

THE DEVELOPMENT AND EVOLUTION OF MALE ANDROPHILIA IN SAMOAN
FA'AFINE

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ABSTRACT

Male androphilia (i.e., male sexual attraction to males) is an evolutionary paradox. It is unclear how genes for male androphilia persist given that androphilic males have lowered reproduction? Evidence suggests that ancestral androphilic males were transgendered. Hence, I address this paradox by focusing on a group of Samoan transgendered androphilic males (i.e., *fa'afafine*). Specifically, I show that male androphilia has consistent developmental correlates across Samoan and Western populations, indicating that *fa'afafine* provide a suitable model for the evolution of male androphilia across populations. In addition, I test hypotheses concerning the evolution of male androphilia. *Fa'afafine's* mothers and grandmothers exhibit elevated reproduction. Also, compared to Samoan men and women, *fa'afafine* exhibit unique kin-investment cognition that would enhance indirect fitness. Elevated reproduction by female kin, and enhanced kin investments may, therefore, contribute to the evolution of male androphilia. Lastly, I outline a developmental model for this unique kin-investment cognition in androphilic males.

PREFACE

All of the research methods described in this thesis received approval from the University of Lethbridge Human Subject Research Committee, an institutional human ethics review board.

Chapters 1 through 9 in this dissertation are published or have been submitted for publication in peer-reviewed journals and were written with co-authors. Below, for those chapters that are already published, I name the place of publication. I also describe the contributions of my co-authors for each chapter. To avoid undue replication, I provide a single list of references at the end of the thesis.

Sections of Chapter 1 contained portions of a manuscript that has been submitted for publication. My co-authors for this manuscript were Zhiyuan Ren and Paul Vasey. Zhiyuan Ren and Paul Vasey provided assistance with the literature review and Paul Vasey also provided conceptual and editorial assistance.

Chapter 2 consists of a manuscript that was published in *Archives of Sexual Behavior*. Paul Vasey was co-author and provided conceptual and editorial assistance.

Chapter 3 consists of a manuscript that has been submitted for publication. John Vokey was co-author and consulted on data analysis. Paul Vasey was co-author and provided editorial assistance.

Chapters 4 and 5 consist of manuscripts that have been submitted for publication. For both chapters, Deanna Forrester and Lanna Petterson were co-authors and assisted with data analysis. Also, Paul Vasey was a co-author and provided editorial assistance.

Chapter 6 consists of a manuscript that was published in *Personal Relationships*. Paul Vasey was a co-author and provided methodological, conceptual, and editorial assistance.

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Chapter 8 consists of a manuscript that has been accepted for publication in *Archives of Sexual Behavior*. Paul Vasey was co-author and provided editorial assistance.

Sections of Chapter 9 contained portions of a manuscript that was published in *Journal of Gay and Lesbian Mental Health*. Laura Gothreau and Nancy Bartlett were co-authors and provided editorial assistance. Paul Vasey was co-author and provided conceptual and editorial assistance.

For Chapters 2 through 8, Paul Vasey also contributed to data collection. Also with respect to data collection, although samples were not identical in their composition across the Samoan field studies, there was participant overlap. Some participants, particularly *fa'afafine* participants, contributed data to multiple studies.

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CHAPTER 1

How Do You Solve a (Conceptual) Problem Like Male Androphilia?

Abstract

The persistence of genetic factors underlying male androphilia (i.e., male sexual attraction toward males) is an evolutionary paradox given that androphilic males have been unlikely to reproduce. Ethnological research indicates that cultural contexts in which androphilic males are transgendered and have opportunities to allocate resource investment toward kin are the most appropriate for testing hypotheses about the evolution of male androphilia. The South Pacific Polynesian island nation of Samoa provides such a cultural context. In Samoa, transgendered androphilic males are known as “*fa’afafine*,” which translated literally means “in the manner of a woman.” In addition, the Samoan cultural setting provides androphilic males with opportunities to invest in kin via close proximity to family and social tolerance toward *fa’afafine*.

Male Androphilia: An Evolutionary Paradox

Androphilia refers to predominant sexual attraction and arousal to males, whereas *gynephilia* refers to predominant sexual attraction and arousal to females. There is some genetic influence on male androphilia (Alanko et al., 2010; Bailey, Dunne, & Martin, 2000; Kendler, Thornton, Gilman, & Kessler, 2000; Långström, Rahman, Carlström, & Lichtenstein, 2010), and androphilic males in Western countries reproduce at lower rates than gynephilic males (King et al., 2005; Saghir & Robins, 1973; Schwartz, Kim, Kolundziji, Rieger, & Sanders, 2010; van de Ven, Rodden, Crawford, & Kippax, 1997; Yankelovich, 1994). Reproduction among transgendered androphilic males in many non-Western cultures is thought to be rare, if not completely absent (LeVay, 1996; Vasey & VanderLaan, 2010a; Whitam, 1997). Consequently, one would have expected genes for male androphilia to become extinct given the relative reproductive benefits of male gynephilia. Yet, prehistoric rock art and pottery suggests that male-male sexual activity has existed for millennia (Mathieu, 2003; Nash, 2001; Yates, 1993). Prehistoric grave sites containing skeletal remains and artifacts indicative of “third” gender males (Hollimon, 1997, 2000) are also suggestive of male androphilia in the distant past given what we know about the androphilic orientation of most contemporary “third” gender males (Nanda, 1999). In addition, the cross-cultural literature indicates that male androphiles constitute a substantial minority of males across populations (approximately 2-5%; Whitam, 1983). A trait that lowers direct reproduction and persists over time requires explanation when viewed within the context of natural selection, a process that favors the evolution of reproductively viable traits.

A number of hypotheses have been forwarded to account for the evolutionary paradox of male androphilia, and they all share one element in common. Each hypothesis posits that the reproductive costs associated with male androphilia must somehow be offset by increased reproduction on the part of androphilic males' kin. Close kin share alleles by virtue of descent (Hamilton, 1963). Hence, although male androphiles do not reproduce, increased reproduction on the part of their relatives would enable genetic factors underlying male androphilia to persist from one generation to the next. What is key to the evolution of male androphilia, then, is not direct fitness gained through reproduction, but instead, indirect fitness gained through the reproduction of close kin. In this manner, the inclusive fitness (i.e., direct plus indirect fitness) of alleles underlying male androphilia should theoretically be equivalent to that of competing alleles, thus allowing the persistence of male androphilia.

The specific hypotheses forwarded to account for the evolutionary paradox of male androphilia can be categorized into two types. The first type draws on the concept of balancing selection. Balancing selection hypotheses posit that genetic factors underlying male androphilia influence the development of same-sex sexual attraction in certain males, but in other individuals these same factors have other influences that enhance direct fitness (Miller, 2000; Camperio-Ciani, Corna, & Capiluppi, 2004). Hence, balancing selection hypotheses view male androphilia as an evolutionary by-product of genetic factors that enhance direct fitness among androphilic males' relatives.

The second type of hypothesis, known as the kin selection hypothesis (Wilson 1975), postulates that male androphiles allocate resources toward close kin. In turn, these resources facilitate increased reproduction among kin. Hence, the kin selection

hypothesis differs from balancing selection hypotheses in that it suggests male androphiles play a role in the persistence of genetic factors underlying male androphilia. According to the kin selection hypothesis, then, male androphilia is not simply an evolutionary by-product. Rather, this hypothesis suggests that male androphiles have undergone selection processes to promote investment in close kin. Thus, the kin selection hypothesis views male androphilia as an adaptation and, as such, it should exhibit evidence of special design.

Both the balancing and kin selection hypotheses make specific predictions concerning the behaviour that individuals should tend to exhibit. For example, balancing selection hypotheses predict that the relatives (or specific subsets of relatives) of androphilic males will exhibit elevated reproductive output (Miller, 2000; Camperio-Ciani et al., 2004). The kin selection hypothesis predicts that androphilic males will show elevated kin-directed altruism relative to other individuals (Bobrow & Bailey, 2001; Vasey, Pocock, & VanderLaan, 2007).

When testing predictions derived from evolutionarily hypotheses, it is necessary to examine the behaviour in question within a sociocultural context that shares relevant characteristics with the ancestral environment within which the behaviour is thought to have evolved (Tooby & Cosmides, 2005). In an inappropriate sociocultural environment without such characteristics, the evolved behaviour might simply not manifest. Contemporary sociocultural environments that possess critical features of the ancestral environment would be most appropriate for testing evolutionary predictions and assessing the validity of balancing selection and kin selection hypotheses.

Male Androphilia in the Ancestral Environment: Ethnological Insights

The manner in which male androphilia is publically expressed varies across cultures (Murray, 2000). This expression typically takes one of two forms¹, which are related to gender role enactment. One form is *sex-gender congruent*², whereas the other is *transgendered*. Sex-gender congruent androphilic males occupy the gender role typical of their sex and identify as “men.” In contrast, transgendered androphilic males occupy gender role categories distinct from the categories of “men” and “women,” and exhibit gender role presentation that is markedly similar to that of members of the opposite sex within their given cultural context. Although examples of both of these forms may be evident within a given culture, one or the other tends to predominate. For example, the sex-gender congruent form is more common in many Western cultures, whereas the transgendered form appears to be more common in a number of non-Western cultures

¹ In addition to these two forms, transgenerational homosexuality involves sexual interactions between a sexually immature or younger male and a sexually mature or older male. Transgenerational homosexuality is considered to have a different evolutionary origin than sex-gender congruent and transgendered male androphilia (see Dixson, 2010). Furthermore, it is not clear that transgenerational homosexuality is motivated by androphilia on the part of either the older or younger partner (Giles, 2004). For discussion of unique properties of transgenerational homosexuality from an ethnological perspective, see Crapo (1995).

² Other authors have referred to this form of male androphilia by other names. For example, the term “egalitarian male androphilia” (e.g., Murray, 2000) refers to a pattern in which male androphiles preferentially engage in sexual and/or romantic relationships with other male androphiles of similar age and gender status. In many cultures, however, no such patterns have been formally recognized or reported, making it difficult to discern whether such a term is applicable. Another alternate term, “homophilic” (Gorer, 1966), is not used here because it connotes “homosexual,” which may be considered pejorative in some cultural contexts and is, therefore, not suitable given the cross-cultural scope of the present research. In addition to not carrying the connotations of these alternate terms, “sex-gender congruent” androphilia is preferred because it pertains to sexual attraction and arousal, not sexual behaviour, which may be constrained by cultural circumstances (e.g., taboo against same-sex sexual behaviour). As such, this terminology makes no assumptions about whether sexual behaviour has been expressed. In addition, the term “sex-gender congruent” androphilia highlights the critical distinction of gender role enactment in relation to sexual expression.

(Murray, 2000). Hence, the sociocultural environment appears to influence which variant is expressed. The question, then, is whether the sex-gender congruent or transgendered form of male androphilia prevailed under the sociocultural conditions of the human evolutionary past.

Multiple lines of evidence provide insight concerning various aspects of the sociocultural environment that likely characterized human evolutionary history. In what follows, we outline evidence pertaining to the forms that characterized the ancestral human group size, sociopolitical system, and religious belief system. First, the social groups human ancestors lived in were likely to be relatively small (Klein, 1999; Ehrlich, 2000). In a comparative analysis examining the relationship between species-typical neocortex size and group size, Dunbar (1993) estimated that the typical group size for anatomically modern humans under ancestral conditions was approximately 148 with a 95% confidence interval range of 100.2 – 231.1. Group sizes in contemporary hunting and foraging societies, which bear conditions similar to those faced by human ancestors, are consistent with this group size estimate (Dunbar, 1998). Small group sizes such as these are influenced partly by the availability of resources, but even in conditions of resource abundance in which larger groups could be supported, smaller group sizes still seem to be the norm (Hassan, 1981). In modern industrialized societies, people's social network size also tends to converge on approximately 150 individuals (Hill & Dunbar, 2002). This preference for smaller group sizes might be a consequence of social cognition that is adapted to small-scale group living (Richerson & Boyd, 1999).

Second, contemporary hunting and gathering societies, which likely bear resemblance to the ancestral human condition, tend to be less hierarchical in their

sociopolitical structure when compared to more complex societies that are more reliant on animal husbandry and agriculture (Kusimba, 2003). Given the historically recent advent of animal and plant domestication approximately 10,000 –7,000 calendar years before present, it has been argued that animal husbandry and agriculture emerged relatively later in human history (Gupta, 2004; Wade, 2006). The degree of reliance on these modes of subsistence appears to be useful for assaying a society's deviation from ancestral social conditions. As reliance on these modes of subsistence increases, there tends to be associated increases in food surpluses, which supports greater population size and density (Hopfenberg & Pimentel, 2001). Under such conditions, social organization increases in complexity, including in relation to political systems, which tend to become increasingly hierarchical (Given, 2004; Kim & Kusimba, 2008; Underhill, 1975).

Third, animism (i.e., the belief that spirits inhabit some or all natural objects and phenomena) appears to be relatively more common among members of contemporary small-scale hunting and foraging groups (Sanderson & Roberts, 2008), and is reflected in prehistoric rock art (Deacon, 1999), suggesting that this belief system represents the ancestral form of religion. Interestingly given the focus of the present study, animistic belief systems might facilitate the transgendered expression of male androphilia because they account for the femininity of male androphiles by appealing to the simultaneous presence of masculine and feminine spiritual entities (Totman, 2003). In contrast, larger hierarchically structured groups that rely more heavily on animal husbandry and agriculture have a greater tendency to display polytheism and monotheism (Sanderson & Roberts, 2008). This may be because the belief in a single deity, or relatively few deities, fits with the social organization of societies that have centralized authority (Seters, 2004).

With these insights concerning the prevailing conditions of human ancestral sociocultural environments in mind, VanderLaan, Ren, and Vasey (submitted) evaluated whether these ancestral conditions were associated with transgendered male androphilia. Cross-gender behaviour among males is highly indicative of androphilic sexual orientation (Lippa, 2005a). As such, VanderLaan et al. compared 46 societies exhibiting male transgenderism (hereto referred to as transgendered societies) to a comparison sample of 146 societies that did not exhibit male transgenderism (hereto referred to as non-transgendered societies). The necessary information for performing this comparison came from the Standard Cross-Cultural Sample (SCCS). The SCCS is a comprehensive database comprised of ethnographic data from a subset of contemporary non-industrial societies that is useful for ethnological analyses because it circumvents Galton's problem (i.e., non-independence of cultures due to common cultural derivation or cultural diffusion; Murdock & White, 1969).

Specifically, VanderLaan et al. (submitted) compared transgendered and non-transgendered societies for a number of variables related to ancestral sociocultural conditions. Variables that assayed group size, subsistence type, sociopolitical structures, and religion were reduced to a single dimensional measure that provided information on the relative presence-absence of ancestral sociocultural conditions. Furthermore, given the potential role of kin selection in the evolutionary maintenance of male androphilia, VanderLaan et al. also examined whether transgendered male androphiles were likely to have had greater opportunity to invest in kin. They did so by examining descent systems, patterns of residency with kin, and the compactness of settlements as well as the level of

acceptance of same-sex sexual behaviour in societies in which transgendered male androphilia exists.

Comparing these two society types showed that, relative to non-transgendered societies, transgendered societies had a significantly greater presence of ancestral sociocultural conditions. It seems likely, then, that if the sociocultural environment of the human ancestral past influenced the expression of male androphilia, then it was likely expressed in a transgendered form.

Also, relative to non-transgendered societies, transgendered societies were more likely to exhibit bilateral and double descent systems than patrilineal, matrilineal, and ambilocal descent systems (VanderLaan et al., submitted). In both bilateral and double descent systems, individuals have greater access to both the paternal and maternal sides of their families. In contrast, individuals in societies with patrilineal, matrilineal, and ambilocal descent systems are relatively more constrained in that they may only access a subset of their kin. The ability to access both sides of their families might have furnished individuals with more opportunities to contact and help all of their kin instead of only a subset of them. Furthermore, such a situation may have characterized ancestral humans' kin-based societies (Boyd & Richerson, 2005). Indeed, the idea that bilateral and double descent systems characterize ancestral human societies is reflected in VanderLaan et al.'s correlation analysis showing that the greater presence of ancestral sociocultural conditions is associated with the greater presence of bilateral and double descent systems.

Although cultural practices concerning which kin individuals reside with following marriage was less constrained in transgendered than non-transgendered societies, this difference was not statistically significant (VanderLaan et al., submitted).

However, correlation analyses across all the societies in VanderLaan et al.'s sample showed that as the absence of ancestral sociocultural conditions increased, individuals had less access to their kin because patterns following marriage increasingly constrained the subset of kin with whom individuals were able to reside. Given that transgendered societies are significantly more likely to show ancestral sociocultural conditions, it seems reasonable to argue that they would be more likely to tend toward marital residence patterns that enable greater access to kin. The lack of a direct significant society type difference for marital residence likely reflects Type II Error due to low statistical power.

Lastly, VanderLaan et al. (submitted) showed that same-sex sexual behaviour was significantly unlikely to receive negative societal reactions in transgendered societies. Thus, the same-sex sexual orientation of transgendered males in transgendered societies appears to be socially tolerated. Such tolerance, particularly on the part of the kin of transgendered males, might be considered essential for kin selection to be deemed as a plausible contributing factor toward the persistence of male androphilia over evolutionary time. Unless transgendered males are accepted by their families, their opportunity to invest in kin is likely mitigated. It is important to note, however, that VanderLaan et al.'s test of the acceptance of homosexuality in transgendered societies might have been biased. The primary reason for this concern is that the literature regarding male androphilia might be biased such that there is a tendency to describe societies that exhibit positive attitudes toward male androphilia. Also, ethnographers may have experienced difficulty obtaining accurate information for transgendered societies that are not accepting of homosexuality, possibly because members of such societies are less willing to discuss such aspects of their culture. At the same time, however, given that

transgendered male androphilia is highly publically visible, it is likely that it would have to tend to be socially tolerated in order to persist. As such, our finding concerning the acceptance of homosexuality in transgendered societies may very well be accurate.

Qualitative sources also suggest that transgendered males might experience elevated ability to invest in kin. Transgendered males in a number of non-industrial societies appear to experience elevated social status, including leadership roles in political or spiritual spheres (Feinberg, 1996). With such elevated status, transgendered males might experience greater access to resources, which, in turn, may be allocated toward kin. In addition, transgendered males are often described by the gender normative members of their societies as being superior in terms of various labor practices, combining the best that men and women have to offer (Vasey & VanderLaan, 2009; Williams, 1992), which may make them more proficient at investing in kin. Moreover, transgendered males may believe it is their unique responsibility to care for their family members (Vasey & VanderLaan, 2009; Vasey et al., 2007; Williams, 1992).

Based on the above ethnographic information, the sociocultural environments of transgendered societies appear similar to that of the human ancestral past, and furnish various characteristics that may enable transgendered male androphiles to invest in kin. Hence, it appears likely that transgendered male androphilia represents the ancestral form of male androphilia and that within ancestral societies androphilic males experienced substantial opportunities to invest in kin. Given these findings, appropriate tests of hypotheses regarding the evolution of male androphilia should be conducted in sociocultural environments in which (1) transgendered male androphilia is the typical form, and (2) transgendered male androphiles are afforded opportunities to invest in kin.

Samoa: A Suitable Sociocultural Context

Samoa, a small, politically autonomous South Pacific island nation, provides a suitable sociocultural context in which to test hypotheses concerning the evolution of male androphilia. In Samoa, androphilic males are referred to as *fa'afafine*, which translated literally means “in the manner of a woman.” The vast majority of *fa'afafine* are transgendered in their appearance and mannerisms, adopting feminine dress as well as preferring female-typical hobbies, occupations, and household chores, although rare exceptions to this rule do exist (Bartlett & Vasey, 2006; Schmidt, 2003). Those few *fa'afafine* who are not transgendered, but are instead more masculine in appearance are, nevertheless, exclusively androphilic and effeminate in their mannerisms. Based on my conversations with these rare individuals, who are known in the *fa'afafine* community as *fa'afafine-tama* (i.e., boy *fa'afafine*), they all identify as *fa'afafine*, and not as men. Similarly, they are identified as *fa'afafine*, and not as men, by Samoans both within and outside the *fa'afafine* community. One of these *fa'afafine-tama* said: “I would prefer to grow my hair long and wear the clothes that girls wear, but it is better for me to have the hair and clothes of a traditional Samoan man because of my job.” Another said: “I dress like this for work, but when I go to church, I sit with the women because I feel like a girl.”

In addition to the presence of transgendered male androphilia, numerous other factors make Samoa a suitable sociocultural context in which to test hypotheses concerning the evolution of male androphilia. With respect to testing balancing selection hypotheses, which predict that the relatives of androphilic males will exhibit higher reproductive output than the relatives of gynephilic males, Samoa provides a more

suitable population than those found in Western countries. Compared to Western populations, the Samoan population exhibits higher fertility (Central Intelligence Agency, 2011), meaning that Samoans are reproducing closer to their maximum capacities. As such, comparisons of the reproductive output of the relatives of androphilic versus gynephilic Samoan males will be more robust compared to the same comparisons in Western populations where reproductive output appears to be relatively more constrained by low fertility.

With respect to testing the kin selection hypothesis, numerous factors make Samoa an appropriate sociocultural context. First, Samoa is a relatively small nation consisting of four, closely situated, populated islands: Apolima, Manono, Savai'i, and Upolu (2934 km² total; Lal & Fortune, 2000). Owing to its small size, kin members within Samoa are likely to be less geographically dispersed than in Western countries. Second, the family unit, or *aiga* (i.e., extended family), is of great importance in Samoa (Mageo, 1998; Besnier, 2000; Schmidt, 2003). Samoan families are usually quite large and often live together or in closely situated dwellings. When a distance separates members of a family, emotional proximity is maintained via frequent visits (Mageo, 1998). Third, Samoan society is characterized by cognatic residency patterns, which allow individuals to live either alone or with whichever kin they wish. Fourth, in contrast to Western societies, androphilic males (i.e., *fa'afafine*) are publicly visible and socially accommodated in Samoa (Bartlett & Vasey, 2006; Mageo, 1996). In this type of cultural context, estrangement of androphilic males from their families is less likely (Besnier, 1994; Croall & Wunderman, 1999). Together, these factors make it likely that Samoan transgendered males are afforded opportunities to invest in kin.

Addressing the Evolutionary Paradox of Male Androphilia in Samoa

For all the reasons stated above, Samoa is ideal for assessing the efficacy of hypotheses pertaining to the evolution of male androphilia. There is, however, one important concern that needs to be addressed before one can make any strong conclusions about the appropriateness of using the Samoan *fa'afafine* as a model for the evolution of male androphilia across human cultures. Because male androphilia has distinct forms (i.e., sex-gender congruent versus transgendered) across cultures, it is possible that these distinct forms are caused by distinct etiologies, reflecting differences in the development and evolution of male androphilia from one population to the next (Blanchard, 2004; Davenport, 1987; Johnson, Jackson, & Herdt, 2000). If different forms of male androphilia do not have similar etiologies, then the Samoan *fa'afafine* model is unlikely to characterize the evolution of male androphilia across human cultures. Instead, unique explanations would be required to explain the evolutionary origins of male androphilia in different populations. Suppose, on the other hand, that transgendered and sex-gender congruent male androphilia are comparable phenomena, etiologically speaking. Then, it would be likely that male androphilia across populations represents a trait that is derived from a shared ancestral population. Hence, if the etiology of male androphilia is consistent across cultures despite cultural variations in its form, then the Samoan *fa'afafine* model is likely suitable for informing the evolution of male androphilia across human populations.

Because of the importance of establishing whether male androphilia is likely to be etiologically consistent across populations, the first aim of the chapters that follow is to discern whether developmental correlates of male androphilia identified in Western

populations also exist in Samoa. Specifically, Chapter 2 examines whether the *fraternal birth order effect* exists in Samoa while Chapters 3 and 4 examine whether patterns of familial clustering of male androphilia in Samoa mirror those patterns documented in the West.

In the latter chapters, I present a series of Samoan studies that test hypotheses concerning the evolution of male androphilia. Chapter 5 presents data that bear on balancing selection hypotheses concerning the evolution of male androphilia. Chapters 6 through 8 assess the kin selection hypothesis. Chapter 6 examines whether there is a male sexual orientation difference in willingness to invest in nieces and nephews (i.e., avuncular tendencies), and considers the influence of romantic/sexual relationship involvement toward avuncular tendencies. Chapter 7 presents an experimental study that tests whether *fa'afafine* exhibit avuncular cognition that would enable the maximization of indirect fitness. Chapter 8 examines the relationship between birth order and avuncular tendencies. In Chapter 9, I review research that informs the development of kin altruism in androphilic males. Lastly, in Chapter 10, I provide a brief summary of the major findings and conclusions from Chapters 1 through 9.

CHAPTER 2

Male Sexual Orientation in Independent Samoa: Evidence for Fraternal Birth Order and Maternal Fecundity Effects

Abstract

In Western cultures, male androphiles tend to have greater numbers of older brothers than male gynephiles (i.e., the *fraternal birth order effect*). In the non-Western nation of Independent Samoa, androphilic males (known locally as *fa'afafine*) have been shown to have greater numbers of older brothers, older sisters, and younger brothers (Vasey & VanderLaan, 2007). It is unclear, however, whether the observed older brother effect, in the context of the additional sibling category effects, represented a genuine fraternal birth order effect or was simply associated with elevated maternal fecundity. To differentiate between these two possibilities, the present study employed a larger, independent replication sample of *fa'afafine* and gynephilic males from Independent Samoa. *Fa'afafine* had greater numbers of older brothers and sisters. The replication sample and the sample from Vasey and VanderLaan were then combined, facilitating a comparison that showed the older brother effect was significantly greater in magnitude than the older sister effect. These results suggest that fraternal birth order and maternal fecundity effects both exist in Samoa. The existence of these effects cross-culturally is discussed in the context of biological theories for the development of male androphilia.

Introduction

The *fraternal birth order effect* refers to the finding that number of older brothers is uniquely predictive of male sexual orientation (Blanchard, 2004). Specifically, androphilic males (i.e., males who exhibit sexual attraction/arousal toward adult males) tend to have greater numbers of older brothers than gynephilic males (i.e., males who exhibit sexual attraction/arousal toward adult females). Evidence in support of the fraternal birth order effect is overwhelming. It has been documented in participants examined in recent years and in participants examined decades ago: in psychiatric patients and non-patient volunteers; in participants examined during childhood and adulthood; in transsexual participants and those who experience no dysphoria with their sexed bodies; in representative, national samples; in non-Caucasian citizens of the U.S. (i.e., Black, Hispanic, East Indian, Asian); and, in samples collected from different Western nations, including England, Italy, The Netherlands, Canada, and the U.S. (for review, see Blanchard, 2004), by independent researchers (e.g., Bogaert, 2003a; Camperio-Ciani et al., 2004; King et al., 2005; Rahman, Clarke, & Morera, 2009; Rice, Harris, Lang, & Chaplin, 2008; Schwartz et al., 2010). In addition, this effect is specific to the influence of biological, as opposed to non-biologically related, older brothers regardless of whether males are raised with these brothers (Bogaert, 2006).

The existence of the fraternal birth order effect has prompted speculation regarding what influence biological older brothers have on the development of sexual orientation in their younger male siblings. The most prominent hypothesis is that this effect reflects the progressive immunization of some mothers to the male-specific antigens that are produced in response to the gestation of each successive male fetus. The

production of maternal antibodies in response to the presence of these male-specific antigens is thought to influence the sexual differentiation of each successive male fetus' brain and, by extension, those neural regions that regulate sexual orientation. This line of reasoning has been referred to as the *maternal immune hypothesis* (Blanchard, 2004; Blanchard & Bogaert, 1996; Blanchard & Klassen, 1997).

Despite the reliability with which the fraternal birth order effect has been observed, Blanchard (2004) cautioned that relying solely on data from Western populations presented limitations. Because male androphilia is expressed differently across cultures (Murray, 2000), extrapolating from patterns observed in Western populations to make statements regarding the development of male androphilia in non-Western populations may be imprudent. In contrast to Western cultures in which androphilic males tend to identify as “gay” or “homosexual” men, there are many non-Western cultures in which androphilic males tend to be transgendered and occupy “alternative” gender categories that are distinguished from “men” and “women.” Some contemporary examples include the *xanith* of Oman, the *hijra* of India, the *kathoey* of Thailand, the *travesti* of Brazil, the *fakafefine* of Tonga, and the *fa'afafine* of Samoa (Murray, 2000). Cultural differences in the expression of male androphilia may reflect unique cultural influences toward development, in which case attempts to compare the development of male androphilia in different cultural settings may not be warranted (e.g., Davenport, 1987; Johnson et al., 2000).

Despite this cultural variability, cross-cultural universals in the psychosexual development of male androphiles appear to exist. For example, in Western cultures, male androphiles exhibit elevated gender-atypical behaviour during childhood (Bailey &

Zucker, 1995). Retrospective studies conducted in Independent Samoa, Brazil, Guatemala, Turkey, Thailand, and the Philippines have shown the same pattern of childhood gender-atypicality among male androphiles raised in these non-Western cultures (Bartlett & Vasey, 2006; Cardoso, 2005, 2009; Whitam & Zent, 1984). Such cross-cultural similarities in childhood behaviour add weight to arguments that similar biological influences, which transcend cultural differences, play a role in the development of male androphilia. Further weight would be added to such arguments if it could be demonstrated that causal biological factors, such as those postulated by the maternal immune hypothesis, are likely to influence the development of male androphilia in non-Western cultures. Hence, establishing the existence of the fraternal birth order effect--a hypothesized consequence of maternal immune responses--in a non-Western culture would further substantiate arguments that similar biological influences underlie the development of male androphilia cross-culturally.

To date, no studies have demonstrated a fraternal birth order effect in a non-Western culture, but some have indicated that male androphiles in non-Western cultures tend to be late born among their siblings (Poasa, Blanchard, & Zucker, 2004; Tsoi, Kok, & Long, 1977; Vasey & VanderLaan, 2007; Zucker & Blanchard, 2003; Zucker, Blanchard, Kim, Pae, & Lee, 2007). Vasey and VanderLaan (2007) investigated birth order in Samoan androphilic and gynephilic males. In Samoa, most androphilic males are referred to as members of an alternative gender category known as *fa'afafine*. Translated literally, *fa'afafine* means "in the manner of a woman." These individuals self-identify as *fa'afafine* and *not* as men or women. Although the term *fa'afafine* implies that the members of this category are uniformly very feminine, they are, in fact, a heterogeneous

group in terms of their gender role presentation (Schmidt, 2003; Vasey & Bartlett, 2007). In appearance and mannerisms, although most would be considered effeminate, they range from strikingly feminine to unremarkably masculine, although instances of the latter are rare.

Utilizing a sample of 83 *fa'afafine* as well as a control group of 114 Samoan gynephilic males, Vasey and VanderLaan (2007) found that *fa'afafine* tended to have greater numbers of older brothers, older sisters, and younger brothers. The finding that *fa'afafine* have more older brothers than their gynephilic counterparts is consistent with patterns observed in Western populations. However, none of the observed sibling category effects took precedence over another (i.e., the three sibling category effects documented did not significantly differ in magnitude), indicating no clearly unique contribution of older brothers and, thus, no genuine fraternal birth order effect.

Sibling category effects, apart from older brother effects, have been reported on occasion in studies of Western populations (Blanchard, 1997; Blanchard & Lippa, 2007; Bogaert, 1998; King et al., 2005). However, given that older brother effects are reported consistently whereas other sibling category effects seem to be a relatively rare occurrence in studies conducted in Western populations, one possible explanation is that these less often observed effects represent cases of Type I error. Alternatively, these additional sibling category effects may have indicated an association between male sexual orientation and the fecundity of kin. Elevated fecundity has been documented among the kin of androphilic males (Blanchard & Lippa, 2007; Camperio-Ciani et al., 2004; Iemmola & Camperio-Ciani, 2009; King et al., 2005; Rahman et al., 2008; Schwartz et al., 2010). Hence, the sibling category effects that are occasionally observed alongside

older brother effects may be a consequence of elevated fecundity in the mothers of androphilic males.

The present study replicated Vasey and VanderLaan (2007) using a larger, independent sample to determine whether the sibling category effects they observed were genuine or were likely to represent cases of Type I error. In addition, the replication sample was combined with the sample of *fa'afafine* and gynephilic males from Vasey and VanderLaan to create the largest data set concerning birth order and male androphilia ever acquired for a non-Western population. The primary advantage of doing so was that the size of the combined sample provided greater statistical power to test for possible differences in the magnitudes of different sibling category effects, thereby allowing an assessment of whether a genuine fraternal birth order effect existed in addition to a fecundity effect.

Method

Participants

All participants were recruited through a network sampling procedure on the two larger and more populated islands of Upolu and Savai'i. A network sampling procedure involves contacting initial participants who display qualities of interest (i.e., status as *fa'afafine* or gynephilic man), then obtaining referrals from them to additional participants who, in turn, provide further referrals, and so on. The rate of participation for all groups was greater than 90%.

To replicate the study by Vasey and VanderLaan (2007), new data were collected from 133 self-identified *fa'afafine* and 208 self-identified straight men that had not been interviewed previously. These data were collected during three field trips (March-June,

2007; December, 2007; July-September, 2008). In order to obtain sufficiently large sample sizes to compare the magnitudes of different sibling category effects, data from the 133 *fa'afafine* and 208 gynephilic males in the replication sample were combined with data from the sample of 83 *fa'afafine* and 114 gynephilic males interviewed in Vasey and VanderLaan. Thus, the combined sample consisted of 216 *fa'afafine* and 322 gynephilic males.

Procedure and Measures

All participants were interviewed using a standardized questionnaire that was available in English and Samoan, after being translated and back-translated by two fluent Samoan-English speakers. A Samoan-speaking research assistant was present to answer Samoan-speaking participants' questions.

The questionnaire contained questions concerning basic biographic information regarding sexual orientation and age. Sexual orientation was assessed using Kinsey ratings (Kinsey, Pomeroy, & Martin, 1948). Specifically, participants were asked the following question: "Which statement best describes your sexual feelings during the last year?" Participants then selected one of the following seven possible responses: "sexual feelings only toward females" (Kinsey rating = 0), "most sexual feelings toward females, but an occasional fantasy about males" (Kinsey rating = 1), "most sexual feelings toward females, but some definite fantasy about males" (Kinsey rating = 2), "sexual feelings about equally divided between males and females with no strong preference for one or the other" (Kinsey rating = 3), "most sexual feelings toward males, but some definite fantasy about females" (Kinsey rating = 4), "most sexual feelings toward males, but an occasional fantasy about females" (Kinsey rating = 5), or "sexual feelings only toward

males” (Kinsey rating = 6). Samoans, both inside and outside the *fa’afafine* community, recognize that *fa’afafine* are biological males that are socially distinct from men and women. Nevertheless, for the sake of consistency, participants were told, prior to answering questions pertaining to the Kinsey ratings, that the category “males” included straight men and/or *fa’afafine* whereas the category “females” included women.

