being most attractive while males with full beards were rated as least attractive (Neave & Shields, 2008). Work by Dixson and Brooks (2013) found that women gave the highest attractiveness ratings to men with heavy stubble. Previous research has demonstrated that as beardedness increases (clean-shaven to full beard) so do men's perceptions of other men's masculinity, dominance, aggression, social maturity, and age (Dixson & Vasey, 2012; Neave & Shields, 2008).

Given the diversity of findings related to female preferences for differing levels of beardedness, I predict that the mothers of androphilic males and gynephilic males will not differ in their attractiveness ratings for natural facial stimuli that present varying levels of facial hair. Additionally, I predict that both groups of women will rate light stubble as most attractive given the recent findings for a female preference for light or heavy stubble (Dixson & Vasey, 2013; Neave & Shields, 2008).

CHAPTER TWO

Do women with and without androphilic sons differ in their preferences for male facial features?

Research demonstrates that the female relatives of male androphiles produce, on average, more offspring compared to the female relatives of male gynephiles (Bailey et al., 1999; Camperio-Ciani, et al., 2004; Camperio-Ciani & Pellizzari, 2012; Iemmola & Camperio-Ciani, 2009; McKnight & Malcolm, 2000; Rahman et al., 2008; Turner, 1995; VanderLaan, Forrester, Petterson, & Vasey, 2012; VanderLaan & Vasey, 2011; Vasey & VanderLaan, 2007), although the precise categories of female kin for which this effect exists remain to be established conclusively. Limited work has been done attempting to understand the mechanisms that might account for this differential reproduction. A single study has been conducted looking at the reproductive health and physiology of the mothers and maternal aunts of androphilic and gynephilic males (Camperio-Ciani et al., 2012). These authors demonstrated that the female kin of androphilic males had fewer gynaecological and pre-parturition problems, and experienced significantly fewer complicated pregnancies. These findings illuminate important differences in the reproductive health of these women.

Another interesting finding of this work is that the female kin of androphilic males reported being significantly less concerned with the importance of having children. Although this finding may seem paradoxical given the fact that these women did in fact give birth to more children, it could potentially suggest that the female kin of androphilic males are psychologically different from the female kin of gynephilic males. In line with this reasoning, Camperio-Ciani et al. (2012) demonstrated that the female kin of

androphilic males were more extraverted than the female kin of gynephilic males. In addition, they were more likely to be divorced or separated. A psychological predisposition toward higher levels of extraversion could potentially influence women's parental and reproductive decision-making. For example, higher extraversion may result in increased sociosexuality and reduced concern for childcare investment from their mate.

This work by Camperio-Ciani et al. (2012) raises the possibility that the female relatives of androphilic and gynephilic males differ psychologically including in terms of their mate preferences. If such group differences in mate preferences exist, they may help account for the differential reproduction seen between the female relatives of androphilic males and those of gynephilic males.

A wealth of research has been conducted investigating the role of facial traits and their influence on perceptions of attractiveness. Preferences for particular facial features partially function as a means for identifying appropriate mate-worthy opposite-sex partners (Little, Jones, & DeBruine, 2011; Thornhill & Gangestad, 1999), due to the fact that the magnitude with which certain facial characteristics are elaborated can potentially signal a number of relevant underlying fitness-enhancing and fitness reducing qualities (i.e., health, willingness to partake in parental investment, developmental stability, age, aggressivity, etc.) about an individual. These sexually dimorphic traits would be influenced by sexual selection if they advertise certain aspects of mate quality in the sex that possesses them and are therefore preferred by the opposite sex (Andersson, 1994).

A number of traits are thought to signal male mate quality (Fink & Penton-Voak, 2002; Gangestad & Scheyd, 2005; Penton-Voak et al., 1999; Thornhill & Gangestad, 1996). Masculine face shape is androgen-dependent (Enlow & Hans, 1996; Penton-Voak

& Chen, 2004; Pound et al., 2009; Sracl, 1969; Roney et al., 2006; Verdonck, Gaethofs, Carels, & de Zegher, 1999) and is hypothesized to signal long-term health, or “health proneness” in males (Folstad & Karter, 1992; Rhodes et al., 2003; Tybur & Gangestad, 2011). Some studies have demonstrated that masculine male face shape is positively correlated with facial symmetry (Gangestad & Thornhill, 2003; Little, Jones, Waitt, et al., 2008, but see Koehler, Simmons, Rhodes, & Peters, 2004), an indicator of long-term health in humans. Additionally, males with masculine face shape report fewer incidences and shorter durations of infections and less frequent antibiotic use (Thornhill & Gangestad, 2006), and a stronger response to the hepatitis B vaccine (Krams, Rantala, & Krams, 2010). On the basis on this work, it is argued that masculine face shape in males provides salient cues of health and, as such, is thought to indicate high genetic quality. Accordingly, any offspring sired by such males would inherit their father’s “good genes”.

Given these theorized genetic benefits, one might predict that females should prefer males who display traits associated with face shape masculinity. However, relevant research has produced mixed findings. Preferences for femininity (Little, Jones, Penton-Voak, Burt, & Perrett, 2002; Penton-Voak et al., 1999, 2003; Perrett et al., 1998; Rhodes, Hickford, & Jeffery, 2000; Welling et al., 2007; Welling, Jones, & DeBruine, 2008, Study 1), masculinity (DeBruine et al., 2006; Feinberg, DeBruine, Jones, & Little, 2008; Johnston, Hagel, Franklin, Fink, & Grammer, 2001; Little, Cohen, Jones, & Belsky, 2007; Little, Jones, DeBruine, & Feinberg, 2008) and no preference for either femininity or masculinity in face shape (Cornwell et al, 2004; Swaddle & Riersen, 2002; Welling et al., 2008, Study 2) have been reported in the literature. On the basis of these studies, the role of masculine facial shape in female mate choice is equivocal.

Trade-off theory has been used to reconcile this variation in female's preferences, or lack thereof, for either masculine or feminine male facial shapes. This theory proposes that female preferences for masculine traits vary depending on the costs and benefits associated with those traits (for comprehensive reviews see Fink & Penton-Voak, 2002; Gangestad & Simpson, 2000; Jones et al., 2008; & Little et al., 2011). While males with masculine facial shape may be of higher genetic quality and health, they might have personality traits that make mating with them costly. Indeed, women rate facially masculine males as less caring and cooperative, and as having lower paternalistic tendencies than their facially feminine counterparts (Boothroyd, Jones, Burt, & Perrett; 2007; Kruger, 2006; Perrett et al., 1998). Males with masculine face shape are also rated as having more short-term relationships than do facially feminine males (Kruger, 2006) and this is consistent with men's own self-report (Rhodes, Simmons, & Peters, 2005). Consequently, facially masculine males might be characterized by high levels of genetic quality and good health, but low levels of partner/parental quality.

A recent overview and study of this topic by Scott and colleagues (2010, 2012) posits that masculine male face shape has little, if any, relevance to female mate preferences. These authors note that evidence supporting female preferences for masculine male face shape is weak and that there are serious concerns with respect to whether or not women's preferences support the trade-off theory of facial preferences (for a thorough review see Scott et al., 2012). Scott et al. (2010) argue that rather than stable facial traits (e.g., face shape), cues of current condition (e.g., skin colour and skin homogeneity) might have more bearing on female attractiveness preferences.

Evidence demonstrates that a male's current health has an influence on his attractiveness (Jones, 2001; Jones et al., 2004; Rhodes, 2006; Rhodes et al., 2007; Shackelford & Larsen, 1999). Cues such as skin colour and homogeneity have been demonstrated to accurately signal current condition in non-human animals and humans (Fink et al., 2006; Jones et al., 2004; Stephen et al., 2009). Furthermore, skin colour has been demonstrated to influence ratings of attractiveness (Fink et al., 2006; Matts et al., 2007) and health (Matts et al., 2007; Law Smith et al., 2009; Stephen, 2009), and is possibly a more reliable cue used for sex discrimination than face shape (Hill et al., 1995).

Additionally, research has demonstrated that within ethnic populations, (e.g., Caucasian, Southeast Asian, etc.) males tend to have darker skin colour compared to females (Edwards & Duntley, 1939; van den Berghe & Frost, 1986; Frost, 1988; & Jablonski & Chaplin, 2000). Work into the androgen-dependency of skin darkness is not well established, but early research found that castrated males had reduced levels of melanin and hemoglobin, resulting in lightening of the skin, and that manually administering testosterone resulted in the darkening of the skin in these males (Edwards et al., 1941). High levels of melanin have been shown to increase skin yellowness while decreasing skin lightness (Stamatas et al., 2004), which may result in a darker skin colour. Melanin protects against sunburn and skin cancer, in addition to contributing to immune defense (Burkhart & Burkhart, 2005). Furthermore, it prevents the photolysis of folate (a naturally occurring form of vitamin B₉), which protects against neural tube defects (Branda & Eaton, 1978). Complimentary to this finding, darker skin colour in

males might assist in the optimization of folate, which may facilitate the process of sperm production (Jablonski, 2006).

On the basis of Scott et al. (2010, 2012), I predict that the mothers of androphilic males and gynephilic males will not differ in their attractiveness ratings of facial stimuli morphed to be either more masculine or more feminine in terms of shape as this trait may have fitness-neutral value for females evaluating potential mates, beyond its value in signaling the sex of an individual. In contrast, given the salience of facial skin colour as a cue of current health condition, I predict that there will be a group difference in attractiveness ratings with the mothers of androphilic males preferring darker skin compared to the mothers of gynephilic males. It might be the case that the female kin of male androphiles attend to this facial characteristics more so than do the female kin of male gynephiles, and therefore receive any associated fitness benefit(s) of darker skin, which could account for these women's increased reproductive output. In addition, I predict that all women will prefer darker skin colour overall.

Another androgen-dependent male trait is facial hair (Farthing et al., 1982). The ability to grow a beard varies between men (Randall, 2008) and is thought to indicate good genetic quality because beards develop under the influence of testosterone (Thornhill & Gangestad, 1993). Given that facial hair is sexually dimorphic, one might predict that it results from sexual selection and, as such, plays a role in either female mate choice or male intrasexual competition or both. Studies using male raters demonstrated that as beardedness increases (clean-shaven to fully bearded), so too do perceptions of other males' masculinity, dominance, aggression, social maturity, and age (Dixson &

Vasey, 2012; Neave & Shield, 2008). In contrast, there is no consensus, at present, regarding the role that male facial hair may play in female mate choice.

With respect to females' perceptions of beards, some studies demonstrate that full beards increase male attractiveness (Hatfield & Sprecher, 1986; Pelligrini, 1973; Reed & Blunk, 1990) while others do not (Dixson & Vasey, 2012; Feinman & Gill, 1977; Muscarella & Cunningham, 1996; Wogalter & Hosie, 1991). Other studies indicate that males with light stubble are rated as being most attractive while males with full beards are rated as least attractive (Neave & Shields, 2008). Research by Dixson & Brooks (2013) found that women rated males with heavy stubble as most attractive. Bearded men are viewed both positively and negatively in terms of personality characteristics. Some studies show that females rate bearded men high on measures of self-confidence, enthusiasm, courage, generosity, sincerity, strength, and industriousness (Hellstrom & Tekle, 1994; Kenny & Fletcher, 1973; Pellegrini, 1973) while others rate them as being more aggressive and dominant, and less socially appealing (Addison, 1989; Muscarella & Cunningham, 1996; Neave & Shields, 2008). As such, beards may cue women to personality characteristics in male mates that may compromise women's fitness.

Given the diversity of findings related to female preferences for differing levels of beardedness, I predict that the mothers of androphilic males and gynephilic males will not differ in their attractiveness ratings for natural facial stimuli that present varying levels of facial hair. Additionally, I predict that both groups of women will rate light stubble as most attractive given the recent findings for a female preference for light or heavy stubble (Dixson & Vasey, 2013; Neave & Shields, 2008).

Materials

Photographic Stimuli

Study 1: Face shape

Twenty-five men (mean age = 26.68, $SD = 6.41$, range 20-42 years) of European descent were photographed under standardized lighting conditions posing with a neutral facial expression. To manipulate face shape, ten ‘base faces’ were constructed by combining pairs of images from 20 face images drawn randomly from the sample (Benson & Perrett, 1993; Tiddeman et al., 2001; Little & Hancock, 2002). The composite base faces are representative of the average traits of the faces within them, reducing idiosyncratic differences between faces. These ten composite base faces were made symmetric prior to being transformed on a sexual dimorphism dimension using the shape linear difference between an average male (50 young adult male faces) and an average female (50 young adult female faces) face, following previous methods (Perrett et al., 1998). Transforms represented $50\% \pm$ the difference between these two composites, resulting in ten pairs of faces wherein one image was 50% masculinized and the other 50% feminized. The ten base faces produced 10 stimulus pairs, each containing one masculinized and one feminized facial photograph (see Figure 2.1) for a total of 20 stimulus photographs.

Study 2: Facial skin colour

The same ten European base faces used in the manipulation of face shape were transformed. To develop units of brightness for the skin colour transformations, 113 young adult European men were photographed under standardized lighting conditions and with a neutral facial expression. These photographs were then rated for skin-darkness on a 7-point scale (1 = very light, 7 = very dark) by two raters ($r = .69$). A mean score

was calculated for the two raters and used to create two composite images by combining images from the top 25 (mean rating = 6.0) and bottom 25 (mean rating = 1.8) faces scored for skin darkness and lightness. The base faces were again made symmetric and then transformed on the skin colour difference between the light and dark skinned composites (Benson & Perrett, 1993; Tiddeman et al., 2001; Little & Hancock, 2002). Transforms represented $-50\% \pm$ the difference between the two composites. The ten base faces produced 10 stimulus pairs, each containing one lightened and one darkened facial photograph (see Figure 2.2) for a total of 20 stimulus photographs.

Study 3: Facial hair

Six men of European descent ($M = 23.50$ years, $SD = 3.57$ years, range 20-30 years) were photographed in each of three conditions in the following order: fully bearded (at least 6 weeks without shaving), clean-shaven, and with 5 days (light stubble) of facial hair growth. Images of men posed smiling were generated using the Facial Action Coding System (Ekman, Friesen, & Hager, 2002). Photographs were taken using a Canon digital camera (8.0 megapixels resolution), 150 cm from the participant under controlled lighting. Images were cropped so that only the face and neck were shown to participants. The six male models produced 6 sets of images, each containing 3 stimulus photographs (clean-shaven, light stubble, and fully bearded) (see Figure 2.3), for a total of 18 stimulus photographs.

Methods

Participants. All participants ($N = 118$) were recruited from Canada and the USA. Participants were recruited two ways: 1) chapters of Parents, Friends, & Families of Lesbians and Gays were contacted through email or telephone asking for members to

participate and 2) network sampling (in person or through private Facebook communications) (see Appendix A).

Sexual feelings were assessed using a 7-point Kinsey scale where 0 = exclusively androphilic and 6 = exclusively gynephilic (Kinsey, Pomeroy, & Martin, 1948). In order to assess sexual feelings, participants were asked “Which of the following best describes your sexual feelings during the last year?” Subsequently, participants were asked to select one of the following six options: “Sexual feelings only toward males” (Kinsey rating = 0), “Most sexual feelings toward males, but an occasional fantasy about females (Kinsey rating = 1), “Most sexual feelings toward males, but some definite sexual feelings toward females” (Kinsey rating = 2), “Sexual feelings equally divided between males and females with no strong preference for one or the other” (Kinsey rating = 3), “Most sexual feelings toward females, but some definite sexual feelings toward males” (Kinsey rating = 4), “Most sexual feelings toward females, but an occasional fantasy about males”, (Kinsey rating = 5), and “Sexual feelings only toward females”, (Kinsey rating = 6). The majority of participants ($N = 95$, 80.5%) described their sexual feelings as exclusively androphilic (Kinsey = 0), with the remaining participants describing their sexual feelings as predominately androphilic with occasional gynephilic feelings ($N = 23$, 19.5%).

Procedure and measures. All data were collected via an online questionnaire made up of two sections (see Appendices C and D). The first section contained standard biographic questions pertaining to participant sex, age, sexual orientation, current relationship status, level of education, and the number of androphilic and/or gynephilic son(s) and daughter(s) participants gave birth to. Participants were also asked a number of questions pertaining to their reproductive status such as whether they are currently

pregnant, if they are menstruating regularly (i.e., when was the last day of their most recent menstruation), if they are currently going through menopause, and if they have completed menopause. Participants were also asked if they are currently using contraceptives and, if so, what type (e.g., oral contraceptives, hormonal or copper intrauterine device, diaphragm, condoms, or other). Participants ($N = 118$) included 68 women with at least one androphilic son and 50 women with at least one gynephilic son, but no androphilic sons.

