

Birth order and male androphilia in Samoan *fa'afafine*

Paul L. Vasey* and Doug P. VanderLaan

Department of Psychology, University of Lethbridge, Lethbridge, Alberta T1K 3M4, Canada

The manner in which male androphilia is publicly expressed varies cross-culturally. As such, it is unclear whether distinct or common underlying causal processes characterize male androphilia in different cultures. Establishing the existence of cross-cultural universals in male androphilia is one means of ascertaining whether common biological bases underlie this phenomenon despite its culturally distinct forms. The evidence that the number of older biological brothers increases the odds of androphilia in later-born males has been well documented for Western samples (i.e. the *fraternal birth order effect*); but there is little evidence for this effect in non-Western samples. Here, we compare the birth order of androphilic males (i.e. *fa'afafine*) and gynephilic males from the politically autonomous Polynesian nation of Independent Samoa. Results indicate that relative to gynephilic males, *fa'afafine* tend to have more siblings and are generally later born when birth order is quantified using Slater, fraternal and sororal indices. More specifically, *fa'afafine* tend to have a greater number of older brothers, older sisters and younger brothers. We discuss the observed effects in relation to the differing reproductive patterns exhibited by the mothers of *fa'afafine* and gynephilic males, and to existing social and biological theories for sexual orientation.

Keywords: birth order; sex ratios; fecundity; sexual orientation; Samoa; cross-cultural universals

1. INTRODUCTION

Androphilia refers to sexual attraction to physically mature males, whereas *gynephilia* refers to sexual attraction to physically mature females. The manner in which male androphilia is publicly expressed varies cross-culturally. In Western societies, *egalitarian male androphilia* is the cultural norm and occurs between two males not markedly different in age, gender-related characteristics or other traits. Partners do not adopt different social roles and treat each other as social equals. In Western cultural contexts, male androphiles who fit this egalitarian pattern are often referred to as *gay men* (Murray 2000).

In contrast, in most non-Western societies, *transgendered male androphilia* appears to be the cultural norm. Transgendered male androphilia occurs between a male who is markedly gender-atypical and another who is more or less gender-typical for his own sex. Thus, partners adopt different social roles and do not treat each other as social equals. In many non-Western cultures, transgendered androphilic males often occupy 'alternative' gender role categories that are distinguished linguistically from the gender-normative categories of 'man' and 'woman'. Some contemporary examples include the *xanith* of Oman, the *hijra* of India, the *kathoey* of Thailand, the *travesti* of Brazil, the *fakafafine* of Tonga and the *fa'afafine* of Samoa (Herdt 1996; Murray 2000). Most researchers working with these various non-Western groups have tended to emphasize their unique cultural properties relative to each other and to egalitarian 'gay' male androphiles living in Western cultures. Implicit, and sometimes explicit, in this emphasis has been the idea that attempts to draw comparisons among androphilic males in these different groups are misguided because these phenomena cannot be

understood outside the unique cultural contexts that give rise to them. As such, the overall impression one gleanes from this literature is that a panoply of male 'androphilias' exist.

At the same time, a much smaller group of researchers has sought to elucidate cross-cultural *universals* among male androphiles by comparing these different groups. For example, retrospective studies conducted in Independent Samoa, Brazil, Guatemala and the Philippines (Whitam & Zent 1984; Cardoso 2005; Bartlett & Vasey 2006) confirm that androphilic males recall significantly more cross-gender behaviours in childhood when compared with their gynephilic counterparts; a pattern that had been well documented in Western nations, such as Canada, the USA and the UK (Bailey & Zucker 1995). On the basis of these findings, it has been suggested that cross-gender behaviour in childhood reflects a culturally invariant pattern of psychosexual development shared by most androphilic males.

Given these differing perspectives, it is not surprising that there has been debate in the literature concerning whether distinct or common underlying causal processes characterize male androphilia in different cultures. If it were possible to establish that androphilic males from different cultural backgrounds shared associated features that are indicators, at least in theory, of underlying causal processes, then this would give support to the possibility of common biological bases. For example, Blanchard (2004) reviews the evidence that the existence of older brothers increases the odds of androphilia in later-born males. He refers to this as the *fraternal birth order effect* (or, alternatively, the *older brother effect*). This effect is thought to reflect the progressive immunization of some mothers to the male-specific antigens that are produced in response to the gestation of each successive male foetus.

* Author for correspondence (paul.vasey@uleth.ca).

It has been postulated that the presence of these antibodies influences the sexual differentiation of each successive male foetus's brain and, by extension, those neural regions that regulate sexual orientation (Blanchard & Bogaert 1996; Blanchard & Klassen 1997). This line of reasoning has been referred to as the *maternal immune hypothesis*.

At present, evidence in support of the maternal immune hypothesis is scanty, but consistent (reviewed in Blanchard 2004). In contrast, evidence in support of the fraternal birth order effect is overwhelming. This effect has been documented in subjects examined in recent years and in subjects examined decades ago: in psychiatric patients and non-patient volunteers; in subjects examined during childhood and adulthood; in transsexual subjects and those who experience no dysphoria with their sexed bodies; in men sexually attracted to adults and in those sexually attracted to pre-pubescent or pubescent children; in non-White (i.e. black, hispanic, East Indian, Asian) citizens of the USA; in samples collected from different Western nations, including England, Italy, The Netherlands, Canada and the USA (reviewed in Blanchard 2004), by independent researchers (Green 2000; Robinson & Manning 2000; Williams *et al.* 2000; Camperio-Ciani *et al.* 2004; King *et al.* 2005); and in men reared with and without their biological older brothers (Bogaert 2006). In addition, research demonstrates that although the number of biological older brothers is correlated with an increased probability of androphilia in men, the number of non-biological older brothers has no effect (Bogaert 2006).