With respect to participants in the replications sample, 129 (97%) *fa’afafine* described their sexual feelings as exclusively androphilic (Kinsey rating = 6), and the remaining 4 (3%) reported most sexual feelings toward males, but occasional fantasies about females (Kinsey rating = 5). For gynephilic males, 200 (96%) described their sexual feelings as exclusively gynephilic (Kinsey rating = 0), and the remaining 8 (4%) reported most sexual feelings toward females, but occasional fantasies about males (Kinsey rating = 1). Of the additional 83 *fa’afafine* interviewed in Vasey and VanderLaan (2007), all described their sexual feelings as exclusively androphilic (Kinsey rating = 6). Of the 114 gynephilic males, 104 (91.2 %) described their sexual feelings as exclusively gynephilic (Kinsey rating = 0). Ten (8.8%) reported most sexual feelings toward females, but occasional fantasies about males (Kinsey rating = 1).

The age ranges of *fa’afafine* and gynephilic males in the replication sample were 18-53 and 18-67, respectively. We compared these *fa’afafine* and gynephilic males for age differences. *Fa’afafine* were significantly younger, on average, than the gynephilic males (*fa’afafine*, mean \pm SD = 27.83 \pm 7.98; gynephilic males, 29.78 \pm 8.73; two-tailed independent *t*-test, $t(337) = 2.07, p = .04$). (Note: age data were missing for two *fa’afafine* participants.) The age ranges of *fa’afafine* and gynephilic males in the combined sample were 18-60 and 18-67, respectively. For the combined sample, there

was no statistically significant difference between these groups with respect to age (*fa'afafine*, mean \pm SD = 28.81 \pm 8.20; gynephilic males, 28.42 \pm 8.23; two-tailed independent *t*-test, $t(527) < 1$). (Note: age data were missing for eight *fa'afafine* participants and one gynephilic male participant.)

The questionnaire also included a section pertaining to birth order. Specifically, participants were asked to list all of the children their mothers gave birth to from first- to last-born. In addition to indicating their own birth order, participants indicated whether each sibling was male or female. Four data points were recorded for each participant: number of older brothers, number of older sisters, number of younger brothers, and number of younger sisters. Participants' birth orders were quantified using Slater's Index (number of older siblings/total number of siblings), a metric that expresses birth order as a value between 0 (first-born) and 1 (last-born), and controls for family size (Slater, 1958). For each participant, two additional birth order indices were also computed, which were introduced by Jones and Blanchard (1998): (1) Fraternal Index (number of older brothers/total number of brothers), and (2) Sororal Index (number of older sisters/total number of sisters).

Results

Replication Sample

Table 2.1 presents descriptive statistics regarding the total number of siblings as well as the numbers of older brothers, older sisters, younger brothers, and younger sisters for *fa'afafine* and gynephilic males for the replication sample. *Fa'afafine* had a greater number of siblings, on average, than did gynephilic males (two-tailed independent *t*-test; $t(339) = 4.63, p < .001$).

Table 2.2 presents descriptive and inferential statistics pertaining to the Slater's, Fraternal, and Sororal indices for *fa'afafine* and gynephilic males in the replication sample. Slater's, Fraternal, and Sororal index values could not be computed for participants who did not have siblings, brothers, or sisters, respectively. Inferential statistics were performed to test for biases in the birth orders of *fa'afafine* and gynephilic males. For each index, the mean index value for each group was compared against a value of .5, the expected mean index value for samples drawn from a hypothetical stable population. *Fa'afafine* were significantly more likely to be later born according to all three indices. Gynephilic males were significantly more likely to have been early born according to Slater's index, but did not differ significantly from the expected .5 value for the Fraternal and Sororal indices. Between-group comparisons of *fa'afafine* and gynephilic males revealed that *fa'afafine* were significantly more likely to be later born for all three indices.

A logistic regression analysis was conducted with sexual orientation (i.e., gynephilic versus androphilic) as the dichotomous criterion variable and number of older brothers, number of older sisters, number of younger brothers, and number of younger sisters as the predictor variables. The model accounted for 13.9% of the variance in sexual orientation. Table 2.3 presents the results of the logistic regression analysis. The results indicated that number of older brothers and number of older sisters were both statistically significant predictors of sexual orientation. The odds ratios derived from the logistic regression analysis for the effects of number of older brothers and number of older sisters were 1.36 and 1.14, respectively.

Expected sex ratios were obtained from the Samoan Statistical Service Division of the Ministry of Finance (2006) and indicated that a ratio of 109 male live births for every 100 female live births was appropriate for the cohort range of our sample. Table 2.4 presents the total and expected numbers of all male siblings, older male siblings, and younger male siblings for *fa'afafine* and gynephilic males. I assessed whether the total number of males in each category differed from the expected values based on the Samoan population parameters using the z approximation to the binomial test. The total number of male siblings, number of older brothers, and number of younger brothers did not differ significantly from the expected values for *fa'afafine*. The total number of male siblings was significantly different from the expected value for gynephilic males. Analyses revealed that, for gynephilic males, the number of older brothers, but not younger brothers, was significantly lower than the expected value.

It is necessary to note that given the age disparity between our *fa'afafine* and gynephilic male samples, I also performed analyses in which I controlled for age. These analyses revealed that age had no impact on the statistical significance of the results reported here. Therefore, the analyses are presented here without controlling for age.

Combined Sample

Table 2.1 presents descriptive statistics regarding the total number of siblings as well as the numbers of older brothers, older sisters, younger brothers, and younger sisters for *fa'afafine* and gynephilic males for the combined sample. *Fa'afafine* had a greater number of siblings, on average, than did gynephilic males (two-tailed independent t -test with between-group equality of variances not assumed; Levene's test for equality of variances, $F = 10.11, p = .002; t(402.03) = 6.85, p < .001$).

Table 2.2 presents descriptive and inferential statistics pertaining to the Slater's, Fraternal, and Sororal indices for *fa'afafine* and gynephilic males in the combined sample. These analyses were performed in the same fashion as for the replication sample. *Fa'afafine* were significantly more likely to be later born according to all three indices. Gynephilic males did not differ significantly from the expected .5 value for all three indices. Between-group comparisons of *fa'afafine* and gynephilic males revealed that *fa'afafine* were significantly more likely to be later born for all three indices.

A logistic regression analysis was conducted with sexual orientation (i.e., gynephilic versus androphilic) as the dichotomous criterion variable and number of older brothers, number of older sisters, number of younger brothers, and number of younger sisters as the predictor variables. The model accounted for 13.5% of the variance in sexual orientation. Table 2.3 presents the results of the logistic regression analysis. The results indicated that number of older brothers and number of older sisters were both statistically significant predictors of sexual orientation. The odds ratios derived from the logistic regression analysis for the effects of number of older brothers and number of older sisters were 1.34 and 1.17, respectively.

We conducted further analyses to assess whether the older brother and older sister effects differed in magnitude. In doing so, we used Fisher's r to z transformations to compare the partial correlations between sexual orientation and each of these statistically significant predictor variables, while controlling for all of the other sibling categories. The partial correlation between sexual orientation and number of older brothers was .275, and the partial correlation between sexual orientation and number of older sisters was

.145. A two-tailed comparison of these partial correlations revealed that the older brother effect was significantly greater in magnitude ($z = 3.16, p = .002$).

Table 2.4 presents the total and expected numbers of all male siblings, older male siblings, and younger male siblings for *fa'afafine* and gynephilic males. We assessed whether the total number of males in each category differed from the expected values based on the Samoan population parameters using the z approximation to the binomial test. The total number of male siblings, number of older brothers, and number of younger brothers did not differ significantly from the expected values for *fa'afafine*. The total number of male siblings was significantly different from the expected value for gynephilic males. Subsequent analyses revealed that the observed numbers of older and younger brothers were both significantly lower than the expected values.

Discussion

The findings of the present study were consistent with those of previous studies examining the relationships between male sexual orientation, birth order, and the fecundity of kin. To begin with, in both Western and non-Western cultures, androphilic males tend to be later born (Blanchard, 2004; Poasa et al., 2004; Tsoi et al., 1977; Vasey & VanderLaan, 2007; Zucker & Blanchard, 2003; Zucker et al., 2007). When I quantified birth order using Slater's, Fraternal, and Sororal indices, *fa'afafine* were later born relative to gynephilic males as well as theoretical expectations based on the null model of a hypothetical stable population.

Studies conducted in Western cultures also point to an association between male androphilia and increased fecundity among kin (Blanchard & Lippa, 2007; Camperio-Ciani et al., 2004; Iemmola & Camperio-Ciani, 2009; King et al., 2005; Rahman et al.,

2008; Schwartz et al., 2010). Vasey and VanderLaan (2007) reported that greater numbers of siblings on the part of *fa'afafine* were due to the existence of older brother, older sister, and younger brother effects. In the replication sample considered here, I observed independent older brother and older sister effects, suggesting that these two effects are genuine, and not the result of Type I error. However, there was no younger brother effect observed for the replication sample. In addition, the younger brother effect was not present in the combined sample even though this sample included the participants from Vasey and VanderLaan. As such, the absence of a younger brother effect in the present study raises the possibility that this effect represented a case of Type I error and was, therefore, not genuine.

It appears that there are various factors responsible for producing the older brother and older sister effects observed here. In Western samples, the older brother effect is due to a greater than expected number of older brothers among androphilic males, based on known population parameters for sex ratios, as well as a tendency for androphilic males to be later born (Blanchard, 2004). In contrast, the sex ratios of older siblings for *fa'afafine* did not differ from expected population values, whereas gynephilic males had significantly fewer older brothers than expected in both the replication and combined samples. It seems likely, then, that the basis for the older brother effect reported here is threefold. First, gynephilic males have fewer older brothers than expected. Second, *fa'afafine* tend to be later born among their brothers compared to gynephilic males. Third, the mothers of *fa'afafine* tend to produce more children than the mothers of gynephilic males.

Clearly, the older brother effect is patterned differently in Samoa relative to the West. These differing patterns may arise due to population differences in fertility rates or attitudes that influence reproductive output, such as rules about the optimal number or sex of offspring (e.g., Blanchard & Lippa, 2007; Zucker et al., 2007). Regardless, in the context of the maternal immune hypothesis (Blanchard, 2004; Blanchard & Bogaert, 1996; Blanchard & Klassen, 1997), the consequence of producing greater numbers of children is that later-born sons will have a higher probability of being androphilic. Thus, although the sex ratios of older siblings appear to be patterned differently in Western populations relative to Samoa, the underlying mechanism that results in the developmental endpoint of male androphilia may be the same.

The tendency of *fa'afafine* to be later born and their mothers' tendency to exhibit elevated fecundity are also necessary considerations to account for the observed older sister effect. The mothers of gynephilic males produced more daughters than expected whereas the mothers of *fa'afafine* produced more children and the sex ratio of these offspring did not deviate from the expected population value. As such, the only avenue by which an older sister effect could have emerged is through the elevated fecundity of *fa'afafine*'s mothers and the fact that *fa'afafine* are later born among their sisters. Interestingly, it has been proposed that Samoan parents decide a male child will be raised as a *fa'afafine* when there are insufficient numbers of girls in the family to carry out traditional female chores (Danielsson, Danielsson, & Pierson, 1978; Mageo, 1992). It is important to note, as Vasey and VanderLaan (2007) originally pointed out, that empirical evidence demonstrating that *fa'afafine* actually have more older sisters refutes this particular hypothesis regarding the etiology of *fa'afafine*.

Regardless of how the older brother and older sister effects arose, the present study found multiple, independent sibling category effects. In such an instance, it is difficult to discern whether the observed older brother effect represents a genuine fraternal birth order effect or is merely a consequence of a maternal fecundity effect. Certainly, the older brother and older sister effects, coupled with the overall sexual orientation difference in number of siblings, support the existence of a maternal fecundity effect. However, the fact that the older brother effect was greater in magnitude suggests that biological older brothers do, in fact, contribute to the development of male androphilia above and beyond any developmental influences that may be associated with biological older sisters. It appears, then, that number of older brothers is a unique predictor of male sexual orientation in Independent Samoa and, therefore, that a genuine fraternal birth order effect exists for *fa'afafine*. As such, the finding that the older brother effect was significantly greater than the older sister effect is the most valuable contribution the present study makes toward the literature concerning birth order and male sexual orientation in non-Western populations.

In addition to supporting the existence of both fraternal birth order and maternal fecundity effects, there was yet another consistency between the findings of the present study and those conducted in Western populations. The odds ratio of 1.33 associated with the older brother effect in Western populations indicates that each additional older brother increases the chances of developing male androphilia by approximately 33% (Cantor, Blanchard, Paterson, & Bogaert, 2002). In our combined sample, the odds ratio associated with the older brother effect was 1.34, indicating that each additional older brother increases the chances of developing male androphilia by approximately 34% in

Samoa. These remarkably similar values suggest that the manner in which older brothers influence the development of male androphilia is constant across diverse populations.

Another aspect of our findings that deserves mention is in regards to the sibling sex ratios observed. As mentioned, in Western samples, androphilic males typically have an excess of brothers in relation to the expected sex ratio whereas gynephilic males do not (Blanchard, 2004). In contrast, our data from Samoa did not conform to this pattern. The sibling sex ratio for *fa'afafine* did not differ from the expected pattern. The lack of a higher than expected sibling sex ratio among the siblings of *fa'afafine*, coupled with their larger sibships, is consistent with mathematical models presented by Suarez and Przybeck (1980), which predict decreases in the sibling sex ratios of androphilic males as mean sibship sizes increase. The sibling sex ratio of gynephilic males did, however, significantly deviate from the expected population-based values, with gynephilic males having fewer brothers than expected. Interestingly, these Samoan data are consistent with patterns of relatively more strongly male-biased sibships in Western samples of highly feminine androphilic males such as homosexual transsexuals (Blanchard, 1997).

Vasey and VanderLaan (2007) also found that the sibling sex ratios of *fa'afafine* did not deviate from expected population-based values, whereas gynephilic males had fewer brothers than expected. They highlighted that, given the Samoan population sex ratio is 109:100, it is difficult to reconcile why the families of gynephilic males, who presumably constitute the majority of the population, do not exhibit the expected sibling sex ratio whereas those of *fa'afafine* conform to the expected pattern. One possibility, they reasoned, was that their sample was somehow biased.

The possibility that sample bias is responsible seems questionable, however, given the consistency in the sibling sex ratio patterns observed in the present study and the study by Vasey and VanderLaan (2007). Also, because a network sampling procedure was employed to recruit participants, *fa'afafine* and gynephilic males were enlisted for the study in an identical manner and from the same social circles. Thus, if sample bias was somehow responsible for these sibling sex ratio patterns, then any hypotheses addressing the nature of the bias must take these two considerations into account. As an example of such a hypothesis, differences between Samoan *fa'afafine* and gynephilic males in emigration might create the necessary bias to produce the observed sibling sex ratio patterns. Specifically, if Samoan gynephilic males belonging to families with male-biased sibships were more likely to emigrate, then such gynephilic males would be relatively unavailable to include as participants. Thus, gynephilic males belonging to predominantly female-biased sibships would be relatively more available to sample, which could result in the sibling sex ratio patterns observed. Examining the sibships of Samoan-born *fa'afafine* and gynephilic males who have emigrated would aid in assessing the efficacy of this emigration hypothesis.

Vasey and VanderLaan (2007) provided an alternative explanation for the observed sibling sex ratio patterns. It is theoretically possible that a certain proportion of Samoan families are similar in composition to those of *fa'afafine* (i.e., greater number of children, expected offspring sex ratio). If so, this reproductive pattern would compensate for the effect of families that are similar in composition to those of gynephilic males (i.e.,

smaller number of children, lower offspring sex ratio), thereby creating the population-wide sex ratio observed in Samoa (i.e., 109:100)³.

Speculating further, such differences in number and sex ratio of offspring may be associated with whether individuals are related to *fa'afafine*. In support of this speculation, the existing empirical literature indicates that the kin of androphilic males exhibit unique reproductive patterns with respect to elevated fecundity (Blanchard & Lippa, 2007; Camperio-Ciani et al., 2004; Iemmola & Camperio-Ciani, 2009; King et al., 2005; Rahman et al., 2008; Schwartz et al., 2010; Vasey & VanderLaan, 2007). Also consistent with this explanation, women are capable of varying in their tendency to produce male or female offspring (James, 2000), and elevated fecundity in women is associated with elevated (i.e., more strongly male-biased) offspring sex ratios (James, 1987). It is also worth noting that *fa'afafine* may facilitate increased reproductive success among their relatives via the elevated avuncular tendencies they exhibit (VanderLaan &

³ Within the context of the alternative explanation provided by Vasey and VanderLaan (2007), the Samoan population sex ratio corresponds to the equation:

$$1.09 = r_f s_f x + s_g (1-x)$$

where

1.09 = the Samoan population sex ratio

r_f = the reproductive rate of women who reproduce like the mothers of *fa'afafine* (i.e., greater number of children) relative to women who reproduce like the mothers of gynephilic males

s_f = the offspring sex ratio of women who reproduce like the mothers of *fa'afafine* (i.e., expected offspring sex ratio)

s_g = the offspring sex ratio of women who reproduce like the mothers of gynephilic males (i.e., lower than expected offspring sex ratio)

x = the proportion of reproductive women in the Samoan population who reproduce like the mothers of *fa'afafine*

As an illustration, estimating the equation's parameters from descriptive statistics derived from the combined sample in the current study yields $r_f = 1.3$, $s_f = 1.09$, and $s_g = 0.89$. Solving the equation to find the value of x shows that $x = 0.38$, which corresponds to an estimate of 38% of Samoan reproductive women who reproduce like the mothers of *fa'afafine*.

Vasey, in press; Vasey et al., 2007; Vasey & VanderLaan, 2009, 2010a). Whether maternal factors that increase the odds of androphilia in later-born males represent a maternal adaptation for producing avuncular sons or a by-product of elevated maternal reproduction cannot be discerned from the current literature and requires investigation.

Studies in Western cultures have demonstrated fraternal birth order as well as fecundity effects in relation to male sexual orientation. The present study provided empirical support for the existence of both effects in a non-Western culture. The cross-cultural consistency with which these effects have been documented is consistent with the conclusion that culturally invariant processes underlie the development of androphilia in males. In addition, the existence of a genuine fraternal birth order effect in Samoa suggests the maternal immune hypothesis is applicable in non-Western cultures.

Table 2.1. *Descriptive statistics for the total number of siblings as well as the numbers of older brothers, older sisters, younger brothers, and younger sisters of fa'afafine and gynephilic males.*

Sibling category	<i>Fa'afafine</i> <i>M (SD)</i>	Gynephilic males <i>M (SD)</i>
Replication Sample		
All siblings	5.62 (2.63)	4.34 (2.41)
Older brothers	1.92 (1.68)	0.86 (1.15)
Older sisters	1.70 (1.59)	1.02 (1.15)
Younger brothers	0.96 (1.14)	1.19 (1.36)
Younger sisters	1.04 (1.40)	1.27 (1.27)
Combined Sample		
All siblings	5.93 (2.81)	4.35 (2.33)
Older brothers	2.06 (1.74)	0.99 (1.24)
Older sisters	1.85 (1.64)	1.10 (1.18)
Younger brothers	1.01 (1.25)	1.06 (1.22)
Younger sisters	1.01 (1.33)	1.20 (1.24)

Table 2.2. Descriptive and inferential statistics for fa'afafine and gynephilic males on the Slater's, Fraternal, and Sororal indices.

Index	<i>Fa'afafine</i>					Gynephilic Males					Group Comparison: Two-tailed independent <i>t</i> -test		
	Two-tailed one- sample <i>t</i> -test					Two-tailed one- sample <i>t</i> -test							
	<i>n</i>	<i>M (SD)</i>	<i>t</i>	<i>df</i>	<i>p</i>	<i>n</i>	<i>M (SD)</i>	<i>t</i>	<i>df</i>	<i>p</i>	<i>t</i>	<i>df</i>	<i>p</i>
Replication Sample													
Slater	130	.63 (.32)	4.64	129	<.001	207	.44 (.37)	-2.42	206	.016	5.06 ^a	301.34	<.001
Fraternal	125	.65 (.36)	4.58	124	<.001	183	.46 (.44)	-1.26	182	.208	4.13 ^b	295.22	<.001
Sororal	119	.62 (.39)	3.44	118	.001	190	.44 (.41)	-1.87	189	.063	3.82	307.00	<.001
Combined Sample													
Slater	213	.64 (.32)	6.48	212	<.001	316	.48 (.36)	-1.09	315	.277	5.52 ^a	484.81	<.001
Fraternal	203	.66 (.36)	6.22	202	<.001	282	.49 (.43)	-0.57	281	.567	4.77 ^b	473.07	<.001
Sororal	197	.65 (.39)	5.34	196	<.001	293	.47 (.40)	-1.13	292	.260	4.75	488.00	<.001

^aLevene's test for equality of variances, $F = 6.1, p = .014$

^bLevene's test for equality of variances, $F = 18.87, p < .001$

Table 2.3. *Logistic regression of sexual orientation on numbers of siblings. Model if term (predictor) removed.*

Predictor	ΔR^2	Change in -2 log likelihood ^a	Significance of the change ^b
Replication Sample			
Older brothers	- 0.078	30.25	< 0.0001
Older sisters	- 0.014	5.45	0.0195
Younger brothers	< -0.001	0.02	0.8794
Younger sisters	- 0.001	0.24	0.6242
Combined Sample			
Older brothers	-0.070	42.84	< 0.0001
Older sisters	-0.019	11.45	0.0007
Younger brothers	-0.003	2.13	0.1444
Younger sisters	< -0.001	0.27	0.6033

Note. The results show the effect of removing one predictor at a time from the regression equation, while leaving the remaining three predictors in the model. The removal of older brothers as well as the removal of older sisters produced a statistically significant decrease in correct prediction of the groups' sexual orientations.

^aDistributed as χ^2 with 1 degree of freedom.

^bTwo-tailed *p*.

Table 2.4. Comparisons of the total and expected^a numbers of all male siblings, older male siblings, and younger male siblings for *fa'afafine* and gynephilic males.

Sibling category	<i>Fa'afafine</i>					Gynephilic males				
	Total	Expected	<i>SD</i>	<i>z</i>	<i>p</i> ^b	Total	Expected	<i>SD</i>	<i>z</i>	<i>p</i> ^b
Replication Sample										
All	384	389	13.66	-0.37	.7114	427	470	15.01	-2.86	.0042
Older	256	251	10.97	0.46	.6456	179	203	9.88	-2.43	.0150
Younger	128	138	8.15	-1.23	.2186	248	266	11.30	-1.59	.1118
Combined Sample										
All	663	666	17.88	-0.17	.8650	660	729	18.70	-3.69	.0002
Older	444	438	14.51	0.41	.6818	319	350	12.97	-2.39	.0168
Younger	219	228	10.46	-0.86	.3898	341	378	13.47	-2.75	.0060

^aCalculated as the total number of siblings for each category multiplied by 0.52, which is the number of live male births divided by the total number of live births reported by the Samoan Statistical Services Division of the Ministry of Finance (2006) appropriate for the cohort range of the samples examined here.

^bTwo-tailed *p*.

CHAPTER 3

Is Male Androphilia Familial in Non-Western Cultures? The Case of a Samoan Village

Abstract

In Western populations, male androphilia (i.e., sexual attraction to adult males) tends to cluster in particular families, likely due to the influence of genetic factors. Here, I examined whether this familial clustering effect extends to non-Western populations. To this end, I considered the case of a natal village of 17 Samoan androphilic males, known locally as *fa'afafine*. Specifically, I compared the genealogies of these 17 *fa'afafine* and those of 17 control males born in the same village. The 17 *fa'afafine* and 17 control males clustered into five and 16 distinct lineages, respectively, which constituted a statistically significant degree of family clustering among the 17 *fa'afafine*. Hence, the present study indicates that male androphilia is familial in non-Western populations as well. Discussion focuses on the potential role of genetic factors in this familial clustering effect and directions for future research.

Introduction

Developmental correlates of male androphilia (i.e., male sexual attraction toward adult males) have been most thoroughly examined in samples drawn from Western populations. Some have cautioned that extrapolating from patterns found in Western populations to make statements regarding the development of male androphilia in non-Western populations may not be warranted given that the etiology of this complex trait might not be cross-culturally consistent (Blanchard, 2004; Davenport, 1987; Johnson et al., 2000). However, some evidence indicates that male androphilia has certain cross-culturally consistent developmental correlates, thus suggesting that a cross-culturally consistent etiology does exist.

The first line of evidence concerns gender-atypical childhood behaviour. Retrospective and prospective studies have shown that male androphiles in Western cultures exhibit elevated gender-atypical behaviour during childhood (e.g., Bailey & Zucker, 1995; Rieger, Linsenmeier, Gygax, & Bailey, 2008). Retrospective studies conducted in Samoa, Brazil, Guatemala, Turkey, Thailand, and the Philippines have shown the same to be true of the childhood behaviour of male androphiles raised in these non-Western cultures (Bartlett & Vasey, 2006; Cardoso, 2005, 2009; Whitam & Zent, 1984). These common behavioural patterns in early life may be indicative of a pattern of psychosexual development that transcends cultural contexts.

The second line of evidence focuses on various aspects of family demographic correlates of male sexual orientation. In the West, compared to gynephilic males (i.e., males who exhibit sexual attraction toward adult females), androphilic males tend to exhibit later birth order (Blanchard, 2004), greater numbers of older biological brothers

(i.e., the fraternal birth order effect; Bogaert & Skorska, 2011), and larger family sizes (Blanchard & Lippa, 2007; Camperio-Ciani et al., 2004; Iemmola & Camperio-Ciani, 2009; King et al., 2005; Rahman et al., 2008; Schwartz et al., 2010). Late birth order has been documented in androphilic males from a variety of non-Western cultures (MacFarlane, 1984; Poasa et al., 2004; Tsoi et al., 1977; VanderLaan & Vasey, 2011; Vasey & VanderLaan, 2007; Zucker & Blanchard, 2003; Zucker et al., 2007). In Samoa in particular, androphilic males exhibit a fraternal birth order effect and have greater numbers of siblings compared to their gynephilic counterparts (VanderLaan & Vasey, 2011; Vasey & VanderLaan, 2007).

An additional family demographic correlate of male sexual orientation that has been documented in the West but, to date, remains unexamined in non-Western populations is the familial nature of male androphilia. A number of studies conducted in Western populations have shown that, compared to male gynephiles, male androphiles tend to have a preponderance of androphilic male relatives (e.g., brothers, male cousins, uncles; Bailey et al., 1999; Bailey & Bell, 1993; Bailey & Pillard, 1991; Camperio-Ciani et al., 2004; Hamer, Magnuson, Hu, & Pattattucci, 1993; Pillard, Poumadere, & Carretta, 1981, 1982; Pillard & Weinrich, 1986; Rahman et al., 2008; Schwartz et al., 2010; Whitam, Diamond, & Martin, 1993). This familial clustering effect is likely due to the influence of genetic factors (Alanko et al., 2010; Bailey et al., 2000; Kendler et al., 2000; Långström et al., 2010). Hence, empirically demonstrating that male androphilia is familial in non-Western cultures would provide a new type of evidence to suggest that it has common developmental correlates across populations.

Here, I present an empirical examination of whether male androphilia is familial in non-Western populations. Specifically, I consider the case of a natal village of 17 Samoan androphilic males, known locally as *fa'afafine*. Translated literally, *fa'afafine* means “in the manner of a woman.” Status as *fa'afafine* is initially assigned on the basis of gender-atypical behaviour exhibited in childhood (Poasa, 1992; Schmitt, 2003; Shore, 1981). In adulthood, *fa'afafine* are markedly feminine in their appearance and mannerisms (Bartlett & Vasey, 2006; Schmitt, 2003; Vasey & Barlett, 2007; Vasey et al., 2007). Effeminate patterns of behaviour, not adult sexual orientation, are the primary basis for having *fa'afafine* status (rather than status as a “man” or “woman”). Nevertheless, *fa'afafine* are overwhelmingly exclusively androphilic in adulthood and exceptions to this rule are exceedingly rare to the point that they are considered highly suspect by Samoans both within and outside of the *fa'afafine* community (Vasey et al., 2007; Vasey & VanderLaan, 2010a). Moreover, over the course of several years of field research, hundreds of *fa'afafine* have been interviewed, and all of these individuals have been exclusively or primarily androphilic, with none being gynephilic.

If male androphilia is familial in non-Western populations, then this should be evident based on the genealogies of the 17 *fa'afafine* examined here. Furthermore, a small number of family clusters among these *fa'afafine* should not simply reflect normative patterns of familial relatedness within this particular village. To ensure that such was not the case, I compared the familial clustering patterns among these 17 *fa'afafine* to those of 17 randomly selected age-matched control males born in the same village.

Method

Data collection for the present study took place during two separate field trips to the rural area of Samoa that was the natal village of 17 *fa'afafine* (August 2008; July 2010). During the first field trip, information pertaining to these 17 *fa'afafine* was gathered from two informants who were interviewed separately. Both informants were life-long residents of the village and were asked to provide the following information: (1) the birth year of each *fa'afafine*, and (2) the genealogical relationships among these *fa'afafine* to the point of the most distant common ancestors. The informants were encouraged to seek out information from other knowledgeable village residents as necessary in order to provide the most accurate information possible. The informants provided identical information regarding birth years and genealogical relationships, indicating that the information obtained was reliable. The birth years of each of the *fa'afafine* were as follows: 1952, 1961, 1966, 1966, 1968, 1972, 1973, 1975, 1977, 1977, 1979, 1981, 1987, 1989, 1990, 1997, and 1999.

Data collection during the second field trip to the same village was conducted to acquire information for a suitable comparison group. As such, I acquired information pertaining to the genealogical relationships of 17 randomly selected age-matched males who were also born in the village. This random sample was acquired by driving from one end of the village to the other and stopping along the way to ask people on the road or in their homes to nominate a male who was born in the village during the same year as one of the 17 *fa'afafine*. Individuals were allowed to nominate anyone who was born in the village regardless of whether they still resided there, but were not allowed to nominate someone from their own family because it was reasoned people from the same family might be together, which may have induced a biased set of nominations. This process was

repeated until 17 such individuals were nominated. During separate interviews, the same two informants were then asked to provide the same information for these 17 males that they previously provided for the 17 *fa'afafine*. Again, the informants provided identical information, indicating that the information obtained was reliable.

With respect to data analysis, for each group and each level of clustering (i.e., ranging from same sibship to same lineage), I calculated the probability of obtaining a family clustering pattern as or more extreme than that observed. Doing so entailed using the following combinatorial formula,

$$\frac{\sum_{n=1}^f \binom{17-1}{n-1}}{\sum_{n=1}^{17} \binom{17-1}{n-1}}$$

in which f is the number of family clusters observed. Specifically, the numerator calculates the number of possible family clustering combinations that is as, or more, extreme than that observed (i.e., equal or fewer number of family clusters) while the denominator calculates the total number of possible combinations for all possible degrees of family clustering, ranging from 1 to 17 clusters (for further discussion of this combinatorial theorem, see Feller, 1950). To obtain the probability of the observed family clustering pattern for *fa'afafine* relative to the base rate probability of relatedness for 17 individuals in the village, as estimated from the comparison group of males, the probability of family clustering patterns observed for *fa'afafine* were divided by those for the comparison males at each level of clustering considered.

Results

The number of family clusters observed at the levels of sibship, first cousins, second cousins, third cousins, and lineage are presented in Table 1 for *fa'afafine* and comparison males separately. The genealogies of the 17 *fa'afafine* are depicted in Figure 3.1. Table 3.1 also presents the probabilities of observing patterns of family clustering as or more extreme than those observed, and the relative probabilities of the clustering patterns observed among *fa'afafine* given the base rate probabilities of relatedness for 17 individuals in the village, as estimated from the comparison group of males. For *fa'afafine*, there were five lineages, with 13 sibships, nine first-cousins, nine second-cousins, and six third-cousins clusters. The 17 males in the comparison group were unrelated with the exception of two who were first cousins, making 17 sibship clusters, and 16 clusters for all other levels of relatedness. The degree of family clustering among *fa'afafine* at the level of lineage was statistically significant ($p = .038$).

Discussion

As highlighted above, in Western and non-Western populations, the development of male androphilia correlates with early childhood gender-atypical behaviour and various aspects of family demography, including late birth order, the fraternal birth order effect, and large family sizes. The present study examined whether yet another family demographic correlate that has been documented in Western populations, the familial clustering of male androphilia, also extends to non-Western populations. To this end, I considered the case of a village that is the natal village of 17 Samoan androphilic males, known locally as *fa'afafine*. Specifically, I examined the genealogies of these 17 *fa'afafine* and compared them to those of 17 age-matched control males born in the same village. At the level of lineage, the 17 *fa'afafine* and 17 comparison males clustered into

five and 16 distinct lineages, which constituted a statistically significant degree of family clustering among the 17 *fa'afafine*. As such, the present study provides evidence indicating that male androphilia is familial in non-Western populations as well.

Although I did not document statistically significant family clustering at the levels of siblings, first cousins, second cousins, and third cousins, it is likely that this lack of statistical significance reflects the limits of the methodology employed rather than limits concerning the extent to which male androphilia is familial. That is, the combinatorics theorem used to calculate the probabilities of obtaining the patterns of family clustering observed no doubt provided overestimates of the actual probabilities. Calculating the precise probabilities requires the exact number of families in the village at the levels of sibship, first cousins, second cousins, third cousins, and lineage for all males born in the village between 1952 and 1999, the birth years of the eldest and youngest *fa'afafine* born in the village. Obtaining accurate records of such information would be difficult, if not impossible. Furthermore, even if such records were obtained and showed statistically significant family clustering for these 17 *fa'afafine* at each of these other levels, the theoretical conclusion would be identical to that drawn from the present finding of statistically significant family clustering at the level of lineage; namely, male androphilia is familial in non-Western populations.

The main question that arises, then, is whether the familial nature of male androphilia in non-Western populations has the same developmental basis or bases as in Western populations. While no data have been garnered in support of theories that posit the role of social influences toward the development of same-sex sexual orientation (Wilson & Rahman, 2005), twin studies have indicated that genetic factors are likely

responsible for why male androphilia is familial in the West (Alanko et al., 2009; Bailey et al., 2000; Kendler et al., 2000; Långström et al., 2010). Evidence that a portion of these genetic factors exist on the X chromosome has been found in some studies (Hamer et al., 1993; Hu et al., 1995), but not in others (Mustanski et al., 2005; Rice, Anderson, Risch & Ebers, 1999). Other research has suggested that it may not necessarily be genetic variants that influence male sexual orientation, but instead, epigenetic influences in the form of variations in the expression of genetic factors on the X chromosome (Bocklandt, Horvath, Vilain, & Hamer, 2006).

The debate concerning the role of X-linked genetic factors is further reflected in the family demographic literature. A number of studies have indicated that androphilic males tend to have a preponderance of androphilic male relatives (i.e., uncles and male cousins) on the maternal side of their family (Camperio-Ciani et al., 2004; Hamer et al., 1993; Rahman et al., 2008). Such a pattern would depend on X-linked genetic factors because the X chromosome of males is unique in that they only share this portion of their genome with their maternal relatives. However, a number of other studies have failed to find such maternal biases in the familial nature of male androphilia (Bailey et al., 1999; Schwartz et al., 2010), again calling into question the role of genetic factors on the X chromosome.