The second section of the questionnaire consisted of the presentation of the stimuli. Participants viewed each individual facial stimulus ($N = 58$) in a random order created using an online random number generating program. Participants were asked to rate each individual face for attractiveness. Each image was rated using a Likert scale with 1 = Very unattractive, 2 = Somewhat unattractive, 3 = Slightly less attractive than average, 4 = Average, 5 = Slightly more attractive than average, 6 = Somewhat attractive, and 7 = Extremely attractive.

Results

Participants

Descriptive statistics for all biographic and reproductive history variables are presented in Table 2.1 according to group. Groups were not significantly different with respect to age ($t[116] = 0.041, p = 0.967$, Cohen's $d = 0.006$). Chi-square tests of independence indicated no group differences in relationship status ($\chi^2[5, N = 118] = 1.693, p = 0.890$, Cramer's $\phi = 0.120$); level of education ($\chi^2[3, N = 118] = 5.759, p = 0.124$, Cramer's $\phi = 0.221$); and reproductive status ($\chi^2[2, N = 118] = 2.096, p = 0.351$, Cramer's $\phi = 0.133$).

Chi-square tests of independence indicated that there was a significant difference between the groups with respect to country of residence ($\chi^2[1, N = 118] = 10.001, p = 0.002$, Cramer's $\phi = 0.291$) and method of recruitment ($\chi^2[2, N = 118] = 15.579, p < 0.001$, Cramer's $\phi = 0.363$). To determine whether these participant variables significantly influenced overall ratings of attractiveness, repeated measures Analyses of Variance (ANOVA) were conducted for the three stimulus measures of attractiveness (i.e., face shape, facial skin colour, and facial hair).

A 2 (country of residence) x 2 (face shape) x 10 (male model) repeated measures ANOVA was conducted with face shape and male model as the within-subjects factors and country of residence as the between-subjects factor. No group difference for overall attractiveness preferences was found ($F [1, 118] = 0.304, p = 0.582$). A 3 (method of recruitment) x 2 (face shape) x 10 (male model) repeated measures ANOVA was conducted with face shape and male model as the within-subjects factors and method of recruitment as the between-subjects factor. No group difference for overall attractiveness preferences was found ($F [2, 118] = 0.734, p = 0.482$).

A 2 (country of residence) x 2 (facial skin colour) x 10 (male model) repeated measures ANOVA was conducted with skin colour and male model as the within-subjects factors and country of residence as the between-subjects factor. No group difference for overall attractiveness preferences was found ($F [1, 118] = 0.044, p = 0.834$). A 3 (method of recruitment) x 2 (facial skin colour) x 10 (male model) repeated measures ANOVA was conducted with skin colour and male model as the within-subjects factors and method of recruitment as the between-subjects factor. No group

difference for overall attractiveness preferences was found ($F [2, 118] = 0.564, p = 0.571$).

A 2 (country of residence) x 3 (facial hair) x 6 (male model) repeated measures ANOVA was conducted with facial hair and male model as the within-subjects factors and country of residence as the between-subjects factor. No group difference for overall attractiveness preferences was found ($F [1, 118] = 2.465, p = 0.119$). A 3 (method of recruitment) x 3 (facial hair) x 6 (male model) repeated measures ANOVA was conducted with facial hair and male model as the within-subjects factors and method of recruitment as the between-subjects factor. No group difference for overall attractiveness preferences was found ($F [2, 118] = 2.431, p = 0.092$). Because between-group differences in country of residence and method of recruitment exerted no significant influence on dependent measures in this study, it was not necessary to control for the impact of these factors in subsequent analyses.

Study 1: Face Shape

A 2 (group) x 2 (face shape) x 10 (male model) repeated measures ANOVA was conducted in which the dependent variable was attractiveness rating, the within-subjects factors were face shape and male model, and the between-subjects factor was group. There was a significant main effect of face shape ($F [1, 118] = 34.781, p < 0.001, \eta^2 = 0.231$), indicating that all women preferred a more feminine face shape ($M = 3.66, SE = .082$) compared to a more masculine face shape ($M = 3.49, SE = 0.081$). However, there was no interaction effect of face shape by group ($F [1, 118] = 0.995, p = 0.321, \eta^2 = 0.009$), indicating that the sexual orientation of one's son(s) does not significantly influence attractiveness ratings for face shape (see Figure 2.4).

There was also a significant main effect of male model ($F [9, 118] = 29.796, p < 0.001, \eta^2 = 0.204$), with average attractiveness ratings ranging from a mean of 3.266 to 4.052 across models. In addition, there was a significant interaction effect of group by male model ($F [9, 118] = 2.152, p = 0.023, \eta^2 = 0.018$). Post-hoc pairwise comparisons indicated that women's attractiveness ratings for certain male models varied according to whether the women had gynephilic or androphilic sons ($p = 0.032$). Specifically, women with a gynephilic son(s) preferred male model 3 ($M = 3.467, SE = 0.183$) significantly more so than did women with an androphilic son(s) ($M = 3.067, SE = 0.183$) (Appendix E). Women with a gynephilic son(s) also preferred male model 6 ($M = 3.585, SE = 0.177$) significantly more so than did women with an androphilic son(s) ($M = 3.224, SE = 0.177$) (Appendix F).

Study 2: Facial skin colour

A 2 (group) x 2 (facial skin colour) x 10 (male model) repeated measures ANOVA was conducted in which the dependent variable was attractiveness rating, the within-subjects factors were facial skin colour and male model, and the between-subjects factor was group. There was a significant main effect of facial skin colour ($F [1, 118] = 35.784, p < 0.001, \eta^2 = 0.236$), indicating that all women preferred a darker facial skin colour ($M = 3.675, SE = .082$) compared to a lighter facial skin colour ($M = 3.516, SE = .080$). However, there was no interaction effect of facial skin colour by group ($F [1, 118] = 0.093, p = 0.761, \eta^2 = 0.001$), indicating that the sexual orientation of one's son(s) does not significantly influence attractiveness ratings for facial skin colour (see Figure 2.5). There was also a significant main effect of male model ($F [9, 118] = 33.717, p < 0.001, \eta^2 = 0.225$), with average attractiveness ratings ranging from a mean of 3.114 to 4.259

across models. There was no significant interaction effect of group by male model ($F [9, 118] = 1.683, p = 0.088, \eta^2 = 0.014$).

Study 3: Facial hair

A 2 (group) x 3 (facial hair) x 6 (male model) repeated measures ANOVA was conducted in which the dependent variable was attractiveness rating, the within-subjects factors were facial hair and male model, and the between-subjects factor was group. There was a significant main effect of facial hair ($F [1.767, 118] = 44.391, p < 0.001, \eta^2 = 0.277$). Pairwise comparisons indicated that women significantly preferred both clean-shaven faces ($M = 3.608, SE = .078$) and light stubble ($M = 3.589, SE = .075$) over full beards ($M = 3.222, SE = .081$); all p values < 0.001). There was no significant difference in preference for clean-shaven faces over light stubble ($p = 0.603$). There was no interaction effect of facial hair by group ($F [1.767, 118] = 0.584, p = 0.538, \eta^2 = 0.005$), indicating that the sexual orientation of one's son(s) does not significantly influence attractiveness ratings for facial hair (see Figure 2.6). There was also a significant main effect of male model ($F [4.261, 118] = 81.518, p < 0.001, \eta^2 = 0.413$), with average attractiveness ratings ranging from a mean of 2.621 to 4.485 across models. There was no significant interaction effect of group by male model ($F [4.261, 118] = 0.761, p < 0.559, \eta^2 = 0.007$).

Discussion

Research conducted a variety of Western cultures (e.g., Italy, England, USA) and in a non-Western one (e.g., Samoa) indicates that female kin of androphilic males exhibit elevated offspring production compared the female kin of gynephilic males (Bailey et al., 1999; Camperio-Ciani et al., 2004; Camperio-Ciani & Pellizzari, 2012; Iemmola &

Camperio-Ciani, 2009; McKnight & Malcolm, 2000; Rahman et al., 2008; Turner, 1995; VanderLaan & Vasey, 2011; VanderLaan et al., 2012; Vasey & VanderLaan, 2007), although more work is needed to identify the exact categories of female kin involved. Nevertheless, there has been little attempt to identify the underlying mechanism(s) that might account for this group difference in reproduction.

Certain male facial cues may provide women with honest signals about both the direct (i.e., resources) and indirect (i.e., genetic) benefits that a male can provide, which may enhance offspring survival (Fink et al., 2007; Hill et al., 2013; Krams et al., 2010; Matts et al., 2007; Mueller & Mazur, 1997; Stephen et al., 2009; Thornhill & Gangestad, 2006; Windhager, 2011; Z Wong & Candolin, 2005). Other facial cues may signal the presence of costly characteristics (i.e., aggressivity), while still others may provide relatively little fitness-relevant information. As such, women may prefer particular facial cues that signal fitness-relevant information, exhibit aversion to other facial cues that signal fitness-reducing information, while exhibit relatively no preference at all for other facial cues that are largely irrelevant in terms of the fitness-enhancing mate choices that they make. With this in mind, I examined whether women with and without an androphilic male son(s) were similar or different in terms of their preferences for one facial trait that is thought to be relatively fitness-neutral, one that is thought to be fitness-enhancing, and one that is thought to signal potential fitness costs. More specifically, I compared attractiveness ratings for male masculine/feminine face shape, light/dark facial skin colour, and varying degrees of facial hirsuteness (i.e., clean-shaven/light stubble/fully bearded).

The results of this research indicate, as predicted, that women, regardless of whether they had androphilic or gynephilic sons, did not differ in their attractiveness ratings for male faces morphed to be either more masculine or more feminine. This may reflect the fact that face shape is a stable trait that does not provide fitness-relevant information about current condition and, as such, it may be judged as irrelevant to mate choice decisions, beyond its value in signaling an individual's sex (i.e., male vs. female). In sum, my research provides no evidence that a preference for masculine facial shape is associated with elevated reproduction in the female relatives of androphilic males.

I also found that all women, regardless of the sexual orientation of their son(s), demonstrated a preference for male faces morphed to be more feminine. This finding may reflect the fact that studies employing composite morphed facial stimuli to test female preferences for male face shape most often find a preference for images morphed to be more feminine rather than more masculine (Little et al., 2001; Little & Hancock, 2002; Penton-Voak et al., 1998; Perrett et al., 1998; Rhodes et al., 2000). Rennels, Bronstad, and Langlois (2008) argue that this preference for feminine composite morphed faces can be explained due to the fact that these images are shifted in a feminine direction by using images of female facial averages rather than images of male faces that are high in measures of femininity. Using female facial averages to shift male faces may create facial representations that are not representative of real world experiences and which are therefore, novel and preferred.

In addition and contrary to my predictions, the results of this research indicate that there was no group difference among women in attractiveness ratings for male models whose facial skin colour was morphed to be either lighter or darker. Consequently, on the

basis of my sample, a differing preference for darker facial skin colour does not appear to be an underlying mechanism accounting for the increased reproduction experienced by the female kin of male androphiles compared to the female kin of male gynephiles. However, in line with my prediction, all of the women in my sample preferred darker skinned male models more so than lighter skinned male models, suggesting that darker skin may be a salient cue used by women when making mate choice decisions. This result is consistent with the argument of Scott et al. (2010) that qualities of facial skin, such as colour, are attended to and appear to be relevant when women are making judgments about a potential male mates' current health and attractiveness.

Finally, as predicted, my research shows that women, regardless of whether they had androphilic or gynephilic sons, rated bearded models as significantly less attractive than those who were clean shaven and those who had stubble. Previous research has shown that women perceive fully bearded male models as being more aggressive than clean-shaven male models (Addison, 1989; Dixson & Vasey, 2012; Muscarella & Cunningham, 1996; Neave & Shields, 2008). As such, beardedness may cue women about the behavioral tendencies of male mates that may be costly in terms of a women's own fitness. In addition, I found no group differences in terms of women's preferences for beards, indicating that the two groups of women were neither more or less averse to bearded men when compared to each other. Consequently, neither group would be more likely than the other to select bearded males as mates. As such, this result does not support the conclusion that a preference for beardedness (i.e., masculinity) is associated with elevated reproduction in the female relatives of androphilic males.

A potential limitation of this study has to do with the age of my sample. The mean age of mothers of was 55.76 years and 55.70 years for the mothers of androphilic and gynephilic males, respectively, with the majority of all women peri or post-menopausal. Therefore, most of my participants were no longer reproductively active. Testing preferences for cues thought to be implicated in mate choice would ideally be done employing a sample of women who are currently in the reproductive phase of their lives (i.e., 18-40 years of age) as this would provide a more accurate picture of what traits are salient for women searching of a reproductive partner. In line with this reasoning, pre- and post-menopausal women differ in their preferences for face shape, with pre-menopausal women preferring masculinity more than post-menopausal women (Little et al., 2010). Furthermore, women over the age of 46 years had significantly lower preferences for masculine face shape than did women aged 15-25 years ($p = .038$), women aged 25-35 ($p < .001$), and women aged 35-45 ($p = .004$) (Little et al., 2010). These findings suggest that as women approach and complete menopause they move away from engaging in active mate choice (Hawkes, O'Connell, Jones, Alvarez, & Charnov, 1998), and may focus more on investment in the family (Hawkes et al, 1998; Shanley, Sear, Mace, & Kirkwood, 2007).

Despite these issues, recruiting post-reproductive women was intentional and not without benefits. An abundance of research has been conducted investigating the role that both menstrual cycle phase (reviewed in Jones et al., 2008) and hormonal contraceptives (reviewed in Alvergne & Lummaa, 2010) play in women's preferences for male traits. By recruiting post- and peri-menopausal women, I attempted to avoid these confounds. Admittedly, however, this recruitment strategy could have been improved further by only

recruiting women that had completed menopause. In addition, in order to recruit women who were in the reproductive phase of their lives, I would most likely have had to search for younger women with androphilic brothers of a similar age. Given that public declarations of sexual orientation identity often change over time for many men with shifts from heterosexual to bisexual and finally to homosexuality (Stokes, Damon, & McKirnan, 1997), it may have been difficult to accurately ascertain the sexual orientation of younger male siblings.

Contrary to the prediction of the SAGH, I found no evidence that mothers with and without androphilic sons differed in the total number of children produced ($t[116] = -0.085, p = 0.933, \text{Cohen's } d = 0.0160$). Women with androphilic sons gave birth to a total of 2.426 children ($SD = 0.869$) and those with gynephilic sons gave birth to a total of 2.440 ($SD = 0.836$). This finding is inconsistent with previous research, which has furnished support for the SAGH (Bailey et al., 1999; Camperio-Ciani et al., 2004; Camperio-Ciani & Pellizzari, 2012; Iemmola & Camperio-Ciani, 2009; McKnight & Malcolm, 2000; Rahman et al., 2008; Turner, 1995; VanderLaan et al., 2012; VanderLaan & Vasey, 2011; Vasey & VanderLaan, 2007). Cultural (i.e., environmental) differences may help account for these discrepant findings. For example, Italy, Samoa, Canada, and the USA all have differing levels of religiosity. According to a 2012 report from the Pew Forum on Religion & Public Life, the number of individuals who identify as “religiously unaffiliated” depends on the country sampled and can be highly variable from one country to the next. “Religiously unaffiliated” refers to individuals who identify as atheist or agnostic, and those who do not identify with any particular religion. This report found the following percentages of individuals who identify as “religiously

unaffiliated”: Samoa = 2.5%; Italy = 12.4%; USA = 16.4%; and Canada = 23.7%.

Research has demonstrated that as religiosity decreases, rates of contraceptive use increase (Balakrishnan & Chen, 1990; Notzer, Levran, Mashiach, & Sqffer, 1984; Ohlendorg & Fehring, 2007; Studer & Thornton, 1987). It is possible that the SAGH for male androphilia is indeed correct, but that the genes in questions are not functionally expressed in my North American sample because a lower level of religiosity reduces reproduction as a result of its mediating effect on contraceptive use.