Hence, research examining the familial nature of male androphilia in non-Western populations should focus on discerning whether data from these populations can inform ongoing debates concerning the role of X-linked genetic factors. As an initial step in doing so, future research might consider testing whether androphilic male probands in non-Western populations tend to have a preponderance of androphilic male relatives on

the maternal side of their family. Such research would also further contribute to the growing body of empirical literature focusing on understanding the development of male androphilia within a comprehensive, cross-cultural framework.

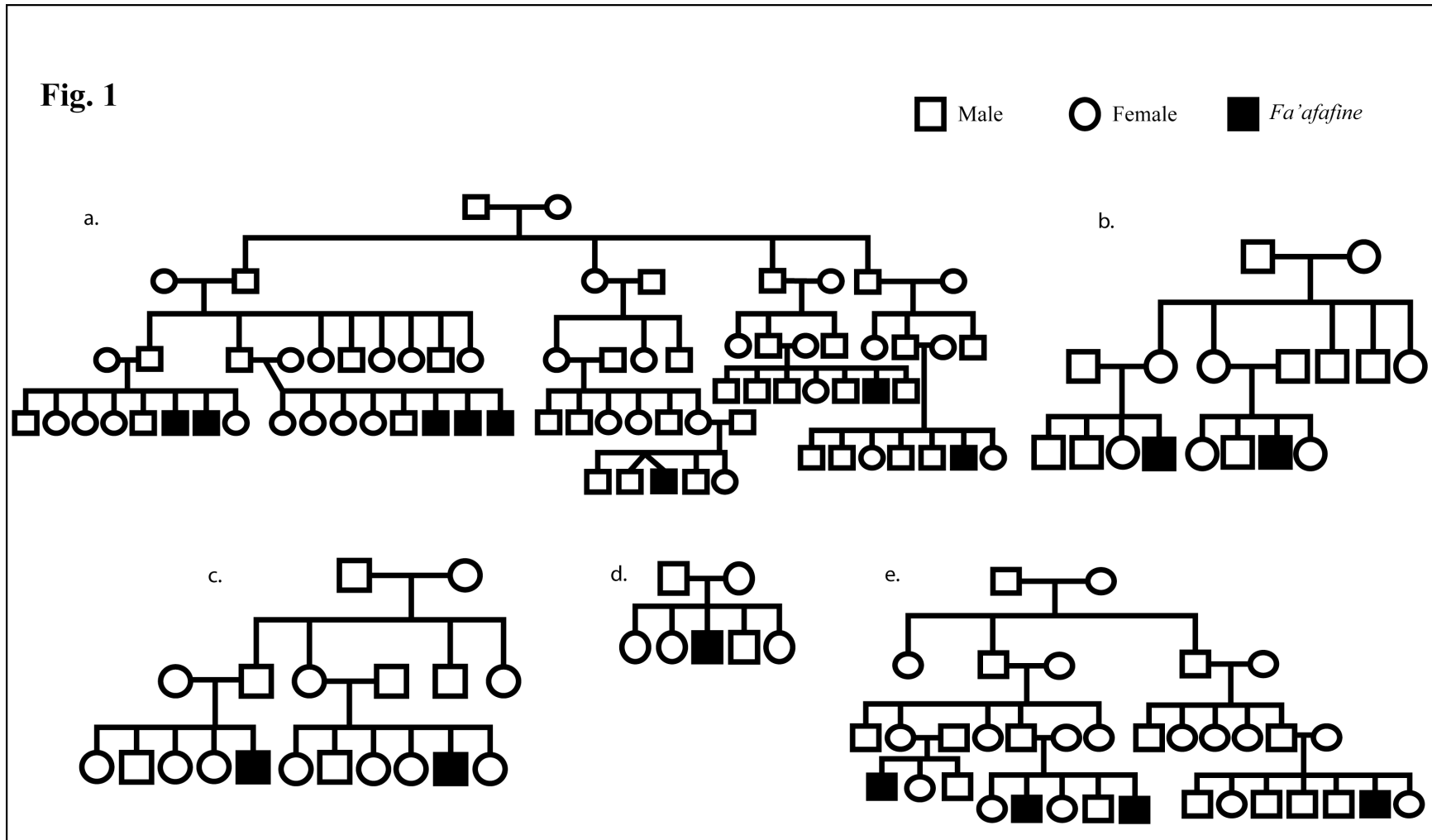
Table 3.1. *Probabilities of observed family clustering patterns.*

Cluster Type	<i>Fa'afafine</i>		Control Males		Relative Probability ^b
	Number of Clusters	Probability ^a	Number of Clusters	Probability ^a	
Sibship	13	.989	17	1.00	.989
First Cousins	9	.598	16	.999	.599
Second Cousins	9	.598	16	.999	.599
Third Cousins	6	.105	16	.999	.105
Lineage	5	.038	16	.999	.038

^aThe proportion of possible family clusters of equal or lesser number out of the total number of possible family clusters.

^bThe probability for *fa'afafine* divided by the probability for control males.

Figure 3.1. Lineages of the 17 fa'afafine born in the village.



CHAPTER 4

The prevalence of *fa'afafine* relatives among Samoan men and *fa'afafine*

Abstract

Androphilia refers to sexual attraction to males, whereas *gynephilia* refers to sexual attraction to females. In Western populations, some studies have indicated that male androphilia is primarily associated with genetic factors on the X chromosome because androphilic males show preponderances of androphilic male relatives in their maternal, but not paternal, lines. Other studies, however, show such preponderances in both the maternal and paternal lines. Low fertility populations, such as those found in the West, are susceptible to producing anomalous patterns with respect to biodemographic correlates of male sexual orientation. Hence, we focused on a high fertility population to determine which pattern prevailed in the relative absence of this fertility-related confound. Specifically, we compared the prevalence of androphilic male relatives in the maternal and paternal lines of Samoan gynephilic and androphilic males. In Samoa, androphilic males are known locally as *fa'afafine*. Compared to Samoan gynephilic males, androphilic males (i.e., *fa'afafine*) had significantly more *fa'afafine* uncles and male cousins in both their maternal and paternal lines. These findings suggest that male androphilia is not primarily an X-linked trait, and that autosomal genetic factors are likely relevant to the development of male androphilia.

Introduction

In Western populations, male androphilia (i.e., male sexual attraction to adult males) is familial (Bailey et al., 1999; Camperio-Ciani et al., 2004; Hamer et al., 1993; Rahman et al., 2008; Schwartz et al., 2010), but the precise nature of this phenomenon is uncertain. Some studies indicate that androphilic males have a preponderance of androphilic male relatives (i.e., uncles and male cousins) through the maternal, but not paternal, line (Camperio-Ciani et al., 2004; Hamer et al., 1993; Rahman et al., 2008). Such a pattern would depend on X-linked genetic factors because the X chromosome of males is unique in that males share this portion of their genome with maternal relatives only. Yet, other studies have identified such preponderances in both the maternal and paternal lines (Bailey et al., 1999; Schwartz et al., 2010). Hence, it is uncertain whether male androphilia is primarily an X-linked phenomenon.

This literature is limited by its focus on Western populations. Fertility rates in the West are, relatively speaking, low (Central Intelligence Agency, 2011). In relation to this pattern of low fertility, individuals often exhibit “stopping rules” with respect to their reproductive behaviour (e.g., cessation of reproduction once a certain number of children are produced or once at least one child of each sex is produced). Consequently, in certain instances samples from low fertility populations can produce anomalous patterns by obscuring the presence of well-established biodemographic correlates of male sexual orientation (Blanchard & Lippa, 2007; Zucker et al., 2007). Discrepancies between Western studies of the familial patterning of male androphilia may, therefore, result from examining samples from low fertility populations. Examining the familial patterning of male androphilia in a high fertility population could, therefore, provide valuable insight.

The Samoan population is suitable for such an examination. Samoa exhibits higher fertility than the West (Central Intelligence Agency, 2011). Furthermore, male androphilia shows developmental commonalities in the West and Samoa. As in the West, male androphilia in Samoa is associated with elevated gender-atypical childhood behaviour (Bailey & Zucker, 1995; Bartlett & Vasey, 2006), later birth order (Blanchard, 2004; VanderLaan & Vasey, 2011), greater numbers of older biological brothers (Bogaert & Skorska, 2011; VanderLaan & Vasey, 2011), and larger family sizes (Blanchard & Lippa, 2007; Camperio-Ciani et al., 2004; Rahman et al., 2008; Schwartz et al., 2010; VanderLaan & Vasey, 2011).

In Samoa, androphilic males are known locally as *fa'afafine*. Translated literally, *fa'afafine* means “in the manner of a woman.” Status as *fa'afafine* is initially assigned on the basis of gender-atypical behaviour beginning in childhood (Poasa, 1992; Schmitt, 2003; Shore, 1981). In adulthood, *fa'afafine* are extremely feminine in their appearance and mannerisms (Bartlett & Vasey, 2006; Schmitt, 2003; Vasey et al., 2007). Effeminate patterns of behaviour, not adult sexual orientation, are the primary basis for having *fa'afafine* status (as opposed to status as “man” or “woman”). Nevertheless, *fa'afafine* are overwhelmingly exclusively androphilic in adulthood and exceptions to this rule are exceedingly rare to the point where they are considered highly suspect by Samoans both within and outside of the *fa'afafine* community (Vasey et al., 2007; Vasey & VanderLaan, 2010a). Hence, a male’s status as androphilic can be reliably assayed from his status as *fa'afafine*. Here, we compared the prevalence of *fa'afafine* maternal and paternal line male relatives (i.e., uncles and cousins) among Samoan *fa'afafine* and

gynephilic (i.e., sexually attracted to adult females) males to shed light on whether male androphilia is primarily an X-linked phenomenon.

Method

Data were collected on Samoa's most populous islands, Upolu and Savai'i, during July-September, 2008. Participants were recruited through a network sampling procedure, which involved contacting initial participants, then obtaining referrals from them to additional participants who, in turn, provided further referrals, and so on. The rate of participation for all groups was greater than 90%. All participants were interviewed in English or Samoan, depending on their preference.

Participants included 86 gynephilic males ($M \pm SD$ age: 29.80 ± 9.61) and 86 *fa'afafine* ($M \pm SD$ age: 29.60 ± 8.44). Across the entire sample, none of the participants were brothers or first cousins. Groups were comparable with respect to age, $t(170) = .15$, $p = .88$. Kinsey ratings of sexual feelings toward males (i.e., men and/or *fa'afafine*) and females (i.e., women) during the previous year were obtained. All 86 gynephilic males described their sexual feelings as exclusively gynephilic (Kinsey rating = 0). For *fa'afafine*, 84 (97.7%) described their sexual feelings as exclusively androphilic (Kinsey rating = 6), and two (2.3%) reported most sexual feelings toward males, but an occasional fantasy about females (Kinsey rating = 5).

Participants also reported the numbers of biological uncles and male cousins on the maternal and paternal sides of their families as well as how many of each were *fa'afafine*. Importantly, Samoans often emigrate to countries with lower fertility populations (e.g., Australia, New Zealand, USA) for the entirety, or a portion of, their reproductive lives. The impact of such emigration on the number of children produced is

unknown. Consequently, we focused our analyses on those male relatives whose parents' entire reproductive histories occurred in Samoa.

Results

I compared the prevalence of paternal and maternal line *fa'afafine* relatives among Samoan androphilic (i.e., *fa'afafine*) versus gynephilic male probands using Mann-Whitney *U*. These comparisons are summarized in Table 4.1. Compared to gynephilic male probands, *fa'afafine* probands exhibited statistically significant preponderances of *fa'afafine* relatives in both the paternal and maternal lines. There were no statistically significant differences in the prevalence *fa'afafine* relatives in the paternal versus maternal lines for *fa'afafine* (Wilcoxon Signed Ranks Test: $n = 82$, $z = -1.61$, $p = .11$, Cohen's $d = .31$) or gynephilic male probands (Wilcoxon Signed Ranks Test: $n = 83$, $z = -0.75$, $p = .45$, Cohen's $d = .07$).

Discussion

The androphilic *fa'afafine* had significant preponderances of *fa'afafine* uncles and male cousins in both the paternal and maternal lines relative to their gynephilic counterparts. In addition, within both groups of probands the presence of *fa'afafine* relatives was not significantly biased toward the paternal or maternal lines. Given that samples from low fertility populations are susceptible to producing anomalous patterns with respect to biodemographic correlates of male sexual orientation, this Samoan familial patterning of male androphilia is likely to be indicative of the true pattern. In other words, the present study suggests that low fertility rates may confound the patterning of androphilic male relatives in Western studies by sometimes obscuring the preponderance of paternal line androphilic male relatives among androphilic male

probands. Future replications of this research in populations differing in fertility rates would be helpful for verifying whether such is indeed the case.

If male androphilia were primarily an X-linked trait, then the preponderance of *fa'afafine* relatives among the *fa'afafine* probands would have been limited to the maternal line. Because it was not limited as such, these findings suggest that male androphilia is not primarily an X-linked trait. Empirical support for theories that posit the role of social influences toward the development of same-sex sexual orientation is lacking (Wilson & Rahman, 2005), but twin studies have indicated that genetic factors are likely responsible for why male androphilia is familial (e.g., Alanko et al., 2010; Långström et al., 2010). Because male androphilia seems to occur more frequently in both the maternal and paternal families of androphilic male probands, it appears likely that the development of male androphilia is influenced by autosomal genetic factors.

Still, it is possible that X-linked genetic factors are related to the development of male androphilia. Indeed, particular regions of the X chromosome have been shown to differ between androphilic and gynephilic males in some studies (Hamer et al., 1993; Hu et al., 1995), although not in others (Mustanski et al., 2005; Rice et al., 1999). Other research has suggested that it may not necessarily be X-linked genetic variants that influence male sexual orientation, but instead, epigenetic influences in the form of variations in the expression of genetic factors on the X chromosome (Bocklandt et al., 2006). Regardless, it is important to stress that the present study does not provide any evidence refuting the existence of X-linked factors in the development of male androphilia. Rather, it indicates that other genetic factors not present on the X-chromosome are likely to be relevant.

Table 4.1. *Prevalence of fa'afafine relatives among fa'afafine versus gynephilic male probands.*

	<i>Fa'afafine</i>					Gynephilic males					Mann-Whitney <i>U</i>	<i>p</i>	Cohen's <i>d</i>
	<i>n</i>	<i>M</i>	<i>SD</i>	Number of <i>fa'afafine</i> relatives/Total number of male relatives	Percentage (%) of <i>fa'afafine</i> relatives	<i>n</i>	<i>M</i>	<i>SD</i>	Number of <i>fa'afafine</i> relatives/Total number of male relatives	Percentage (%) of <i>fa'afafine</i> relatives			
Paternal Relatives	84	.080	.183	38/812	4.68%	83	.026	.080	18/664	2.71%	4209.0	.001	.38
Maternal Relatives	84	.036	.078	28/903	3.10%	86	.021	.063	15/813	1.85%	4077.5	.036	.21

CHAPTER 5

Offspring Production Among the Extended Relatives of Samoan Men and *Fa'afafine*

Abstract

Androphilia refers to sexual attraction to males, whereas *gynephilia* refers to sexual attraction to females. Because male androphilia has a genetic basis, but lowers reproductive output, its existence raises the question of how genetic factors underlying male androphilia persist. Some researchers have hypothesized that sexually antagonistic genetic factors on the X chromosome lead to male androphilia, but that this fitness cost is offset because the same factors lead to elevated reproduction on the part of the matrilineal female relatives of androphilic males. Some studies have not supported this hypothesis, and instead showed elevated reproduction in paternal, not maternal, line female kin of androphilic males. Thus, the accuracy of the X-linked sexual antagonism model is unclear based on data from Western samples drawn from low fertility populations. Samoa is a high fertility population in which individuals reproduce closer to their maximum capacities. This study compared the reproductive output of the paternal and maternal line grandmothers, aunts, and uncles of 86 Samoan androphilic males, known locally as *fa'afafine*, and 86 Samoan gynephilic males. Reproductive output was elevated in the paternal and maternal line grandmothers, but not aunts or uncles, of *fa'afafine*. These findings are partially consistent with the sexual antagonism model for the evolution of male androphilia, but do not support the argument that sexually antagonistic genetic factors are located on the X chromosome.

Introduction

Male androphilia (i.e., male sexual attraction to adult males) has a genetic basis (Alanko et al., 2010; Bailey et al., 2000; Kendler et al., 2000; Långström et al., 2010). At the same time, androphilic males exhibit lower reproductive output than males who are gynephilic (i.e., exhibit sexual attraction and arousal to adult females; King et al., 2005; Schwartz et al., 2010). Consequently, it is unclear how genetic factors underlying male androphilia persist from one generation to the next. The persistence of genetic factors for male androphilia over evolutionary time is a paradox in need of explanation given that natural selection is a process that favors the evolution of traits that facilitate reproductive success.

Balancing selection is one explanation for why genetic factors underlying male androphilia persist despite their detrimental influence toward offspring production. Because close kin share common genes by virtue of descent (Hamilton, 1963), the reproductive costs associated with male androphilia may be offset if androphilic males' relatives exhibit increased reproduction. In essence, then, the fitness benefits of increased reproduction on the part of relatives of androphilic males would balance out the fitness costs of androphilic males' lack of reproduction. Thus, the balancing selection hypothesis predicts that the relatives of androphilic males should tend to produce more offspring than those of gynephilic males (i.e., males who are sexually attracted to adult females).

To date, several studies carried out in Western populations have compared the reproductive output of the extended relatives of male androphiles versus gynephiles. In two Italian samples, elevated reproduction was documented among the matrilineal female kin of androphilic males (i.e., mothers and maternal line grandmothers and aunts;

Camperio-Ciani et al., 2004; Iemmola & Camperio-Ciani, 2009). In one British sample, elevated reproduction was documented among the maternal aunts of androphilic males (Rahman et al., 2008). Based on these findings, these authors suggested that the form of balancing selection involved in the evolution of male androphilia was sexual antagonism. Sexually antagonistic selection pertains to situations in which genetic factors that produce fitness costs when present in one sex result in fitness benefits when present in the other sex. In this case, genetic factors for male androphilia might result in fitness costs when expressed in males, but conversely, result in fitness benefits in the form of elevated reproduction when expressed in females.

In addition, the authors of these Italian and British studies suggested that the matrilineal bias in elevated female reproduction indicated that the sexually antagonistic genetic factors in question were likely present on the X chromosome. Such X-linkage was suggested because males share this chromosome with their matrilineal kin only. Furthermore, this suggestion is in agreement with other studies indicating that genetic factors on the X chromosome are associated with the etiology of male androphilia. For example, in several Western samples, androphilic male probands show preponderances of androphilic male relatives (i.e., uncles and cousins) in the maternal, but not paternal, line (Camperio-Ciani et al., 2004, Hamer et al., 1993; Rahman et al., 2008), a pattern that would depend on X-linkage. Moreover, two genetic studies have documented differences in the X chromosomes of androphilic and gynephilic males at the Xq28 locus (Hamer et al., 1993; Hu et al., 1995), while another study has indicated that activation (i.e., epigenetic) processes related to genetic factors on the X chromosome are important (Bocklandt et al., 2006).

At the same time, however, findings from other studies raise doubt about the existence of sexually antagonistic, X-linked genetic factors in the development and evolution of male androphilia. To begin with, androphilic male probands have shown preponderances of androphilic male relatives in both the maternal and paternal lines in some samples (Bailey et al., 1999; Schwartz et al., 2010). Also, two genetic studies did not show X-chromosome differences between androphilic and gynephilic males (Mustanski et al., 2005; Rice et al., 1999). In a study from the USA comparing the reproductive output of maternal and paternal kin of androphilic and gynephilic males, elevated reproduction was documented among paternal grandmothers, but not the matrilineal female kin, of androphilic males (Schwartz et al., 2010). Similarly, a study in Britain showed that androphilic males had significantly more aunts and uncles as well as cousins in the paternal, but not maternal, line (King et al., 2005). Based on these findings, one would argue that male androphilia is not primarily an X-linked phenomenon, and that sexual antagonism might not be the form of balancing selection responsible for its evolution.

One important limitation of this literature is its focus on samples drawn from Western populations. Such populations exhibit relatively low fertility (Central Intelligence Agency, 2011). In relation to this pattern of low fertility, individuals often exhibit “stopping rules” with respect to their reproductive behaviour (e.g., cessation of reproduction once a certain number of children are produced or once at least one child of each sex is produced). Consequently, in certain instances samples from low fertility populations can produce anomalous patterns by obscuring the presence of biodemographic correlates of male sexual orientation (Blanchard & Lippa, 2007; Zucker

et al., 2007). Discrepancies between Western studies of the familial patterning of male androphilia may, therefore, result from examining samples from low fertility populations. The susceptibility of these populations to producing anomalous familial patterning raises the possibility that some subset, or possibly all, of the aforementioned Western studies on male sexual orientation and family size are inaccurate. Hence, examining the reproductive output of androphilic and gynephilic males' kin in a high fertility population in which individuals are more likely to be reproducing closer to their maximum capacities could provide valuable insight.

The Samoan population is suitable for such an examination. The Samoan population is characterized by higher fertility than the West (Central Intelligence Agency, 2011). Furthermore, male androphilia shows developmental commonalities in the West and Samoa. As in the West, male androphilia in Samoa is associated with elevated gender-atypical childhood behaviour (Bailey & Zucker, 1995; Bartlett & Vasey, 2006), later birth order (Blanchard, 2004; VanderLaan & Vasey, 2011; Vasey & VanderLaan, 2007), greater numbers of older biological brothers (Bogaert & Skorska, 2011; VanderLaan & Vasey, 2011), and greater numbers of siblings (Blanchard & Lippa, 2007; Camperio-Ciani et al., 2004; VanderLaan & Vasey, 2011; Vasey & VanderLaan, 2007).

In Samoa, androphilic males are known locally as *fa'afafine*. Translated literally, *fa'afafine* means "in the manner of a woman." Status as *fa'afafine* is initially assigned on the basis of gender-atypical behaviour beginning in childhood (Poasa, 1992; Schmitt, 2003; Shore, 1981). In adulthood, *fa'afafine* are extremely feminine in their appearance and mannerisms (Bartlett & Vasey, 2006; Schmitt, 2003; Vasey & Barlett, 2007; Vasey et al., 2007). Effeminate patterns of behaviour, not adult sexual orientation, are the

primary basis for having *fa'afafine* status (as opposed to status as “man” or “woman”). Nevertheless, *fa'afafine* are overwhelmingly androphilic in adulthood and exceptions to this rule are exceedingly rare to the point where they are considered questionable and highly suspect by Samoans both within and outside of the *fa'afafine* community (Vasey et al., 2007; Vasey & VanderLaan, 2010a).

The current study compared the reproductive output of the maternal and paternal line male and female relatives (i.e., grandmothers, aunts, and uncles) of Samoan *fa'afafine* and gynephilic males. It did so to shed light on whether male androphilia in this relatively high fertility population is associated with elevated reproduction in matrilineal female kin only (i.e., X-linked sexual antagonism), or in additional categories of kin as well.

Method

Data were collected on Samoa's most populous islands, Upolu and Savai'i, during July-September, 2008. Participants were recruited through a network sampling procedure, which involved contacting initial participants, then obtaining referrals from them to additional participants who, in turn, provided further referrals, and so on. The rate of participation for all groups was greater than 90%. All participants were interviewed in English or Samoan, depending on their preference, using a standardized questionnaire. The questionnaire included questions concerning gender identity (i.e., status as a man or *fa'afafine*), age, sexual orientation, and numbers of children produced by various categories of kin (i.e., maternal and paternal grandmothers, aunts, and uncles).

Participants included 86 gynephilic males ($M \pm SD$ age: 29.80 ± 9.61) and 86 *fa'afafine* ($M \pm SD$ age: 29.60 ± 8.44). Across the entire sample, none of the participants

were brothers or first cousins. Groups were comparable with respect to age ($t[170] = .15$, $p = .88$). Kinsey ratings of sexual feelings toward males (i.e., men and/or *fa'afafine*) and females (i.e., women) during the previous year were obtained. Specifically, participants were asked the following question: "Which statement best describes your sexual feelings during the last year?" Participants then selected one of the following seven possible responses: "sexual feelings only toward females" (Kinsey rating = 0), "most sexual feelings toward females, but an occasional fantasy about males" (Kinsey rating = 1), "most sexual feelings toward females, but some definite fantasy about males" (Kinsey rating = 2), "sexual feelings about equally divided between males and females with no strong preference for one or the other" (Kinsey rating = 3), "most sexual feelings toward males, but some definite fantasy about females" (Kinsey rating = 4), "most sexual feelings toward males, but an occasional fantasy about females" (Kinsey rating = 5), or "sexual feelings only toward males" (Kinsey rating = 6). Samoans, both inside and outside the *fa'afafine* community, recognize that *fa'afafine* are biological males that are socially distinct from men and women. Nevertheless, for the sake of consistency, participants were told, prior to answering questions pertaining to the Kinsey ratings, that the category "males" included straight men and/or *fa'afafine*, whereas the category "females" included women. All 86 gynephilic males described their sexual feelings as exclusively gynephilic (Kinsey rating = 0). Of the *fa'afafine*, 84 (97.7%) described their sexual feelings as exclusively androphilic (Kinsey rating = 6), and two (2.3%) reported most sexual feelings toward males, but an occasional fantasy about females (Kinsey rating = 5).

Finally, following previous studies (Camperio-Ciani et al., 2004; Iemmola & Camperio-Ciani, 2009; Rahman et al., 2008), participants were asked to provide the number of children born to their grandmothers and each of their aunts and uncles (i.e., not including adopted or step-family) for the maternal and paternal sides of their families. From this information, for each participant I calculated the mean number of children produced by their maternal aunts, maternal uncles, paternal aunts, and paternal uncles. Importantly, Samoans often emigrate to countries with lower fertility populations (e.g., Australia, New Zealand, USA) for the entirety, or a portion, of their reproductive lives. The impact of such emigration on the number of children produced is unknown. Consequently, analyses focused on the reproduction of grandmothers, aunts, and uncles for whom all offspring were born in Samoa.

Results

The offspring production of paternal and maternal line grandmothers, aunts, and uncles in Samoan androphilic (i.e., *fa'afafine*) versus gynephilic male probands was compared using independent *t*-tests. These comparisons are summarized in Table 5.1, and showed that the paternal and maternal grandmothers, but not aunts or uncles, of androphilic males exhibited elevated reproduction.

Discussion

Some studies conducted in low fertility, Western populations (i.e., Italy and the UK) reported elevated offspring production among the matrilineal female kin of androphilic males (Camperio-Ciani et al., 2004; Iemmola & Camperio-Ciani, 2009; Rahman et al., 2008). Based on these findings, the authors of these studies suggested that X-linked, sexually antagonistic genetic factors might be primarily responsible for the

development and evolution of male androphilia. The present study compared the number of children born to the paternal and maternal line grandmothers, aunts, and uncles of androphilic (i.e., *fa'afafine*) versus gynephilic males in Samoa, a relatively high fertility population in which individuals are more likely to reproduce closer to their maximum capacities. These comparisons indicated that offspring production in Samoa is elevated among the maternal and paternal line grandmothers, but not aunts and uncles, of androphilic males.

One may wonder whether the lack of group differences for aunts and uncles is due to the fact that these relative categories are less likely to have completed their reproductive careers compared to grandmothers. The samples presented here were age-matched. As such, if the reproduction of androphilic males' relatives was elevated throughout their reproductive careers, then group differences should have emerged. The only manner in which incompleteness of reproductive careers can account for the lack of group differences for aunts and uncles is, therefore, if the kin of *fa'afafine* have greater reproductive output than the kin of gynephilic males toward the latter part of their reproductive careers. In any case, the conclusion drawn from the present findings is in line with those of one study from the USA (Schwartz et al., 2010) and another from Britain (King et al., 2005) documenting elevated reproduction in the paternal grandmothers of androphilic males. Because elevated reproduction was not limited to the matrilineal female kin of androphilic males, it is necessary to question whether the X-linked sexually antagonistic selection model of male androphilia is accurate.

Although the maternal and paternal grandmothers of *fa'afafine* had elevated reproduction, their reproduction is naturally confounded with that of grandfathers. As

such, it is difficult to discern whether elevated reproduction is limited to the female relatives of androphilic males from this study alone. That said, in the present study and all previous studies comparing the offspring production of the extended relatives (i.e., grandmothers, aunts, and uncles) of androphilic versus gynephilic males, the only categories of androphilic male relatives to show elevated reproduction were those comprised partially (i.e., reproduction of aunts and uncles combined) or entirely of female kin (Camperio-Ciani et al., 2004; Iemmola & Camperio-Ciani, 2009; King et al., 2005; Rahman et al., 2008; Schwartz et al., 2010). In addition, the mothers of androphilic males appear to have greater numbers of children compared to the mothers of gynephilic males in the West (Blanchard & Lippa, 2007; Camperio-Ciani et al., 2004; Iemmola & Camperio-Ciani, 2009) as well as in Samoa (VanderLaan & Vasey, 2011; Vasey & VanderLaan, 2007).

Based on this information, sexual antagonism is still a tenable explanation for the evolution of male androphilia. However, instead of sexually antagonistic genetic factors being X-linked, elevated reproduction in the maternal and paternal lines suggests that such factors are likely to be autosomal. If such genetic factors do indeed exist, then a fundamental question that follows concerns how they might promote reproduction in the female relatives of androphilic males. To address this question, future research will need to compare the female kin of androphilic versus gynephilic males to ascertain those mechanisms responsible for such elevated reproduction.

It is noteworthy that a number of studies have demonstrated that Samoan *fa'afafine* are more willing to help care for their nieces and nephews than Samoan women and gynephilic males (VanderLaan & Vasey, in press; Vasey et al., 2007; Vasey &

VanderLaan, 2009, 2010a). It is possible that such willingness contributes to the reproduction of kin and that genetic factors underlying male androphilia accrue fitness in this manner as well. Interestingly, one study focusing on monetary donations found that *fa'afafine* allocate more money toward younger siblings' nieces in particular (Vasey & VanderLaan, 2010b). A bias to invest in nieces on the part of *fa'afafine* could be the best means of maximizing fitness given that the female, but not male, kin of androphilic males seem to exhibit elevated reproduction. Future research should, therefore, examine whether the kin investment tendencies of androphilic males promote the reproduction of female kin in particular.

The main strength of the study presented here was its consideration of reproductive output among the relatives of androphilic and gynephilic males within a population that has higher fertility compared to the West. Elevated reproduction was documented among the grandmothers of *fa'afafine*. This finding, in conjunction with the findings of the several Western studies reviewed above, indicates that elevated reproduction among the extended relatives of male androphiles is a stable correlate of male sexual orientation that holds across populations varying in fertility.

However, it is still unclear why there are inconsistencies with respect to which categories of extended relatives show differences in reproductive output. To date, the only consistent aspect of these findings is the one noted above: elevated reproduction has only been documented in kin categories of androphilic males that are comprised partially or entirely of female kin. Future replications of this research are required to discern which categories of extended relatives most reliably show elevated reproduction. In addition, it is necessary to replicate this research in various populations to identify those

factors that influence inter-population differences in the expression of elevated reproduction among the relatives of androphilic males.

Table 5.1. *Numbers of offspring produced by the paternal and maternal line grandmothers, aunts, and uncles of Samoan fa'afafine versus gynephilic males.*

	<i>Fa'afafine</i>			Gynephilic males			<i>t</i>	<i>df</i>	<i>p</i> ^c	Cohen's <i>d</i>
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>				
Paternal grandmothers	85	6.35	2.46	83	4.99	1.71	4.19	150 ^a	< .001	.64
Paternal aunts	66	4.93	3.42	73	4.63	3.80	.49	137	.625	.08
Paternal uncles	70	4.84	3.24	74	4.70	2.90	.27	142	.791	.05
Maternal grandmothers	86	7.29	2.97	86	5.47	2.08	4.67	152.3 ^b	< .001	.71
Maternal aunts	65	5.28	3.70	76	4.92	3.43	.61	139	.546	.10
Maternal uncles	74	5.31	5.01	79	5.78	4.12	-.64	151	.522	-.10

^aDegrees of freedom adjusted based on Levene's test for equality of variances: $F = 10.80, p = .001$.

^bDegrees of freedom adjusted based on Levene's test for equality of variances: $F = 6.09, p = .015$.

^cTwo-tailed *p*-value.

CHAPTER 6

Relationship Status and Elevated Avuncularity in Samoan *Fa'afafine*

Abstract

Androphilia and *gynephilia* refer to sexual attraction to males and females, respectively. Samoan androphilic males are known as *fa'afafine*. Previously, *fa'afafine* reported greater avuncular tendencies compared to those of men as well as the materteral (i.e., aunt-like) tendencies of women. Here, the Samoan male sexual orientation difference in avuncular tendencies was replicated. Further, I hypothesized *fa'afafine* might form and invest in intimate sexual/romantic relationships less, leaving them with more resources, thus facilitating increased avuncularity. *Fa'afafine*, men, and women were comparable for sexual/romantic relationship involvement. Men and women tended to lower avuncular/materteral tendencies when involved in sexual/romantic relationships, which partially mediated the difference between *fa'afafine* and women for avuncular/materteral tendencies. Discussion detailed alternate explanations for elevated avuncularity among Samoan *fa'afafine*.

Introduction

Androphilia refers to sexual attraction and arousal to males, whereas *gynephilia* refers to sexual attraction and arousal to females. In many non-Western cultures, androphilic males, particularly those who are transgendered, often occupy “alternative” gender role categories that are distinguished linguistically from the gender-normative categories of “man” and “woman.” Some contemporary examples include, but are not limited to, the *woubi* of the Ivory Coast (Brooks & Bocahut, 1998), the *xanith* of Oman (Wikan, 1977), the *hijra* of India (Nanda, 1998), the *kathoey* of Thailand (Totman, 2003), and the *muxes* of Mexico (Chiñas, 1995). In Samoa, androphilic males are referred to as *fa’afafine*, which means “in the manner of a woman.”

Most *fa’afafine* do not self-identify as men or women; rather, they self-label as *fa’afafine*. *Fa’afafine* tend to be effeminate in appearance and mannerisms, and from a Western cultural perspective many would be described as effeminate males while others would be described as transgendered. Only a small minority would be described as transsexual because the vast majority of *fa’afafine* do not experience any dysphoria towards their male bodies (Vasey & Bartlett, 2007). They range from extremely feminine to unremarkably masculine, although instances of the latter are quite rare (Bartlett & Vasey, 2006; Schmidt, 2003; Vasey & Bartlett, 2007).

Despite this heterogeneity in gender role presentation, *fa’afafine* are, with very few exceptions, androphilic. As such, *fa’afafine* are, almost without exception, childless (Vasey et al., 2007; Vasey & VanderLaan, 2010a). It is important to note that *fa’afafine* do not engage in sexual activity with each other. Instead, *fa’afafine* are attracted to, and engage in sexual interactions with, masculine males who self-identify as “straight men”

(Bartlett & Vasey, 2006). This pattern of sexual attraction and interaction is one of the primary reasons why *fa'afafine* do not identify as “gay.” In a Samoan cultural context “gays sleep with other gays.”

In a Samoan cultural context, “straight men” are those who self-identify as men and are masculine with respect to gender role presentation. Inclusion in this category is not contingent on exclusive sexual activity with women. Most self-identified straight men are gynephilic, but may engage in sexual activity with *fa'afafine* or other straight men on a temporary basis, particularly if female sexual partners are unavailable. Our participants informed us that many straight men in Samoa have engaged in sexual interactions with *fa'afafine* at least once in their lives (also see Croall & Wunderman, 1999).

A large body of research indicates that there is a biological basis for male androphilia (for review, see Mustanski, Chivers, & Bailey, 2002; Wilson & Rahman, 2005), and familial studies point to a genetic component (e.g., Alanko et al., 2010; Bailey et al., 2000; Hamer & Copland, 1994; Kendler et al., 2000; Långström et al., 2010). At the same time, research demonstrates that androphilic males in Western cultures reproduce at about one-fifth to one-tenth the rate of gynephilic males (e.g., Bell & Weinberg, 1978; Hamer & Copland, 1994; Iemmola & Camperio-Ciani, 2009; Saghir & Robins, 1973; van de Ven et al., 1997; Yankelovich Partners, 1994). Given the reproductive benefits associated with male gynephilia, one would expect genes for male gynephilia to have long replaced those for male androphilia. Despite this prediction, archaeological evidence suggests that male same-sex sexual activity existed during human prehistory (e.g., Nash, 2001; Yates, 1993). Moreover, male androphilia seems to exist at similar, albeit low, frequencies across diverse cultures (Whitam, 1983). Given

that male androphilia has persisted over time across a wide range of populations, it is necessary to provide a functional (evolutionary) explanation for this trait's continued existence despite its detrimental influence on direct reproduction.

The kin selection hypothesis for male androphilia (Wilson, 1975) offers a potential explanation for the maintenance of male androphilia over evolutionary time. This hypothesis postulates that genes for male androphilia could possibly be maintained in the population if the fitness costs of not reproducing directly were offset by enhancing indirect fitness. Indirect fitness is a measure of an individual's impact on the fitness of kin (who share some identical genes by virtue of descent), weighted by the degree of relatedness (Haldane, 1955; Hamilton, 1963). Theoretically speaking, androphilic males could increase their indirect fitness by directing altruistic behaviour toward kin, which, in principle, would allow kin to increase their reproductive success. In particular, androphilic males should allocate altruistic behaviour toward close kin because they share more genes in common with such individuals. Hence, if this process of kin selection accounts for the evolution of male androphilia, then selection should have favored the evolution of cognitive biases in androphilic males that could enhance investment in kin. The implication, then, is that androphilic males should be more willing to invest in kin relative to other individuals whose life histories are (or will likely be) characterized by direct reproduction.

To date, studies conducted in the United States and Great Britain have not found that androphilic men are more willing to invest time and money toward parents, siblings, or nieces and nephews relative to gynephilic men; these studies, therefore, do not support the kin selection hypothesis for male androphilia (Bobrow & Bailey, 2001; Rahman &

Hull, 2005). These studies were replicated in Samoa and, in contrast, a male sexual orientation difference in willingness to invest time and money toward kin was found (Vasey et al., 2007; Vasey & VanderLaan, 2010a). Specifically, *fa'afafine* exhibited elevated avuncular tendencies (i.e., uncles' willingness to care for nieces and nephews) relative to Samoan gynephilic men. In addition, *fa'afafine* exhibited elevated avuncular tendencies compared to the maternal (i.e., aunt-like) tendencies of Samoan women (Vasey & VanderLaan, 2009). Also, compared to Samoan women and gynephilic men, *fa'afafine* give more money to nieces (Vasey & VanderLaan, 2010b) and exhibit a pattern of avuncular cognition that appears to be adaptively designed for maximizing resources directed toward nieces and nephews while minimizing resources directed toward non-kin children (Vasey & VanderLaan, 2010c). Taken together, these findings from Samoa are consistent with the kin selection hypothesis for male androphilia.

Despite these results, there is a need to be cautious about claiming that the kin selection hypothesis for male androphilia provides an accurate account of why *fa'afafine* exhibit elevated avuncular tendencies (Vasey et al., 2007; Vasey & VanderLaan, 2009, 2010a). Some unique proximate factor(s) not explicitly posited by this hypothesis might underlie elevated avuncular tendencies in Samoan *fa'afafine* and better explain why they differ from Samoan women and gynephilic men as well as Western male androphiles in this regard. As such, factors that are specific to the group that is exhibiting the unique pattern represent the most tenable candidate explanations (Bailey, Gaulin, Agyei, & Gladue, 1994; VanderLaan & Vasey, 2008). Here, we consider one such factor, involvement in sexual/romantic relationships, which may potentially be different for *fa'afafine* as well as relevant to their elevated avuncular tendencies.

Inclusion in the category *fa'afafine* is contingent on feminine gender role presentation rather than sexuality (Poasa, 1992; Schmidt, 2003; Shore, 1981). Not surprisingly then, *fa'afafine* are often identified in childhood, long before patterns of overt sexuality emerge (Bartlett & Vasey, 2006; Vasey & Bartlett, 2007). Although the vast majority of *fa'afafine* are androphilic in adulthood, Samoans view this pattern of attraction as an optional consequence of being a *fa'afafine*, rather than as a defining criterion for inclusion in this category (Besnier, 1993). *Fa'afafine*'s gender-atypicality seems to be relatively unproblematic for most Samoans, perhaps because the *fa'afafine*'s gender liminal status affords them the opportunity to undertake both men's and women's work, which families and community members prize (Schmitt, 2003; Vasey & VanderLaan, 2009, 2010a).

The same cannot be said for *fa'afafine*'s expression of same-sex sexuality, however, to which some Samoans voice objections (Schmitt, 2003). Because the *fa'afafine*'s same-sex sexuality is sometimes viewed disparagingly, it is not surprising that marriage between *fa'afafine* and men is not sanctioned by Samoan society. Sexual interactions between Samoan men and *fa'afafine* are often clandestine, "one-night stands." When sexual relationships between Samoan men and *fa'afafine* do occur, they tend to be quite short-lived (Dolgoy, 2000; Mageo, 1992; Schmidt, 2003). Reflecting on this situation, some *fa'afafine* have told me that it is simply not part of their role in Samoan society to have enduring sexual/romantic relationships with men. Thus, unlike their androphilic male counterparts in Western cultures (i.e., gay men), and gynephilic men and women in Samoan culture, *fa'afafine* may be less involved in sexual/romantic relationships.

If *fa'afafine* are, in fact, less involved in sexual/romantic relationships, this may have implications for their avuncular tendencies. Because resources are finite, investing effort in forming and maintaining sexual/romantic relationships might then limit the amount of resources that can be allocated toward other endeavors. Hence, if *fa'afafine* invest less in sexual/romantic relationships, then this might afford them greater resources, such as time and money, that can be allocated toward nieces and nephews, and thus form the basis of their elevated avuncular tendencies.

Here, I present two studies. In Study 1, I replicated previous studies comparing the avuncular tendencies of Samoan *fa'afafine* and gynephilic men (Vasey et al., 2007; Vasey & VanderLaan, 2010a). In Study 2, I tested the relationship hypothesis, which suggests that elevated avuncular tendencies on the part of *fa'afafine* are mediated by their lesser involvement in sexual/romantic relationships (i.e., having a relationship partner, frequency of spending time with a relationship partner, money allocated to a relationship partner). Specifically, on the basis of the information presented above, it was predicted that *fa'afafine* would be less likely to form, and invest in, intimate sexual/romantic relationships with men, than women and gynephilic men would be to form, and invest in, intimate relationships with each other. In addition, we tested whether decreased sexual/romantic relationship involvement was associated with increased willingness to invest time and money toward nieces and nephews as well as whether *fa'afafine*'s elevated avuncular tendencies could be accounted for by their sexual/romantic relationship involvement.

Study 1: Replication

Method

Participants

All participants were recruited through a network sampling procedure on the two larger and more populated islands of Independent Samoa: Upolu and Savai'i. A network sampling procedure involves contacting initial participants who display qualities of interest (i.e., status as women, *fa'afafine*, or men), then obtaining referrals from them to additional participants who, in turn, provide further referrals, and so on. The rate of participation for all groups was greater than 90%.

Data used to replicate the sexual orientation difference in avuncular tendencies were collected during a single field trip (July – August, 2008) from 42 self-identified *fa'afafine* and 44 self-identified straight men who had not been interviewed previously. A total of 41 *fa'afafine* (97.6%) described their sexual feelings as exclusively androphilic (Kinsey rating = 6). One *fa'afafine* (2.4%) reported most sexual feelings toward males, but an occasional fantasy about females (Kinsey rating = 5). All 44 (100%) straight men described their sexual feelings as exclusively gynephilic (Kinsey rating = 0).

Procedure and Measures

Participants were interviewed using standardized questionnaires. A Samoan-speaking research assistant was present for those interviews for which the participants indicated that they preferred to do the interview in Samoan, or for those participants who were deemed by the researchers to be insufficiently fluent in English.

Biographic Questionnaire. Participants responded to questions about basic biographic information including age, sex, gender identity (i.e., *fa'afafine*, “straight” man, woman), sexual orientation (androphilic versus gynephilic), highest level of education received, and annual income. Highest level of education received was coded in

an ordinal fashion (i.e., “primary school or less” = 1, “secondary” = 2, and “post-secondary” = 3). Data on the participants’ annual incomes were converted to American Dollars (USD). Sexual orientation was assessed using a Kinsey rating (Kinsey et al., 1948) question about sexual feelings experienced during the last year. Samoans, both inside and outside the *fa’afafine* community, recognize that *fa’afafine* are biological males that are socially distinct from men and women. Nevertheless, for the sake of consistency, participants were told, prior to answering questions pertaining to the Kinsey scale, that the category “males” included straight men and/or *fa’afafine*, whereas the category “females” included women.

Avuncular/Maternal Tendencies Subscale. All participants completed a subscale comprised of nine items that was used in previous research (e.g., Bobrow & Bailey, 2001; Vasey et al., 2007), and was designed to measure avuncular/maternal tendencies toward nieces and nephews. Specifically, participants were asked to imagine that a brother or sister lived nearby (i.e., in the same village) and asked for help with the following childcare activities: (a) babysitting for an evening, (b) babysitting on a regular basis, (c) taking care of the children for a week while their parents are away, (d) buying toys for the children, (e) tutoring one of the children in a subject you know well, (f) helping to expose the children to art and music, (g) contributing money for daycare, (h) contributing money for the children’s medical expenses, and (i) contributing money for the children’s education. Responses to these items were based on a 7-point Likert-type scale that ranged from 1 = “Very Unwilling” to 7 = “Very Willing.” Avuncular/maternal tendencies scores were calculated as the mean response to these nine items.

Results

Internal consistency reliabilities, standardized item *alpha* (α), were computed for *fa'afafine* and men on the avuncular tendencies subscale, and were appreciable for both groups (*fa'afafine*: $\alpha = .74$; gynephilic men: $\alpha = .84$). Table 6.1 provides descriptive statistics concerning age, annual income, and avuncular tendencies. Response frequencies for highest level of education received for *fa'afafine* and men, respectively, were primary school or less: 0 (0%) and 2 (4.5%); secondary: 21 (50%) and 32 (72.7%); post-secondary: 21 (50%) and 10 (22.8%).

Avuncular tendencies subscale scores of *fa'afafine* and gynephilic men were compared using hierarchical multiple linear regression. Avuncular tendencies score was the dependent (criterion) variable. Participant age, annual income, and education were entered as control variables on the first step of the equation. Group (i.e., *fa'afafine* versus men) was entered as a dichotomous predictor variable on the second step of the equation. *Fa'afafine* exhibited significantly greater avuncular tendencies subscale scores than men (Table 6.2).

Study 2: Relationship Hypothesis

Method

Participants

To assess the relationship hypothesis, I used data collected during a single field trip (March – June, 2007) from 73 *fa'afafine*, 48 self-identified straight men, and 37 women, all of whom did not have children. Data were collected from the islands of Upolu and Savai'i using a network sampling procedure with a rate of participation greater than 90% as in Study 1. All 73 *fa'afafine* (100%) described their sexual feelings as exclusively androphilic (Kinsey rating = 6). A total of 39 (81.3%) straight men described their sexual

feelings as exclusively gynephilic (Kinsey rating = 0), five (10.4%) reported most sexual feelings toward females, but occasional fantasies about males (Kinsey rating = 1), and four (8.3%) reported most sexual feelings toward females, but some definite sexual feelings about males (Kinsey rating = 2). Kinsey ratings for women indicated that 36 (97.3%) described their sexual feelings as exclusively androphilic (Kinsey rating = 0), and one (0.7%) reported most sexual feelings toward males, but occasional fantasies about females (Kinsey rating = 1).

Procedure and Measures

All participants included in Study 2 completed the biographic questionnaire and avuncular/materteral tendencies subscale as in Study 1. Data from the avuncular/materteral tendencies subscale was used to assess (1) willingness to make time investments (i.e., the mean response for items a-f of the avuncular/materteral tendencies subscale), (2) willingness to make monetary investments (i.e., the mean response of items g-i of the avuncular/materteral tendencies subscale), and overall avuncular/materteral tendencies (i.e., the mean response to all nine items of the avuncular/materteral tendencies subscale).

Relationship Involvement Questionnaire. Participants in Study 2 also responded to an additional set of questions that assessed involvement in romantic and/or sexual relationships. Specifically, participants were asked to indicate whether they were currently involved in a romantic and/or sexual relationship by providing a “Yes” (coded as 1) or “No” (coded as 0) response. The definition of what constituted a romantic relationship or a sexual relationship was left open-ended so that participants could identify whether they belonged to such relationships based on their own perception. In

addition, participants were asked to report the frequency with which they spent time with a relationship partner. Response options for this second question were treated in an ordinal fashion and included: “Never,” “Less than once a week,” “At least once a week,” “Two to three times a week,” “Almost every day,” and “Every day.” These responses were coded as 1 through 6, respectively. Finally, these participants were asked to report the amount of money they allocated toward relationship partners over the course of the previous year. Monetary amounts were converted to American Dollars (USD).

Results

With respect to the sample used to test the relationship hypothesis, internal consistency reliabilities, standardized item *alpha* (α), were computed for *fa'afafine*, gynephilic men, and women for avuncular/materteral tendencies measures. For all three groups, reliabilities were appreciable for the six items used to assess time investment (*fa'afafine*: $\alpha = .71$; men: $\alpha = .72$; women: $\alpha = .75$), three items used to assess monetary investment (*fa'afafine*: $\alpha = .82$; men: $\alpha = .76$; women: $\alpha = .84$), and the overall avuncular/materteral tendencies subscale (*fa'afafine*: $\alpha = .84$; men: $\alpha = .82$; women: $\alpha = .81$).

Table 6.1 provides descriptive statistics concerning age, annual income, amount of money allocated to sexual/romantic relationship partner, and the avuncular/materteral tendencies measures. Response frequencies for highest level of education received for *fa'afafine*, men, and women, respectively, were primary school or less: 0 (0%), 0 (0%), 1 (2.7%); secondary: 51 (69.9%), 28 (58.3%), 10 (27.0%); post-secondary: 22 (30.1%), 20 (41.7%), 26 (70.3%). Forty-one (53.6%) *fa'afafine*, 31 men (64.6%), and 28 (75.7%) women indicated that they had a sexual/romantic relationship partner. Responses to the

question concerning amount of time spent with a sexual/romantic relationship partner for *fa'afafine*, gynephilic men, and women, respectively, were as follows: Every day: 24 (32.9%), 15 (31.3%), and 10 (27%); Almost every day: 1 (1.4%), 2 (4.2%), and 3 (8.1%); Two to three times a week: 9 (12.3%), 4 (8.4%), and 8 (21.6%); At least once a week: 2 (2.8%), 9 (18.8%), and 7 (18.9%); Less than once a week: 3 (4.2%), 0 (0%), and 0 (0%); Never: 34 (46.4%), 18 (37.3%), and 9 (24.4%).

To investigate whether relationship involvement mediated *fa'afafine*'s elevated avuncular tendencies, the guidelines for investigating the presence of possible mediation effects described by Frazier, Tix, and Barron (2004) were followed. Hence, I first confirmed that group was significantly associated with avuncular/materteral tendencies above and beyond the influence of control variables (i.e., age, income, education). As mentioned, previous studies showed that *fa'afafine* exhibit greater willingness to invest in nieces and nephews compared to Samoan men and women, but Samoan men and women do not differ in this regard. For the present sample, group comparisons were conducted using a stepwise hierarchical multiple linear regression model that simultaneously evaluated whether men and women differed from *fa'afafine* for avuncular/materteral investment tendencies after age, income, and education were statistically controlled. To this end, I used two dummy coded predictor variables with men coded as 1 in the first, women coded as 1 in the second, and *fa'afafine* coded as 0 in both. The results of these analyses were consistent with those of previous studies. Specifically, relative to *fa'afafine*, men showed significantly lower avuncular time investment tendencies, women showed significantly lower materteral monetary investment tendencies, and both men and

women showed significantly lower overall avuncular/materteral investment tendencies (Table 6.3).

Next, I evaluated whether relationship involvement was a potential mediator of any of these group differences. Doing so entailed first assessing whether *fa'afafine* differed from men or women for the variables used to assay relationship involvement. Regression analyses using the same dummy coding scheme as the previous analyses showed that women were significantly more likely to be involved in a relationship relative to *fa'afafine*, but that no additional significant group differences existed for these variables (Table 6.4). Hence, none of the relationship variables were candidate mediators for the significant group differences between men and *fa'afafine* for the avuncular tendencies measures because there were no significant group differences for any of the relationship variables.

Given these results, I narrowed the analyses and focused on whether the difference between women and *fa'afafine* for being in a relationship mediated the difference between these groups for avuncular/materteral monetary and overall investment tendencies. Using stepwise hierarchical multiple linear regression controlling for age, income, and education, I examined whether being involved in a relationship was predictive of monetary and/or overall investment tendencies. I also included two additional interaction terms in the model. These terms were the cross products of the binary variable for whether the participant had a relationship partner (“No” = 0; “Yes” = 1) and each of the two dummy coded variables used above to conduct group comparisons. Thus, inclusion of these interaction terms made it possible to also assess whether the prediction of investment tendencies by relationship involvement was

moderated by group (i.e., moderated mediation; Preacher, Rucker, & Hayes, 2007). These analyses showed that although avuncular/materteral investment tendencies were not significantly predicted by whether the participant had a relationship partner for the overall sample, significant interaction effects did exist whereby men and women's avuncular/materteral investment tendencies tended to be lower when they had a relationship partner (Table 6.5).

According to guidelines in the literature (Frazier et al., 2004; Preacher et al., 2007), the results detailed thus far indicate that having a relationship partner (i.e., "yes" versus "no") satisfies the prerequisite conditions for potential moderated mediation of the avuncular/materteral investment tendencies differences between women and *fa'afafine*. Consequently, I examined whether the observed interaction whereby women, but not *fa'afafine*, who were involved in a sexual/romantic relationship tended to show lower investment tendencies toward nieces and nephews mediated the differences in such investment tendencies between *fa'afafine* and women. In a stepwise hierarchical multiple linear regression analysis using the same dummy coded predictor variables for group comparisons as had been used above, after age, income, education, and the aforementioned interaction term were controlled, compared to women, *fa'afafine* still had significantly greater avuncular monetary, $B = -1.19$, $SE B = .50$, 95% CI = -2.17, -.20, $\beta = -.37$, $p = .02$, and overall investment tendencies, $B = -.78$, $SE B = .39$, 95% CI = -1.56, .00, $\beta = -.30$, $p = .05$. Moderated mediation effects were calculated in accordance with the guidelines provided by Preacher et al., and these effects were significant for the difference between *fa'afafine* and women in monetary (one-tailed: $z = -1.81$, $p = .04$) and overall investment tendencies (one-tailed: $z = -1.64$, $p = .05$). Taken together, these

results indicate that the tendency of women in relationships to exhibit lower investment tendencies partially explains why they differ from *fa'afafine* in this regard, but does not completely mediate these group differences.

Discussion

In Study 1, the previously reported male sexual orientation difference in avuncular tendencies (Vasey et al., 2007; Vasey & VanderLaan, 2010a) was replicated using an independent sample. This additional replication further suggests that the documented male sexual orientation difference in avuncular tendencies in Samoa is genuine and not the result of sampling bias.

In Study 2, I tested the hypothesis that the elevated avuncular tendencies of *fa'afafine* (Table 6.3) were mediated by their lesser involvement in sexual/romantic relationships. The findings were generally inconsistent with this hypothesis. First, contrary to the ethnographic literature, *fa'afafine* reported levels of sexual/romantic relationship involvement that were comparable to that of Samoan men and women, particularly in terms of the frequency with which they spent time with sexual/romantic relationship partners as well as the amount of money they allocated to sexual/romantic relationship partners (Table 6.4). Second, based on the hypothesis, it was predicted that *fa'afafine* would show greater avuncular tendencies due to a relative lack of relationship involvement. However, *fa'afafine*'s investment tendencies were relatively less affected by whether they had a sexual/romantic relationship partner. Instead, it was men and women who showed a relatively greater decline in avuncular/maternal tendencies when they had a sexual/romantic relationship partner (Table 6.5). Third, the results indicated

that relationship involvement was insufficient to account fully for *fa'afafine*'s elevated willingness to invest in nieces and nephews relative to men and women.

Previous research demonstrated that the elevated avuncular tendencies of *fa'afafine* are not a by-product of a lack of parental care responsibilities (Vasey & VanderLaan, 2010a), increased femininity (Vasey & VanderLaan, 2009), or general interest in children (Vasey & VanderLaan, 2010c). On the basis of this study, it appears that the elevated avuncular tendencies of *fa'afafine* are also not simply a by-product of a lack of investment in sexual/romantic relationships. That said, it is important to highlight that women's tendency to lower investment in nieces and nephews when involved in a sexual/romantic relationship did partially mediate the group difference between women and *fa'afafine* for avuncular/materteral tendencies. There is some evidence, then, to suggest that relationship involvement bears relevance to understanding group differences in avuncular/materteral tendencies. Yet, the manner in which relationship involvement does so may differ from that posited by the hypothesis examined here. Rather than a lack of relationship involvement being associated with an elevation in the avuncular investment tendencies of *fa'afafine*, the present findings tentatively indicate that men and women might have a tendency to lower their avuncular/materteral tendencies when involved in a relationship, thus widening the existing gap in willingness to invest in nieces and nephews between them and *fa'afafine*.

The question remains, then, as to what additional circumstances might influence elevated avuncular tendencies in Samoan *fa'afafine* when compared to women and gynephilic men. Like *fa'afafine*, "gay" male androphiles in Western nations are, on average, more feminine than gynephilic men (for review, see Bailey, 2003), particularly

with respect to their social interests and work preferences (for review, see Lippa, 2005a), but unlike *fa'afafine*, they do not exhibit a transgendered pattern of male androphilia. Instead, Western gay men exhibit an *egalitarian* pattern of male androphilia in which both partners are more or less gender normative for their sex and do not adopt specialized roles, instead treating each other as equals (Murray, 2000). It is noteworthy that although both are androphilic, it is the transgendered *fa'afafine* who exhibit elevated avuncular tendencies relative to gynephilic men (Vasey et al., 2007; Vasey & VanderLaan, 2010a), whereas non-transgendered “gay” men from Western nations do not (Bobrow & Bailey, 2001; Rahman & Hull, 2005). One possible explanation for this cross-cultural difference is that elevated avuncular tendencies may be more contingent on a male’s transgendered status than on a male’s androphilic status.

For reasons that remain unclear, transgendered male androphiles are often described by the gender-normative members of their societies as being superior to men and women in terms of various labor practices, often combining the best that both sexes have to offer (see Williams, 1992). For example, in Samoa, Chief Vaasili Fiji stated: “Most of the families consider having a *fa'afafine* in the Samoan home as an asset because in the plantation they are men; in the house they are wonderful and great housekeepers” (Croall & Wunderman, 1999). Due to their “third” gender status, *fa'afafine* may adopt unique (trans)gender role orientations that are distinct from, but combine elements of, the singularly masculine and feminine roles of men and women. The elevated avuncular tendencies of *fa'afafine* may somehow reflect such unique (trans)gender role orientations. In this regard, it is interesting to note that various individuals with whom we spoke emphasized the special role of *fa'afafine* within Samoan

families. For example, one *fa'afafine* we spoke with on the island of Savai'i had this to say: "My brothers and sisters have all gone off and started their own families. *Fa'afafine* are more available if the family needs their support. They bring the family together." Similarly, a woman we spoke with on the island of Savai'i said: "A *fa'afafine* is more responsible than a son or a daughter. They contribute more to the family. *Everyone* knows that."

Research conducted in Western societies indicates that when individuals transgress normative gender role expectations, their individual gender role orientations (i.e., "masculine" and "feminine" characteristics and behaviours), as perceived by others, become linked to the social roles they occupy rather than their sex (e.g., stay-at-home dads, women athletes; e.g., Etaugh & Poertner, 1991, 1992; Harrison & Lynch, 2005; Riggs, 1997). For example, men who occupy gender-atypical social roles (e.g., stay-at-home dads) are more likely to be perceived by others as having a feminine gender role orientation compared to men who occupy traditional social roles. Future research should assess whether Samoans hold special (trans)gender role expectations for *fa'afafine*, particularly in relation to familial duties, including avuncularity.

Self-attribution of atypical gender role orientations by individuals who do not conform to normative gender role expectations has been documented in Western (e.g., Colker & Widom, 1980; Lantz & Schroeder, 1999) and non-Western cultures (Koca, Aşçı, & Kirazcı, 2005). For example, Koca et al. showed that female athletes in Turkey perceive themselves as having a more masculine or more androgenous gender role orientation compared to their non-athlete counterparts. Future research should, therefore, also assess whether *fa'afafine* come to hold unique (trans)gender role expectations for

themselves, including their role in regards to avuncularity. It is also worth noting that *fa'afafine* tend to have more siblings than Samoan gynephilic men (VanderLaan & Vasey, 2011; Vasey & VanderLaan, 2007), and that having larger families might exaggerate the expectations that *fa'afafine* have of themselves regarding their role as care-takers of the family. Future research may, therefore, also consider how family size influences attitudes toward caring for kin, including attitudes about avuncularity.

Finally, Williams (1992) hypothesized that transgendered androphilic males in many non-Western cultures excel at various labor practices, especially feminine ones, as a way of striving for prestige within their families and communities. He argued that one consequence of this pattern of prestige acquisition was that transgendered androphilic males sometimes behave in a competitive manner when executing feminine labor (Williams, 1992). Anecdotal evidence from Samoa provides some support for these ideas. For example, one *fa'afafine* from the island of Upolu stated “If you cook with a *fa'afafine*, I think a *fa'afafine* will be better than you. If you're cleaning or doing all those kind of stuff that a woman should do, a *fa'afafine* is better than a woman for doing that” (Poe, 2004). Given that childcare in Samoa is primarily a feminine labor practice (Freeman, 1983; Nardi, 1983; Ochs, 1988), it would be valuable if future research assessed whether *fa'afafine* strive for prestige by over-excelling in the domain of avuncularity.

There are a number of respects in which the methodology employed here could be improved in future studies. For example, simply asking participants to report sexual/romantic relationship status, frequency of spending time with a sexual/romantic relationship partner, and the amount of money allocated to a sexual/romantic relationship

partner may have provided measures of relationship involvement that did not provide sufficient detail to effectively test the relationship hypothesis assessed in Study 2. A more refined assessment of sexual/romantic relationship involvement might have entailed gathering additional information about participants' sexual/romantic relationships such as degree of emotional attachment to relationship partners. Also, the present study did not consider a number of variables that may impact investment in kin, including, but not limited to, the financial status of the participants' siblings (i.e., parents of nieces and nephews), the sexes of the participants' siblings, and the ages of nieces and nephews. Furthermore, in addition to obtaining reports of willingness to allocate time and money toward nieces and nephews, it might also be worthwhile to assess participants' histories of actually allocating time and money toward nieces and nephews. Consideration of additional information captured by variables such as these would further inform the extent to which sexual/romantic relationship involvement relates to investments in kin.

There are also analytical limitations worth noting. Appropriate tests of mediation effects rely on the use of regression techniques. In certain respects, however, the data analyzed here were not ideal for such techniques. In particular, participant income and money spent on relationship partner had skewed distributions, and time spent with relationship partner was measured in an ordinal fashion. Also, group differences in biographic variables existed, which, although statistically controlled, is less ideal than having matched groups. Yet, from a pragmatic point of view, these limitations are difficult to overcome. Growing economic disparities exist among people in Samoa (Tone, 2010), which naturally skews the distributions of income and money that can be allocated to others. Quantifying time spent with relationship partners in a continuous fashion (e.g.,

number of days or hours) seems likely to produce substantial measurement error. Finally, obtaining samples of childless Samoan men and women that were comparable to *fa'afafine* for biographic variables (e.g., age) would also not be ideal because, not only would they be difficult to procure, but they would be peculiar given that *fa'afafine* have very different reproductive life history courses in Samoan society. Given the various limitations of the present study, the findings reported here should lead one to tentatively downgrade, as opposed to outright refute, the hypothesis that increased avuncular tendencies in Samoan *fa'afafine* are mediated by their lesser involvement in sexual/romantic relationships.

Table 6.1. *Descriptive statistics for continuous biographic and relationship variables as well as avuncular/materteral tendencies.*

	<i>Fa'afafine</i>		Men		Women	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Study 1						
Age	27.69	8.92	28.91	8.81	-	-
Income	3426.70	4837.64	2464.24	5194.19	-	-
Avuncular Tendencies	5.99	.96	5.51	1.43	-	-
Study 2						
Age	29.23	6.36	22.02	4.58	20.08	4.79
Income	6719.37	8839.84	2200.26	3368.33	2327.33	3074.63
Money Spent on Relationship Partner	252.74	1044.44	203.46	434.25	95.73	204.39
Avuncular/Materteral Tendencies: Time Investment (6 items)	6.20	.97	5.55	1.13	5.37	1.27
Avuncular/Materteral Tendencies: Monetary Investment (3 items)	6.37	1.08	5.78	1.24	5.14	1.66
Avuncular/Materteral Tendencies: Overall Subscale	6.25	.93	5.63	1.06	5.29	1.20

Table 6.2. *Study 1: Stepwise hierarchical linear multiple regression of avuncular tendencies (fa'afafine coded as 1; men coded as 0).*

	<i>B</i>	<i>SE B</i>	95%CI	β	ΔR^2
Step 1:					
Age	.04	.02	.01, .08	.31 ^a	
Income	.00	<.01	>-.01, <.01	-.02	
Education	-.11	.31	-.55, .66	.02	.091 ^a
Step 2:					
Group	.57	.27	.05, 1.10	.23 ^a	.050 ^a

^a $p < .05$

Table 6.3. Study 2: Group comparisons of investment tendencies of men and women relative to *fa'afafine* using stepwise hierarchical multiple linear regression.

	Time Investment Tendencies				Monetary Investment Tendencies				Overall Investment Tendencies			
	<i>B</i>	<i>SE B</i>	95%CI	β	<i>B</i>	<i>SE B</i>	95%CI	β	<i>B</i>	<i>SE B</i>	95%CI	β
Step 1: Controlled Variables												
Age	.04	.02	.01, .07	.25 ^b	.04	.02	<.01, .07	.18 ^a	.04	.02	.01, .07	.24 ^b
Income	.00	<.01	>-.01, <.01	-.03	.00	<.01	>-.01, <.01	.03	.00	<.01	>-.01, <.01	-.01
Education	-.49	.17	-.84, -.15	-.22 ^b	-.43	.21	-.86, -.01	-.16 ^a	-.47	.17	-.81, -.14	-.22 ^b
Step 2: Group Comparisons												
Predictor 1: Men	-.50	.23	-.95, -.04	-.20 ^a	-.51	.28	-1.06, .03	-.17	-.50	.22	-.94, -.07	-.21 ^a
Predictor 2: Women	-.51	.27	-1.04, .01	-.19	-1.08	.32	-1.71, -.45	-.34 ^c	-.70	.25	-1.20, -.20	-.27 ^b

^a $p < .05$ ^b $p < .01$ ^c $p < .001$

Note: In Step 2, groups were compared using dummy coding such that men were coded as 1 for Predictor 1, women were coded as 1 for Predictor 2, and *fa'afafine* were coded as 0 for both predictors. Predictors 1 and 2, therefore, show the effects of *fa'afafine* versus men and women, respectively.

Table 6.4. *Study 2: Group comparisons for relationship involvement of men and women relative to fa'afafine using multiple regression.*

	<i>B</i>	<i>SE B</i>	95%CI	β
Relationship partner (“Yes” = 1; “No” = 0)				
Predictor 1: Men	.11	.09	-.07, .29	.11
Predictor 2: Women	.22	.10	.03, .42	.20 ^a
Frequency of time spent with partner				
Predictor 1: Men	.19	.40	-.59, .97	.04
Predictor 2: Women	.54	.43	-.31, 1.39	.11
Money allocated toward partner				
Predictor 1: Men	-49.28	140.74	-327.29, 228.74	-.03
Predictor 2: Women	-157.02	152.84	-458.94, 144.90	-.09

^a $p < .05$

Note: Group differences in whether the participant had a relationship partner were assessed using logistic regression, whereas analyses pertaining to the other relationship variables utilized linear regression. Groups were compared using dummy coding such that men were coded as 1 for Predictor 1, women were coded as 1 for Predictor 2, and *fa'afafine* were coded as 0 for both Predictors. Predictors 1 and 2, therefore, show the effects of *fa'afafine* versus men and women, respectively.

Table 6.5. *Study 2: Stepwise hierarchical multiple linear regression of investment tendencies on whether the participant is involved in a relationship and its interaction with group.*

	Monetary Investment Tendencies				Overall Investment Tendencies			
	<i>B</i>	<i>SE B</i>	95%CI	β	<i>B</i>	<i>SE B</i>	95%CI	β
Relationship partner (“Yes” = 1; “No” = 0)	.47	.27	-.07, 1.00	.17	.37	.22	-.06, .80	.16
Predictor 1 * Relationship partner	-.86	.34	-1.52, -.19	-.25 ^a	-.64	.27	-1.17, -.11	-.23 ^a
Predictor 2 * Relationship partner	-1.14	.36	-1.84, -.43	-.32 ^b	-.71	.29	-1.27, -.14	-.24 ^a

^a $p < .05$ ^b $p < .01$

Note: Statistics related to the controlled effects of age, income, and education are identical to those presented in Table 6.3. Interaction terms were calculated as cross products using dummy coding such that men were coded as 1 for Predictor 1, women were coded as 1 for Predictor 2, and *fa'afafine* were coded as 0 for both Predictors. Thus, the Predictor 1 by Relationship partner and Predictor 2 by Relationship partner interaction terms indicate how relationship involvement differentially affects investment tendencies for *fa'afafine* versus men and women, respectively.