Some of the mother’s of gynephilic males in our sample may have gone on to produce an androphilic son(s) if they had not restricted their reproductive output by using contraceptives. This is because the probability of producing an androphilic son increases with every older brother produced. This effect, known as the Fraternal Birth Order Effect (FBOE) has been replicated numerous times employing diverse sample populations (reviewed in Blanchard, 2004; Blanchard, 2006; Bogaert & Skorska, 2011). However, cultural attitudes concerning reproduction can influence whether the FBOE is expressed.. For example, Zucker, Blanchard, Kim, Pae, and Lee (2007) did not find evidence for the FBOE when using a South Korean sample. These authors argue that this lack of support can be attributed to the cultural norms surrounding reproduction in this population. Specifically, there is a preference towards having a son and mothers will most often stop reproducing upon the birth of a male child (McClelland, 1979; Yamaguchi, 1989). The result of this male-preferred stopping rule restricts the number of brothers a male will have. Therefore, the absence of the FBOE in this population does not furnish evidence against the existence of this effect because cultural influences can account for this absence. Given that cultural differences appear to have an influence on the expression of

the FBOE and possibly the SAGH, more research should be conducted looking at the basic tenets of the SAGH (i.e., that there will be reproductive output differences between the female kin of androphilic males and those of gynephilic males) in populations where female reproduction is relatively unrestricted (i.e., no or infrequent use of contraceptives, no stopping rules, etc.). Cross-cultural research should also be conducted to examine how cultural beliefs influences reproduction.

If some of the mother's of gynephilic men in my sample had not used contraceptives, then it is possible that they may have gone on to produce androphilic sons. These women might share characteristics with "mothers of androphilic sons" but have been grouped with "mothers of gynephilic sons" making it difficult to parse any meaningful results from tests of group differences. In contrast, if this work had been conducted in a population where women were reproducing naturally without the impediment of contraceptive use, then it would have been more likely that any woman that was going to produce an androphilic son would have done so. This "natural fertility" situation would facilitate greater confidence in the accurate classification of women into their respective category (i.e., mother of an androphilic/gynephilic son), which would have presumably rendered potential group differences in offspring production more apparent. Given this, future research attempting to identify the underlying mechanism of differential reproduction between women with, and without, androphilic sons should be conducted in populations where women are reproducing at natural rate (i.e., without contraceptives).

The lack of support of the SAGH in this thesis in no way diminishes the value of investigating the underlying *mechanisms* that account for the differential reproduction

between the female kin of androphilic males and those of gynephilic males demonstrated in some populations. Even if the genes that contribute to male androphilia are not being expressed in an adaptive way (i.e., increased reproduction), the putative mechanism(s) associated with elevated reproduction in the female kin of male androphiles might still be present, if the SAGH is correct (see Tooby & Cosmides, 2005 for a general discussion). For example, Forrester, VanderLaan, Parker, and Vasey (2011) argued that, in line with the predictions of the Kin Selection Hypothesis for male androphilia (i.e., androphilic males can increase their indirect fitness by directing avuncular and altruistic behaviour toward closely related kin, which allows kin to increase their reproductive success), Canadian androphilic males should demonstrate increased willingness to invest in kin children compared to non-kin children. It was in fact the case the androphilic males reported a greater willingness to invest in kin children over non-kin children. However, this study did not find evidence for elevated avuncular tendencies among androphilic males compared to androphilic women and gynephilic males (Forrester, 2011). These findings suggest that there is a cognitive mechanism in place for elevated avuncular tendencies, but those tendencies are not functionally expressed in this Western environment, perhaps due to geographic distance from kin or the degree of individualism versus collectivism within this society. It could be the case that the cognitive mechanism (i.e., differing mate preferences) is in place to facilitate increased reproduction in the female kin of androphilic males in North America, while at the same time the cultural factors present in this population restrict the expression of this mechanism from functioning in any adaptive way.

A further limitation of this study has to do with the stimuli used to measure attractiveness. For all three analyses (face shape, facial skin colour, and facial hair) there was a main effect of male model meaning that all women rated some models as significantly more or less attractive than others. When some models are more or less attractive, participants may potentially be attending to the overall difference in attractiveness between models rather than the subtle facial feature differences that were being experimentally manipulated. Although both the composite and natural stimuli used in this study were standardized as best as possible, the methodology could have been improved by having individuals rate a large number of both composite and natural faces for attractiveness prior to the manipulation of facial traits. This would allow for overall attractiveness to be standardized. Subsequently, faces scoring similarly on attractiveness could be presented together, hopefully reducing or even eliminating any main effect of male model. Additionally, to this researcher's knowledge, this is the first study into facial attractiveness preferences that has included male model as a within-subjects measure. In the future, other researchers might benefit from structuring their analyses in a similar way for the above-mentioned reason.



Figure 2.1. An example of the face shape stimuli used in Study 1. Images show the same composite face when morphed to be feminine (left) and masculine (right).



Figure 2.2. An example of the facial skin colour stimuli used in Study 2. Images show the same composite face when morphed to be light (left) and dark (right).



Figure 2.3. An example of the facial hair stimuli used in Study 3. Images show the same man when clean-shaven, with light stubble, and with a full beard.

Table 2.1. *Descriptive statistics for biographic and reproductive variables*

Biographic Variable	Mothers of androphilic males ($n = 68$)	Mothers of gynephilic males ($n = 50$)
Age (in years) M (SD)	55.76 (9.93)	55.70 (7.04)
Reproductive output (total) M (SD)	2.426 (0.869)	2.440 (0.836)
Current relationship status		
Single (%)	1.47	2.00
Dating one person exclusively (%)	4.41	2.00
Common law (%)	1.47	0.00
Married (%)	79.41	86.00
Separated or divorced (%)	10.29	8.00
Widowed (%)	2.94	2.00
Education		
High school (%)	20.58	6.00
Some post-secondary (%)	14.70	18.00
Completed post-secondary (%)	38.23	26.00
Graduate school or post-graduate (%)	26.47	24.00
Reproductive status		
Currently pregnant (%)	0.00	0.00
Regularly menstruating (%)	20.58	18.00
Menopausal (%)	27.94	18.00
Post-menopausal (%)	51.47	64.00
Country of residence		
Canada (%)	47.05	76.00

U. S. A. (%)	52.94	24.00
Method of recruitment		
Facebook (%)	2.94	2.00
P. F. L. A. G. (%)	52.94	18.00
Other (%)	44.11	80.00

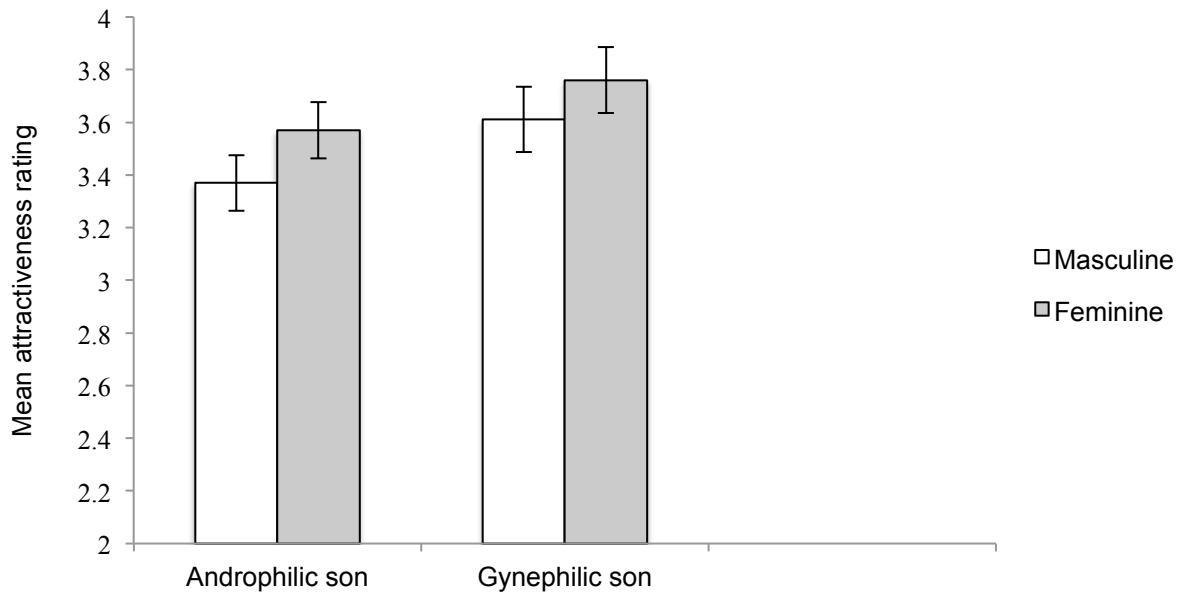


Figure 2.4. Mean attractiveness rating for mothers with an androphilic son(s) versus mothers with a gynephilic son(s) in response to facial stimuli that has been morphed to be masculine or feminine. No significant between group difference was found ($p = 0.321$). Error bars represent standard error.

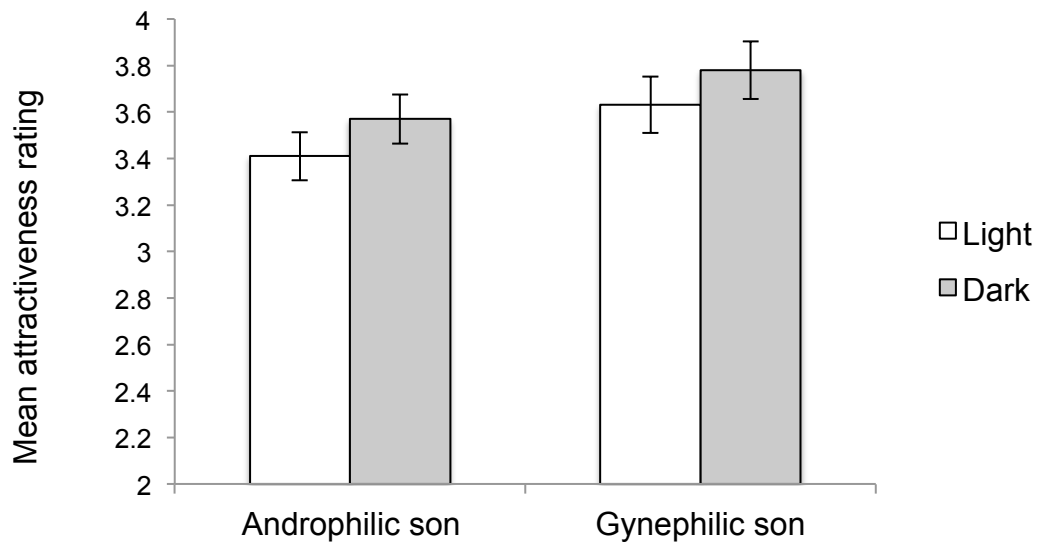


Figure 2.5. Mean attractiveness rating for mothers with an androphilic son(s) versus mothers with a gynephilic son(s) in response to facial stimuli that has been morphed to be light or dark. No significant between group difference was found ($p = 0.761$). Error bars represent standard error.

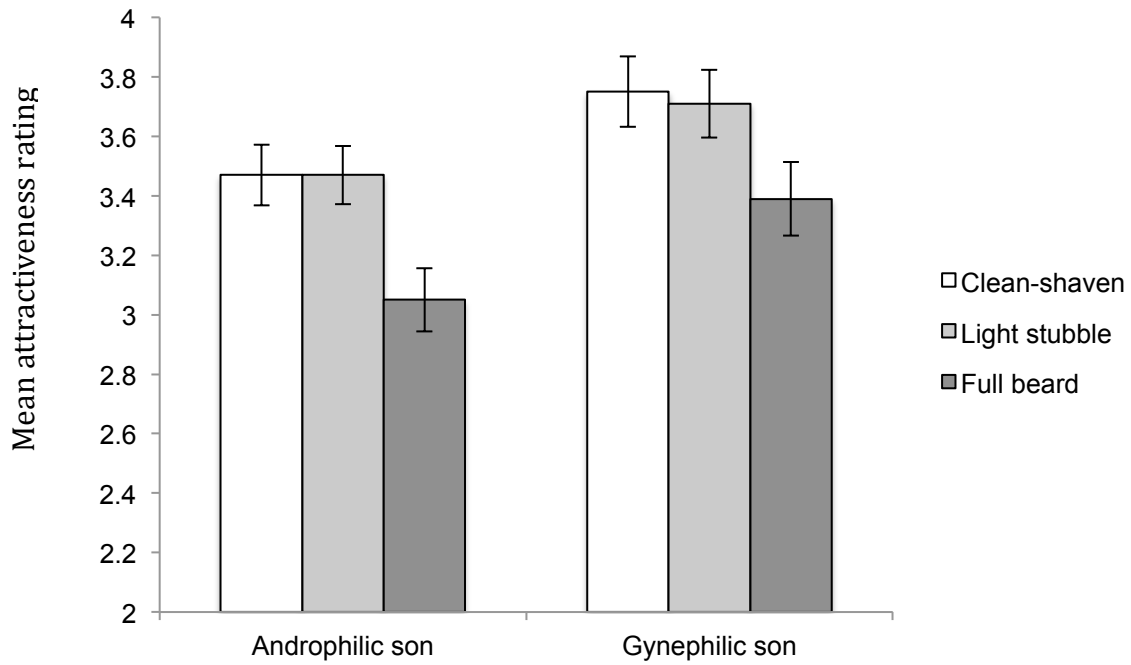


Figure 2.6. Mean attractiveness rating for mothers with an androphilic son(s) versus mothers with a gynephilic son(s) in response to natural facial stimuli that vary in degree of beardedness (i.e., clean-shaven, light stubble, full beard). No significant between group difference was found ($p = 0.538$). Error bars represent standard error.

CHAPTER THREE

Implications for Future Research

Male androphilia is paradoxical when viewed from an evolutionary perspective. There is a genetic component to this sexual orientation (Bailey & Bell, 1993; Bailey et al., 1999; Bailey et al., 2000; Kendler et al., 2000; Långström et al., 2010; LeVay, 2010; Wilson & Rahman, 2005) and male androphiles reproduce at a fraction of the rate of male gynephiles (Bell & Weinburg, 1978; King et al., 2005; Saghir & Robins, 1973; Schwartz et al., 2010; van de Ven et al., 1997; Yankelovich, 1994), if they reproduce at all (Vasey et al., 2014). Nevertheless, archaeological evidence suggests that male-male sexual activity has existed for millennia (Gebhard, 1970; Nash, 2001; Yates, 1993). The maintenance of genes that contribute to a behaviour that reduces reproductive success is antithetical to evolution through natural selection and, therefore, requires an explanation.

One explanation is the Sexually Antagonistic Gene Hypothesis (SAGH) for male androphilia, which posits that the genes that contribute to androphilia in males result in reproductive costs (i.e. reduced reproduction) while those same genes confer fitness benefits (i.e. increased reproduction) in the female relatives of androphilic males. The fitness-benefits for females are thought to offset the fitness costs in males and, in this way, genes for male androphilia persist in the population over evolutionary time.

In support of this hypothesis, evidence indicates that the female relatives of male androphiles produce more offspring than do the female kin of male gynephiles (Bailey et al., 1999; Camperio-Ciani et al., 2004; Camperio-Ciani & Pellizzari, 2012; Iemmola & Camperio-Ciani, 2009; McKnight & Malcolm, 2000; Rahman et al., 2008; Turner, 1995; VanderLaan et al., 2012; VanderLaan & Vasey, 2011; Vasey & VanderLaan, 2007).

Despite this finding, little research has been done to identify the underlying mechanism that could account for this differential reproduction. Some studies indicate that masculine males (as measured by male face shape and facial hair) confer direct (i.e., resource) and indirect (i.e., genetic) benefits to their female mates, which, in turn, would enhance the fitness of those women. Conversely, studies also show that masculine males possess negative personality and dispositional traits that might be detrimental to these males' female mates. Upon a thorough review of the literature pertaining to female preferences for face shape (i.e., masculine/feminine) in males, I reasoned that this trait does not appear to be a salient cue used in female mate choice and subsequently hypothesized that the mothers of both androphilic and gynephilic males would not differ in their preferences for faces morphed to be either more masculine or feminine in shape. I also hypothesized, given the equivocal role of facial hair in female judgments of male attractiveness, that the mothers of androphilic and gynephilic males would not differ in their preferences for natural faces displaying varying degrees of beardedness (i.e., clean-shaven, light stubble, fully bearded). Finally, I employed a facial characteristic that has only recently been used to study judgments of attractiveness in an attempt to better understand the mechanism that could account for the differential reproduction seen between women with and without androphilic sons. Given that research has demonstrated the salience of skin colour (as assayed by skin yellowness, redness, lightness, and darkness) on judgments of both health and attractiveness, I reasoned that the mothers of male androphiles might attend to cues of skin darkness more so than the mothers of male gynephiles and subsequently be the recipients of any fitness benefits associated with dark skin, which may account for their increased reproduction. Therefore, I hypothesized that

the mothers of male androphiles would rate faces morphed to be darker as more attractive than the mothers of male gynephiles. The three studies presented in this thesis tested these hypotheses using a sample of North American mothers of androphilic and gynephilic males.

In Chapter 2, I tested whether or not face shape (masculine/feminine) in males functioned as a salient determinant of female mate choice. The results of this research indicate that all women, regardless of the sexual orientation of their son(s), rate face shape in a similar manner suggesting that this trait in males is relatively fitness-neutral cue. It is possible that face shape serves to cue an individual's sex (i.e., male or female), but beyond that it appears as if this trait does not provide information about males' relative mate quality (i.e., genetic quality, parental investment). As such, the results of my study indicate that different preferences for masculine/feminine male face shape cannot account for the reproductive differences seen between mothers with androphilic sons and those with gynephilic sons. In addition, I found that all participants had a preference for male composite faces that were more feminine in appearance. This finding may reflect the fact that studies employing composite morphed facial stimuli to test female preferences for male face shape most often find a preference for images morphed to be more feminine rather than more masculine (Little et al., 2001; Little & Hancock, 2002; Penton-Voak et al., 1998; Perrett et al., 1998; Rhodes et al., 2000). Rennels, Bronstad, and Langlois (2008) argue that this preference for feminine composite morphed faces can be explained due to the fact that these images are shifted in a feminine direction by using images of female facial averages rather than images of male faces that are high in measures of femininity. Using female facial averages to shift male faces may create

facial representations that are not representative of real world experiences, which are therefore novel and preferred.

I also tested whether mothers with androphilic male sons preferred male models with darker skin colour more so than mothers with gynephilic sons. Facial skin colour in males is thought to be a fitness-relevant trait that cues females to the current condition of potential male mates (Fink et al., 2006; Jones et al., 2004; Law Smith et al., 2009; Matts et al., 2007; Stephen, 2009; Stephen et al., 2009). The results of my study suggest that all women, regardless of the sexual orientation of their son(s), rate facial skin colour in a similar fashion. This finding suggests that different preferences for light/dark male skin colour cannot account for the reproductive differences seen between mothers with androphilic sons and those with gynephilic sons. Additionally, I also found that the women in this study showed a preference for darker coloured skin compared to lighter skin colour. This finding suggests that darker skin may be a salient cue used by women when making mate choice decisions. This result is consistent with the argument of Scott et al. (2010) that qualities of facial skin, such as colour, are attended to and appear to be relevant when women are making judgments about a potential male mates' current health and attractiveness. Dark skin may cue women to its associated benefits, such as protection from cancer, increased immune defense, and elevated reproductive health in males (Stephen, Coetzee, & Perrett, 2011), and therefore be a preferred trait when evaluating a male.

Finally, I tested whether or not varying degrees of facial hair in males plays are relevant to female mate choice. I found that all women, regardless of the sexual orientation of their son(s), rated natural male faces with varying degrees of facial hair in a

similar manner. This finding suggests that different preferences for male facial hair cannot account for the reproductive differences seen between mothers with androphilic sons and those with gynephilic sons. I also found that all women rated males that were either clean-shaven or had light stubble as being significantly more attractive than males with full beards. This finding is consistent with the conclusion that full beards may serve as a cue of negative personality traits in male mates (e.g., aggressivity) that may compromise a woman's fitness. Future research should determine whether this perception of aggressivity in bearded males is actually manifested behaviorally.

In light of the research presented in this thesis, the question remains as to what mechanism underlies the elevated reproductive output of the female kin of androphilic males compared to the female kin of gynephilic males. In the following sections, I suggest some potential avenues for future research.

Future Directions

Properties of Facial Skin Colouration

Research investigating the role of skin as it pertains to facial attractiveness has focused mainly on the underlying colour characteristics of skin that are thought to provide cues of current condition (i.e., health). For example, skin redness increases with blood oxygenation, which is heightened during aerobic activity (Armstrong & Welsman, 2001). In contrast, oxygen deprivation (hypoxia) reduces skin redness and increases skin blueness, which is an indicator of respiratory and coronary disease (Ponsonby, Dwyer, & Couper, 1997). When asked to manipulate skin colour in order to indicate the optimum level of health in female and male faces, both male and female participants increased skin redness (Stephen et al., 2009). Another study found that females increased skin redness

when asked to optimize apparent aggression, dominance, and attractiveness in male faces (Stephen, Oldham, Perrett, & Barton, 2012). Interestingly, the largest increase in redness occurred when participants were asked to optimize aggression, the second largest increase occurred when asked to optimize dominance, and the smallest increase occurred when asked to optimize attractiveness (Stephen et al., 2012). This finding may indicate that there is a trade-off between high health and negative personality characteristics when using skin redness as a measure of male facial attraction.

Skin yellowness, which increases and decreases with levels of carotenoid in the diet, has also been found to be attractive in male faces. A study asking males and females to manipulate both male and female faces on measures of carotenoid and melanin individually to optimize health demonstrated that increases in both of these measures resulted in the healthiest facial appearance (Stephen et al., 2011). Additionally, participants increased melanin and carotenoid colour more in faces that were initially low in skin yellowness, and carotenoid was increased more so overall than melanin. In two-dimensional trials (manipulating melanin and carotenoid levels at the same time), participants slightly increased melanin and significantly increased carotenoid resulting in an overall increase in skin lightness and yellowness (Stephen et al., 2011). These results indicate that carotenoid colouration plays a more central role in the perception of the health of human faces compared to that of melanin colouration.

Subsequent work by Stephen, Scott, Coetzee, Pound, & Perrett, et al. (2012) asked Caucasian females to rate the attractiveness of Caucasian male faces on measures of face shape masculinity and facial skin colour and found that face shape masculinity was not a predictor of attractiveness. Greater attractiveness was predicted by increased

levels of skin yellowness and decreased levels of skin lightness. This finding remained when African raters were asked to rate African faces indicating that ethnic differences in skin colour and yellowness did not affect the overall findings.

Although these two independent studies (Stephen et al., 2011; Stephen et al., 2012) found conflicting results regarding the role of melanin and related skin lightness/darkness, together they suggest that skin lightness/darkness is a salient feature used when making judgments of attraction and mate choice. Given this, more research is needed in order to demonstrate the categories of skin colouration (e.g., lightness/darkness, yellowness, redness) that are implicated in judgments of attractiveness and whether or not these judgments can help account for the reproductive differences in women with and without androphilic sons.

Other Possible Mechanisms Underlying Differential Reproduction

Another facial feature that should be used in future research attempting to identify the underlying mechanisms that account for differential reproduction could be facial adiposity. The majority of research looking at preferences for cues of weight has focused on the body (Tovée & Cornelissen, 2001; Tovée, Reinhardt, Emery, & Cornelissen, 1998), but facial adiposity has also been demonstrated to have an effect on attractiveness preferences. Work by Coetzee, Perrett, & Stephen (2009) found that men and women rate both men and women with intermediate levels of facial adiposity to be more attractive than those with low or high levels of facial adiposity. More recent work has been conducted looking at the relative importance of both facial masculinity and facial adiposity in males. This work by Rantala et al. (2012) demonstrates that women use cues of facial adiposity, an indicator of current health condition (Coetzee et al., 2009), rather

than facial masculinity, when making judgments of attraction. Again, more research should be done examining the role of facial adiposity as it pertains to mate choice and whether or not these judgments of attractiveness can account for the reproductive differences in women with and without androphilic sons.

It is possible that other psychological mechanisms not directly related to mate choice may account for the differences in reproductive output seen between the female kin of androphilic males and those of gynephilic males. Camperio-Ciani (2012) found that the mothers and maternal aunts of androphilic males were significantly more extraverted than those of gynephilic males. These women were also less concerned with the importance of having children, with romantic love within a couple, and with family stability (Camperio-Ciani, 2012). These women also had a more relaxed attitude toward family values. These results are not surprising given that women who score high on measures of extraversion also score high on measures of sexual promiscuity and sociosexuality (Schmitt, 2004; Wright & Reise, 1997; Eysenck, 1974). Future research should be done to better establish how prevalent high extraversion is among the female relatives of androphilic males because the presence of this personality trait appears to be coupled with a greater willingness to engage in sexual behaviour. It might be the case that the female kin of androphilic males are more sexually active than those of gynephilic males, increasing their likelihood of becoming pregnant. If these women also experience fewer gynaecological and pre-parturition problems in addition to fewer complicated pregnancies, as found by Camperio-Ciani's (2012) study, then these two factors (increased sociosexuality and higher reproductive health) might contribute to their elevated reproduction.

Alternatively, there is evidence to demonstrate that high extraversion is positively correlated with the strength of female preferences for face shape masculinity in males (Welling, DeBruine, Little, & Jones, 2009). As such, it might be the case that face shape functions as a more salient cue of attractiveness for women high in extraversion. Future research could employ the cues of facial attractiveness that my study used while also measuring extraversion in order to better understand the interaction between these two variables. It could be the case that women with both high extraversion and androphilic sons attend to male face shape differently than the women in my study did. The same might be true for other cues such as skin colour as it pertains to lightness and darkness, and varying degrees of facial hair. Furthermore, this might also be the case for other cues of health and attractiveness such as skin yellowness and redness and facial adiposity.

Cross-Cultural Assessment of Mating Psychology

Research demonstrates that mate preferences and mating systems vary cross-culturally depending on the pathogen prevalence in a given location (Gangestad & Buss, 1993; Low, 1990). Specifically, participants from 29 cultures were asked to indicate the importance of certain physical attributes when selecting a potential mate (Gangestad & Buss, 1993). In locations with a higher prevalence of pathogens individuals rated physical attractiveness more highly than did individuals in locations where the prevalence of pathogens was comparatively lower (Gangestad & Buss, 1993). Using a sample of 186 cultures and a variety of pathogens (e.g., leishmanias, trypanosomes, malaria, schistosomes, filariae, spirochetes, and leprosy), Low (1990) found that as the threat of pathogens increases so do rates of polygyny. This finding may suggest that in regions where pathogen threat is high women select mates based on genetic quality rather than

paternal investment (Low, 1990). A number of studies have been done exploring the role of pathogens and their effects on mate preferences. Work by DeBruine, Jones, Tybur, Lieberman, & Griskevicius (2010) demonstrated that pathogen disgust was positively correlated with female preferences for masculine male face shape as measured by both morphed composite and natural facial stimuli. In light of this finding, DeBruine et al. (2010) examined female attractiveness preferences using a cross-cultural sample of 30 countries and found that preferences for masculine face shape increased as national health (measured by the National Health Index) decreased. In conditions where national health is poor, women may value high genetic quality over elevated paternal investment so as to potentially increase offspring survival.

Brooks et al. (2011) note that while facial masculinity signals aggression and low investment, it may also signal dominance (Boothroyd et al., 2007), which predicts competitive success in male hierarchies in certain environments (Mueller & Mazur, 1996). In environments where there is greater income inequality and resources are less evenly distributed, females show higher preferences for males with greater face shape masculine (Brooks et al., 2011). This finding suggests that women might be attracted to masculinity when the benefits of dominance (i.e., resource acquisition) outweigh the costs of possible aggression (Brooks et al., 2011). Higher preferences for masculinity have been demonstrated when females are exposed to brief visual cues of pathogens and male-male competition suggesting that both of these variables may interact to influence female mate choice (Little, DeBruine, & Jones, 2011, 2013). Furthermore, women who have been primed to imagine that they receive high support from their family show heightened preferences for males with masculine face shape as long-term partners (Little,

Cohen, Jones, & Belsky, 2007). Conversely, when primed to conditions of low support women prefer males with feminine face shape (Watkins, DeBruine, Little, & Jones, 2012).

Given that preferences for masculinity become stronger in countries where health care is low and pathogen threat is high (DeBruine et al., 2010; Moore et al., 2013) and where resources are less evenly distributed (Brooks et al., 2011), it is important to investigate the attractiveness preferences of women with and without androphilic sons in these types of environments. If preferences for male face shape masculinity are more pronounced in certain environments, then similarly, preferences for facial skin colour (i.e., redness, yellowness, lightness/darkness) and facial adiposity might also be more pronounced. Studying mate preferences in a variety of cultural environments might generate different results than the ones reported in this thesis. Further, examining preferences for additional facial features not examined in this thesis (e.g., facial yellowness, redness, adiposity) may reveal group differences in what the female kin of androphilic males find attractive compared to the female kin of gynephilic males. This, in turn, might potentially illuminate mate choice preference mechanisms that may underlie differential offspring production between these two groups of women.

REFERENCES

- Addison, W. E. (1989). Beardedness as a factor in perceived masculinity. *Perceptual and Motor Skills*, 68, 921-922.
- Alvergne, A., & Lummaa, V. (2010). Does the contraceptive pill alter mate choice in humans? *Trends in Ecology and Evolution*, 25, 171-179.
- Andersson, M. (1994). *Sexual selection*. Princeton, NJ: Princeton University Press.
- Armstrong, N., & Welsman, J. R. (2001). Peak oxygen uptake in relation to growth and maturation in 11-17-year-old humans. *European Journal of Applied Physiology*, 85, 546-551.
- Bailey, J. M., Pillard, R. C., Dawood, K., Miller, M., Farrer, L. A., Trivedi, S., & Murphy, R. L. (1999). A family history study of male sexual orientation using three independent samples. *Behavior Genetics*, 29, 79-86.
- Bailey, J. M., & Bell, A. P. (1993). Familiality of female and male homosexuality. *Behavior Genetics*, 23, 313-322.
- Bailey, J. M., Dunne, M. P., & Martin, N. G. (2000). Genetics and environmental influences on sexual orientation and its correlates in an Australian twin sample. *Journal of Personality and Social Psychology*, 78, 524-536.
- Bailey, J. M., & Pillard, R. C. (1991). A genetic study of male sexual orientation. *Archives of General Psychiatry*, 48, 1089-1096.
- Barden, C. W., & Catterall, J. F. (1981). Testosterone – a major determinant of extra-genital sexual dimorphism. *Science*, 211, 1285-1294.

- Benson P. J., & Perrett D. I. (1993). Extracting prototypical facial images from exemplars. *Perception*, *22*, 257-262.
- Blanchard, R. (2004). Quantitative and theoretical analyses of the relation between older brothers and homosexuality in men. *Journal of Theoretical Biology*, *230*, 173-187.
- Bogaert, A. F., & Skorska, M. (2011). Sexual orientation, fraternal birth order, and the maternal immune hypothesis: A review. *Frontiers in Neuroendocrinology*, *32*, 247-254.
- Boothroyd, L. G., Jones, B. C., Burt, D., M., & Perrett, D. I. (2007). Partner characteristics associated with masculinity, health and maturity in male faces. *Personality and Individual Differences*, *43*, 1161-1173.
- Branda R., & Eaton, J. (1978). Skin color and nutrient photolysis: an evolutionary hypothesis. *Science*, *201*, 625-626.
- Brooks, R., Scott, I. M., Maklakov, A. A., Kasumovic, M. M., Clark, A. P., & Penton Voak, I. S. (2011). National income inequality predicts women's preferences for masculinized faces better than health does. *Proceedings of the Royal Society B: Biological Sciences*, *278*, 810-812.
- Bulygina, E., Mitteroecker, P., & Aiello, L. (2006). Ontogeny of facial dimorphism and patterns of individual development within one human population. *American Journal of Physical Anthropology*, *131*, 432-443.
- Burkhart, C. G., & Burkhart, C. N. (2005). The mole theory: primary function of melanocytes and melanin may be antimicrobial defense and immunomodulation (not solar protection). *International Journal of Dermatology*, *44*, 340-342.