CHAPTER 7

Evidence of Enhanced Cognitive Biases for Maximizing Indirect Fitness in Samoan *Fa'afafine*

Abstract

The kin selection hypothesis posits that male androphilia (i.e., sexual attraction to adult males), although detrimental to reproduction (i.e., direct fitness), has persisted and evolved because androphilic males compensate by increasing their indirect fitness via increased investment in kin. Previous research has shown that Samoan androphilic males (known locally as *fa'afafine*) exhibit elevated avuncular (i.e., uncle-like) tendencies compared to Samoan men and women. The present study examined whether the avuncular cognition of *fa'afafine* is enhanced for maximizing indirect fitness. To do so, it examined whether *fa'afafine* show a stronger bias than Samoan men and women to invest in kin categories that will result in more reliable and substantive increases in indirect fitness (i.e., young, female kin). Using a forced-choice paradigm, shifting the investment context from frivolous to non-frivolous prompted *fa'afafine* to exhibit an enhanced preference, relative to Samoan men and women, to invest in young, female kin. These findings are consistent with the kin selection hypothesis, and suggest that although all individuals exhibit cognitive biases for increasing indirect fitness, the avuncular cognition of androphilic males has undergone selective enhancement to maximize the accrual of indirect fitness via kin-directed altruism.

Introduction

The kin selection hypothesis (Wilson, 1975) is a potential explanation for the persistence of genetic factors underlying male androphilia (i.e., male sexual attraction to males). According to the kin selection hypothesis, androphilic males may offset the cost of not reproducing directly (King et al., 2005; Schwartz et al., 2010) by facilitating the reproduction of kin, who share genes in common by virtue of descent. In essence, androphilic males could increase their *indirect fitness* (a measure of an individual's impact on the reproduction of genetic relatives weighted by the degree of relatedness; Hamilton, 1963) via kin-directed altruism and thereby facilitate the maintenance of genetic factors underlying male androphilia in the gene pool.

Empirical support for the kin selection hypothesis has been found among transgendered, androphilic Samoan males known locally as *fa'afafine*. Compared to Samoan women and gynephilic men (i.e., males who are sexually attracted to females), *fa'afafine* exhibit elevated avuncular (i.e., uncle-like) tendencies (Vasey & VanderLaan, 2009). Research indicates that *fa'afafine* do not exhibit elevated avuncular tendencies because they lack parental responsibilities (Vasey & VanderLaan, 2009, 2010a), assume the caretaking role typical of women (Vasey & VanderLaan, 2009), have increased willingness to help any children regardless of kinship status (Vasey & VanderLaan, 2010c), or invest less in romantic or sexual relationships (VanderLaan & Vasey, in press).

Because individual fitness depends on direct and indirect fitness, one would expect all individuals, regardless of sexual orientation, to exhibit cognitive biases for increasing indirect fitness (Daly, Salmon, & Wilson, 1997). However, if male androphilia

persisted primarily due to the efficient accrual of indirect fitness, then selection should have favored the evolution of enhanced cognitive biases related to maximizing indirect fitness in androphilic males, relative to men and women whose life histories will likely be characterized by direct reproduction. For example, one study indicated that while all Samoans prefer to invest in kin over non-kin children, *fa'afafine* possess distinctive cognitive features for maximizing investment in kin children while minimizing investment in non-kin children (Vasey & VanderLaan, 2010c). Here, we further refine our tests of the kin selection hypothesis by examining whether individuals exhibit cognitive biases concerning which kin they prefer to help, with such biases being sensitive to context. In particular, when the context signals that the investment is non-frivolous, and the consequences of receiving versus not receiving the investment are non-trivial, individuals should tend to prefer helping those kin whose reproduction will result in the most reliable and substantive increases in indirect fitness.

Sex and age of siblings and their children are aspects relevant to accruing indirect fitness. With respect to sex, individuals should prefer to invest in female, compared to male, kin (Gaulin, McBurney, & Brakeman-Warell, 1997). The mechanics of human reproduction necessarily result in a sexual asymmetry in which a woman's putative genetic offspring is certainly hers, whereas it is less certain for a man. Hence, investments toward sisters', compared to brothers', children will more reliably result in increased indirect fitness. Similarly, investments in nieces will more reliably result in increased indirect fitness than investments in nephews because of this sexual asymmetry.

With respect to age, individuals should prefer to invest in the offspring of younger, compared to older, siblings. Relatively speaking, younger siblings have greater

residual reproductive value (i.e., potential for future reproduction)---especially sisters, due to menopause---and they will tend to have younger children, who may benefit more than older children from receiving investment due to higher risk of mortality (Howell, 1979; Sear, Steele, McGregor, & Mace, 2002). Consequently, investing in the children of younger, compared to older, siblings would be more beneficial for indirect fitness. In partial support of these predictions, compared to Samoan women and gynephilic men, *fa'afafine* reported giving more money to their younger siblings' daughters (Vasey & VanderLaan, 2010b).

Utilizing a sample of Samoan women, gynephilic men, and *fa'afafine*, the present study used an experimental approach to further assess whether the predicted kin nepotism biases characterized all individuals, and, if so, whether these biases were enhanced in androphilic males. Specifically, it was predicted that when given a choice, all individuals should prefer investing in their sisters' children, especially daughters, and avoid investing in brothers' children, especially sons. Also, it was predicted that all individuals should prefer investing in younger, compared to older, siblings' children. These preferences were predicted to be stronger in non-frivolous, compared to frivolous, investment contexts because non-frivolous investment contexts have non-trivial consequences for indirect fitness. Finally, while such biases were expected among all individuals, it was predicted that they would be enhanced in *fa'afafine* because male androphiles depend more heavily on the efficient accrual of indirect fitness.

Method

Participants

Data were collected from June to August 2010 on Upolu, the most populous island of Samoa. All participants were recruited through a network sampling procedure, which involved contacting initial participants, then obtaining referrals from them to additional participants who, in turn, provided further referrals, and so on. The rate of participation for all groups was greater than 90%. Participants included 116 men ($M \pm SD$ age: 30.48 ± 10.25), 118 women ($M \pm SD$ age: 31.81 ± 11.98), and 111 *fa'afafine* ($M \pm SD$ age: 30.14 ± 7.93). A one-way analysis of variance (ANOVA) comparing age across groups revealed no significant main effect of group, $F(2, 342) = .85, p = .43$.

Kinsey ratings of sexual feelings toward males (i.e., men and/or *fa'afafine*) and females (i.e., women) during the previous year were obtained. A total of 115 (99.1%) men described their sexual feelings as exclusively gynephilic (Kinsey rating = 0), and one (0.9%) reported most sexual feelings toward females, but occasional fantasies about males (Kinsey rating = 1). All 118 (100%) women described their sexual feelings as exclusively androphilic (Kinsey rating = 0). A total of 110 (99.1%) *fa'afafine* described their sexual feelings as exclusively androphilic (Kinsey rating = 6), and one (0.9%) reported most sexual feelings toward males, but an occasional fantasy about females (Kinsey rating = 5).

Experimental Design and Procedure

Participants were given a hypothetical scenario in which they were asked to imagine that they had the following eight nieces and nephews: Older Sister's Son, Older Sister's Daughter, Younger Sister's Son, Younger Sister's Daughter, Older Brother's Son, Older Brother's Daughter, Younger Brother's Son, and Younger Brother's Daughter. Participants were asked to also imagine that the younger siblings' children

were younger than the older siblings' children, without exact ages being specified. The participants were then asked which one of these eight nieces and nephews they would choose to allocate investment toward for each of 12 items, with the qualification that the remaining seven nieces and nephews would receive no such investment. Instructions were given to participants verbally in English or Samoan, depending on the participant's preference. Participants indicated their investment choices for each item via verbal or written response, also depending on their preference, after the Experimenter or Research Assistant had read the item aloud.

The 12 items, which were presented to participants in a random order, belonged to four context categories, each with three items. *Non-Frivolous Time Investment* items included: "take care of (i.e., supervise or babysit) for a week while his/her parents are away," "spending time cooking or preparing food," and "helping with schoolwork/homework." *Frivolous Time Investment* items included: "take to the beach for the day," "take for a walk," and "sit beside while watching television." *Non-Frivolous Monetary Investment* items included: "buying food," "paying educational expenses (e.g., school fees, buying books or pencils)," and "paying medical expenses (e.g., paying doctors or traditional healers, buying medicine)." *Frivolous Monetary Investment* items included: "buying candy," "buying toys," and "buying a radio, iPod, or mp3 player."

Results

Participants' investment choices were analyzed using a six-way mixed model ANOVA in which all the factors were completely crossed. The six factors in the model included: Investment Type (i.e., Time versus Monetary), Investment Context (i.e., Non-Frivolous versus Frivolous), Sibling Age (i.e., Older versus Younger), Sibling Sex (i.e.,

Sister versus Brother), Offspring Sex (i.e., Son versus Daughter), and Group (i.e., Men, Women, *Fa'afine*). The ANOVA revealed two statistically significant five-way interactions. One five-way interaction omitted Sibling Age, $F(2, 342) = 3.93, p = .02$, while the other omitted Sibling Sex, $F(2, 342) = 4.75, p = .009$. For both of these interactions, the manner in which groups differed in their investment choice patterns varied according to Investment Type and Investment Context. The former interaction indicated that participant groups differed in their investment choices toward Sisters' Sons, Sisters' Daughters, Brothers' Sons, and Brothers' Daughters. The latter interaction indicated that participant groups differed in their investment choices toward Older Siblings' Sons, Older Siblings' Daughters, Younger Siblings' Sons, and Younger Siblings' Daughters.

In light of these interactions, subsequent analyses focused on time investments and monetary investments separately, and assessed the extent to which participant choice patterns conformed to the predictions. Specifically, within-group patterns of investment choices were conducted to test whether participants showed the predicted sex and age preferences. These within-group patterns are depicted in Figures 7.1 and 7.2, respectively. In addition, whether participants shifted their patterns of investment choices for the non-frivolous versus frivolous investment contexts was examined within groups (Figure 7.3). Lastly, groups were compared directly to assess differences in how frequently they chose to invest in the various niece and nephew categories. These between-group analyses were conducted separately for time and monetary investments as well as non-frivolous and frivolous investment contexts. Between-group comparisons for Sisters' Sons, Sisters' Daughters, Brothers' Sons, and Brothers' Daughters are depicted in

Figure 7.4. Between-group comparisons of Older Siblings' Sons, Older Siblings' Daughters, Younger Siblings' Sons, and Younger Siblings' Daughters are depicted in Figure 7.5. All of these comparisons were conducted using Fisher's Least Significant Difference or paired *t*-tests, as is appropriate when evaluating *a priori* predictions (Saville, 1990).

Within-Group Investment Choice Patterns

Men

Sisters' Sons, Sisters' Daughters, Brothers' Sons, and Brothers' Daughters (Figure 7.1a)

For frivolous time investments, men preferred all kin categories to Brothers' Daughters ($ps < .001$). For non-frivolous time investments, men preferred sisters' children to brothers' children (Sisters' Sons > Brothers' Sons, $p < .001$; Sisters' Sons and Sisters' Daughters > Brothers' Daughters, $p < .001$; Sisters' Daughters > Brothers' Sons, $p = .01$). Specifically, men avoided choosing Brothers' Sons for non-frivolous relative to frivolous time investments, $t(115) = -2.66, p = .009$ (Figure 7.3a).

For frivolous monetary investments, men preferred Sisters' Sons to all other kin categories (Sisters' Sons > Brothers' Sons, $p = .002$; Sisters' Sons > Sisters' Daughters and Brothers' Daughters, $p < .001$). Additionally, for frivolous monetary investments, men preferred Brothers' Daughters less than Brothers' Sons ($p < .001$) and Sisters' Daughters ($p = .001$). For non-frivolous monetary investments, men preferred sisters' to brothers' children (Sisters' Sons > Brothers' Sons and Brothers' Daughters, $ps < .001$; Sisters' Daughters > Brothers' Daughters, $p < .001$; Sisters' Daughters > Brothers' Sons, $p = .002$). For non-frivolous relative to frivolous monetary investments, men again tended

to avoid choosing Brothers' Sons, $t(115) = -2.99, p = .003$, and were more likely to choose Sisters' Daughters, $t(115) = 2.89, p = .005$ (Figure 7.3a).

Thus, men showed a clear pattern of favoring sisters' over brothers' children, but only in non-frivolous investment conditions. This preference for sisters' children in non-frivolous investment contexts was facilitated by avoidance of Brothers' Sons, as well as greater preference for Sisters' Daughters in the monetary investment context in particular.

Older Siblings' Sons, Older Siblings' Daughters, Younger Siblings' Sons, and Younger Siblings' Daughters (Figure 7.2a)

For frivolous time investments, men preferred Older Siblings' Sons to all other groups ($ps < .001$). For non-frivolous time investments, men preferred Younger Siblings' Daughters less than Older Siblings' Sons ($p = .001$) and Younger Siblings' Sons ($p = .04$). For non-frivolous relative to frivolous time investments, men avoided Older Siblings' Sons, $t(115) = -2.94, p = .004$ and preferred Younger Siblings' Sons, $t(115) = 2.05, p = .04$ (Figure 7.3b).

For frivolous monetary investments, men preferred Older Siblings' Sons over all other categories ($ps < .001$) and Older Siblings' Daughters over Younger Siblings' Daughters ($p = .02$). For non-frivolous monetary investments, men preferred Older Siblings' Sons to Older Siblings' Daughters ($p = .03$) and Younger Siblings' Sons ($p = .02$). For non-frivolous relative to frivolous monetary investments, men avoided Older Siblings' Sons, $t(115) = -3.13, p = .002$, and preferred Older Siblings' Daughters, $t(115) = 2.12, p = .04$, and Younger Siblings' Daughters, $t(115) = 2.89, p = .005$ (Figure 7.3b).

Thus, in the non-frivolous investment conditions, men showed an avoidance of investments toward Older Siblings' Sons, with preference toward Younger Siblings' Sons for time investments and preference toward sisters' daughters for monetary investments.

Women

Sisters' Sons, Sisters' Daughters, Brothers' Sons, and Brothers' Daughters (Figure 7.1b)

For frivolous time investments, women preferred Sisters' Daughters to Brothers' Daughters ($p = .03$) and Brothers' Sons ($p = .002$). For non-frivolous time investments, women preferred Sisters' Daughters to Sisters' Sons ($p = .03$), Brothers' Daughters, and Brothers' Sons ($ps < .001$). However, women did not show statistically significant differential investment choice patterns for non-frivolous versus frivolous time investments (Figure 7.3a).

For frivolous monetary investments, women preferred Brothers' Daughters less than Brothers' Sons ($p = .008$) and Sisters' Daughters ($p < .001$). For non-frivolous monetary investments, women preferred Sisters' Daughters to Brothers' Daughters ($p = .01$) and Brothers' Sons ($p < .001$) as well as Sisters' Sons to Brothers' Sons ($p = .02$). For non-frivolous relative to frivolous monetary investments, women avoided Brothers' Sons, $t(117) = -3.87, p < .001$, and preferred Brothers' Daughters, $t(117) = 2.14, p = .03$ (Figure 7.3a).

Hence, across investment types and conditions, women appeared to have a general bias to invest in sisters' children, particularly Sisters' Daughters. For the monetary investment context in particular, women avoided Brothers' Sons in the non-frivolous condition, and instead preferred Brothers' Daughters.

Older Siblings' Sons, Older Siblings' Daughters, Younger Siblings' Sons, and Younger Siblings' Daughters (Figure 7.2b)

For frivolous time investments, women preferred Younger Siblings' Sons less than Younger Siblings' Daughters ($p = .04$) and Older Siblings' Daughters ($p = .03$). For non-frivolous time investments, women preferred Younger Siblings' Sons less than Younger Siblings' Daughters ($p = .002$), Older Siblings' Daughters ($p = .01$), and Older Siblings' Sons ($p = .05$). For frivolous monetary investments, women showed no preference. For non-frivolous monetary investments, women preferred Younger Siblings' Daughters to Younger Siblings' Sons ($p = .01$). These non-frivolous relative to frivolous condition choice patterns showed no statistically significant differential preferences for time or monetary investments (Figure 7.3b). As such, these data do not signify any preference for younger siblings' children on the part of women.

Fa'afafine

Sisters' Sons, Sisters' Daughters, Brothers' Sons, and Brothers' Daughters (Figure 7.1c)

For frivolous time investments, *fa'afafine* preferred sisters' to brothers' children (Sisters' Daughters and Sisters' Sons > Brothers' Sons, $p = .01$; Sisters' Sons > Brothers' Daughters, $p = .01$; Sisters' Daughters > Brothers' Daughters, $p < .001$). For non-frivolous time investments, *fa'afafine* also preferred sisters' to brothers' children (Sisters' Sons > Brothers' Sons, $p < .001$; Sisters' Sons and Sisters' Daughters > Brothers' Daughters, $p < .001$; Sisters' Daughters > Brothers' Sons, $p = .01$). *Fa'afafine* did not show differential investment choice patterns for non-frivolous versus frivolous time investments (Figure 7.3a).

For frivolous monetary investments, *fa'afafine* preferred Brothers' Daughters less than Brothers' Sons, Sisters' Daughters ($p = .001$), and Sisters' Sons ($p < .001$). For non-frivolous monetary investments, *fa'afafine* preferred Sisters' Daughters to Sisters' Sons ($p = .01$), Brothers' Sons ($p = .003$), and Brothers' Daughters ($p < .001$). For non-frivolous relative to frivolous monetary investments, *fa'afafine* avoided Sisters' Sons, $t(110) = -2.01, p = .05$, and Brothers' Sons, $t(110) = -2.02, p = .05$, whereas they preferred Sisters' Daughters, $t(110) = 2.66, p = .009$ (Figure 7.3a).

These data indicated, therefore, that *fa'afafine* had a general preference for sisters' children over brothers' children for time investments. For monetary investments, however, *fa'afafine* showed a clear preference for Sisters' Daughters in the non-frivolous investment condition. This preference was facilitated by an avoidance of investing toward siblings' sons.

Older Siblings' Sons, Older Siblings' Daughters, Younger Siblings' Sons, and Younger Siblings' Daughters (Figure 7.2c)

Fa'afafine preferred Younger Siblings' Daughters to Younger Siblings' Sons ($p = .03$) for non-frivolous time investments, and showed no preference for frivolous time investments. Also, for non-frivolous relative to frivolous time investments, *fa'afafine* were more likely to choose Younger Siblings' Daughters, $t(110) = 2.07, p = .04$ (Figure 7.3b).

For frivolous monetary investments, *fa'afafine* preferred Older Siblings' Sons to Younger Siblings' Sons ($p = .01$) and Older Siblings' Daughters ($p < .001$) as well as Younger Siblings' Daughters to Older Siblings' Daughters ($p = .02$). For non-frivolous monetary investments, *fa'afafine* preferred Younger Siblings' Daughters to Older

Siblings' Sons ($p = .05$), Younger Siblings' Sons ($p = .03$), and Older Siblings' Daughters ($p = .03$). For non-frivolous relative to frivolous monetary investments, *fa'afafine* avoided Older Siblings' Sons, $t(110) = -3.61, p < .001$ (Figure 7.3b).

Hence, *fa'afafine* showed clearer preferences for Younger Siblings' Daughters in the non-frivolous investment conditions. In the non-frivolous time investment condition, this preference was facilitated by a greater likelihood of choosing to invest in Younger Siblings' Daughters. In the non-frivolous monetary investment condition, it was facilitated by an avoidance of Older Siblings' Sons.

Between-Group Comparisons of Investment Choice Patterns

Sisters' Sons, Sisters' Daughters, Brothers' Sons, and Brothers' Daughters

The following group differences are depicted in Figure 7.4a. For frivolous time investments, men showed a greater preference than women for Sisters' Sons and Brothers' Sons ($ps = .02$) and a lesser preference for Sisters' Daughters than women ($p = .05$) and *fa'afafine* ($p = .04$). In contrast, women showed a greater preference for Brothers' Daughters than men ($p = .001$) and *fa'afafine* ($p = .05$). For non-frivolous time investments, men preferred Sisters' Sons relative to women ($p < .001$) and *fa'afafine* ($p = .02$), whereas women preferred Brothers' Daughters relative to men ($p = .005$).

The following group differences are depicted in Figure 7.4b. For frivolous monetary investments, men preferred Sisters' Sons relative to women ($p < .001$) and *fa'afafine* ($p = .003$). Also, women preferred Sisters' Daughters relative to men ($p = .006$). For non-frivolous monetary investments, men preferred Sisters' Sons compared to women ($p = .03$) and *fa'afafine* ($p = .003$).

Older Siblings' Sons, Older Siblings' Daughters, Younger Siblings' Sons, and Younger Siblings' Daughters

The following group differences are depicted in Figure 7.5a. For frivolous time investments, men chose Older Siblings' Sons more than women ($p < .001$) and *fa'afafine* ($p = .001$), and, compared to men, women preferred Older Siblings' Daughters ($p = .02$) and Younger Siblings' Daughters ($p = .02$). For non-frivolous time investments, compared to women, men preferred Older Siblings' Sons ($p = .05$) and Younger Siblings' Sons ($p = .01$), and men chose Younger Siblings' Daughters less than women ($p < .001$) and *fa'afafine* ($p = .001$).

The following group differences are depicted in Figure 7.5b. For frivolous monetary investments, men chose Older Siblings' Sons more than women ($p = .002$) and Younger Siblings' Daughters less than women ($p = .005$) and *fa'afafine* ($p = .01$). For non-frivolous monetary investments, men, compared to *fa'afafine*, chose Older Siblings' Sons more ($p = .03$) and Younger Siblings' Daughters less ($p = .04$).

Discussion

Participants' choice patterns during the experiment were generally consistent with those predicted. When investment was non-frivolous, men had a greater tendency to favor their sisters' children and avoid Brothers' Sons, which would be the least adaptive kin category choice from an indirect fitness perspective. Further, for non-frivolous monetary investments, men also showed an increased tendency to choose Sisters' Daughters, which would be the most adaptive kin category choice from an indirect fitness perspective. In the non-frivolous, relative to frivolous, time investment condition, men shifted their preference away from Older Siblings' Sons and toward Younger Siblings' Sons, which

provides some evidence that men have a bias to allocate investment toward relatively younger kin when the context is less trivial.

Compared to men, women differed in that they showed no bias to invest in relatively younger kin, but were similar in that they showed evidence of a bias to invest in female kin and, when doing so, sensitivity to the non-frivolous versus frivolous conditions. That is, women showed a tendency to avoid Brothers' Sons in favor of Brothers' Daughters, which shows a shift toward a more adaptive choice pattern, although not the most adaptive available (i.e., Sisters' Daughters).

When juxtaposed with the choice patterns of men and women, those of *fa'afafine* appear even more adaptive. For time investments, *fa'afafine* showed a general bias toward sisters' over brothers' children. For the non-frivolous monetary condition, however, *fa'afafine* showed a distinct preference for Sisters' Daughters over all other categories as well as an avoidance of siblings' sons in favor of Sisters' Daughters specifically. *Fa'afafine* also showed more robust biases toward favoring younger siblings' children, particularly daughters, in the non-frivolous conditions. For non-frivolous relative to frivolous time investments, *fa'afafine* were more likely to choose Younger Siblings' Daughters. For non-frivolous monetary investments, *fa'afafine* were the only group to favor Younger Siblings' Daughters over all other categories. Moreover, for non-frivolous relative to frivolous monetary investments, *fa'afafine* avoided Older Siblings' Sons, the least adaptive category, and, as mentioned, favored Sisters' Daughters, with the younger category benefiting most substantially. Overall, then, compared to men and women, *fa'afafine* exhibited enhanced sensitivity to non-frivolous investment contexts as well as enhanced preferences for young, female kin.

The findings derived from between-group comparisons further indicated that the avuncular cognition of *fa'afafine* exhibits distinctive elements that would be adaptive for enhancing indirect fitness. Compared to men, *fa'afafine* tended to be less likely to favor siblings' sons, and were more likely to favor the adaptive choice categories of Sisters' Daughters and Younger Siblings' Daughters, particularly for the non-frivolous investment conditions. Women also differed from men in these respects, but unlike *fa'afafine*, they consistently showed lesser preference for siblings' sons compared to men in both non-frivolous and frivolous investment conditions. In addition, compared to men, women often preferred less adaptive choice categories of Brothers' Daughters and Older Siblings' Daughters, whereas *fa'afafine* did not. Taken together, it appears men generally favor nephews and women generally favor nieces regardless of the investment context (i.e., non-frivolous or frivolous), but *fa'afafine* do not generally favor one over the other in a similarly consistent fashion.

If men and women have a bias for investing in siblings' offspring of the same-sex, then these between-group patterns fit with the observations from within-group comparisons. The observed general tendency of women to bias investment toward siblings' daughters with a slight modification to prefer sisters' daughters in non-frivolous contexts may be sufficient for women to augment indirect fitness positively. Men, however, show biases that are more sensitive to investment context, enabling preference for more adaptive, female kin categories during non-frivolous contexts. Further, because Samoan men and women's fitness depends on the proficient accrual of direct fitness as well as indirect fitness, these biases might reflect an adaptive cognitive pattern given their particular life histories. For instance, Samoan women may be biased to invest in their

female kin because these kin help rear offspring (Holmes, 1989; Nardi, 1983/84; Sear & Mace, 2008; Turke, 1988). Samoan men, on the other hand, may be biased to invest in their male kin because their reproductive success could be aided by the social benefits associated with belonging to kin-based male coalitions (e.g., increased success competing with rival males for status, resources, or access to females; Manson & Wrangham, 1991; Watts, 1998). In contrast, *fa'afafine*, whose fitness primarily relies on the reproduction of kin, appear to allocate their avuncular investment toward the most adaptive kin categories in a manner that is, relatively speaking, the least biased, the most flexible (i.e., sensitive to context), and, therefore, the most proficient for enhancing indirect fitness in particular.

The bases of participants' investment choices might also be further elucidated through consideration of cultural norms surrounding sibling relationships. In Samoa, relations between same-sex siblings, particularly brothers, are often marked by an implicit atmosphere of competitiveness and conflict, whereas relations between opposite-sex siblings carry an implicit expectation of interdependence and cooperation (Shore, 1978). Such norms might account for certain patterns documented here, including why men and *fa'afafine* tended to invest toward sisters' rather than brothers' children and why women were more likely to invest in Brothers' Daughters in the non-frivolous time investment condition compared to men. Still, these norms alone are insufficient to account fully for the findings reported here, particularly with respect to participants' tendencies to invest in the more adaptive young, female kin categories in the non-frivolous relative to frivolous conditions. Instead, kin selection theory more adequately explains this pattern.

The findings reported here support the kin selection hypothesis' central tenet that androphilic males contributed to the persistence of genetic factors underlying male androphilia by enhancing their indirect fitness via kin-directed altruism. Specifically, compared to men and women, *fa'afafine*'s kin-investment choices, as indicated by the current experimental paradigm, are consistent with the hypothesis that the avuncular cognition of androphilic males has undergone selective enhancement to maximize indirect fitness. Interestingly, unlike *fa'afafine*, Western androphilic (i.e., gay) men do not exhibit elevated avuncular tendencies (Bobrow & Bailey, 2001; Forrester, VanderLaan, Parker, & Vasey, 2011; Rahman & Hull, 2005). However, VanderLaan, Gothreau, Bartlett, and Vasey (2011a) argued that developmental precursors of elevated avuncularity (i.e., elevated childhood attachment to kin) characterize pre-androphilic boys across diverse cultures. A number of inter-related factors might mitigate the development and expression of elevated avuncular tendencies in Western androphilic men, including greater levels of individualism, geographic disconnect from kin, and homophobia coupled with the relative lack of male transgenderism (Bobrow & Bailey, 2001; Vasey et al., 2007; Vasey & VanderLaan, in press). Employing experimental paradigms in the West like that used in the present study may circumvent these cultural differences and more effectively reveal the cognitive specializations predicted for androphilic men by the kin selection hypothesis.

Figure 7.1. Investment choice patterns toward Sisters' Sons, Sisters' Daughters, Brothers' Sons, and Brothers' Daughters among (a) Men, (b) Women, and (c) Fa'afafine.

Figure 1a. Men

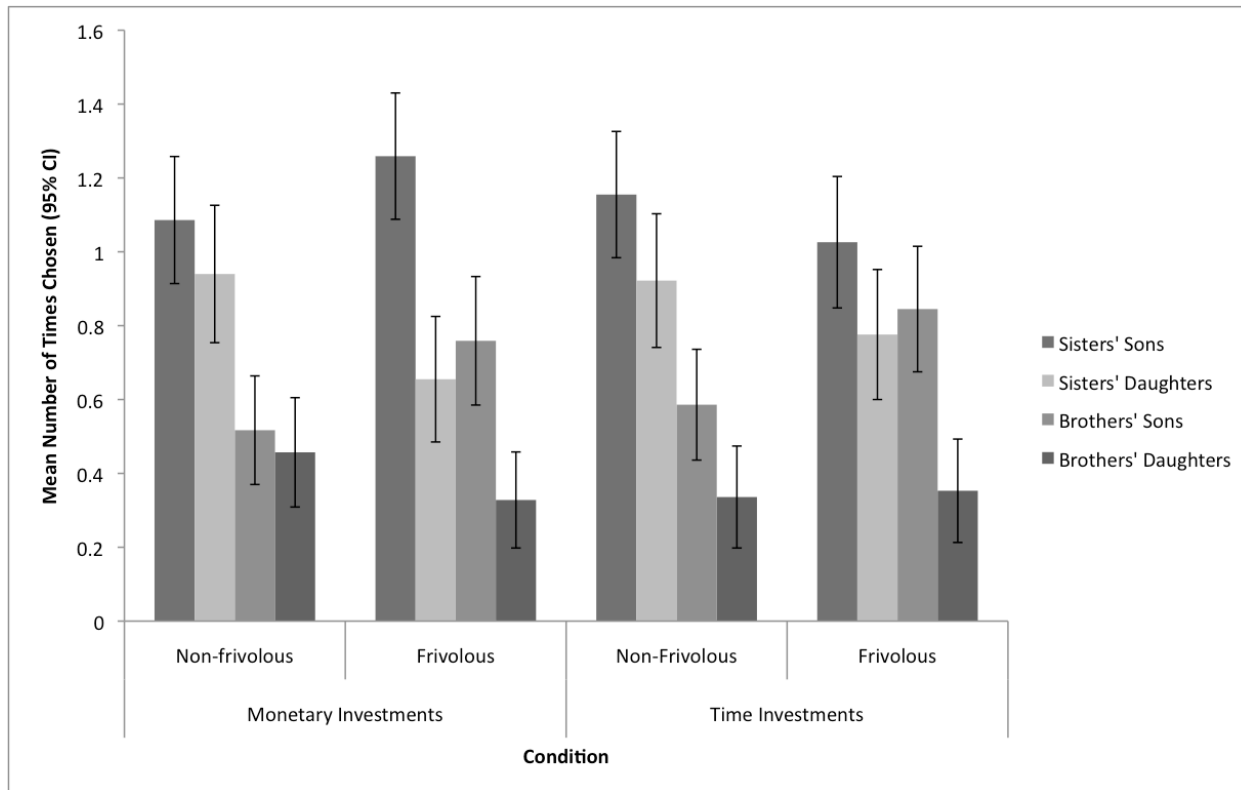


Figure 1b. Women

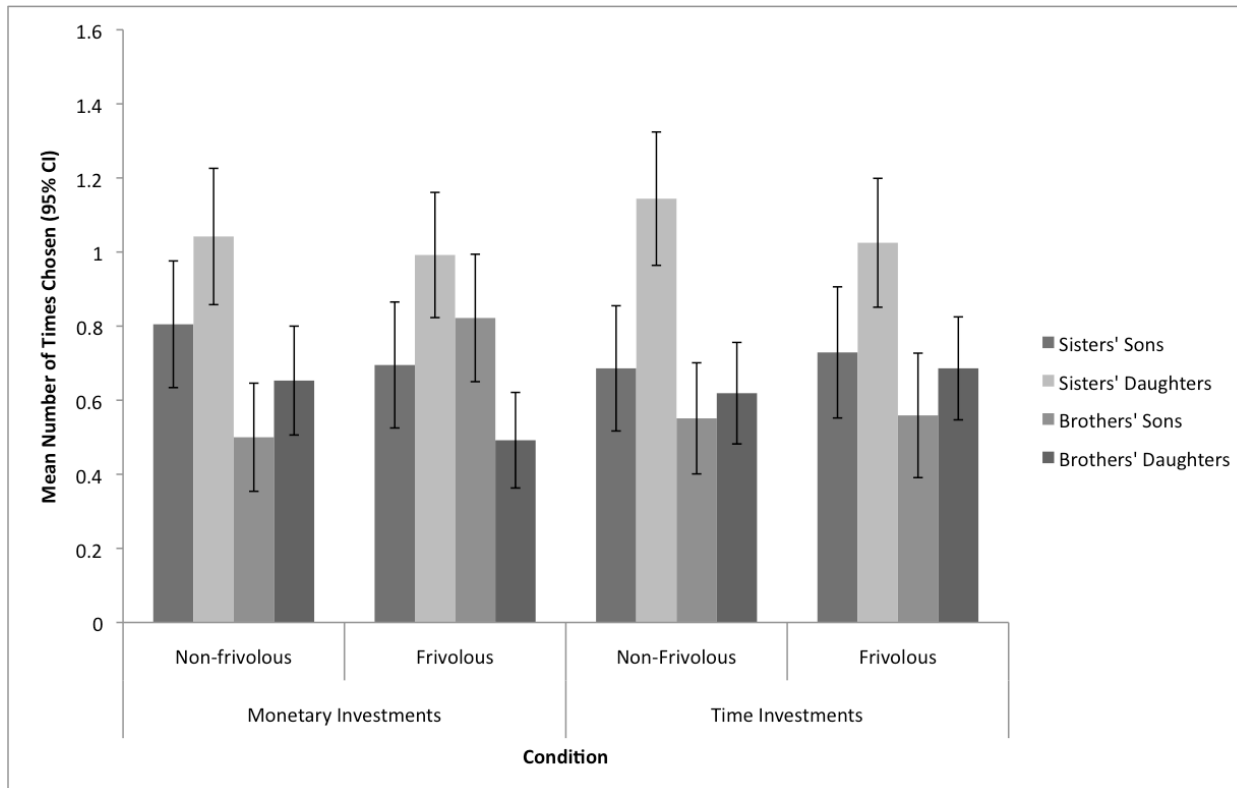


Figure 1c. *Fa'afafine*

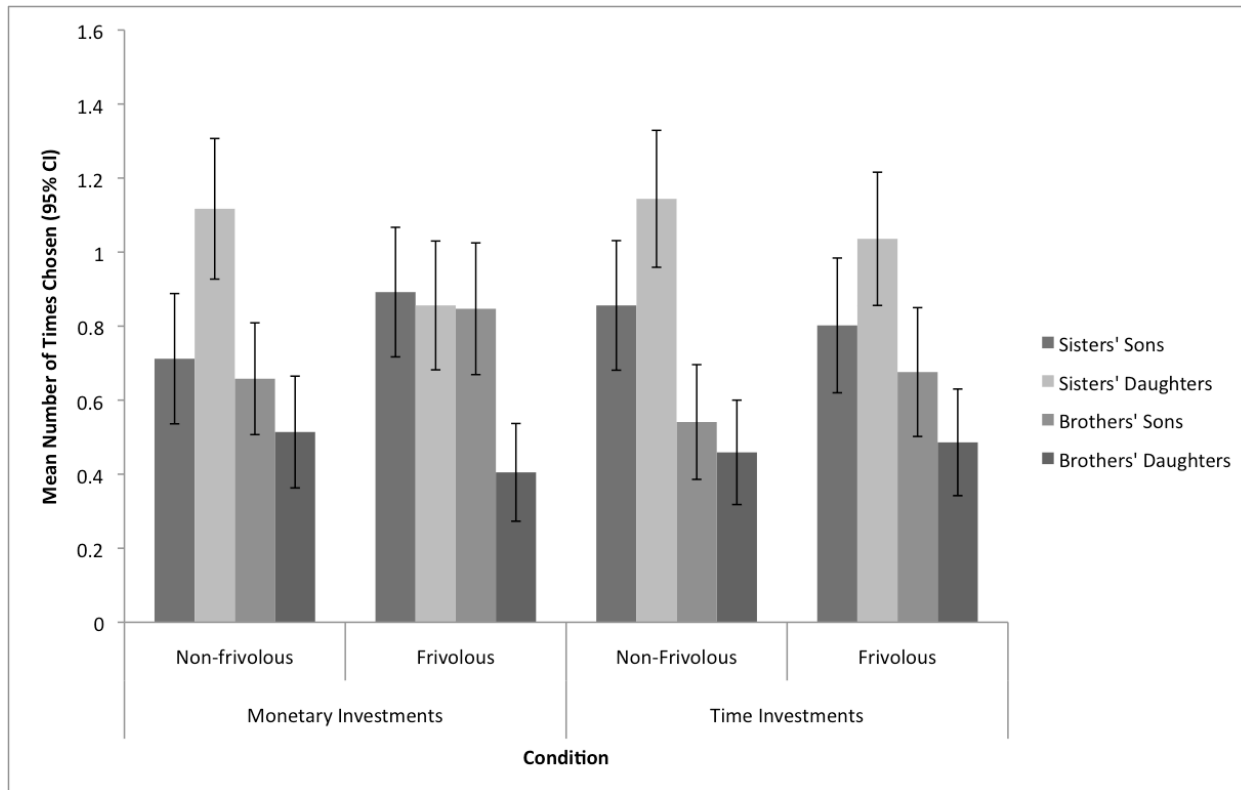


Figure 7.2. Investment choice patterns toward Older Siblings' Sons, Older Siblings' Daughters, Younger Siblings' Sons, and Younger Siblings' Daughters among (a) Men, (b) Women, and (c) Fa'afafine.