- Camperio-Ciani, A., Corna, F., & Capiluppi, C. (2004). Evidence for maternally inherited factors favoring male homosexuality and promoting female fecundity. *Proceedings of the Royal Society of London B*, 271, 2217-2221.
- Camperio-Ciani, A., Fontanesi, L., Iemmola, F., Giannella, E., Ferron, C., & Lombardi, L. (2012). Factors associated with higher fecundity in female maternal relatives of homosexual men. *International Journal for Sexual Medicine*, 9, 2878-2887.
- Camperio-Ciani, A., & Pellizzari, E. (2012). Fecundity of paternal and maternal non-parental female relatives of homosexual and heterosexual men. *PLoS One*, 7(12), e51088.
- Chivers, M. L., Rieger, G., Latty, E., & Bailey, J. M. (2004). A sex difference in the specificity of sexual arousal. *Psychological Science*, 15, 736-744.
- Coetsee, V., Perrett, D. I., & Stephen, I. D. (2009). Facial adiposity: A cue to health? *Perception*, 38, 1700-1711.
- Cornwell, R. E., Boothroyd, L. G., Burt, D. M., Feinberg, D. R., Jones, B. C., Little, A. C., et al. (2004). Concordant preferences for opposite-sex signals? Human pheromones and facial characteristics. *Proceedings of the Royal Society of London B*, 271, 635-640.
- DeBruine, L. M. (2013). Women's preferences for male facial features. In: Weekes-Shackelford, V. A. & Shackelford, T. K. (eds), *Evolutionary Perspectives on human sexual psychology and behavior*, (pp. 261-277). New Yorker: Springer.
- DeBruine, L. M., Jones, B. C., Little, A. C., Boothroyd, L. G., Perrett, D. I., Penton-

- Voak, I. S., et al. (2006). Correlated preferences for facial masculinity and ideal and actual partner's masculinity. *Proceedings of the Royal Society of London B*, 273, 1355-1360.
- DeBruine, L. M., Jones, B. C., Tybur, J. M., Lieberman, D., & Griskevicius, V. (2010). Women's preferences for masculinity in male faces are predicted by pathogen disgust, but not by moral or sexual disgust. *Evolution and Human Behavior*, 31, 69-74.
- DeBruine, L. M., Jones, B. C., Crawford, J. R., & Welling, L. L. M. (2011). Further evidence for regional variation in women's masculinity preferences. *Proceedings of the Royal Society B: Biological Sciences*, 278, 813-814.
- DeBruine, L. M., Jones, B. C., Crawford, J. R., Welling, L. L. M. & Little, A. C. (2010). The health of a nation predicts their mate preferences: cross-cultural variation in women's preferences for masculinized male faces. *Proceedings of the Royal Society B: Biological Sciences*, 277, 2405-2410.
- Delgado, R. A. (2006). Sexual selection in the loud calls of male primates: Signal content and function. *International Journal of Primatology*, 27, 5-25.
- Dixson, B. J., & Brooks, R. C. (2013). The role of facial hair in women's perceptions of men's attractiveness, health, masculinity and parenting ability. *Evolution and Human Behavior*, 34, 236-241.
- Dixson, B. J., Tam, G. M., Ormsby, D. K., Dixson, A. F. (2014). Eye-tracking women's preferences for men's somatotypes. *Evolution and Human Behavior*, 35, 73-79.

- Dixon, B. J., & Vasey, P. L. (2012). Beards augment perceptions of men's age, social status, and aggressiveness, but not attractiveness. *Behavioral Ecology*, *23*, 481-490.
- Edwards, E. A. & Duntley, S. Q. (1939). The pigments and color of the living human skin. *American Journal of Anatomy*, *65*, 1-33.
- Edwards, A. E., Hamilton, J. A., Duntley, S. Q., Hubert, G. (1941). Cutaneous vascular and pigmentary changes in castrate and eunuchoid men. *Endocrinology*, *20*, 119-128.
- Eibl-Eibesfeldt, I. (1989). *Human ethology*. New York: Aldine de Gruyter.
- Ekman, P., Friesen, W. V., & Hager, J. C. (2002). Facial action coding system (FACS): Manual. Salt Lake City (UT): A human face.
- Enlow, D. H. (1982). *Handbook of facial growth*, 2nd ed. Philadelphia: Saunders.
- Enlow, D. H., & Hans, M. G. (1996). *Essentials of facial growth*. Philadelphia: Saunders.
- Evans, D. M., & Martin, N. G. (2008). The validity of twin studies. *GeneScreen*, *1*, 77-79. doi: 10.1046/j.1466-9218.2000.00027
- Eysenck, H. J. (1974). Personality, premarital sexual permissiveness, and assortative mating. *Journal of Sex Research*, *10*, 47-51.
- Farthing, M. J., Mattei, A. M., Edwards, C. R., & Dawson, A. M. (1982). Relationship between plasma testosterone and dihydrotestosterone concentrations and male facial growth. *British Journal of Dermatology*, *107*, 559-564.
- Feinberg, D. R., DeBruine, L. M., Jones, B. C., & Little, A. C. (2008). Correlated

- preferences for men's facial and vocal masculinity. *Evolution and Human Behavior*, 29, 223-241.
- Feinman, S., & Gill, G. W. (1977). Females' response to males' beardedness. *Perceptual and Motor Skills*, 44, 533-534.
- Fink, B., Grammer, K., & Matts, P. J. (2006). Visible skin color distribution plays a role in perception of age, attractiveness, and health in female faces. *Evolution and Human Behavior*, 27, 433-442.
- Fink, B., Neave, N., & Seydel, H. (2007). Male facial appearance signal physical strength to women. *American Journal of Human Biology*, 19, 82-87.
- Fink, B., & Penton-Voak, I. S. (2002). Evolutionary psychology of facial attractiveness. *Current Directions in Psychological Science*, 11, 154-158.
- Folstad, I., & Karter, A. J. (1992). Parasites, bright males and the immunocompetence handicap hypothesis. *American Naturalist*, 139, 603-622.
- Forrester, D. L., VanderLaan, D. P., Parker, J. L., & Vasey, P. L. (2011). Male sexual orientation and avuncularity in Canada: Implications for the kin selection hypothesis. *Journal of Cognition and Culture*, 11, 339-352.
- Frost, P. (1988). Human skin color: A possible relationship between its sexual dimorphism and its social perception. *Perspectives in Biology and Medicine*, 32: 38-58.

- Gangestad, S. W., & Eaton, M. A. 2013. Toward an integrative perspective on sexual selection and men's masculinity. *Behavioral Ecology*, 24, 594-595.
- Gangestad, S. W., & Scheyd, G. J. (2005). The evolution of human physical attractiveness. *Annual Review of Anthropology*, 34, 523-548.
- Gangestad, S. W., & Simpson, J. A. (2000). The evolution of human mating: trade-offs and strategic pluralism. *Behavioral and Brain Sciences*, 23, 573-644.
- Gangestad, S. W., & Thornhill, R. (2003). Facial masculinity and fluctuating asymmetry. *Evolution and Human Behavior*, 24, 231-241.
- Gebhard, P. H. (1970). Sexual motifs in prehistoric Peruvian ceramics. In: T. Bowie & C. V. Christenson (Eds.), *Studies in Erotic Art*, (pp. 109-144). New York: Basic Books.
- Hamer, D. H., Hu, S., Magnuson, V. L., Hu, N., & Pattatucci, A. M. L. (1993). A linkage between DNA markers on the X chromosome and male sexual orientation. *Science*, 261, 321-327.
- Hatfield, E., & Sprecher, S. (1986). *Mirror, mirror: the importance of looks in everyday life*. Albany: State University of New York Press.
- Harrington, J. P. (1942). Culture element distributions¹⁹: Central California coast. *American Naturalist*, 97, 354-356.

- Hawkes. K., O'Connell, J. F., Jones, N. G. B., Alvarez, H., & Charnov, E. L. (1998). Grandmothering, menopause, and the evolution of human life histories. *Proceedings of the National Academy of Sciences of the United States of America*, 95, 1336-1339.
- Hellstrom, A., & Tekle, J. (1994). Person perceptions through facial photographs: effects of glasses, hair, and beard on judgments of occupation and personal qualities. *European Journal of Social Psychology*, 24, 693-705.
- Hewlett, B. S. (1992). Husband-wife reciprocity and the father-infant relationship among Aka pygmies. In: B. S. Hewlett (ed.), *Father-child relations: Cultural and biosocial contexts* (pp. 153-176). New York: Aldine de Gruyter.
- Hill, H., Bruce, V., & Akamatsu, S. (1995). Perceiving the sex and race of faces: The role of shape and colour. *Proceedings of the Royal Society of the Royal Society: Biological Sciences*, 261, 367-373.
- Hill AK, Hunt J, Welling LL, Cárdenas RA, Rotella MA, Wheatley JR, Dawood K, Shriver MD, Puts, DA. 2013. Quantifying the strength and form of sexual selection on men's traits. *Evolution and Human Behaviour*, 34, 334-341.
- Hollimon, S. E. (1997). The third gender in California: Two-spirit undertakers among the Chumash, their neighbours. In: C. Claassen & R. A. Joyce (eds.), *Women in prehistory: North America and Mesoamerica* (pp. 173-188). Philadelphia: University of Pennsylvania Press.
- Hu, S., Pattatucci, A., Patterson, C., Li, L., Fulker, D., Cherny, S., Kruhlyak, L., & Hamer, D. (1995). Linkage between sexual orientation and chromosome Xq28 in

- males but not females. *Nature Genetics*, *11*, 248-256.
- Iemmola, F., & Camperio-Ciani, A. (2009). New evidence of genetic factors influencing sexual orientation in men: Female fecundity increase in the maternal line. *Archives of Sexual Behavior*, *38*, 393-399.
- Jablonski, N. G. (2006). *Skin: A natural history*. California: University of California Press.
- Jablonski, N. G., & Chaplin, G. (2000). The evolution of skin coloration. *Journal of Human Evolution*, *39*, 259-280.
- Johnston, V. S., Hagel, R., Franklin, M., Fink, B., & Grammer, L. (2001). Male facial attractiveness: evidence for a hormone-mediated adaptive design. *Evolution and Human Behavior*, *22*, 251-267.
- Jones, B. C., DeBruine, L. M., Perrett, D. I., Little, A. C., Feinberg, D. R., & Law Smith, M. J. (2008). Effects of menstrual cycle on face preferences. *Archives of Sexual Behavior*, *37*, 78-84.
- Jones, B. C., Little, A. C., Burt, D. M., & Perrett, D. I. (2004). When facial attractiveness is only skin deep. *Perception*, *33*, 569-576.
- Jones, B. C., Little, A. C., Penton-Voak, I. S., Tiddeman, B. P., Burt, D. M., & Perrett, D. I. (2001). Facial symmetry and judgements of apparent health: Support for a “good genes” explanation of attractiveness-symmetry relationship. *Evolution and Human Behavior*, *22*, 417-429.

- Kendler, K. S., Thornton, L. M., Gilman, S. E., & Kessler, R. C. (2000). Sexual orientation in a U.S. national sample of twin and nontwin sibling pairs. *The American Journal of Psychiatry*, *157*, 1843-1846.
- Kenny, C. T., & Fletcher, D. (1973). Effects of beardedness on person perception. *Perceptual and Motor Skills*, *37*, 413-414.
- King, M. D., Green, J., Osborn, D. P. J., Arkell, J., Hetherington, J., & Pereira, E. (2005). Family size in white gay and heterosexual men. *Archives of Sexual Behavior*, *34*, 117-122. doi: 10.1007/s10508-005-1006-8.
- Kinsey, A. C., Pomeroy, W. B., & Martin, C. E. (1948). *Sexual behavior in the human male*. Philadelphia, PA and London, UK: Saunders.
- Koehler, N., Simmons, L. W., Rhodes, G., & Peters, M. (2004). The relationship between sexual dimorphism in human faces and fluctuating asymmetry. *Proceedings of the Royal Society B*, *271*(Suppl. 4), S233-236.
- Krams, I., Rantala, M. J., & Krams, T. (2010, March). *Facial attractiveness signals the strength of immune function in men*. Paper presented at the annual meeting of the European Human Behaviour and Evolution Association, Wroclaw, Poland.
- Kruger, D. J. (2006). Male facial masculinity influences attributions of personality and reproductive strategy. *Personal Relationships*, *13*, 451-463.
- Långström, N., Rahman, Q., Carlström, E., & Lichtenstein, P. (2010). Genetic and environmental effects on same-sex sexual behavior: a population study of twins in Sweden. *Archives of Sexual Behavior*, *39*, 75-80.

- LeVay, S. (2010). *Gay, straight, and the reason why*. New York: Oxford University Press.
- Little, A. C., Burt, D. M., Penton-Voak, I. S., & Perrett, D. (2001). Self-perceived attractiveness influences female preferences for sexual dimorphism and symmetry in male faces. *Proceedings of the Royal Society of London B*, *268*, 39-44.
- Little, A. C., Cohen, D. L., Jones, B. C., & Belsky, J. (2007). Human preferences for facial masculinity change with relationship type and environmental harshness. *Behavioral Ecology and Sociobiology*, *61*, 967-973.
- Little, A. C., DeBruine, L. M., & Jones, B. C. (2011). Exposure to visual cues of pathogen contagion changes preferences for masculinity and symmetry in opposite-sex faces. *Proceedings of the Royal Society of London B*, *278*, 2032-2039.
- Little, A. C., & Hancock, P. J. (2002). The role of masculinity and distinctiveness in judgments of human male facial attractiveness. *British Journal of Psychology*, *93*, 451-464.
- Little, A. C., Jones, B. C., & DeBruine, L. M. (2011). Facial attractiveness: Evolutionary based research. *Philosophical Transactions of the Royal Society, B: Biological Sciences*, *366*(1571), 1634-1637. doi: 10.1098/rstb.2010.0404
- Little, A. C., Jones, B. C., DeBruine, L. M., & Feinberg, D. R. (2008). Symmetry and sexual-dimorphism in human faces: Interrelated preferences suggest both signal quality. *Behavioral Ecology*, *19*, 902-908.

- Little, A. C., Jones, B. C., Penton-Voak, I. S., Burt, D. M., & Perrett, D. I. (2002). Partnership status and the temporal context of relationships influence human female preferences for sexual dimorphism in male face shape. *Proceedings of the Royal Society of London B*, *269*, 1095-1103.
- Little, A. C., Jones, B. C., Waitt, C., Tiddeman, B. P., Feinberg, D. R., Perrett, D. I., et al. (2008). Symmetry is related to sexual dimorphism in faces: data across cultures and species. *PLoS One*, *3*, e2106.
- Little, A. C., & Mannion, H. (2006). Viewing attractive or unattractive same-sex individuals changes self-rated attractiveness and face preferences in women. *Animal Behavior*, *72*, 981-987.
- Little, A. C., Saxton, T. K., Roberts, S. C., Jones, B. C., DeBruine, L. M., Vukovic, J., et al. (2010). Women's preferences for masculinity in male faces are highest during reproductive age range and lower around puberty and post-menopause. *Psychoneuroendocrinology*, *35*, 912-920.
- Matts, P. J., Fink, B., Grammer, K., & Burquest, M. (2007). Color homogeneity and visual perception of age, health, and attractiveness of female facial skin. *Journal of the American Academy of Dermatology*, *57*, 977-984.
- McClelland, G. H. (1979). Determining the impact of sex preferences on fertility: A consideration of parity progression ratio, dominance, and stopping rule measures. *Demography*, *16*, 377-388.
- McKnight, J., & Malcolm, J. (2000). Is male homosexuality maternally linked?

- Psychology, Evolution & Gender*, 2, 229-252.
- Mitani, J. C. (1985). Sexual selection and adult male orangutan long calls. *Animal Behavior*, 33, 272-283.
- Moore, F. R., Coetzee, V., Contreras-Garduño, J., Debruine, L. M., Kleisner, K., Krams, I., Marcinkowska, U., Nord, A., Perrett, D. I., Rantala, M. J., Schaum, N., Suzuki, T. N. (2013). Cross-cultural variation in women's preferences for cues to sex-and stress-hormones in the male face. *Biology Letters*, 9, 20130050.
- Mueller, U., & Mazur, A. (1997). Facial dominance in *Homo sapiens* as honest signaling of male quality. *Behavioral Ecology*, 8, 569-579.
- Murray, S. O. (2000). *Homosexualities*. Chicago: The University of Chicago Press.
- Muscarella, F., & Cunningham, M. R. (1996). The evolutionary significance and social perceptions of male pattern baldness and facial hair. *Ethology and Sociobiology*, 17, 99-117.
- Nash, G. (2001). The subversive male: Homosexual and bestial images on European Mesolithic rock art. In: L. Bevan (Ed.), *Indecent exposure: Sexuality, society, and the archaeological record* (pp. 43-55). Glasgow: Cruithne Press.
- Neave, N. Laing, S., Fink, B., & Manning, J. T. (2003). Second to fourth digit ratio, testosterone and perceived male dominance. *Proceedings of the Royal Society B*, 270, 2167-2172.
- Neave, N., & Shields, K. (2008). The effects of facial hair manipulation on female perceptions of attractiveness, masculinity, and dominance in male faces.

- Personality and Individual Differences*, 45, 373-377.
- Pellegrini, R. J. (1973). Impressions of the male personality as a function of beardedness. *Psychology: A Journal of Human Behavior*, 10, 29-33.
- Penton-Voak, I. S., & Chen, J. Y. (2004). High salivary testosterone is linked to masculine male facial appearance in humans. *Evolution & Human Behavior*, 25, 229-241.
- Penton-Voak, I. S., Jacobson, A., & Trivers, R. L. (2004). Populational differences in attractiveness judgements of male and female faces: Comparing British and Jamaican samples. *Evolution and Human Behavior*, 25, 355-370.
- Penton-Voak, I. S., Little, A. C., Jones, B. C., Burt, D. M., Tiddeman, B. P., & Perrett, D. I. (2003). Female condition influences preferences for sexual dimorphism in faces of male humans (homo sapiens). *Journal of Comparative Psychology*, 117, 264-271.
- Penton-Voak, I. S., Perrett, D. I., Castles, D. L., Kobayashi, T., Burt, D. M., Murray, L. K., et al. (1999). Menstrual cycle alters face preference. *Nature*, 399(6738), 741-742.
- Perrett, D. I., Lee, K. J., Penton-Voak, I.S., Rowland, D. R., Yoshikawa, S., Burt, D. M., Henzi, S. P., Castles, D. L., & Akamatsu, S. (1998). Effects of sexual dimorphism on facial attractiveness. *Nature*, 394, 884-887.
- Peters, M., Simmons, L. W., & Rhodes, G. (2008). Testosterone is associated with

- mating success but not attractiveness or masculinity in human males. *Animal Behavior*, 76, 297-303.
- Pew Research Center's Forum on Religion & Public Life (2012). *The global religious landscape: A report on the size and distribution of the world's major religious groups as of 2010*. Washington, DC.
- Pillard, R. C., & Weinrich, J. D. (1986). Evidence of familial nature of male homosexuality. *Archives of General Psychiatry*, 43, 808-812.
- Ponsonby, A. I., Dwyer, T., & Couper, D. (1997). Sleeping position, infant apnea, and cyanosis: a population-based study. *Pediatrics*, 99, e3, 1.
- Pound, N., Penton-Voak, I. S., & SurrIDGE, A. K. (2009). Testosterone responses to competition in men are related to facial masculinity. *Proceedings of the Royal Society B*, 276, 153-159.
- Puts, D. A., Jones, B. C., & DeBruine, L. M. (2012). Sexual selection on human faces and voices. *Journal of Sex Research*, 49, 227-243.
- Rahman, Q., Collins, A., Morrison, M., Orrels, J. C., Cadinouche, K., Greenfield, S., & Begum, S. (2008). Maternal inheritance and familial fecundity factors in male homosexuality. *Archives of Sexual Behavior*. doi: 10.1007/s10508-007-9191-2.
- Randall, V. A. (2008). Androgens and hair growth. *Dermatologic Therapy*, 21, 314-328.

- Rantala, M. J., Coetzee, V., Moore, F. R., Skrinda, I., Kecko, S., Krama, T., Kivleniece, I., & Krams, I. (2012). Adiposity, compared with masculinity, serves as a more valid cue to immunocompetence in human mate choice. *Proceedings of the Royal Society B: Biological Sciences*, *280*(1751), 20122495.
- Ravosa, M. J. (1991). The ontogeny of cranial sexual dimorphisms in two Old World monkeys: *Macaca fascicularis* (cercopithecinae) and *nasalis larvatus* (colobinae). *International Journal of Primatology*, *12*, 403-426.
- Reed, J. A., & Blunk, E. M. (1990). The influence of facial hair on impression formation. *Social Behavior and Personality: An International Journal*, *18*, 169-175.
- Rennels, J. L., Bronstad, P. M., & Langlois, J. H. (2008). Are attractive men's faces masculine or feminine? The importance of type of facial stimuli. *Journal of Experimental Psychology: Human Perception and Performance*, *34*, 884-893.
- Rhodes, G. (2006). The evolutionary psychology of facial beauty. *Annual Review of Psychology*, *3*, 452-460.
- Rhodes, G., Chan, J., Zebrowitz, L. A., & Simmons, L. W. (2003). Does sexual dimorphism in human faces signal health? *Proceedings of the Royal Society B*, *270*, S93-95. doi: 10.1098/rsbl.2003.0023
- Rhodes, G., Hickford, C., & Jeffery, L. (2000). Sex-typicality and attractiveness: Are supermale and superfemale faces super-attractive? *British Journal of Psychology*, *91*, 125-140.
- Rhodes, G., Yoshikawa, S., Palermo, R., Simmons, L. W., Peters, M., Lee, K.,

- Halberstadt, J., & Crawford, J. R. (2007). Perceived health contributes to the attractiveness of facial symmetry, averageness, and sexual dimorphism. *Perception, 36*, 1244-1252.
- Rice, G., Anderson, C., Risch, N., & Ebers, G. (1999). Male homosexuality: Absence of linkage to microsatellite markers on Xq28. *Science, 284*, 665-667.
- Rieger, G., Chivers, M. L., & Bailey, J. M. (2005). Sexual arousal patterns of bisexual men. *Psychological Science, 16*, 579-584.
- Roney, J. R., Hanson, K. N., Durante, K. M., & Maestipieri, D. (2006). Reading men's faces: women's mate attractiveness judgments track men's testosterone and interest in infants. *Proceedings of the Royal Society B, 273*, 2169-2175.
- Saghir, M. T., & Robins, E. (1973). *Male and female homosexuality: a comprehensive investigation*. Baltimore: Williams & Wilkins.
- Sanders, A. R., Dawood, K., Rieger, G., Badner, J.A., Gershon, E. S., Krishnappa R. S., Kolundzija, A. B., Beecham, G. W., Martin, E. R., Bailey, J. M. (2012, November). Genome-wide linkage scan of male sexual orientation. Poster presented at the *American Society of Human Genetics Annual Meeting*. San Francisco, California.
- Schmitt, D. P. (2004). The big five related to risky sexual behavior across 10 world regions: Differential personality associations of sexual promiscuity and relationship infidelity. *European Journal of Personality, 18*, 301-319.
- Schwartz, G., Kim, R. M., Kolundzija, A. B., Rieger, G., & Sanders, A. R. (2010).

- Biodemographic and physical correlates of sexual orientation in men. *Archives of Sexual Behavior*, 39, 93-109.
- Scott, I. M., Clark, A. P., Boothroyd, L. G. & Penton-Voak, I. S. (2012). Do men's faces really signal heritable immunocompetence?. *Behavioral Ecology*, 24, 579-589.
- Scott, I. M., Pound, N., Stephen, I. D., Clark, A. P., Penton-Voak, I. S. (2010). Does masculinity matter? The contribution of masculine face shape to male attractiveness in humans. *PLoS One*, 5, e12585.
- Shackelford, T. K., & Larsen, R. J. (1999). Facial attractiveness and physical health. *Evolution and Human Behavior*, 20, 71-76.
- Shanley, D. P., Sear, R., Mace, R., & Kirkwood, T. B. L. (2007). Testing evolutionary theories of menopause. *Proceedings of the Royal Society B: Biological Sciences*, 274, 2943-2949.
- Shostak, M. (1981). *Nisa: The life and words of a !Kung woman*. Cambridge, MA: Harvard University Press.
- Smith, F. G., Jones, B. C., Welling, L. L. M., Little, A. C., Vukovic, J., Main, J. C., et al. (2009). Waist-hip ratio predicts women's preferences for masculine male faces, but not perceptions of men's trustworthiness. *Personality and Individual Differences*, 47, 476-480.
- Srael, H. (1969). Pubertal influence upon the growth and sexual differentiation of the human mandible. *Archives of Oral Biology*, 14, 583-590.

- Stamatas, G. N., Zmudzka, B. Z., Kollias, N., & Beer, J. Z. (2004). Non-invasive measurements of skin pigmentation in situ. *Pigment Cell Research*, *17*, 618-626.
- Stephen, I., Coetzee, V., Law Smith, M., & Perrett, D. (2009). Skin blood perfusion and oxygenation colour affect perceived human health. *PLoS ONE*, *4*, e5083.
- Stephen, I. D., Coetzee, V., & Perrett, D. I. (2011). Carotenoid and melanin pigment coloration affect perceived human health. *Evolution and Human Behavior*, *32*, 216-227.
- Stephen, I., Law Smith, M., Stirrat, M., & Perrett, D. (2009). Facial skin coloration affects perceived health of human faces. *International Journal of Primatology*, *30*, 845-857.
- Stephen, I. D., Oldham, F. H., Perrett, D. I., & Barton, R. A. (2012). *Evolutionary Psychology*, *10*, 562-572.
- Stephen, I. D., Scott, I. M. L., Coetzee, V., Pound, N., Perrett, D. I., & Penton-Voak, I. S. (2012). Cross-cultural effects of color, but not morphological masculinity, on perceived attractiveness of men's faces. *Evolution and Human Behavior*, *33*, 260-267.
- Stokes, J. P., Damon, W., & McKirnan, D. J. (1997). Predictors of movement toward homosexuality: A longitudinal study of bisexual men. *Journal of Sex Research*, *34*, 304-312.
- Swaddle, J. P., & Riersen, G. W. (2002). Testosterone increases perceived dominance but not attractiveness in human males. *Proceedings of the Royal Society of London B*, *292*, 2285-2289.

- Tanner, J. M. (1990). *Foetus into man: physical growth from conception to maturity*.
Cambridge, MA: Harvard University Press.
- Taylor, A. B. (2006). Size and shape dimorphism in great ape mandibles and implications for fossil species recognition. *American Journal of Physical Anthropology*, *129*, 82-98.
- Thornhill, R., & Gangestad, S. W. (1993). Human facial beauty: Averageness, symmetry, and parasite resistance. *Human Nature*, *4*, 237-269.
- Thornhill, R., & Gangestad, S. W. (1999). Facial attractiveness. *Trends in Cognitive Science*, *3*, 452-460.
- Thornhill, R., & Gangestad, S. W. (2006). Facial sexual dimorphism, developmental stability, and susceptibility to disease in men and women. *Evolution and Human Behavior*, *27*, 131-144.
- Tiddeman, B. P., Perrett, D. I., & Burt, D. M. (2001). Prototyping and transforming facial textures for perception research. *Comp Graph Appl IEEE*. *21*: 42–50.
- Tooby, J. & Cosmides, L. (2005). Conceptual foundations of evolutionary psychology. In: D. M. Buss (ed). *The Handbook of Evolutionary Psychology*, Hoboken NJ: Wiley.
- Tovée, M. J., & Cornelissen, P. L. (2001). Female and male perceptions of female physical attractiveness in front-view and profile. *British Journal of Psychology*, *92*, 391-402.

- Tovée, M. J., Reinhardt, S., Emery, J. L., & Cornelissen, P. L. (1998). Optimum body mass index and maximum sexual attractiveness. *The Lancet*, *352*, 548.
- perceived attractiveness of men's faces. *Evolution and Human Behaviour*, *33*, 260-267.
- Turner, W. J. (1995). Homosexuality, type 1: An Xq28 phenomenon. *Archives of Sexual Behavior*, *24*, 109-134.
- Tybur, J. M., & Gangestad, S. W. (2011). Mate preferences and infectious disease: Theoretical considerations and evidence in humans. *Philosophical Transactions of the Royal Society of London B*, *366*, 3375-3388.
- Waite, C., Little, A. C., Wolfensohn, S., Hones, P., Brown, A. P., Buchanan-Smith, H. M., et al. (2003). Evidence from rhesus macaques suggests that male coloration plays a role in female primate mate choice. *Proceedings of the Royal Society B*, *270(Suppl. 2)*, S144-146.
- Welling, L. L. M., DeBruine, L. M., Little, A. C., & Jones, B. C. (2009). Extraversion predicts individual differences in women's face preferences. *Personality and Individual Differences*, *47*, 996-998.
- Welling, L. L. M., Jones, B. C., DeBruine, L. M. (2008). Sex drive is positively associated with women's preferences for sexual dimorphism in men's and women's faces. *Personality and Individual Differences*, *44*, 161-170.
- Welling, L. L. M., Jones, B. C., DeBruine, L. M., Conway, C. A., Law Smith, M. J., Little, A. C., et al. (2007). Raised salivary testosterone in women is associated with increased attraction to masculine faces. *Hormones and Behavior*, *52*, 156-

161.

Whitman, F. L., Diamond, M., & Martin, J. (1993). Homosexual orientation in twins: A report on 61 pairs and three triplet sets. *Archives of Sexual Behavior, 22*, 187-206.

Wilson, G. & Rahman, Q. (2005). *Born gay: The psychobiology of sexual orientation*. London: Peter Owen.

Windhager, S., Schaefer, K., & Fink, B. (2011). Geometric morphometrics of male facial shape in relation to physical strength and perceived attractiveness, dominance, and masculinity. *American Journal of Human Biology, 23*, 805-814.

Wogalter, M. S., & Hosie, J. A. (1991). Effects of cranial and facial hair on perceptions of age and person. *Journal of Social Psychology, 131*, 589-591.

Wong, B. & Candolin, U. (2005). How is female choice affected by male competition?. *Biology Review, 80*, 559-571.

Wood, B. A., Li, Y., & Willoughby, C. (1991). Intraspecific variation and sexual dimorphism in cranial and dental variables among higher primates and their bearing on the hominid fossil record. *Journal of Anatomy, 174*, 185-205.

Wright, T. M., & Reise, S. P. (1997). Personality and unrestricted sexual behavior: Correlations of sociosexuality in Caucasian and Asian college students. *Journal of Research in Personality, 31*, 166-192.

van de Ven, P., Rodden, P., Crawford, J., & Kippax, S. (1997). A comparative demographic and sexual profile of older homosexually active men. *Journal of Sex*

- Research*, 34, 349-360.
- van den Berghe P.L. & Frost, P. (1986). Skin color preference, sexual dimorphism and sexual selection: A case of gene culture co-evolution? *Ethnic and Racial Studies*, 9, 87-113.
- VanderLaan, D. P., Forrester, D. L., Petterson, L. J., & Vasey, P. L. (2012). Offspring production among the extended relatives of Samoan men and fa'afafine. *PLoS ONE*, 7, e36088.
- VanderLaan, D. P., Forrester, D. L., Petterson, L. J., & Vasey, P. L. (2013). The prevalence of fa'afafine relatives among Samoan gynephilic men and fa'afafine. *Archives of Sexual Behavior*, 42, 353-359.
- VanderLaan, D. P., & Vasey, P. L. (2011). Male sexual orientation in independent Samoa: Evidence for fraternal birth order and maternal fecundity effects. *Archives of Sexual Behavior*, 40, 495-503.
- Vasey, P. L., Parker, J. L., & VanderLaan, D. P. (2014). Comparative reproductive output of androphilic and gynephilic males in Samoa. *Archives of Sexual Behavior*, 43, 363-367.
- Vasey, P. L., & VanderLaan, D. P. (2007). Birth order and male androphilia in Samoan fa'afafine. *Proceedings of the Royal Society B*, 274, 1437-1442.
- Verdonck, A., Gaethofs, M., Carels, C., & de Zegher, F. (1999). Effect of low-dose testosterone treatment on craniofacial growth in boys with delayed puberty. *European Journal of Orthodontics*, 21, 137-143.

- Yamaguchi, K. (1989). A formal theory for male-preferring stopping rules of childbearing: Sex differences in birth order and in the number of siblings. *Demography*, 26, 451-465.
- Yankelovich Partners. (1994). *A Yankelovich MONITOR perspective on gays/lesbians*. Norwalk, CT: Yankelovich Partners.
- Yates, T. (1993). Frameworks for archaeology of the body. In: C. Tilley (ed.), *Interpretive Archaeology* (pp. 31-72). Providence, RI: Berg Publishers.
- Zeh, J. A., & Zeh, D. W. (2005). Maternal inheritance, sexual conflict and the maladapted male. *Trends in Genetics*, 21, 281-286.
- Zucker, K. J., Blanchard, R., Kim, T. S., Pae, C. U., & Lee, C. (2007). Birth order and sibling sex ratio in homosexual transsexual South Korean men: Effects of the male-preference stopping rule. *Psychiatry and Clinical Neuroscience*, 61, 529-533.