Figure 2a. Men

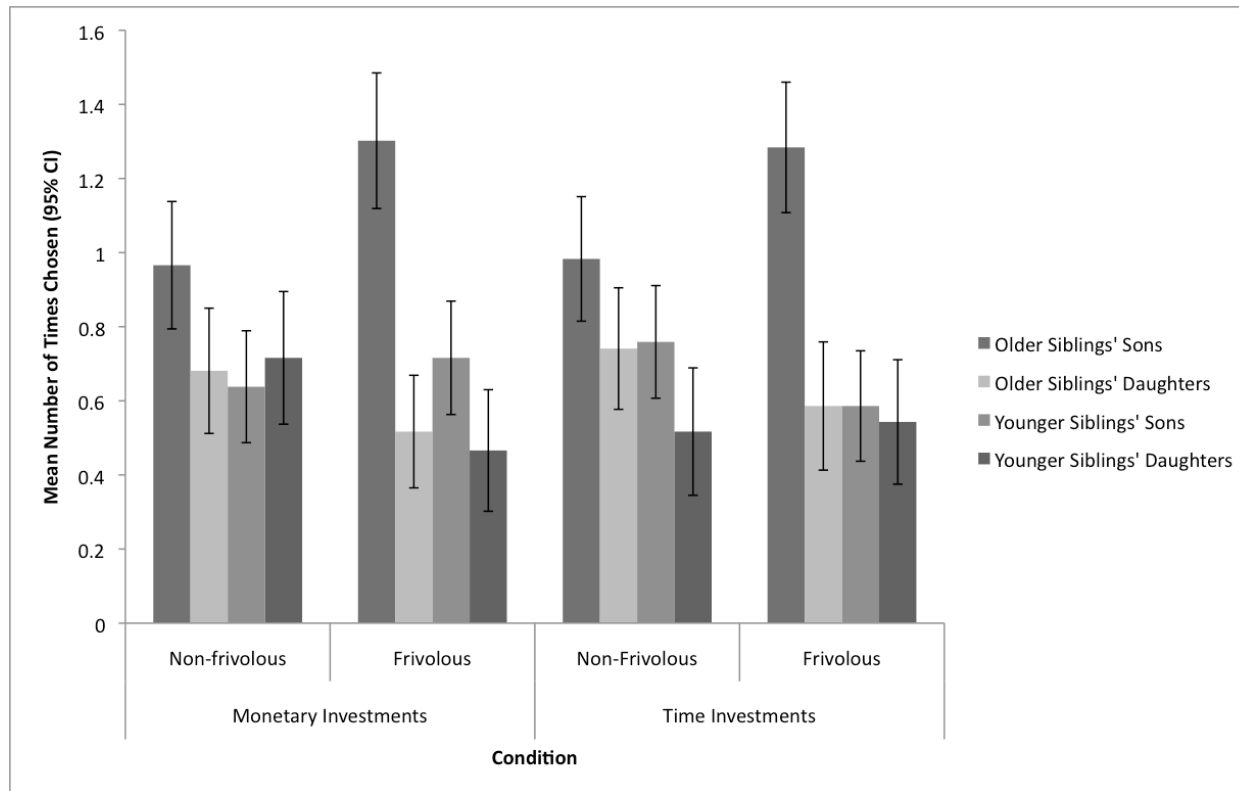


Figure 2b. Women

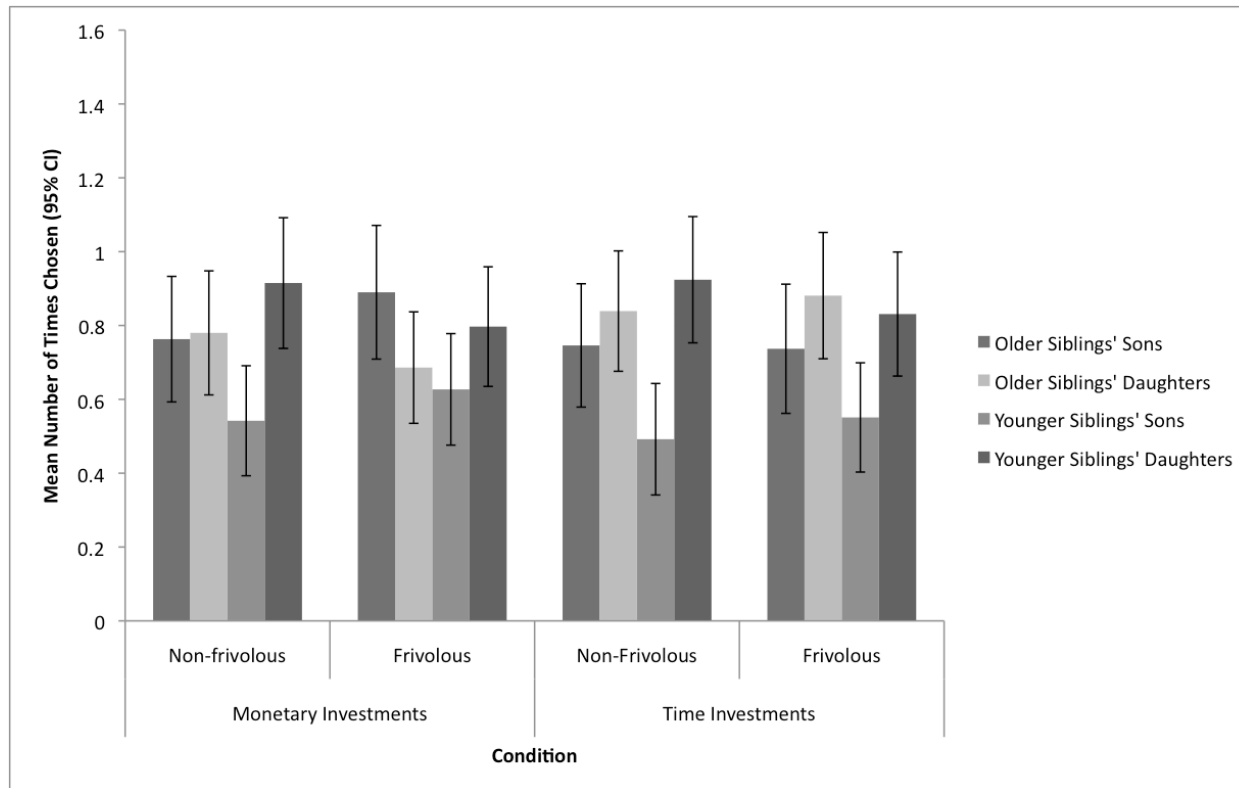


Figure 2c. *Fa'afafine*

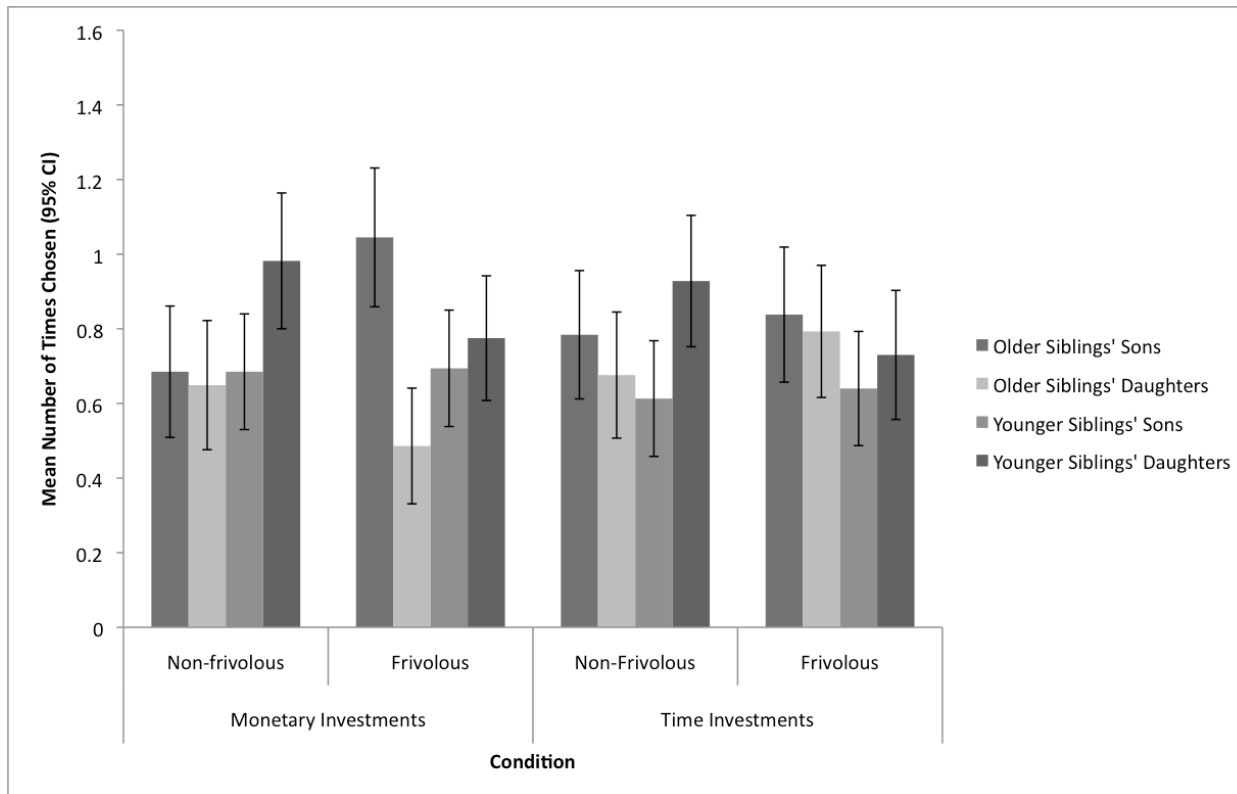


Figure 7.3. *Non-frivolous relative to frivolous investment patterns for (a) Sisters' Sons, Sisters' Daughters, Brothers' Sons, and Brothers' Daughters, and (b) Older Siblings' Sons, Older Siblings' Daughters, Younger Siblings' Sons, and Younger Siblings' Daughters.*

Figure 3a. Sisters' Sons, Sisters' Daughters, Brothers' Sons, and Brothers' Daughter

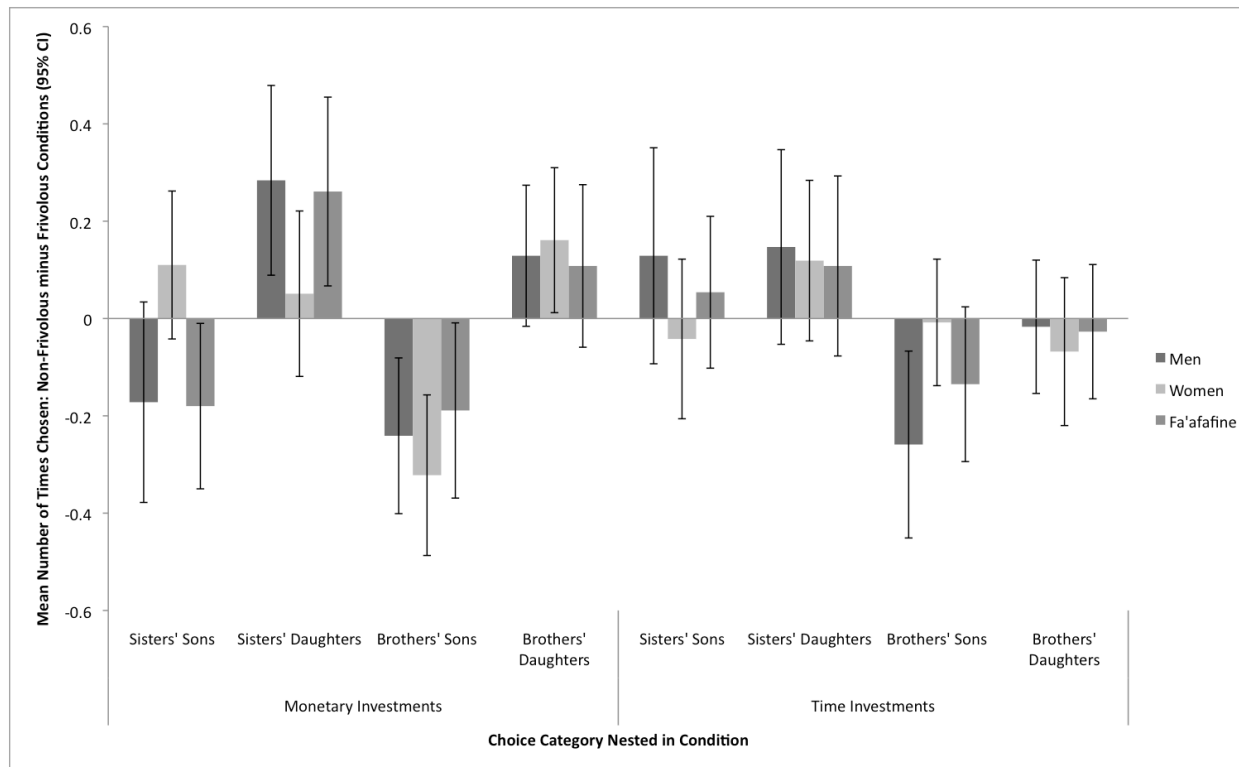


Figure 3b. Older Siblings' Sons, Older Siblings' Daughters, Younger Siblings' Sons, and Younger Siblings' Daughters

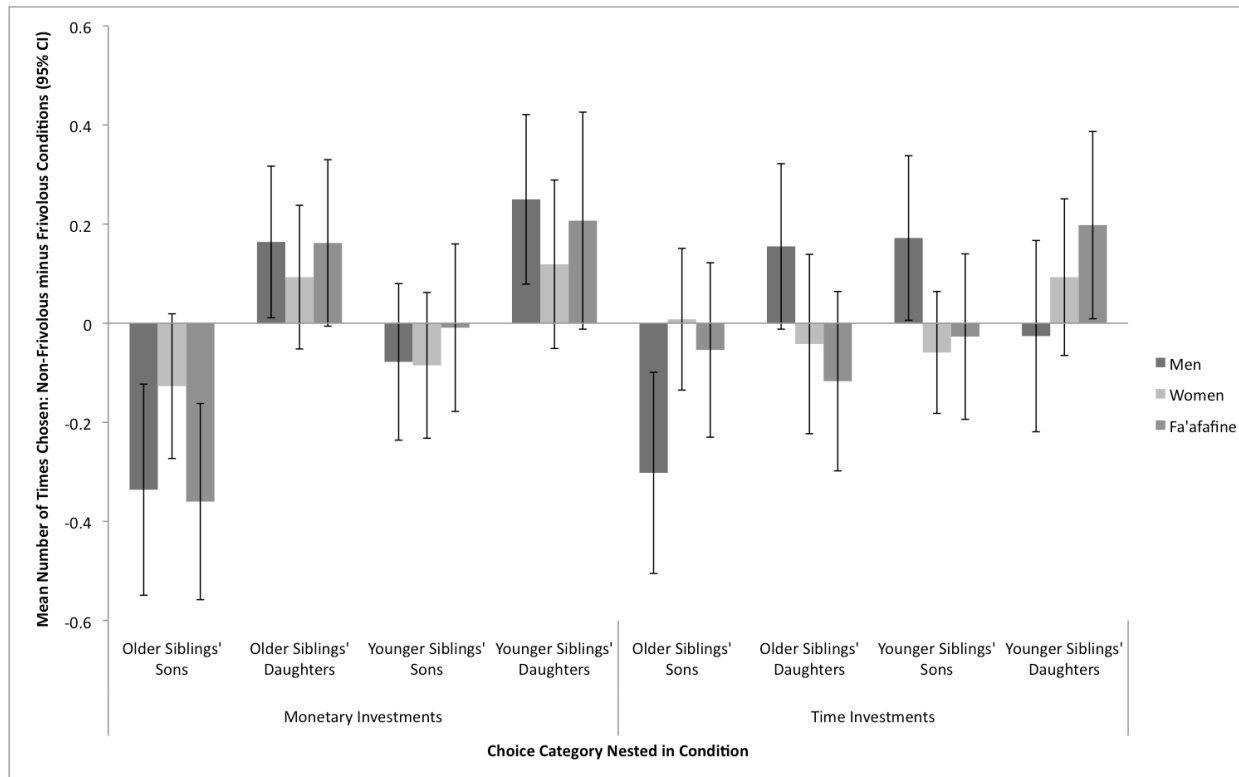


Figure 7.4. Between-group comparisons of investment choice patterns toward Sisters' Sons, Sisters' Daughters, Brothers' Sons, and Brothers' Daughters. Effect size (Cohen's *d*) differences of men and women relative to *fa'afafine* for (a) Time Investments, and (b) Monetary Investments.

Figure 4a. Time Investments

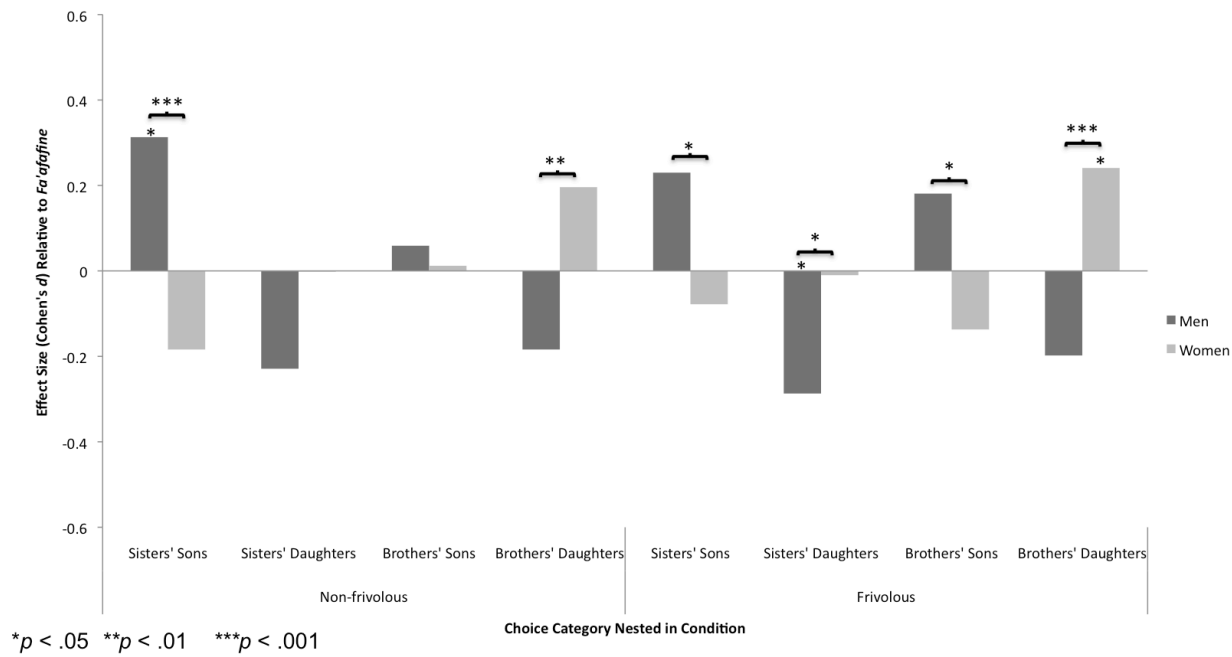


Figure 4b. Monetary Investments

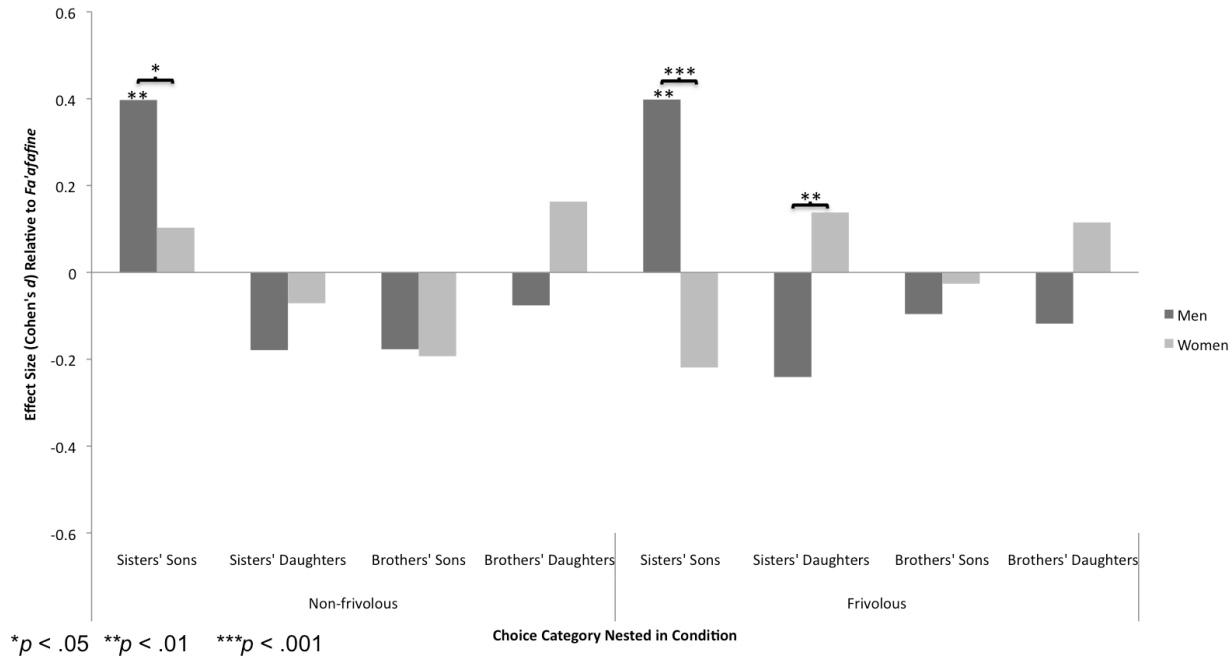


Figure 7.5. Between-group comparisons of investment choice patterns toward Older Siblings' Sons, Older Siblings' Daughters, Younger Siblings' Sons, and Younger Siblings' Daughters. Effect size (Cohen's *d*) differences of men and women relative to fa'afafine for (a) Time Investments, and (b) Monetary Investments.

Figure 5a. Time Investments

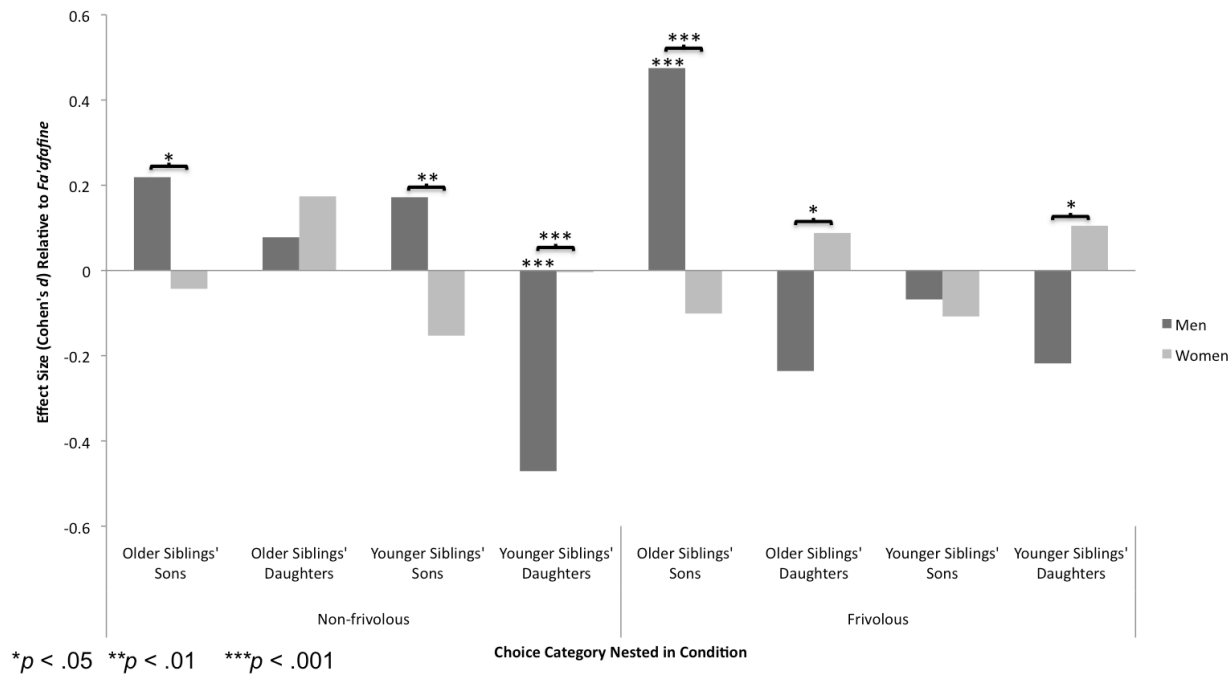
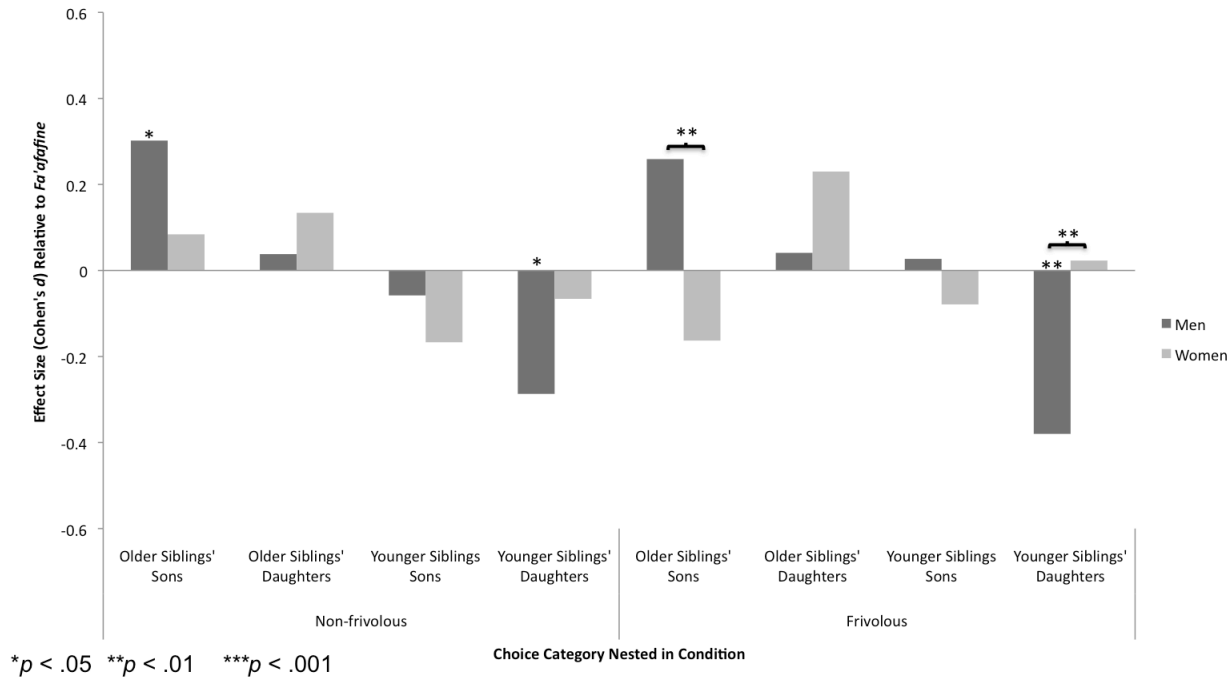


Figure 5b. Monetary Investments



CHAPTER 8

Birth Order and Avuncular Tendencies in Samoan Men and *Fa'afafine*

Abstract

Compared to Samoan gynephilic men, *fa'afafine* exhibit greater avuncular tendencies and also tend to have greater numbers of older brothers and older sisters. The present study examined whether the Samoan male sexual orientation difference in avuncular tendencies was owing to these parallel differences in number of older brothers and older sisters. The sample included 204 *fa'afafine* and 272 Samoan gynephilic men. Each participant completed a measure of avuncular tendencies as well as reported their numbers of older and younger biological brothers and sisters. Compared to Samoan gynephilic men, *fa'afafine* had significantly higher avuncular tendencies scores as well as significantly greater numbers of older brothers and older sisters. Among *fa'afafine*, but not Samoan gynephilic men, number of older brothers and number of older sisters were both significantly positively associated with avuncular tendencies. Number of older brothers partially mediated the Samoan male sexual orientation difference in avuncular tendencies, whereas number of older sisters completely mediated this difference. Discussion detailed how these findings help hone in on the proximate basis of elevated avuncular tendencies among *fa'afafine*. In addition, discussion focused on how particular evolutionary and cultural factors might relate to the avuncular cognition of *fa'afafine*.

Introduction

Androphilia refers to sexual attraction and arousal to adult males, whereas *gynephilia* refers to sexual attraction and arousal to adult females. In Samoa, androphilic males are referred to as *fa'afafine*, which means “in the manner of a woman.” Most *fa'afafine* do not self-identify as men or women; rather, they self-label as *fa'afafine*. Overall, *fa'afafine* tend to be effeminate in appearance and mannerisms, and from a Western cultural perspective many would be described as effeminate males while others would be described as transgendered. They range from extremely feminine to unremarkably masculine, although instances of the latter are quite rare (Bartlett & Vasey, 2006; Schmidt, 2003; Vasey & Bartlett, 2007). Despite this heterogeneity in gender role presentation, *fa'afafine* are, with very few exceptions, androphilic, and consequently, almost without exception, childless (Vasey et al., 2007; Vasey & VanderLaan, 2010a). Because male same-sex sexual partner preference appears to have a genetic basis (Alanko et al., 2010; Bailey et al., 2000; Kendler et al., 2000; Långström et al., 2010), lower reproductive output by androphilic males raises the question of how genetic factors underlying male androphilia persist from one generation to the next.

The kin selection hypothesis for male androphilia (Wilson, 1975) offers a potential answer to this question. This hypothesis postulates that male androphiles compensate for their lack of direct reproduction by enhancing the reproduction of close kin. Because close kin share common genes by virtue of descent (Hamilton, 1963), androphilic males may facilitate the perpetuation of genes for male androphilia by allocating altruism toward close kin, thereby helping kin increase their reproductive success. To date, studies conducted in cultures in which androphilic males identify as

“gay” or “homosexual men” have indicated that such men do not exhibit elevated kin-directed altruism (United States: Bobrow & Bailey, 2001; Canada: Forrester et al., 2011; UK: Rahman & Hull, 2005; Japan: Vasey & VanderLaan, in press).

Because gay men in such sociocultural environments might be likely to experience factors that could potentially interfere with the expression of kin-directed altruism (Bobrow & Bailey, 2001; Vasey et al., 2007), such as homophobia and geographic disconnectedness from kin, a series of studies examined kin-directed altruism in Samoan androphilic males (i.e., *fa'afafine*). *Fa'afafine* tend to experience social tolerance within Samoan society and, like all Samoans, they tend to live either with kin or nearby in closely situated dwellings (see Vasey et al., 2007). In three independent samples, *fa'afafine* reported greater willingness to allocate time and money toward caring for their nieces and nephews compared to Samoan gynephilic men (VanderLaan & Vasey, in press; Vasey et al., 2007; Vasey & VanderLaan, 2010a). In another study, these elevated avuncular (i.e., uncle-like) tendencies manifested behaviourally in the form of greater monetary donations toward certain categories of nieces (Vasey & VanderLaan, 2010b). Hence, the findings from these Samoan studies are consistent with the kin selection hypothesis for male androphilia.

Regardless of whether this evolutionary hypothesis is accurate, a comprehensive understanding of this male sexual orientation difference requires consideration of proximate factors that might underlie the development of elevated avuncular tendencies in *fa'afafine*. A number of potential proximate factors have already been identified as unlikely to be responsible; *fa'afafine* do not exhibit elevated avuncular tendencies because they lack parental responsibilities (Vasey & VanderLaan, 2009, 2010a), assume

the caretaking role typical of women (Vasey & VanderLaan, 2009), have increased willingness to help any children regardless of kinship status (Vasey & VanderLaan, 2010c), or invest less in romantic or sexual relationships (VanderLaan & Vasey, in press). Of the remaining possibilities, the most tenable candidate explanations for the elevated avuncular tendencies of *fa'afafine* are those that emphasize the role of factors that are known to differ between Samoan gynephilic men and *fa'afafine* (Bailey et al., 1994; VanderLaan & Vasey, 2008).

Previous research has established that Samoan gynephilic men and *fa'afafine* differ on aspects related to sibship composition (VanderLaan & Vasey, 2011; Vasey & VanderLaan, 2007). Compared to Samoan gynephilic men, *fa'afafine* tend to be later born among their siblings, with greater numbers of older brothers and older sisters. It is reasonable, then, to question whether these male sexual orientation differences in sibship composition characteristics are somehow related to the parallel differences in avuncular tendencies. For example, it has been argued that maternal immunological responses to the gestation of successive male fetuses increases the odds of androphilia in subsequent male fetuses because maternal antibodies affect the action of sex hormones, thus promoting the feminization of neural areas associated with sexual orientation in these later-born sons (Bogaert & Skorska, 2011). If so, then this same feminization process may have generalized effects and also influence neural areas related to attachment to family members. For example, studies of childhood separation anxiety suggest that attachment to family members is elevated in girls (Shear, Jin, Ruscio, Walters, & Kessler, 2006) as well as pre-androphilic boys (VanderLaan, Gothreau, Bartlett, & Vasey, 2011b; Vasey, VanderLaan, Gothreau, & Bartlett, 2011; Zucker, Bradley, & Sullivan, 1996).

Alternatively, compared to Samoan gynephilic men, *fa'afafine* may be more likely to actually have nieces and nephews due to the fact that they tend to have greater numbers of older siblings who, by virtue of being older, would presumably be more likely to have reproduced. The greater presence of nieces and nephews may, therefore, evoke elevated avuncular tendencies in *fa'afafine* (VanderLaan & Vasey, in press).

In any case, for these or any other possible explanations that draw on the importance of sibship characteristics to be considered feasible, sibship characteristics have to be associated with avuncular tendencies. Furthermore, it would also have to be demonstrated that the Samoan male sexual orientation difference in avuncular tendencies is owing to differences in sibship composition. Here, the relationship between sexual orientation, avuncular tendencies, and sibship characteristics in Samoan men and *fa'afafine* was examined in order to assess whether Samoan male sexual orientation differences in sibship composition might be relevant to the expression of elevated avuncular tendencies in Samoan *fa'afafine*.

Method

Participants

All participants were recruited through a network sampling procedure on the two larger and more populated Samoan islands of Upolu and Savai'i. A network sampling procedure involves contacting initial participants who display qualities of interest (i.e., status as *fa'afafine* or gynephilic man), then obtaining referrals from them to additional participants who, in turn, provide further referrals, and so on. The rate of participation for both groups was greater than 90%. Over the course of seven field trips (August-September, 2005; December, 2005-January, 2006; September-October, 2006; March-

June, 2007; December, 2007; July-September, 2008; June-August, 2010), we collected data pertaining to avuncular tendencies and sibship composition from 204 self-identified Samoan *fa'afafine* and 272 self-identified Samoan gynephilic men. The majority of these participants contributed data to previously published studies (for independent samples pertaining to sibship composition, see VanderLaan & Vasey, 2011; Vasey & VanderLaan, 2007; for independent samples pertaining to avuncular tendencies, see VanderLaan & Vasey, in press; Vasey et al., 2007; Vasey & VanderLaan, 2010a). Hence, the data presented here do not provide a replication of previous studies pertaining to sibship composition or avuncular tendencies. Rather, the present study makes a novel contribution by providing the first examination of the associations among these variables.

Procedure and Measures

All participants were interviewed using a standardized questionnaire that was available in English and Samoan, after being translated and back-translated by two fluent Samoan-English speakers. A Samoan-speaking research assistant was present to answer Samoan-speaking participants' questions. The questionnaire contained questions concerning basic biographic information regarding sexual orientation, age, income, and level of education received.

Sexual orientation was assessed using Kinsey ratings (Kinsey et al., 1948). Specifically, participants were asked the following question: "Which statement best describes your sexual feelings during the last year?" Participants then selected one of the following seven possible responses: "sexual feelings only toward females" (Kinsey rating = 0), "most sexual feelings toward females, but an occasional fantasy about males" (Kinsey rating = 1), "most sexual feelings toward females, but some definite fantasy

about males” (Kinsey rating = 2), “sexual feelings about equally divided between males and females with no strong preference for one or the other” (Kinsey rating = 3), “most sexual feelings toward males, but some definite fantasy about females” (Kinsey rating = 4), “most sexual feelings toward males, but an occasional fantasy about females” (Kinsey rating = 5), or “sexual feelings only toward males” (Kinsey rating = 6). Samoans, both inside and outside the *fa’afafine* community, recognize that *fa’afafine* are biological males that are socially distinct from men and women. Nevertheless, for the sake of consistency, participants were told, prior to answering questions pertaining to the Kinsey ratings, that the category “males” included straight men and/or *fa’afafine*, whereas the category “females” included women. In total, 203 (99.5%) *fa’afafine* described their sexual feelings as exclusively androphilic (Kinsey rating = 6), and the remaining one (0.5%) reported most sexual feelings toward males, but occasional fantasies about females (Kinsey rating = 5). For gynephilic men, 262 (96.3%) described their sexual feelings as exclusively gynephilic (Kinsey rating = 0), and the remaining 10 (3.7%) reported most sexual feelings toward females, but occasional fantasies about males (Kinsey rating = 1).

The age ranges of Samoan *fa’afafine* and gynephilic men in the replication sample were 18-65 and 18-69, respectively. There was no statistically significant difference between these groups with respect to age (*fa’afafine*, mean \pm SD = 29.48 \pm 8.43; gynephilic men, 29.25 \pm 9.19; two-tailed independent *t*-test, $t(474) = -0.28$, $p = .78$). Average weekly income was coded in an ordinal fashion as follows: 1 = 0 to 199 Samoan Tala, 2 = 200 to 499 Samoan Tala, and 3 = 500 or more Samoan Tala. A chi-square test of independence showed that men and *fa’afafine* differed for average weekly income (for

fa'afafine and gynephilic men, respectively, 0 to 199 Samoan Tala: 117 (57.4%) and 205 (75.4%); 200 to 499 Samoan Tala: 55 (30%) and 50 (18.4%); 500 or more Samoan Tala: 32 (12.6%) and 17 (6.2%); $\chi^2(2) = 19.57, p < .001$. Level of education received was coded in an ordinal fashion as follows: 1 = high school or less, and 2 = post-secondary. A chi-square test of independence showed that men and *fa'afafine* differed for level of education received (for *fa'afafine* and gynephilic men, respectively, high school or less: 106 (52%) and 171 (62.9%); post-secondary: 98 (48%) and 101 (37.1%); $\chi^2(1) = 5.70, p = .017$).

The questionnaire also included a section pertaining to sibship composition. Specifically, participants were asked to list all of the children their mothers gave birth to from first- to last-born. In addition to indicating their own birth order, participants indicated whether each sibling was male or female. Four data points related to sibship composition were recorded for each participant: number of older brothers, number of older sisters, number of younger brothers, and number of younger sisters.

To measure avuncular tendencies, all participants completed a subscale comprised of nine items that was used in previous research (e.g., Bobrow & Bailey, 2001; Vasey et al., 2007). Specifically, participants were asked to imagine that a brother or sister lived nearby (i.e., in the same village) and asked for help with the following childcare activities: (a) babysitting for an evening, (b) babysitting on a regular basis, (c) taking care of the children for a week while their parents are away, (d) buying toys for the children, (e) tutoring one of the children in a subject you know well, (f) helping to expose the children to art and music, (g) contributing money for daycare, (h) contributing money for the children's medical expenses, and (i) contributing money for the children's education.

Responses to these items were based on a 7-point Likert-type scale that ranged from 1 = “Very Unwilling” to 7 = “Very Willing.” Avuncular tendencies scores were calculated as the mean response to these nine items.

Results

Internal consistency reliabilities, standardized item *alpha* (α), were calculated for responses on the avuncular tendencies subscale. Reliabilities were appreciable (*fa’afafine*: $\alpha = .72$; gynephilic men: $\alpha = .82$; total sample: $\alpha = .79$). Table 8.1 shows descriptive statistics pertaining to avuncular tendencies and sibship variables.

Given the group differences in average weekly income and level of education received, I first examined whether these variables were predictive of avuncular tendencies using linear regression. Average weekly income was not a statistically significant predictor ($B = .14$, $SE(B) = .08$, 95 % CI = $-.01, .30$, $\beta = .08$, $p = .07$), nor was level of education received ($B = .01$, $SE(B) = .11$, 95 % CI = $-.21, .22$, $\beta < .01$, $p = .94$). Nonetheless, to control for these biographic variables when examining avuncular tendencies, I performed stepwise linear regression analyses with these variables entered on the first step and focal variables entered on the second step. As such, none of the findings reported below pertaining to avuncular tendencies are confounded by either of these variables.

To assess whether the Samoan male sexual orientation difference in avuncular tendencies was mediated by sibship characteristics, I conducted a series of analyses based on the guidelines of Frazier et al. (2004) and Preacher et al. (2007). The initial step involved examining whether group was predictive of avuncular tendencies scores as well as any of the sibship variables using linear regression analyses in which each sibship

variable was regressed on group separately⁴. Compared to gynephilic men, *fa'afafine* had statistically significantly higher avuncular tendencies scores, and greater numbers of older brothers and older sisters (Table 8.2).

Next, using linear regression, I examined which sibship variables were predictive of avuncular tendencies scores after controlling for income and education. For the total sample, in four separate models, I regressed avuncular tendency scores on each of the sibship variables as well as their interaction with group. These interaction terms were calculated as the cross products of each given sibship variable and group, which was dummy coded with *fa'afafine* coded as 1 and men coded as 0, thus permitting analysis of the possibility of moderated mediation (for discussion of moderated mediation, see Preacher et al., 2007). These analyses revealed that the older brothers by group and older sisters by group interaction terms were statistically significant predictors of avuncular tendencies (Table 8.3). These interactions are depicted in Figure 8. 1, which shows that avuncular tendencies were positively associated with number of siblings in these categories, but only among *fa'afafine*.

Based on the above analyses, it is possible that there are moderated mediation effects of number of older brothers and number of older sisters on the Samoan male

⁴ It is important to note that studies of the relationship between birth order and sexual orientation typically examine this relationship in an inverse fashion by assessing the regression of sexual orientation on the sibship variables (i.e., numbers of older brothers, older sisters, younger brothers, and younger sisters) to identify which sibling categories are uniquely predictive of sexual orientation (for example, see Blanchard, 2004). However, testing whether sibship variables mediate the association between sexual orientation and avuncular tendencies, as I did here, required that regression analyses examine the regression of each sibship variable on group (see Frazier et al., 2004). Given this analytical difference, the analyses presented here are not useful for indicating how different categories of siblings might differentially contribute to the development of male androphilia in Samoa. For this latter information, see VanderLaan and Vasey (2011).

sexual orientation difference in avuncular tendencies (i.e., the presence of a statistically significant positive correlation between avuncular tendencies and number of older brothers as well as number of older sisters is moderated by whether the group is *fa'afafine* or gynephilic males, and the Samoan male sexual orientation difference in avuncular tendencies may be mediated by the presence of such correlations among *fa'afafine*). In other words, it is possible that the Samoan male sexual orientation difference in avuncular tendencies is owing to the fact that avuncular tendencies is positively correlated with number of older brothers and number of older sisters among *fa'afafine*. To examine whether such was the case, I conducted stepwise linear regression analyses predicting avuncular tendencies scores in which the interaction term was entered as a predictor on the second step, after the income and education control variables, and group was entered as a predictor on the third step. Thus, the interaction term was controlled when comparing groups. I conducted separate analyses for each interaction term.

After controlling for the older brothers by group interaction term, *fa'afafine* still tended to have statistically significantly higher avuncular tendencies scores ($B = .31$, $SE(B) = .14$, 95 % CI = .04, .59, $\beta = .13$, $p = .027$). In other words, the Samoan male sexual orientation difference in avuncular tendencies remained after controlling for the fact that *fa'afafine* had significantly more older brothers than gynephilic males. Given that a statistically significant effect of group remained, the greater number of older brothers among *fa'afafine* does not produce complete moderated mediation of the Samoan male sexual orientation difference in avuncular tendencies. Still, the greater number of older brothers among *fa'afafine* was a statistically significant partial moderated mediator of

this Samoan male sexual orientation difference (one-tailed Sobel's test: $z = 2.37, p = .006$).

After controlling for the older sisters by group interaction term, there was no longer a statistically significant effect of group toward avuncular tendencies scores ($B = .23, SE(B) = .14, 95\% CI = -.04, .51, \beta = .10, p = .10$). In other words, the Samoan male sexual orientation difference in avuncular tendencies ceased to exist after controlling for the fact that *fa'afafine* had significantly more older sisters than gynephilic males. This lack of a statistically significant group difference was due to a statistically significant complete moderated mediation effect of number of older sisters among *fa'afafine* toward the Samoan male sexual orientation difference in avuncular tendencies (one-tailed Sobel's test: $z = 1.81, p = .035$).

Discussion

The present study examined whether the elevated avuncular tendencies of Samoan *fa'afafine*, compared to those of Samoan gynephilic men, were related to differences in sibship characteristics. *Fa'afafine* and gynephilic men did not differ significantly for number of younger brothers or number of younger sisters. Furthermore, these sibship variables were not significantly predictive of avuncular tendencies. Given that these associations were lacking, number of younger brothers and number of younger sisters were not candidate mediators of the Samoan male sexual orientation difference in avuncular tendencies.

In contrast, *fa'afafine* had significantly more older brothers and older sisters relative to Samoan gynephilic men. Furthermore, although number of older brothers and older sisters was not predictive of avuncular tendencies scores across both groups, there

was a significant interaction with group whereby *fa'afafine*'s, but not gynephilic men's, avuncular tendencies scores were significantly positively correlated with number of older brothers and number of older sisters, respectively. Based on these interactions with group, it was possible that the Samoan male sexual orientation difference in avuncular tendencies was owing to the fact that *fa'afafine* had significantly more older brothers and older sisters.

Subsequent analyses showed that there was still a significant group difference in avuncular tendencies after controlling for number of older brothers among *fa'afafine*. Yet, number of older brothers among *fa'afafine* was a significant partial moderated mediator of this group difference. In other words, number of older brothers among *fa'afafine* accounted for part, but not all, of the Samoan male sexual orientation difference in avuncular tendencies. Based on this finding, hypotheses that emphasize the role of factors related to the Samoan male sexual orientation difference in number of older brothers as contributing to the parallel difference in avuncular tendencies may be considered tenable. For example, the developmental process by which older brothers increase the chances of expressing male androphilia might also contribute to the expression of elevated avuncular tendencies. Alternatively, if number of older brothers is positively correlated with number of actual nieces and nephews, then the relatively greater presence of nieces and nephews might contribute to the elevated avuncular tendencies of *fa'afafine*. At the same time, however, because only partial, and not complete, moderated mediation was documented, the present study indicates that number of older brothers is insufficient to completely account for additional sexual orientation-related traits in males. This finding is consistent with the existing literature on the

association between number of older brothers and additional sexual orientation-related traits in males. For example, past research has shown that number of older brothers does not appear to be associated with other known correlates of male sexual orientation, including adulthood psychological traits (i.e., psychological gender and mental rotation ability; Rahman, 2005) and childhood femininity (Bogaert, 2003b).

With respect to the influence of older sisters, after controlling for the number of older sisters among *fa'afafine*, there was no longer a statistically significant Samoan male sexual orientation difference in avuncular tendencies. Number of older sisters among *fa'afafine* was a significant complete moderated mediator of the group difference in avuncular tendencies. In other words, the Samoan male sexual orientation difference in avuncular tendencies ceases to exist once number of older sisters among *fa'afafine* is taken into account. Hence, hypotheses that emphasize the role of factors related to the Samoan male sexual orientation difference in number of older sisters to explain the parallel difference in avuncular tendencies may be considered tenable. For example, as was the case with number of older brothers, if number of older sisters is positively correlated with number of actual nieces and nephews, then the relatively greater presence of nieces and nephews might contribute to the elevated avuncular tendencies of *fa'afafine*. This particular hypothesis may be considered especially favorable given that it is consistent with the mediating effects of both older brothers and older sisters, who would be more likely to have children, as well as the lack of mediating effects associated with younger brothers and younger sisters, who would be less likely to have children. The present study has, therefore, further honed in on the proximate basis for *fa'afafine*'s

elevated avuncular tendencies by implicating the presence of siblings with children as being of particular importance.

Still, the question remains as to why *fa'afafine* exhibited greater avuncular tendencies with increases in number of older siblings while Samoan gynephilic men did not. Moreover, the question remains as to why the influence of older sisters was more robust. That is, why is it that number of older sisters completely accounted for the Samoan male sexual orientation difference in avuncular tendencies, whereas number of older brothers only partially accounted for it? This latter question is of particular interest given previous findings that indicate *fa'afafine*'s avuncular tendencies are especially focused toward female kin. Compared to Samoan women and gynephilic men, *fa'afafine* exhibit greater monetary investments toward certain categories of nieces, but not nephews (Vasey & VanderLaan, 2010b). Also, in an experimental study comparing *fa'afafine* to Samoan women and gynephilic men, *fa'afafine* exhibited an enhanced bias to direct investment toward their sisters' daughters in non-frivolous investment contexts (e.g., paying for medical fees) compared to frivolous investment contexts (e.g., buying candy; VanderLaan & Vasey, submitted a). The finding that number of older sisters accounts for *fa'afafine*'s elevated avuncular tendencies adds to this existing literature by further indicating that female kin are of particular importance.

The kin selection perspective informs one possible interpretation of these patterns. Compared to gynephilic males, androphilic males rely more heavily on the reproduction of kin to pass their genes to future generations. As such, if male androphilia persisted, primarily or partially, due to the efficient accrual of indirect fitness, then selection should have favored the evolution of enhanced cognitive biases related to maximizing indirect

fitness in androphilic males, relative to men whose life histories will likely be characterized by direct reproduction. For example, research in Canada and Samoa has shown that although all individuals prefer to invest in kin over non-kin children, androphilic males possess distinctive cognitive features for maximizing investment in kin children while minimizing investment in non-kin children (Forrester et al., 2011; Vasey & VanderLaan, 2010c). Another study indicated that Samoan men and women show decreases in their willingness to invest in nieces and nephews when they become involved in romantic or sexual relationships, whereas *fa'afafine* maintain a high level of avuncular tendencies regardless of relationship status (VanderLaan & Vasey, in press). Similarly, the present study showed that the kin investment tendencies of *fa'afafine* increased with the presence of older siblings, whereas those of Samoan gynephilic men did not. These findings suggest that the kin investment cognition of *fa'afafine* is sensitive to the relative presence of kin, whereas that of gynephilic males is not. Distinctive features of androphilic male kin investment cognition such as this sensitivity to the relative presence of kin are also consistent with expectations based on the kin selection perspective.

Furthermore, the finding that number of older sisters has a more robust effect than number of older brothers toward the Samoan male sexual orientation difference in avuncular tendencies is also consistent with the kin selection perspective. The mechanics of human reproduction necessarily result in a sexual asymmetry in which a woman's putative genetic offspring is certainly hers, whereas it is less certain for a man. Hence, investments toward sisters', compared to brothers', children will more reliably result in increased indirect fitness. Given this asymmetry and androphilic males' relatively greater

dependence on the reproduction of kin, heightened sensitivity to opportunities to invest in the children of sisters in particular would further enhance indirect fitness. Thus, the fact that number of older sisters completely mediates the Samoan male sexual orientation difference in avuncular tendencies because *fa'afafine* show increases in avuncular tendencies as number of older sisters increases further suggests that androphilic males possess distinctive cognitive mechanisms for maximizing indirect fitness. This finding, therefore, also complements the previous findings detailed above indicating that *fa'afafine's* avuncular cognition produces unique biases to invest in female kin.

The patterns documented here might also be informed by consideration of certain cultural factors. Williams (1992) hypothesized that transgendered androphilic males in many non-Western cultures excel at various labor practices, especially feminine ones, as a way of striving for prestige within their families and communities. He also argued that one consequence of this pattern was that transgendered androphilic males sometimes behave in a competitive manner when executing feminine labor. Anecdotal evidence from Samoa provides some support for these ideas. For example, one *fa'afafine* from the island of Upolu stated “If you cook with a *fa'afafine*, I think a *fa'afafine* will be better than you. If you're cleaning or doing all those kind of stuff that a woman should do, a *fa'afafine* is better than a woman for doing that” (Poe, 2004). Given that childcare in Samoa is primarily a feminine labor practice (Freeman, 1983; Nardi, 1983; Ochs, 1988), it would be valuable if future research assessed whether *fa'afafine*, but not men, strive for prestige by over-excelling in the domain of avuncularity. In addition, cultural factors might also explain why number of older sisters completely accounted for *fa'afafine's* elevated avuncular tendencies, whereas number of older brothers only partially did so. In

Samoa, relations between opposite-sex, but not necessarily same-sex, siblings carry an implicit expectation of interdependence and cooperation (Shore, 1978, 1982). Future research should, therefore, also consider whether status striving among *fa'afafine* and Samoan cultural norms pertaining to sibling relations combine to influence the patterns documented here.

Although such cultural factors might contribute to the present findings, there are a number of reasons to doubt that they provide a completely sufficient explanation. To begin with, it is not apparent that cultural factors can account for certain aspects of the distinctive avuncular cognition of *fa'afafine*. Such aspects include *fa'afafine*'s distinctive cognition for dissociating investment in kin children from non-kin children, which would enable maximizing investment in kin children and minimizing investment in non-kin children (Vasey & VanderLaan, 2010c), as well as their tendency to exhibit an enhanced bias to invest in sisters' daughters in non-frivolous investment contexts specifically, as opposed to frivolous ones (VanderLaan & Vasey, submitted a). Furthermore, culturally-specific factors cannot account for cross-cultural consistencies among androphilic males. For example, distinctive features of avuncular cognition exhibited by *fa'afafine* are also exhibited by non-transgendered, Canadian androphilic "gay" males (Forrester et al., 2011). In addition, prospective and retrospective research indicates that pre-androphilic boys in both Canada and Samoa experience elevated traits of childhood separation anxiety (VanderLaan et al., 2011b; Vasey et al., 2011; Zucker et al., 1996). VanderLaan, Gothreau, Bartlett, and Vasey (2011a) suggested that elevated separation anxiety may be a cross-culturally universal pattern of psychosexual development in pre-androphilic boys that is indicative of elevated attachment toward kin and, as such, may represent a

developmental precursor of elevated adulthood kin-directed altruism. Whereas culturally-specific explanations are insufficient in these regards, the kin selection hypothesis for male androphilia presents a viable alternative that provides consilience among these various findings. Hence, in addition to examining the potential influence of cultural factors, future research should also continue to assess the efficacy of the kin selection hypothesis for male androphilia by examining the kin investment cognition of androphilic males across cultures.

Table 8.1. *Descriptive statistics for avuncular tendencies scores and sibship variables.*

Variable	<i>Fa'afafine</i>		Gynephilic Men	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Avuncular tendencies scores ^a	5.93	0.89	5.56	1.32
Number of older brothers	1.84	1.71	1.22	1.39
Number of older sisters	1.74	1.58	1.14	1.23
Number of younger brothers	1.07	1.25	0.94	1.17
Number of younger sisters	1.01	1.28	1.11	1.14

^aAbsolute range, 1-7

Table 8.2. *Linear regression of avuncular tendencies scores and sibship variables on group (men coded as 0, fa'afafine coded as 1).*

Dependent Variable	<i>B</i>	<i>SE</i>	95% CI	β	<i>p</i>
Avuncular tendencies scores ^a	.35	.11	.13, .56	.15	.002
Older brothers	.31	.07	.17, .45	.20	< .001
Older sisters	.30	.07	.17, .42	.20	< .001
Younger brothers	.06	.06	-.05, .17	.05	.27
Younger sisters	-.05	.06	-.16, .06	-.04	.39

^aControlling for average weekly income and level of education received.

Table 8.3. Linear regression of avuncular tendencies on sibship variables as well as sibship variables' interaction with group (*men coded as 0, fa'afafine coded as 1*).

Predictor ^a	<i>B</i>	<i>SE B</i>	95%CI	β	<i>p</i>
Older brothers	-.07	.05	-.16, .02	-.10	.12
Older brothers x Group	.14	.05	.04, .24	.17	.006
Older sisters	-.01	.05	-.11, .10	.00	.96
Older sisters x Group	.12	.06	.01, .23	.14	.027
Younger brothers	-.06	.06	-.17, .05	-.06	.31
Younger brothers x Group	.13	.07	-.01, .27	.11	.06
Younger sisters	-.09	.06	-.19, .02	-.09	.12
Younger sisters x Group	.12	.07	-.02, .25	.10	.09

^aEach sibship variable and its interaction with group were entered as pairs in separate stepwise linear regression analyses. Predictor variables were entered on the second step of each analysis, with average weekly income and level of education received controlled by entering them on the first step.

Figure 8.1. Regression of avuncular tendencies score on numbers of (a) older brothers and (b) older sisters for gynephilic men and fa'afafine.

Figure 8.1a. Older Brothers

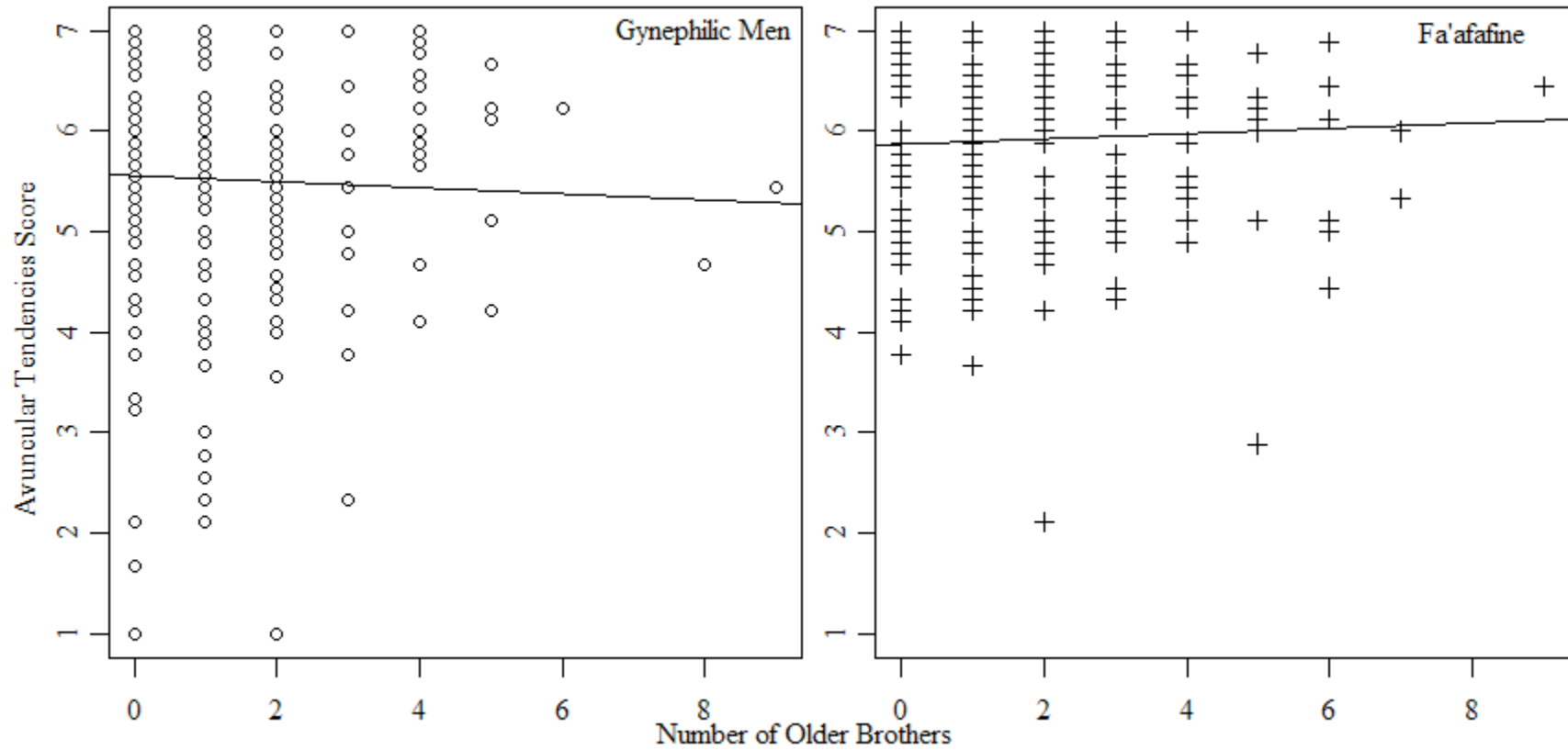
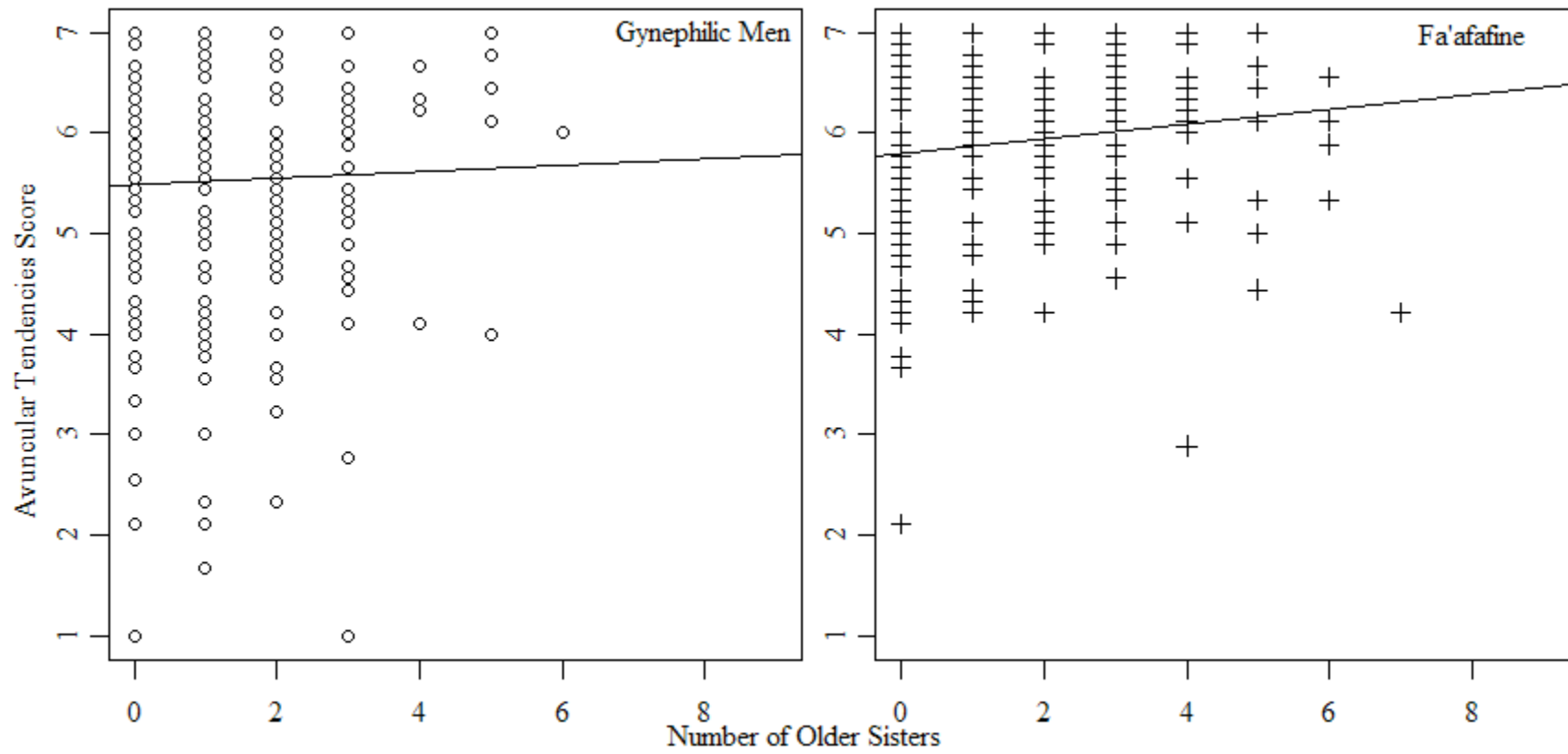


Figure 8.1b. Older Sisters



CHAPTER 9

The Development of the Avuncular Androphilic Male Phenotype

Abstract

In a number of respects, transgendered Samoan *fa'afafine* and Western sex-gender congruent androphilic males appear to be developmentally similar. One important difference, however, concerns willingness to allocate time and money toward caring for nieces and nephews. Samoan *fa'afafine* exhibit elevated avuncularity, whereas sex-gender congruent androphilic men do not. This difference is unlikely to be due to isolated cultural factors such as differences in social acceptance toward androphilic males, geographic proximity to kin, and individualism versus collectivism. Here, I consider whether this cross-cultural difference in elevated avuncularity is developmentally contingent on the transgendered, feminine expression of male androphilia. Research in Canada and Samoa has indicated that feminine, (pre-)androphilic boys experience elevated attachment to kin that is expressed as elevated traits of separation anxiety. The continued expression of such elevated attachment to kin throughout childhood and into adulthood might be contingent on the continued expression of femininity that occurs more reliably among transgendered, but not sex-gender congruent, male androphiles. Broader theoretical and empirical literature, which is consistent with this model, is also discussed.

Cross-Cultural Similarities and Differences Among Androphilic Males

In the preceding chapters, the existence of developmental and biodemographic consistencies among androphilic Samoan *fa'afafine* and androphilic sex-gender congruent men from Western cultures was documented. As in the West, Samoan *fa'afafine* show late birth order (VanderLaan & Vasey, 2011; Vasey & VanderLaan, 2007), a fraternal birth order effect (VanderLaan & Vasey, 2011), familial clustering (VanderLaan, Forrester, Petterson, & Vasey, submitted a; VanderLaan, Vokey, & Vasey, submitted), and large family sizes (VanderLaan, Forrester, Petterson, Parker, & Vasey, submitted b; VanderLaan & Vasey, 2011; Vasey & VanderLaan, 2007). In addition, previous research has shown that Samoan *fa'afafine*, like androphilic men in the West, are gender-atypical with respect to childhood behaviour (Bartlett & Vasey, 2006). Based on these developmental consistencies, it appears likely that male androphilia shares the same developmental rudiments in both transgendered Samoan *fa'afafine* and sex-gender congruent Western male androphiles.