APPENDIX A

Recruitment Advertisement

**Advertisement Distributed to P.F.L.A.G. Members
by P.F.L.A.G. Chapter Leaders**

Dear Potential Participants,

My name is Jessica Parker and I am a graduate student in the Department of Psychology at the University of Lethbridge, Canada. My supervisor, Dr. Paul Vasey, and I are inviting heterosexual women with a biological son(s) to participate in a short, online study.

Previous research suggests that the maternal female relatives (mothers, grandmothers, aunts) of homosexual men have more children compared to the maternal female relatives of heterosexual men. We are interested in knowing what might underlie this differential reproduction. Therefore, we are examining the mating psychology of heterosexual women to see if differences in their partner preferences might be influencing the number of children they produce.

To this end, we are inviting you (heterosexual women with biological son(s) to participate in an ONLINE survey that will take 15 minutes of your time. Any heterosexual woman with a biological son can participate in this study. For example, if you are a straight woman with a gay son, gay daughter, and straight daughter, you can participate. If you are a straight woman with a straight son and a gay daughter, you can participate. If you are a straight woman with a straight son, you can participate. As long as you are straight and have a biological son, you can participate.

You will be asked a few questions about your reproductive health and will then be asked to rate how attractive you find a series of photos. Everything should take 15 minutes. Your identity will remain completely anonymous.

We would be very grateful for your participation. The results of this study will be used to satisfy the thesis component of a Masters degree in Psychology.

If you are interested in participating or have questions, please email me at:
jessica.parker@uleth.ca

Alternatively, you can copy and paste the link below into your browser, which will take you directly to the survey:

<http://www.surveymethods.com/EndUser.aspx?A98DE1F8ABECF9FDAB>

Sincerely,

Jessica Parker, Master of Science Candidate
Department of Psychology, University of Lethbridge
Research Supervisor: Dr. Paul Vasey

APPENDIX B

Informed Consent Form

Female Facial Attractiveness Preferences Study

Informed Consent

You are invited to participate in research conducted by Jessica Parker, a graduate student in psychology at the University of Lethbridge, and her supervisor, Dr. Paul Vasey. This research examines how genes for homosexuality persist over time. You are free to participate or not participate in this survey. By participating you will make a contribution to knowledge about the evolutionary mechanisms that drive human sexuality, and you will experience what it is like to be a participant in psychological research.

You will not receive any financial benefit from your participation.

The questionnaire involves a series of questions including biographical information, information about your menstrual cycle, your sexual orientation, and your attractiveness preferences. Specifically, you will be shown a number of photographs to rate for attractiveness.

You are not obligated to answer all of the questions. Your responses will be kept completely anonymous and confidential. The study should take approximately 15-20 minutes to complete. You must be 18 years of age or older to consent.

The language in the questionnaire is somewhat candid. If you are uncomfortable with candid discussions of sexuality there is a risk that you may experience some discomfort during your participation. The risks associated with this study are no greater than the risks associated with everyday life. If you choose to participate, you are under no obligation to discuss things that you do not wish to discuss and can withdraw from the study by closing your web browser. Participants who continue to be upset after withdrawing from the study will be directed toward the Alberta Mental Help Line which provides support through trained consultants 24 hours a day at 1-877-303-2642.

Your identity will remain anonymous and all data will remain confidential. Your name will not be asked and therefore will not be collected. Your responses to the questionnaire will remain password protected. All responses will be destroyed upon the completion of the study.

You may withdraw your consent from the study without any negative consequences. To do so, simply close your web browser at any time. Once you hit "submit" on the final page of the study your responses will be pooled with previously collected data.

Questions regarding your rights as a participant in this research may be addressed to the Office of Research Services, University of Lethbridge (phone: 403-329-2747 or email: jessica.parker@uleth.ca).

Questions about this research may be directed to Jessica Parker, University of Lethbridge (phone: 403-329-5089 or email: jessica.parker@uleth.ca).

Acknowledgement of Consent

I am aware that my participation in this study is completely voluntary and that I am free to withdraw at any time. I understand that no personally identifying information will be recorded. I understand that I am being asked to complete a questionnaire concerning human mating strategies that may involve questions of a sensitive nature and rate facial stimuli. I understand that my responses will be used in combination with other individuals' responses to assess the evolutionary mechanisms that contribute to homosexuality and the data generated may be submitted for publication to a peer-reviewed journal. I understand that I can request that Ms. Parker or Dr. Vasey mail me the results of this study or describe to me the results of this study once it is completed. By selecting "I consent" I acknowledge that I am providing informed consent to participate in this study. By selecting "I do not consent" I am declining to participate in this study.

I consent I do not consent

APPENDIX C

Questionnaire: Part I

Female Facial Attractiveness Preferences Study

Please answer the following questions to the best of your ability. Most of the questions require you to use your mouse to highlight the appropriate answer by “clicking”. Others require you to type in your responses. You do not have to answer any questions that you find upsetting or objectionable. Please complete this questionnaire in a room by yourself to ensure that your responses are solely your own and not those informed by consensus with others.

Biographic Information

1. Are you biologically: (choose one) Male Female
2. What is your age in years? _____
3. Do you have any biological sons? (choose one) Yes No
4. If you have biological sons, how many heterosexual sons do you have? _____
5. If you have biological sons, how many homosexual sons do you have? _____
6. Do you have any biological daughters? (choose one) Yes No
7. If you have biological daughters, how many heterosexual daughters do you have? _____
8. If you have biological daughters, how many homosexual daughters do you have? _____
9. What is the highest level of education you have completed? (choose one)
 - a. None
 - b. Elementary school
 - c. Less than high school
 - d. High school
 - e. Some post-secondary (e.g., college, trade school, university)
 - f. Completed post-secondary (e.g., college, trade school, university)
 - g. Graduate or post-graduate school
10. What is your current relationship status? (choose one)
 - a. Single
 - b. Dating one person exclusively
 - c. Dating multiple people
 - d. Common law (you live with your partner but are not married)
 - e. Married
 - f. Separated or divorced
 - g. Widowed
11. If you are currently in a relationship, please state the length of that relationship in years (e.g., 10 years, 1.5 years, 7.75 years, etc.). _____

12. How did you come to participate in this study? (choose one)

- a. Undergraduate course
- b. Facebook
- c. Advertisement on campus (U of L)
- d. Pride Center
- e. PFLAG
- f. Advertisement in a women's magazine
- g. Advertisement in a men's magazine
- h. Pride Parade
- i. Advertisement around town (exercise class, coffee shop, etc.)
- j. Other

13. In which country do you currently live? _____

The next section of questions will ask you about your sexual feelings. Read the options carefully and select the answer that is most appropriate.

Please remember, this information is completely confidential and anonymous. Your responses will be combined with the responses of others and will contain no personally identifying information.

“Sexual feelings, fantasies, and attractions” here refers to feelings of genital petting, oral sex, and/or sexual intercourse.

14. In the past year, which statement best describes your sexual feelings, fantasies, and attractions?

- a. Sexual feelings toward males only
- b. Most sexual feelings toward males, but an occasional sexual feeling toward females
- c. Most sexual feelings toward males, but some definite sexual feelings toward females
- d. Sexual feelings about equally divided between males and females
- e. Most sexual feelings toward females, but some definite sexual feelings toward males
- f. Most sexual feelings toward females, but an occasional sexual feeling toward males
- g. Sexual feelings toward females only
- h. No sexual feelings

The next few questions pertain to your menstrual cycle. We understand that some of these questions may be difficult to answer, however, please answer as accurately as possible. All responses are anonymous and confidential.

15. Have you gone through menopause (completed menopause from beginning to end?) (choose one) Yes No

16. Are you currently going through menopause? (choose one) Yes No

17. Are you currently pregnant? (choose one) Yes No

18. When was the last day of your most recent period? In other words, when was the last day that you bled? (dd/mm/yy)

If this is not applicable to you (you have completed menopause), please type in "N/A" into the answer box.

19. How confident are you that the information you provided in the previous question is accurate? (choose one)

- a. Not at all confident
- b. Not very confident
- c. Somewhat confident
- d. Extremely confident

20. Are you currently using contraceptives? (choose one) Yes No

21. If you are currently using contraceptives, what type are you using? (check all that apply)

- a. Oral contraceptives
- b. The vaginal ring
- c. Hormonal intrauterine device
- d. Cooper intrauterine device
- e. Diaphragm
- f. Condoms
- g. Other

22. How old were you when you had your first period? (If applicable) _____

23. How old were you when you began menopause? (If applicable) _____

APPENDIX D

Questionnaire: Part II

In the next section you will be asked to rate how attractive you find a series of faces. Please use the scale provided at the bottom of each page to indicate your rating.



24. Please use the scale provided to rate the attractiveness of the photo above.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Extremely unattractive	Somewhat unattractive	Slightly less attractive than average	Average	Slightly more attractive than average	Somewhat attractive	Extremely attractive



25. Please use the scale provided to rate the attractiveness of the photo above.

- | | | | | | | |
|---------------------------|--------------------------|--|--------------------------|--|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Extremely
unattractive | Somewhat
unattractive | Slightly
less
attractive
than average | Average | Slightly
more
attractive
than average | Somewhat
attractive | Extremely
attractive |



26. Please use the scale provided to rate the attractiveness of the photo above.

- | | | | | | | |
|---------------------------|--------------------------|--|--------------------------|--|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Extremely
unattractive | Somewhat
unattractive | Slightly
less
attractive
than average | Average | Slightly
more
attractive
than average | Somewhat
attractive | Extremely
attractive |



27. Please use the scale provided to rate the attractiveness of the photo above.

Extremely unattractive Somewhat unattractive Slightly less attractive than average Average Slightly more attractive than average Somewhat attractive Extremely attractive



28. Please use the scale provided to rate the attractiveness of the photo above.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Extremely unattractive	Somewhat unattractive	Slightly less attractive than average	Average	Slightly more attractive than average	Somewhat attractive	Extremely attractive



29. Please use the scale provided to rate the attractiveness of the photo above.

- | | | | | | | |
|---------------------------|--------------------------|--|--------------------------|--|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Extremely
unattractive | Somewhat
unattractive | Slightly
less
attractive
than average | Average | Slightly
more
attractive
than average | Somewhat
attractive | Extremely
attractive |



30. Please use the scale provided to rate the attractiveness of the photo above.

- | | | | | | | |
|---------------------------|--------------------------|--|--------------------------|--|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Extremely
unattractive | Somewhat
unattractive | Slightly
less
attractive
than average | Average | Slightly
more
attractive
than average | Somewhat
attractive | Extremely
attractive |



31. Please use the scale provided to rate the attractiveness of the photo above.

Extremely unattractive Somewhat unattractive Slightly less attractive than average Average Slightly more attractive than average Somewhat attractive Extremely attractive



32. Please use the scale provided to rate the attractiveness of the photo above.

Extremely unattractive Somewhat unattractive Slightly less attractive than average Average Slightly more attractive than average Somewhat attractive Extremely attractive



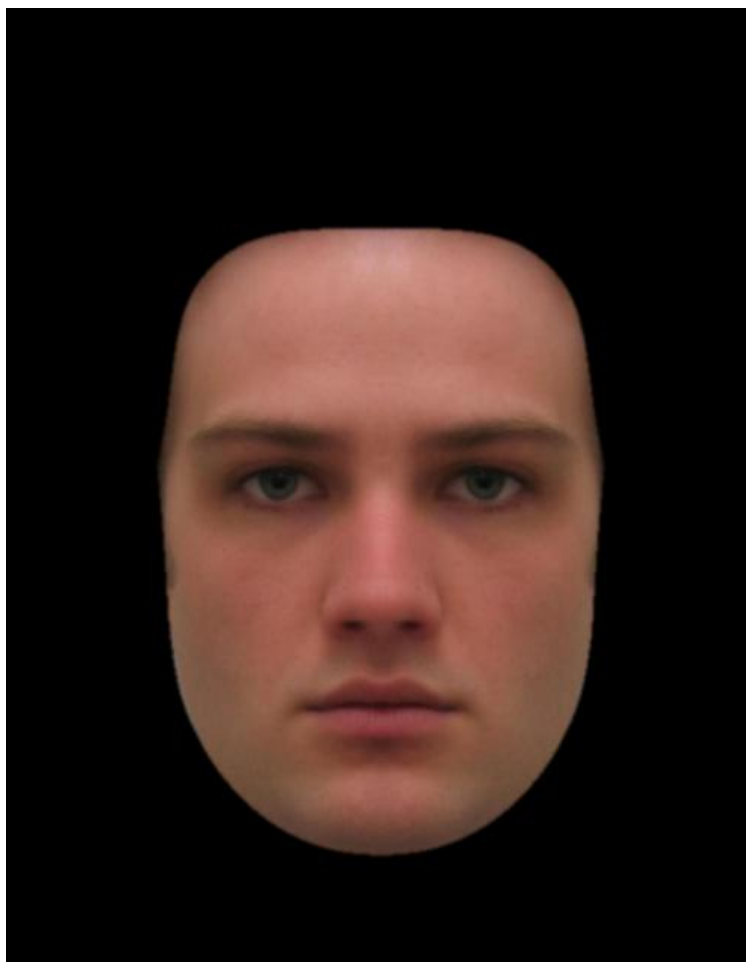
33. Please use the scale provided to rate the attractiveness of the photo above.

- | | | | | | | |
|---------------------------|--------------------------|--|--------------------------|--|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Extremely
unattractive | Somewhat
unattractive | Slightly
less
attractive
than average | Average | Slightly
more
attractive
than average | Somewhat
attractive | Extremely
attractive |



34. Please use the scale provided to rate the attractiveness of the photo above.

- | | | | | | | |
|---------------------------|--------------------------|--|--------------------------|--|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Extremely
unattractive | Somewhat
unattractive | Slightly
less
attractive
than average | Average | Slightly
more
attractive
than average | Somewhat
attractive | Extremely
attractive |



35. Please use the scale provided to rate the attractiveness of the photo above.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Extremely unattractive	Somewhat unattractive	Slightly less attractive than average	Average	Slightly more attractive than average	Somewhat attractive	Extremely attractive



36. Please use the scale provided to rate the attractiveness of the photo above.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Extremely unattractive	Somewhat unattractive	Slightly less attractive than average	Average	Slightly more attractive than average	Somewhat attractive	Extremely attractive



37. Please use the scale provided to rate the attractiveness of the photo above.

- | | | | | | | |
|---------------------------|--------------------------|--|--------------------------|--|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Extremely
unattractive | Somewhat
unattractive | Slightly
less
attractive
than average | Average | Slightly
more
attractive
than average | Somewhat
attractive | Extremely
attractive |



38. Please use the scale provided to rate the attractiveness of the photo above.

- | | | | | | | |
|---------------------------|--------------------------|--|--------------------------|--|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Extremely
unattractive | Somewhat
unattractive | Slightly
less
attractive
than average | Average | Slightly
more
attractive
than average | Somewhat
attractive | Extremely
attractive |



39. Please use the scale provided to rate the attractiveness of the photo above.

Extremely unattractive Somewhat unattractive Slightly less attractive than average Average Slightly more attractive than average Somewhat attractive Extremely attractive



40. Please use the scale provided to rate the attractiveness of the photo above.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Extremely unattractive	Somewhat unattractive	Slightly less attractive than average	Average	Slightly more attractive than average	Somewhat attractive	Extremely attractive



41. Please use the scale provided to rate the attractiveness of the photo above.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Extremely unattractive	Somewhat unattractive	Slightly less attractive than average	Average	Slightly more attractive than average	Somewhat attractive	Extremely attractive



42. Please use the scale provided to rate the attractiveness of the photo above.

- | | | | | | | |
|---------------------------|--------------------------|--|--------------------------|--|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Extremely
unattractive | Somewhat
unattractive | Slightly
less
attractive
than average | Average | Slightly
more
attractive
than average | Somewhat
attractive | Extremely
attractive |



43. Please use the scale provided to rate the attractiveness of the photo above.

Extremely unattractive Somewhat unattractive Slightly less attractive than average Average Slightly more attractive than average Somewhat attractive Extremely attractive



44. Please use the scale provided to rate the attractiveness of the photo above.

Extremely unattractive Somewhat unattractive Slightly less attractive than average Average Slightly more attractive than average Somewhat attractive Extremely attractive



45. Please use the scale provided to rate the attractiveness of the photo above.

- | | | | | | | |
|---------------------------|--------------------------|--|--------------------------|--|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Extremely
unattractive | Somewhat
unattractive | Slightly
less
attractive
than average | Average | Slightly
more
attractive
than average | Somewhat
attractive | Extremely
attractive |