Still, these culturally distinct groups show important differences with respect to their willingness to engage in avuncular (i.e., uncle-like) behaviour. Samoan *fa'afafine* show elevated avuncular tendencies and behaviour (VanderLaan & Vasey, in press; Vasey et al., 2007; Vasey & VanderLaan, 2009, 2010a,b), whereas androphilic men from Western cultures and Japan do not (Canada: Abild, VanderLaan, & Vasey, submitted; Forrester et al., 2011; USA: Bobrow & Bailey, 2001; UK: Rahman & Hull, 2005; Japan: Vasey & VanderLaan, in press). Given the developmental similarities among male androphiles in the West and Samoa, these cross-cultural differences are significant in that they raise the question of why Samoan transgendered *fa'afafine*, but not sex-gender

congruent androphilic men, would develop elevated avuncularity. Vasey et al. (2007) outlined four potential differences between Samoa and the West that might potentially explain why elevated avuncularity is expressed among *fa'afafine*, but not among androphilic men in other cultures: (1) level of social tolerance toward androphilic males, (2) geographic proximity to kin, (3) collectivism versus individualism, and (4) transgendered versus sex-gender congruent expression.

To investigate whether social tolerance was likely to be the critical factor involved in the development of elevated avuncularity, Forrester et al. (2011) examined androphilic men's avuncular tendencies in Canada. Compared to other Western countries, Canada is characterized by a lesser amount of homophobia (Anderson & Fetner, 2008). It was reasoned, therefore, that if elevated avuncularity among male androphiles developed in sociocultural environments in which androphilic males experience greater social acceptance, then Canadian androphilic males would be more likely than androphilic males in many other Western populations to express elevated avuncularity. The findings were not consistent with this prediction, however, and Canadian androphilic men did not show elevated avuncular tendencies compared to Canadian gynephilic men and androphilic women. One limitation of this study was that it did not directly test family members' tolerance of participants' sexual orientations. Nevertheless, the tentative conclusion based on this study is that the development of elevated avuncularity among male androphiles does not appear to be contingent on social acceptance of male androphiles on its own.

In another Canadian study, Abild et al. (submitted) examined the influence of geographic proximity toward the expression of avuncularity. This study used two sets of

items, those that assessed willingness to engage in avuncular activities that could be performed at a distance (e.g., provide advice about dating) and those that assessed willingness to perform avuncular activities that required close proximity (e.g., babysitting nieces and nephews). Abild et al. predicted that if elevated avuncularity in the West was mitigated by a lack of proximity among kin, then androphilic men would be more likely to express elevated avuncularity for items that could be performed at a distance. Compared to gynephilic men and androphilic women, however, androphilic men did not show elevated avuncularity for either set of items. Hence, when taken alone, geographic proximity to kin does not seem to be the key factor in the development of elevated avuncularity among androphilic males. That said, future research should further test the influence of geographic proximity toward attitudes concerning caring for nieces and nephews by taking into account actual proximity to nieces and nephews.

To test whether elevated avuncularity was expressed in androphilic males in Samoa because Samoa is a collectivistic culture, Vasey and VanderLaan (in press) examined avuncularity in Japan. Like Samoan culture, Japanese culture is characterized by vertical collectivism, which entails a hierarchical social structure in which group well-being is emphasized over individual well-being (Shore, 1981; Triandis, 1995). It was predicted that if this form of collectivism facilitated elevated avuncularity in androphilic males, then Japanese androphilic men should be more willing to invest in nieces and nephews. Compared to Japanese gynephilic men, however, Japanese androphilic men did not show elevated avuncularity. Based on this lack of a difference between these two groups, it appears that collectivism alone cannot account for elevated avuncularity among androphilic males.

As highlighted by the authors of these three studies, social tolerance toward androphilic males, geographic proximity to kin, and collectivism are not necessarily irrelevant to the development of elevated avuncular tendencies (Abild et al., submitted; Forrester et al., 2011; Vasey & VanderLaan, in press). Rather, they are simply insufficient on their own to account for elevated avuncularity among Samoan *fa'afafine*. They may, nevertheless, contribute to the expression of elevated avuncularity. As such, it is necessary to consider whether the transgendered expression of male androphilia is the key to the development of elevated avuncularity. In what follows, I consider what are likely to be developmental beginnings of elevated avuncular tendencies to identify why this more feminine form of the androphilic male phenotype might be the critical component.

Gender Identity Disorder in Children and Separation Anxiety Disorder

The *Diagnostic and Statistical Manual of Mental Disorders*, 4th edition – Text Revision (DSM-IV-TR; American Psychiatric Association, 2000) instructs mental health professionals to diagnose children with Gender Identity Disorder in Children (GIDC) if they exhibit: (a) a desire to be the other sex⁵ or insistence that they are the other sex (“cross-sex wishes/identification”), and/or (b) a strong and persistent desire to engage in activities typical of the other sex (“cross-sex behaviours”), and (c) a sense of inappropriateness in the gender role associated with their sex (“cross-gender identification”), or (d) discomfort with their biological sex (see American Psychiatric Association, 2000 for the verbatim diagnostic criteria; for possible changes in these

⁵ The word “sex” is commonly used to refer to an individual’s biological status as male or female. In contrast, the word “gender” commonly refers to the social roles expected for males and females within a given culture.

diagnostic criteria in the upcoming DSM-V, see Zucker, 2010). In addition, a criterion for this disorder is that the condition must cause clinically significant distress or impairment in important areas of functioning (for review, see Zucker, 2005). As such, a clinical diagnosis of GIDC in boys reflects more than simply the presence of “sissy-like” behaviour. Estimates of the prevalence of GIDC in boys in Western nations range from .003 to 3% (American Psychiatric Association, 2000; Green, 1995; Zucker, 1990). Research demonstrates that the vast majority of GIDC boys are androphilic in adulthood (Green, 1987; Zucker & Bradley, 1995). Consequently, GIDC boys are sometimes referred to as “pre-androphilic.”

Separation Anxiety Disorder (SAD) is defined in the DSM-IV-TR (American Psychiatric Association, 2000) as developmentally inappropriate and excessive anxiety concerning separation from home or from those to whom the individual is attached (e.g., parents). The separation anxiety must persist for at least one month in order to be diagnosed, and onset needs to be in childhood or adolescence (i.e., less than 18 years of age). In addition, a criterion for this disorder is that the condition must cause clinically significant distress or impairment in important areas of functioning. In contrast to GIDC, SAD is a relatively common disorder that, according to the DSM-IV-TR, affects approximately 4% of children (American Psychiatric Association, 2000).

In clinical samples from Western populations, it is not uncommon for boys who are diagnosed with GIDC to also exhibit traits of childhood separation anxiety (Coates & Person, 1985; Zucker, Bradley, & Sullivan, 1996; but see Wallien, Swaab, & Cohen-Kettenis, 2007). Coates and Person reported that in a sample of boys diagnosed with GIDC, the majority (60%) also satisfied the criteria for a diagnosis of SAD. Zucker et al.

found that boys who met the complete diagnostic criteria for GIDC were significantly more likely to exhibit traits of childhood separation anxiety compared to sub-threshold boys who showed signs of GIDC, but did not meet the complete diagnostic criteria. This finding led Zucker et al. to conclude that GIDC in boys was associated with *elevated traits* of childhood separation anxiety, as opposed to a complete diagnosis of SAD.

As Zucker et al. (1996) highlighted, the link between gender variance and separation anxiety in boys raises the basic question of why such an association exists. A number of hypotheses have emerged from the clinical perspective that bear on this question. For example, Coates and Person (1985) suggested that the emergence of extreme gender variant behaviour in boys was precipitated by separation anxiety, and represented the child's attempt to reconcile distress associated with a physically or emotionally absent mother by becoming a substitute for "Mommy." Similarly, Zucker and Bradley (1995) suggested that emotional distress and anxiety might somehow be relieved via gender variant behaviour and identity. In contrast, others have argued in favor of the opposite causal pathway, namely, that cross-gender behaviour leads to additional symptoms of psychopathology (Pleak, Meyer-Bahlburg, O'Brien, Bowen, & Morganstein, 1989), which may include traits of separation anxiety.

The impression gleaned from such hypotheses is that clinical perspectives tend to conceptualize elevated separation anxiety as part of a more general pattern of psychopathology linked to GIDC in boys. Yet, Zucker et al. (1996) have characterized previous clinical attempts to theorize the link between GIDC and elevated traits of childhood separation anxiety as vague in terms of their articulation of developmental associations, which results in a lack of any strong rationale as to why these particular

traits should co-occur. Indeed, little theoretical or empirical progress has been made with respect to identifying the key factors responsible for this developmental link (Wallien et al., 2007). The lack of progress in this regard may stem, in part, from an overly narrow focus on clinical populations and a conceptual framework that, *a priori*, characterizes the phenomena in question as psychopathological.

Is Elevated Childhood Separation Anxiety Part of a More General Pattern of Femininity in (Pre-)Androphilic Males?

Research conducted in Western populations indicates that SAD is more common among females than males (Shear et al., 2006). Given this sex difference, elevated childhood separation anxiety may simply be a component of the more general pattern of behavioural and psychological femininity that characterizes GIDC boys. In males, common genetic factors appear to underlie the development of various expressions of childhood gender-atypicality (e.g., pretending to be a feminine character during imaginary play, aversion to rough-and-tumble play) as well as androphilia in adulthood (Alanko et al., 2010; Zietsch et al., 2008), lending support to the conclusion that the various components of male femininity are not independent behavioural/psychological units, but rather constitute part of the same behavioural/psychological complex and thus, co-vary. This “generalized femininity hypothesis” differs from traditional clinical perspectives, which hold that GIDC and elevated childhood separation anxiety in boys are overlapping, but separate, phenomena (i.e., comorbid psychopathology).

If childhood separation anxiety is linked to generalized developmental femininity in males, as opposed to factors specific to GIDC, then it should be evident in various non-clinical populations of males, who, like GIDC boys, are feminine in childhood and

androphilic in adulthood. Non-clinical populations of androphilic males are an appropriate group for testing this prediction. Not only do androphilic males exhibit female-typical sexual partner preference, but prospective and retrospective studies conducted in Canada, the USA, and the UK all show that androphilic males tend to exhibit elevated levels of feminine behaviour and identity during childhood when compared to gynephilic males (Bailey & Zucker, 1995; Rieger et al., 2008). This same pattern has also been well documented in a wide variety of non-Western cultures including Thailand, the Philippines, Brazil, Guatemala, Turkey, and Samoa (Bartlett & Vasey, 2006; Cardoso, 2005, 2009; Vasey & Bartlett, 2007; Whitam & Mathy, 1991; Whitam & Zent, 1984).

To test the prediction that elevated childhood separation anxiety would characterize androphilic males in general, VanderLaan et al. (2011b) conducted a study of androphilic (i.e., “gay”) men from the general Canadian population. In this study, androphilic men recalled much more feminine patterns of behaviour and identity during childhood compared to gynephilic (i.e., “straight”) men. With respect to childhood separation anxiety, androphilic men recalled levels that were significantly higher than those of gynephilic men, but similar to those of women. In addition, for androphilic men, but not for women or gynephilic men, increases in recalled childhood femininity were associated with increases in childhood separation anxiety. These findings indicate that increased femininity is associated with increased separation anxiety among pre-androphilic boys.

Research has also considered whether the link between male femininity and elevated childhood separation anxiety exists in Samoa among the *fa’afafine*. Contrary to

the prediction derived from the clinical literature, *fa'afafine* do not experience distress in relation to their cross-gender behaviours during childhood (Vasey & Bartlett, 2007). Rather, when asked how they felt about participating in female-typical behaviours, the modal response they gave was “I loved it.” At the same time, *fa'afafine* participants recalled that they hated being forced to engage in male-typical activities, such as rough-and-tumble play, and it was not unusual for some of them to recall negative feelings about being a boy (Bartlett & Vasey, 2006; Vasey & Bartlett, 2007). With respect to childhood separation anxiety, Vasey et al. (2011) found that *fa'afafine* recalled significantly more childhood separation anxiety compared to Samoan women and gynephilic men. As such, this elevated separation anxiety is unlikely to be related to distress caused by gender variant behaviour. Instead, there must be an alternate explanation.

Taken together, the Canadian and Samoan studies indicate that the link between femininity and elevated childhood separation anxiety in males is not limited to clinical populations. Rather, this non-clinical research, in conjunction with the clinical work on GIDC boys, is consistent with the hypothesis that elevated childhood separation anxiety is simply part of a more general pattern of feminine development exhibited by androphilic males regardless of their cultural milieu.

Elevated Separation Anxiety in GIDC Boys: Pathological or Prosocial?

The tendency of psychologists and psychiatrists to characterize certain traits that appear on extreme ends of the spectrum as maladaptive, aberrant, disordered, pathological, or otherwise dysfunctional has been critically challenged by those taking an evolutionarily minded perspective (e.g., Keller & Miller, 2006; Nesse, 2005). One of the

fundamental themes of such critiques is that properly evaluating whether a trait is truly dysfunctional requires consideration of what the typical, normal function might be for the given trait. If one considers that emotions evolved to guide behaviour toward adaptive courses of action, then it stands to reason that emotional states need not be associated with positive affect in order to be considered adaptive. For example, anxiety is associated with negative affect, but may aid in avoiding potentially harmful events by guiding individuals away from circumstances that appear to carry some risk of danger.

Thus, an evolutionarily minded perspective seeks to address, at least in part, what the functional (i.e., adaptive) basis of elevated childhood separation anxiety might be in feminine, androphilic males. The diagnostic criteria for SAD highlight that this condition occurs in response to separation from major attachment figures. It, therefore, seems reasonable to suggest that elevated traits of childhood separation anxiety in feminine, (pre-)androphilic boys are indicative of marked attachment to parents and other close family members. This suggestion is consistent with the finding that androphilic males are more likely than their gynephilic counterparts to exhibit elevated emotional instability (Neuroticism⁶; Lippa, 2005b) and, in general, such individuals are more likely to form strong relationship attachments and be highly empathic (Ashton, Paunonen, Helmes, & Jackson, 1998). Given the previous discussion of the generalized femininity hypothesis, it is noteworthy that high attachment and empathy accompanied with elevated emotional instability appears to be more common among females (Ashton et al., 1998). Ashton et al. cogently deduced that the association between these personality dimensions likely exists

⁶Personality psychologists define *Neuroticism* (emotional instability) as the predisposition to experience negative emotions such as anxiety. Individuals who are highly neurotic are emotionally reactive and vulnerable to stress (McCrae & John, 1992).

because it facilitates behaving altruistically toward kin.⁷ People are invariably attached to their kin and experiencing childhood separation anxiety could serve as a powerful motivator to secure the physical and psychological well-being of kin. In formulating a functional account of elevated separation anxiety in feminine, androphilic males this insight is key and raises an important question. Namely, why should feminine, pre-androphilic boys be so invested in the well-being of close kin?

To understand why from the standpoint of evolutionary theory, it is important to recall that androphilic males are much less likely to produce offspring than their gynephilic counterparts (e.g., King et al., 2005; Schwartz et al., 2010). This lack of reproduction raises an obvious question: How are genes for male androphilia maintained in the population from one generation to the next? The kin selection hypothesis (Wilson, 1975) postulates that genes for male androphilia could be maintained in a population if androphilic males were able to increase their *indirect fitness*⁸ so as to offset the cost of not reproducing directly. Theoretically speaking, androphilic males could increase their indirect fitness by directing altruistic behaviour toward close kin, which, in principle, would allow kin to increase their reproductive success. A basic prediction that flows from this hypothesis is that androphilic males should possess unique cognitive and behavioural

⁷ Ashton et al. (1998) argue that the greater dependence of offspring on maternal investment (most notably lactation) favored the evolution of elevated attachment, empathy, and emotional instability (Neuroticism) as female-typical traits. Elevated levels of these traits in women would facilitate enhanced maternal attentiveness to the needs of offspring, thus aiding in offspring survival. As such, although men are also capable of caring for and aiding in offspring survival, the relatively greater importance of maternal investment forms the basis for the evolution of relatively greater expression of attachment, empathy, and emotional instability (Neuroticism) in women.

⁸ Fitness refers to an individual's capacity to pass on its genes (or copies of its genes) to the next generation. *Indirect fitness* is a measure of an individual's impact on the fitness of kin (who share some identical genes by virtue of descent), weighted by the degree of relatedness (Hamilton, 1963).

tendencies that result in elevated kin-directed altruism. As demonstrated by Ashton et al. (1998), cognitive biases such as elevated emotional instability (Neuroticism) are associated with strong relationship attachment and heightened empathy, which facilitate kin-directed altruism. Such cognitive biases would be of great utility to androphilic males in terms of passing on their genes via kin.

In light of this literature, it is reasonable to suggest that traits of elevated childhood separation anxiety in androphilic males may be a developmental precursor of an evolved predisposition for prosocial tendencies, particularly elevated kin-directed altruism. In other words, anxiety might manifest in the face of uncertainty regarding the well-being of attachment figures (who are invariably kin) because it provides a powerful motivator to direct prosocial behaviour toward such individuals. According to this model, in childhood, anxiety about one's kin manifests as childhood separation anxiety in androphilic males, but later in development it is expressed in terms of strong relationship attachments to kin, enhanced kin-directed empathy, and elevated kin-directed altruism. Altruistic behaviour would presumably aid in securing the well-being of kin and, in turn, facilitate their reproductive success. This would be particularly important for androphilic males given that they rely on kin to reproduce in order to pass copies of their genes to future generations. This evolutionary account stands in stark contrast to existing clinical explanations. Instead of appealing to the notion of dysfunction, this evolutionary account views elevated childhood separation anxiety in feminine, pre-androphilic boys as functional.

Is Childhood Separation Anxiety in Feminine, Androphilic Males Related to Elevated Kin-Directed Altruism?

Research by Vasey et al. (2011) on Samoan *fa'afafine* and by VanderLaan et al. (2011b) on Canadian “gay” men suggests that traits of elevated separation anxiety among feminine, androphilic males are largely prompted by concern for kin. In both studies, androphilic males scored highest when items used to measure childhood separation anxiety involved worrying about parents (e.g., “I worried that something terrible might happen to my parents”). Similarly, using parental reports, Zucker et al. (1996) found that GIDC boys also scored highest for items that assessed worrying about parents.

These findings are echoed by qualitative data collected during interviews with adult Samoan *fa'afafine*. The anxiety that some *fa'afafine* recalled experiencing with respect to something terrible happening to their parents seemed to generalize into a pattern of extreme worry about all aspects of the parents’ (especially the mothers’) lives. For example, one *fa'afafine* participant recounted the following story, which concluded with her breaking down crying:

“When my mom brought my lunch to school and she was wearing a *puleyasi* [a traditional Samoan two-piece dress], I knew she wasn’t too rushed and had time to make herself look pretty. But when she came wearing a *lavalava* [a colourful Samoan garment similar to a sarong] and a t-shirt, I knew she was too busy to make herself beautiful. I would ask her if I could go home with her to help but she would tell me to stay at school. I would be worried all afternoon and wouldn’t be able to focus on my work. I just waited for that final bell to ring. I would have rather helped my mom at home but I had to stay behind.”

Do Feminine, Androphilic Adult Males Exhibit Elevated Kin-Directed Altruism?

The strongest evidence suggesting that feminine, androphilic males possess cognitive biases for enhanced kin-directed altruism come from studies of Samoan *fa'afafine*. Vasey et al. (2007) found that *fa'afafine* exhibit significantly higher avuncular (i.e., uncle-like) tendencies compared to Samoan gynephilic men. This male sexual orientation difference was replicated in Samoa using a larger, independent sample (Vasey & VanderLaan, 2010a). *Fa'afafine* exhibit significantly higher avuncular tendencies even when compared to childless gynephilic men who, like *fa'afafine*, have no direct childcare responsibilities (Vasey & VanderLaan, 2010a). *Fa'afafine* also exhibit significantly higher avuncular tendencies compared to the maternal (i.e., aunt-like) tendencies of Samoan mothers and childless women (Vasey & VanderLaan, 2009). These avuncular tendencies appear to translate into real-world behaviour, at least according to one behavioural measure, namely, monetary donations to certain categories of nieces (Vasey & VanderLaan, 2010b).

In addition, evidence suggests that the avuncular cognition of *fa'afafine* exhibits unique, adaptive design features. Such features include cognitive patterns that would be useful for maximizing altruism directed toward nieces and nephews while minimizing altruism directed toward non-kin children (Vasey & VanderLaan, 2010c). Also, whereas Samoan men and women show decreased willingness to invest in nieces and nephews when in romantic or sexual relationships, *fa'afafine* maintain a high level of willingness to make such investments regardless of relationship status (VanderLaan & Vasey, in press). Lastly, compared to Samoan men and women, *fa'afafine*'s avuncular cognition is more finely tuned toward making investment decisions that will enhance indirect fitness maximization (VanderLaan & Vasey, submitted a, b). Specifically, in non-trivial

investment contexts, *fa'afafine* have a bias to invest in young, female kin, who will provide more reliable and substantive increases to indirect fitness (VanderLaan & Vasey, submitted a). Also, *fa'afafine* show increases in avuncular tendencies with increases in their numbers of older siblings, especially their numbers of older sisters, which likely indicates a sensitivity to increase avuncularity in the presence of nieces and nephews (VanderLaan & Vasey, submitted b).

Taken together, these findings are consistent with the kin selection hypothesis, which suggests that androphilic males have been selected over evolutionary time to act as “helper-in-the-nest,” caring for close kin. Statements made by *fa'afafine* corroborate this hypothesis. For example, one *fa'afafine* on the island of Savai'i had this to say: “My brothers and sisters have all gone off and started their own families. *Fa'afafine* are more available if the family needs their support. They bring the family together.” Similar statements concerning the focal importance of family for feminine, androphilic males are echoed repeatedly in the cross-cultural literature and are entirely consistent with the qualitative data we have collected on Samoan *fa'afafine*. For example, Williams (1992) quotes a Hupa *berdache* (i.e., a feminine, androphilic male from the Hupa Valley in Northern California) as saying: “You live your life around your family. My aunt says ‘I’m counting on you.’ What she means is that someone like me has a special responsibility to help care for the elders” (p. 54).

As mentioned, in stark contrast to this Samoan work, studies conducted in Western countries and Japan have not found that androphilic men show elevated avuncular tendencies compared to gynephilic men (Canada: Abild et al., submitted; Forrester et al., 2011; USA: Bobrow & Bailey, 2001; UK: Rahman & Hull, 2005; Japan:

Vasey & VanderLaan, in press). Although Forrester et al. (2011) found that Canadian androphilic men did not exhibit elevated avuncular tendencies, their avuncular tendencies are, like those of Samoa *fa'afafine*, more dissociated from altruistic interest in non-kin children compared to the gynephilic men. As such, avuncular cognition with hallmarks of special adaptive design appears to be present in Canadian sex-gender congruent androphilic males, but not expressed in terms of elevated avuncular tendencies.

Compared to their gynephilic counterparts, androphilic males in Western cultures are relatively feminine as boys (Bailey & Zucker, 1995), but they behaviourally defeminize to varying degrees as they develop. This behavioural defeminization probably occurs in response to Western gender role expectations, which hold that male-bodied individuals should behave in a masculine manner (Bailey, 2003). In contrast, in Samoa and other non-Western cultures where transgendered male androphilia is the norm, feminine boys develop into feminine adult males. Consequently, adult male androphiles from Western cultures are relatively masculine when compared to transgendered adult male androphiles from non-Western cultures (Murray, 2000). Conversely, they are relatively feminine when compared to adult male gynephiles (Bailey, 2003; Lippa, 2005a). It is interesting to speculate as to whether the process of relative defeminization that characterizes the development of Western male androphiles negatively impacts on the expression of elevated kin-directed altruism that seems to exist among transgendered Samoan *fa'afafine*.

Despite the apparent absence of elevated kin-directed altruism in adult male androphiles from Western cultures, it is intriguing to note that feminine boys from such cultures *have* been described as exceptionally focused on helping close kin. For example,

Coates (1985) outlined how feminine boys from the USA often function as “mother’s helpers” who

“...constantly keep the house in order. They washed dishes, cleaned bathrooms, kept their own rooms clean, and involved themselves extensively in housekeeping functions. Many were involved in direct caretaking of their mothers as well. One boy served his mother breakfast in bed on weekends. Others liked to comb and style their mothers’ hair. Some would give their mothers back rubs” (p. 104).

All this being said, some studies conducted in Western cultures *are* consistent with the idea that adult male androphiles are more prosocial, even though this prosocial disposition may not necessarily be directed toward kin. To begin with, a number of studies have found that, compared to gynephilic men, androphilic men are less aggressive (Ellis, Hoffman, & Burke, 1990; Gladue & Bailey, 1995; Sergeant, Dickins, Davies, & Griffiths, 2006; VanderLaan & Vasey, 2009). In an additional line of research, the personality profiles of androphilic men indicate that, compared to gynephilic men, they tend to be more empathetic (Salais & Fischer, 1995) and agreeable (Lippa, 2005b).

Furthermore, research indicates that Western androphilic men have positive impacts on the psychological well-being of their non-kin, female friends. For example, women with more androphilic male friends tend to have greater self-esteem in regards to their physical attractiveness (Bartlett, Patterson, VanderLaan, & Vasey, 2009). Like relationships with kin, friendships in contemporary Western culture are often accompanied by relationship qualities such as a high degree of emotional closeness (Kruger, 2003). Research suggests that such emotional closeness may provide a basis for elevated altruism toward friends who represent “social kin” in the context of

contemporary Western culture (Korchmaros & Kenny, 2001; Stewart-Williams, 2007). These latter findings concerning personality and the benefits of androphilic male friends might, therefore, be reflective of how evolved prosocial tendencies for kin-directed altruism among androphilic males manifest given the ancestrally-atypical contingencies of contemporary Western culture. In conjunction, then, these various studies suggest that feminine, androphilic males may exhibit developmental continuity from childhood to adulthood with respect to psychological traits that are postulated to underlie such a disposition.

If kin selection accounts, at least in part, for the evolution of male androphilia then psychological characteristics purported to dispose androphilic males to exhibit elevated kin-directed altruism should have a genetic component. As argued here, such psychological characteristics include elevated separation anxiety in childhood and elevated Neuroticism. It is significant, therefore, that there appears to be a genetic basis underlying both elevated symptoms of psychological distress, including Neuroticism, and same-sex sexual attraction (Zietsch, Verweij, Bailey, Wright, & Martin, 2011).

Finally, for elevated prosocial, kin-directed altruistic tendencies to have any beneficial impact with respect to maintaining genes for male androphilia in the population, these tendencies must enhance the actual reproductive success of kin. Studies have shown that the families of male androphiles tend to be larger in both the West (Blanchard & Lippa, 2007; Camperio-Ciani et al., 2004; Iemmola & Camperio Ciani, 2009; King et al., 2005; Rahman et al., 2008; Schwartz et al., 2010) as well as in Samoa (VanderLaan et al., submitted b; VanderLaan & Vasey, 2011; Vasey & VanderLaan, 2007). Further research is still required, however, to discern whether such increases in

family size are attributable, in whole or in part, to increased altruistic efforts on the behalf of androphilic male relatives.

Conclusions

Contrary to initial clinical perspectives, the cross-cultural, non-clinical studies conducted in Samoa and Canada indicate that elevated childhood separation anxiety in (pre-)androphilic males is itself part of a more general pattern of femininity that extends to multiple psychological domains. Based on this insight, the question of why elevated separation anxiety and GIDC are related in boys becomes more focused on elucidating the basis of male femininity itself. When couched within an evolutionarily minded framework that attempts to understand the functional basis of traits associated with elevated femininity in androphilic males, including traits of elevated childhood separation anxiety, it is possible to form an impression that differs markedly from the focus on pathology seen in clinical perspectives.

As speculated above, traits of elevated separation anxiety, and other feminine traits exhibited by male androphiles such as increased empathy, agreeableness, and emotional instability (Neuroticism) may be better conceptualized as developmental specializations that facilitate enhanced prosocial tendencies, namely, enhanced kin-directed altruism. This model might, therefore, account for why elevated kin-directed altruism is repeatedly documented among the transgendered Samoan *fa'afafine*, but not among sex-gender congruent androphilic males from Western cultures and Japan. Furthermore, this model echoes the importance of examining hypotheses concerning the existence of evolved behaviours within sociocultural environments that facilitate its development.

Admittedly, this model is largely speculative at present. One of its strengths, however, is that it provides consistency within the broader theoretical and empirical literature. Moreover, much of the data that are available are consistent with the model's predictions. Clearly, more data are required to test the efficacy of this model. Specifically, future research will have to test whether it accurately articulates the developmental associations among (pre-)androphilic male femininity and prosocial tendencies, including kin-directed altruism, and accounts for the documented cross-cultural patterns concerning avuncular tendencies among androphilic males.

CHAPTER 10

Summary

Synopsis of Preceding Chapters

The preceding chapters all contributed toward reconciling an outstanding conceptual problem: the existence of male androphilia. As was highlighted in Chapter 1, male androphilia is associated with low reproductive output. Consequently, it is unclear why genetic factors underlying male androphilia have not gone extinct. Chapter 1 also reviewed ethnological evidence suggesting that transgendered, as opposed to sex-gender congruent, male androphilia was the ancestral form of male androphilia. As such, it was suggested that empirical tests of hypotheses concerning the evolution of male androphilia should focus on transgendered male androphiles. Hence, the Samoan *fa'afafine* were identified as a population of transgendered male androphiles in which it would be suitable to test hypotheses concerning the evolution of male androphilia. Chapter 1 ended by noting that for the Samoan *fa'afafine* to provide a model of the evolution of male androphilia across human populations, it was first necessary to demonstrate that male androphilia follows consistent developmental patterns across populations.

Given the necessity of establishing cross-cultural consistency in the development of male androphilia, Chapters 2 through 4 assessed whether developmental correlates of male androphilia found among Western sex-gender congruent male androphiles existed among the Samoan *fa'afafine*. Specifically, Chapter 2 provided evidence for the presence of the *fraternal birth order effect* in Samoa by demonstrating that *fa'afafine* have

significantly more older biological brothers compared to Samoan gynephilic males. Chapter 3 described a case study focusing on 17 *fa'afafine* who were all born in the same village. This case study showed that there was a significant degree of family clustering among these 17 *fa'afafine*, indicating that male androphilia is familial in Samoa. This finding was consistent with what is known about male androphilia in the West. Lastly, Chapter 4 presented data showing that, compared to Samoan men, *fa'afafine* have significant preponderances of *fa'afafine* relatives, which is in line with the findings of a number of Western studies. In one sense, then, the conclusions of Chapter 4 were consistent with those of Chapter 3. Namely, male androphilia is familial in Samoa. However, Chapter 4 made an additional contribution by indicating that male androphilia is familial in both the maternal and paternal lines. These findings suggested that if the basis of the familiarity of male androphilia is genetic, then a portion of the genetic factors underlying male androphilia must be autosomal.

Having established that male androphilia is developmentally consistent across the Samoan and Western populations, Chapters 5 through 8 made use of the Samoan *fa'afafine* model to examine hypotheses concerning the evolution of male androphilia. Chapter 5 tested the hypothesis that X-linked sexually antagonism was responsible for the evolutionary maintenance of genetic factors underlying male androphilia. However, comparisons of the average reproductive output of Samoan men's and *fa'afafine*'s maternal and paternal line grandmothers, aunts, and uncles did not support this hypothesis. *Fa'afafine*'s maternal and paternal line grandmothers, but not aunts or uncles, showed elevated reproduction. These results did not support the idea that X-linked genetic factors lead to male androphilia in males while promoting reproduction in

females. Instead, these results were consistent with the idea that autosomal genetic factors lead to male androphilia in males while promoting reproduction in females. As such, sexual antagonism is tentatively a possible explanation for the evolution of male androphilia. Yet, it was emphasized in Chapter 5 that more research needs to be done before any firm statements can be made regarding genetic factors that promote male androphilia as well as elevated reproduction in the relatives of androphilic males.

Chapter 6 was the first of three chapters to focus on testing the kin selection hypothesis. This hypothesis posits that genetic factors underlying male androphilia persist because androphilic males facilitate the reproduction of their close relatives, who share alleles with androphilic males by virtue of descent. First, Chapter 6 provided data showing that, compared to Samoan men, *fa'afafine* report elevated avuncular tendencies (i.e., willingness to invest in nieces and nephews). Then, Chapter 6 tested whether these elevated avuncular tendencies were owing to a lesser degree of sexual and/or romantic relationship involvement on the part of *fa'afafine*. However, compared to Samoan men and women, *fa'afafine* had comparable levels of relationship involvement. Furthermore, *fa'afafine*'s willingness to invest in nieces and nephews remained high regardless of relationship status, whereas that of men and women lessened when they were involved in a sexual and/or romantic relationship. As such, Chapter 6 indicated that elevated avuncular tendencies among *fa'afafine* are not simply a by-product of differential sexual and/or romantic relationship involvement.

Chapter 7 described the results of a field experiment that tested a refined set of predictions derived from the kin selection hypothesis. Specifically, it was predicted that when investment contexts had non-trivial fitness consequences, *fa'afafine* would show an

enhanced tendency to invest in the most adaptive relative categories (i.e., young, female kin) compared to Samoan men and women. The results were generally consistent with these predictions, and thus further supported the idea that the avuncular cognition of androphilic males has undergone selective enhancement to maximize the accrual of indirect fitness via investments in kin.

Chapter 8 assessed the relationship between birth order and avuncular tendencies among Samoan men and *fa'afafine*. The avuncular tendencies of *fa'afafine*, but not men, were positively correlated with number of older brothers and number of older sisters. The Samoan male sexual orientation difference in avuncular tendencies was accounted for by a combination of (1) the positive correlation between avuncular tendencies and number of older sisters among *fa'afafine*, and (2) the fact that *fa'afafine* had significantly greater numbers of older sisters. As such, these findings strengthened the conclusion that the avuncular cognition of *fa'afafine* is responsive to the presence of female kin, which is consistent with the idea that the avuncular cognition of androphilic males has undergone selective enhancement to maximize the accrual of indirect fitness via investments in kin.

Lastly, Chapter 9 provided a literature review that aimed to hone in on the developmental basis of elevated kin-directed altruism in androphilic males. On the basis of a series of cross-cultural studies, lack of homophobia, geographic proximity among kin, and the presence of societal collectivism were all deemed unlikely to be solely responsible for the expression of elevated kin-directed altruism among *fa'afafine*. Important clues regarding the development such elevated kin-directed altruism come from clinical literature as well as some cross-cultural, non-clinical literature that focuses on childhood separation anxiety in (pre-)androphilic feminine males. Such males are

more likely to experience childhood separation anxiety, and such anxiety appears to primarily occur in response to concern about the well-being of family members. Given that such anxiety is elevated in feminine (pre-)androphilic males, and that elevated adulthood kin-directed altruism is unique to the transgendered *fa'afafine*, it was suggested that these traits were contingent on the expression of femininity. Chapter 9 thus provided a theoretical framework for the future study of the development of elevated kin-directed altruism in androphilic males.

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