46. Please use the scale provided to rate the attractiveness of the photo above.

- | | | | | | | |
|---------------------------|--------------------------|--|--------------------------|--|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Extremely
unattractive | Somewhat
unattractive | Slightly
less
attractive
than average | Average | Slightly
more
attractive
than average | Somewhat
attractive | Extremely
attractive |



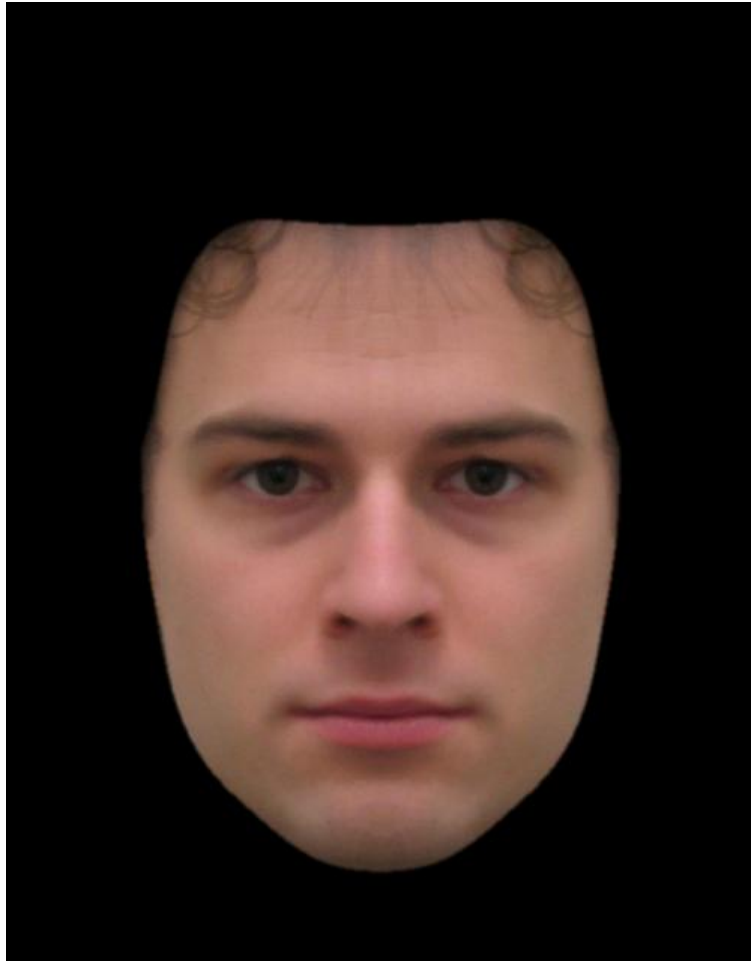
47. Please use the scale provided to rate the attractiveness of the photo above.

Extremely unattractive Somewhat unattractive Slightly less attractive than average Average Slightly more attractive than average Somewhat attractive Extremely attractive



48. Please use the scale provided to rate the attractiveness of the photo above.

Extremely unattractive Somewhat unattractive Slightly less attractive than average Average Slightly more attractive than average Somewhat attractive Extremely attractive



49. Please use the scale provided to rate the attractiveness of the photo above.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Extremely unattractive	Somewhat unattractive	Slightly less attractive than average	Average	Slightly more attractive than average	Somewhat attractive	Extremely attractive



50. Please use the scale provided to rate the attractiveness of the photo above.

- | | | | | | | |
|---------------------------|--------------------------|--|--------------------------|--|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Extremely
unattractive | Somewhat
unattractive | Slightly
less
attractive
than average | Average | Slightly
more
attractive
than average | Somewhat
attractive | Extremely
attractive |



51. Please use the scale provided to rate the attractiveness of the photo above.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Extremely unattractive	Somewhat unattractive	Slightly less attractive than average	Average	Slightly more attractive than average	Somewhat attractive	Extremely attractive



52. Please use the scale provided to rate the attractiveness of the photo above.

- | | | | | | | |
|---------------------------|--------------------------|--|--------------------------|--|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Extremely
unattractive | Somewhat
unattractive | Slightly
less
attractive
than average | Average | Slightly
more
attractive
than average | Somewhat
attractive | Extremely
attractive |



53. Please use the scale provided to rate the attractiveness of the photo above.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Extremely unattractive	Somewhat unattractive	Slightly less attractive than average	Average	Slightly more attractive than average	Somewhat attractive	Extremely attractive



54. Please use the scale provided to rate the attractiveness of the photo above.

- | | | | | | | |
|---------------------------|--------------------------|--|--------------------------|--|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Extremely
unattractive | Somewhat
unattractive | Slightly
less
attractive
than average | Average | Slightly
more
attractive
than average | Somewhat
attractive | Extremely
attractive |



55. Please use the scale provided to rate the attractiveness of the photo above.

Extremely unattractive Somewhat unattractive Slightly less attractive than average Average Slightly more attractive than average Somewhat attractive Extremely attractive



56. Please use the scale provided to rate the attractiveness of the photo above.

Extremely unattractive Somewhat unattractive Slightly less attractive than average Average Slightly more attractive than average Somewhat attractive Extremely attractive



57. Please use the scale provided to rate the attractiveness of the photo above.

- | | | | | | | |
|---------------------------|--------------------------|--|--------------------------|--|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Extremely
unattractive | Somewhat
unattractive | Slightly
less
attractive
than average | Average | Slightly
more
attractive
than average | Somewhat
attractive | Extremely
attractive |



58. Please use the scale provided to rate the attractiveness of the photo above.

- | | | | | | | |
|---------------------------|--------------------------|--|--------------------------|--|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Extremely
unattractive | Somewhat
unattractive | Slightly
less
attractive
than average | Average | Slightly
more
attractive
than average | Somewhat
attractive | Extremely
attractive |



59. Please use the scale provided to rate the attractiveness of the photo above.

Extremely unattractive Somewhat unattractive Slightly less attractive than average Average Slightly more attractive than average Somewhat attractive Extremely attractive



60. Please use the scale provided to rate the attractiveness of the photo above.

Extremely unattractive Somewhat unattractive Slightly less attractive than average Average Slightly more attractive than average Somewhat attractive Extremely attractive



61. Please use the scale provided to rate the attractiveness of the photo above.

- | | | | | | | |
|---------------------------|--------------------------|--|--------------------------|--|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Extremely
unattractive | Somewhat
unattractive | Slightly
less
attractive
than average | Average | Slightly
more
attractive
than average | Somewhat
attractive | Extremely
attractive |



62. Please use the scale provided to rate the attractiveness of the photo above.

- | | | | | | | |
|---------------------------|--------------------------|--|--------------------------|--|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Extremely
unattractive | Somewhat
unattractive | Slightly
less
attractive
than average | Average | Slightly
more
attractive
than average | Somewhat
attractive | Extremely
attractive |



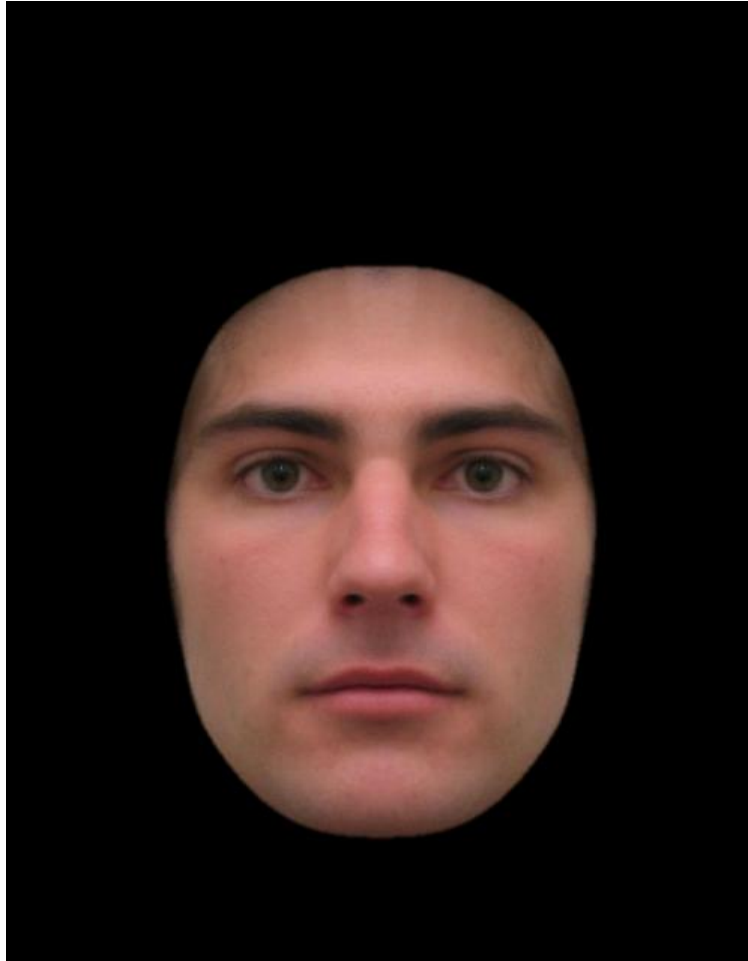
63. Please use the scale provided to rate the attractiveness of the photo above.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Extremely unattractive	Somewhat unattractive	Slightly less attractive than average	Average	Slightly more attractive than average	Somewhat attractive	Extremely attractive



64. Please use the scale provided to rate the attractiveness of the photo above.

Extremely unattractive Somewhat unattractive Slightly less attractive than average Average Slightly more attractive than average Somewhat attractive Extremely attractive



65. Please use the scale provided to rate the attractiveness of the photo above.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Extremely unattractive	Somewhat unattractive	Slightly less attractive than average	Average	Slightly more attractive than average	Somewhat attractive	Extremely attractive



66. Please use the scale provided to rate the attractiveness of the photo above.

- | | | | | | | |
|---------------------------|--------------------------|--|--------------------------|--|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Extremely
unattractive | Somewhat
unattractive | Slightly
less
attractive
than average | Average | Slightly
more
attractive
than average | Somewhat
attractive | Extremely
attractive |



67. Please use the scale provided to rate the attractiveness of the photo above.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Extremely unattractive	Somewhat unattractive	Slightly less attractive than average	Average	Slightly more attractive than average	Somewhat attractive	Extremely attractive



68. Please use the scale provided to rate the attractiveness of the photo above.

Extremely unattractive Somewhat unattractive Slightly less attractive than average Average Slightly more attractive than average Somewhat attractive Extremely attractive



69. Please use the scale provided to rate the attractiveness of the photo above.

- | | | | | | | |
|---------------------------|--------------------------|--|--------------------------|--|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Extremely
unattractive | Somewhat
unattractive | Slightly
less
attractive
than average | Average | Slightly
more
attractive
than average | Somewhat
attractive | Extremely
attractive |



70. Please use the scale provided to rate the attractiveness of the photo above.

- | | | | | | | |
|---------------------------|--------------------------|--|--------------------------|--|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Extremely
unattractive | Somewhat
unattractive | Slightly
less
attractive
than average | Average | Slightly
more
attractive
than average | Somewhat
attractive | Extremely
attractive |



71. Please use the scale provided to rate the attractiveness of the photo above.

- | | | | | | | |
|---------------------------|--------------------------|--|--------------------------|--|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Extremely
unattractive | Somewhat
unattractive | Slightly
less
attractive
than average | Average | Slightly
more
attractive
than average | Somewhat
attractive | Extremely
attractive |



72. Please use the scale provided to rate the attractiveness of the photo above.

- | | | | | | | |
|---------------------------|--------------------------|--|--------------------------|--|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Extremely
unattractive | Somewhat
unattractive | Slightly
less
attractive
than average | Average | Slightly
more
attractive
than average | Somewhat
attractive | Extremely
attractive |



73. Please use the scale provided to rate the attractiveness of the photo above.

- | | | | | | | |
|---------------------------|--------------------------|--|--------------------------|--|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Extremely
unattractive | Somewhat
unattractive | Slightly
less
attractive
than average | Average | Slightly
more
attractive
than average | Somewhat
attractive | Extremely
attractive |



74. Please use the scale provided to rate the attractiveness of the photo above.

- | | | | | | | |
|---------------------------|--------------------------|--|--------------------------|--|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Extremely
unattractive | Somewhat
unattractive | Slightly
less
attractive
than average | Average | Slightly
more
attractive
than average | Somewhat
attractive | Extremely
attractive |



75. Please use the scale provided to rate the attractiveness of the photo above.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Extremely unattractive	Somewhat unattractive	Slightly less attractive than average	Average	Slightly more attractive than average	Somewhat attractive	Extremely attractive



76. Please use the scale provided to rate the attractiveness of the photo above.

Extremely unattractive Somewhat unattractive Slightly less attractive than average Average Slightly more attractive than average Somewhat attractive Extremely attractive



77. Please use the scale provided to rate the attractiveness of the photo above.

- | | | | | | | |
|---------------------------|--------------------------|--|--------------------------|--|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Extremely
unattractive | Somewhat
unattractive | Slightly
less
attractive
than average | Average | Slightly
more
attractive
than average | Somewhat
attractive | Extremely
attractive |



78. Please use the scale provided to rate the attractiveness of the photo above.

- | | | | | | | |
|---------------------------|--------------------------|--|--------------------------|--|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Extremely
unattractive | Somewhat
unattractive | Slightly
less
attractive
than average | Average | Slightly
more
attractive
than average | Somewhat
attractive | Extremely
attractive |



79. Please use the scale provided to rate the attractiveness of the photo above.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Extremely unattractive	Somewhat unattractive	Slightly less attractive than average	Average	Slightly more attractive than average	Somewhat attractive	Extremely attractive



80. Please use the scale provided to rate the attractiveness of the photo above.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Extremely unattractive	Somewhat unattractive	Slightly less attractive than average	Average	Slightly more attractive than average	Somewhat attractive	Extremely attractive



81. Please use the scale provided to rate the attractiveness of the photo above.

- | | | | | | | |
|---------------------------|--------------------------|--|--------------------------|--|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Extremely
unattractive | Somewhat
unattractive | Slightly
less
attractive
than average | Average | Slightly
more
attractive
than average | Somewhat
attractive | Extremely
attractive |

82. If you are interested in participating in future research being conducted by the Vasey lab, please leave your primary email address.

Thank you for participating in this study. Your responses, in combination with the responses of other participants, will allow us to examine hypotheses about the reproductive differences seen in women both with and without homosexual sons. All of your responses are confidential.

Male homosexuality has a heritable component however; homosexual males reproduce far less frequently than heterosexual males. According to evolutionary theory, this reduced rate of reproduction should be a disadvantage and selected against, yet genes for homosexual males persist and continue to exist. There are a few explanations that attempt to address this evolutionary puzzle. One such explanation is that the reproductive costs associated with the genes for male homosexuality are compensated for by reproductive benefits that same genes confer in females who inherit them. In other words, perhaps these genes give the female relatives of homosexual males some distinct reproductive advantage when compared to the female relatives of heterosexual males. Cross-cultural evidence has indicated that indeed female relatives of homosexual males do demonstrate a higher lifetime reproductive success than female relatives of heterosexual males. This study aims to answer the question: what is the mechanism that is driving this increased reproductive success in the female relatives of homosexual males?

Why some adult men are sexually attracted to other adult men is a question posed in virtually every introductory/social/personality psychology textbook followed by the general comment: “We don’t really know.” With this research I hope to inform upon this question. Your contribution helps in the process of determining whether female relatives of homosexuals have a differing and thereby advantageous mating psychology, a different preference for more masculine males, and so on.

In humans, males are primarily attracted to females, and females are primarily attracted to males. This is perhaps the largest and most widespread of any psychological sex difference. By studying the evolutionary mechanisms that contribute to male homosexuality my goal is to contribute to an understanding of why differences to this fundamental pattern exist.

By combining your responses with the responses of many other people, we hope to see whether group differences exist.

If you are interested in the results of this study, or if you have any questions related to this study, please contact Jessica.

Jessica Parker
MSc (Candidate)
Department of Psychology
University of Lethbridge
Lethbridge, Alberta, Canada T1K 3M4
Phone: 403-319-5029; Email: jessica.parker@uleth.ca

APPENDIX E

Male model 3



Women with gynephilic sons preferred this male model significantly more so ($p = 0.032$) than did women with androphilic sons.

APPENDIX F

Male model 6



Women with gynephilic sons preferred this male model significantly more so ($p = 0.032$) than did women with androphilic sons.