As Blanchard (2004) notes, the main limitation in generalizing about the fraternal birth order effect is that there is very little evidence for the effect in non-Western cultures. Drawing on Heinemann's (2000) data for five Tongan *fakafafine* (i.e. transgendered androphilic males), Zucker & Blanchard (2003) highlighted that all of these subjects had a large number of siblings (range 4–10) relative to Western standards and were later born (i.e. four last born, one next to the last born). Similarly, Tsoi *et al.* (1977) reported late birth order in a sample of 56 male-to-female transsexuals in Singapore, 47 of whom had sexual experiences with men as receptive partners or were involved in sexual/romantic relationships with men, or both. Although both of these brief reports are welcome contributions to the literature, neither provides information pertaining to participants' actual number of older brothers, no tests are applied to confirm statistical significance, CIs are not reported and no control group is employed. In addition, the manner in which the participants' sexual orientations were assessed in the Tsoi *et al.* (1977) study is ambiguous.

In the Samoan islands, androphilic males are referred to as *fa'afafine*. Translated literally, *fa'afafine* means 'in the manner of a woman'. Indeed, a small number of *fa'afafine* self-identify as women, even though they recognize, as do all Samoans, that they differ physically and socially from biological women. Most, however, self-identify as *fa'afafine* and *not* as men. Although the term *fa'afafine* implies that the members of this category are uniformly very feminine, they are, in fact, a heterogeneous group in many ways (Schmidt 2003; Bartlett & Vasey 2006). In appearance and mannerisms, although most would be considered effeminate, they range from strikingly feminine to unremarkably masculine.

Poasa *et al.* (2004) presented birth order data for 13 *fa'afafine* from the USA territory of American Samoa. They reported that the mean fraternal index for their *fa'afafine* subjects was 0.85 (95% CI, 0.75–0.95), which they note is higher than the mean fraternal index of 0.48 reported by Jones & Blanchard (1998) for a subgroup of 2115 heterosexual males who had at least one brother. The fraternal index (older brothers/total number of brothers) expresses the participant's birth order relative to brothers as a quantity between 0 and 1, where 0 corresponds to the first-born brother and 1 to the last-born brother (Jones & Blanchard 1998). On the basis of this finding, Poasa *et al.* (2004) conclude that their *fa'afafine* subjects were born late in their sibships relative to their brothers.

Although the analyses conducted by Poasa *et al.* (2004) represent an improvement over the two previous studies mentioned (Tsoi *et al.* 1977; Zucker & Blanchard 2003), they are less than ideal because a gynephilic male control group from American Samoa was not employed. Instead, the comparison group that was drawn from the Jones & Blanchard (1998) study consisted of gynephilic males recruited from Western nations, such as Canada, The Netherlands, the UK and the USA. Moreover, most of the participants in the Jones & Blanchard (1998) study were Caucasian, not Polynesian. Poasa *et al.* (2004) recommended that future research on birth order in non-Western androphilic males should employ control groups composed of gynephilic males from the same populations.

In this study, we compare the birth order of androphilic *fa'afafine* and gynephilic 'straight' men from the politically autonomous Polynesian nation of Independent Samoa. If the fraternal birth order effect is an inherent correlate of male androphilia, then *fa'afafine* should have a greater number of older brothers relative to males in the gynephilic control group.

2. MATERIAL AND METHODS

The methodology employed in this study was approved by the Human Subjects Research Committee of the University of Lethbridge and conducted according to the principles expressed in the Declaration of Helsinki (<http://www.wma.net/e/policy/b3.htm>). Each participant provided informed consent prior to participating in this study.

All participants were recruited through a network sampling procedure on the two larger and more populated islands of Upolu and Savai'i. The network sampling procedure involves contacting initial participants who display qualities of interest (i.e. status as *fa'afafine* or gynephilic men), then obtaining referrals from them to additional participants who, in turn, provide further referrals, and so on. For all groups, more than 90% of the individuals contacted about participating in the study agreed to do so. Participants were 83 self-identified *fa'afafine* and 114 self-identified straight men. Data were collected during three field trips (August–September 2005, December 2005–January 2006 and September–October 2006).

This study employed 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.

Kinsey ratings (Kinsey *et al.* 1948) of sexual feelings over the previous year were obtained for all participants. All of the

83 *fa'afafine* described their sexual feelings as exclusively androphilic (Kinsey rating=6). Of the 114 straight men, 104 (91.2%) described their sexual feelings as exclusively gynephilic (Kinsey rating=0) and 10 (8.8%) reported most sexual feelings towards females, but occasional fantasies about males (Kinsey rating=1).

The age range of our *fa'afafine* participants was 18–60 and that of our gynephilic male participants was 18–43. We compared the *fa'afafine* and gynephilic males for age differences. *Fa'afafine* were significantly older, on average, than the gynephilic males (*fa'afafine*, mean ± s.d. = 30.48 ± 8.35; gynephilic males, 26.03 ± 6.63; two-tailed independent *t*-test, $t_{189}=4.1, p<0.001$). (Note: age data were missing for six *fa'afafine* participants.)

Participants were asked to list all of the children their mothers had given birth to from the first to the last born. In addition to indicating their own birth order, participants indicated whether each sibling was male or female. We recorded four data points 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, we also computed two additional birth order indices, which were introduced by Jones & Blanchard (1998): (i) fraternal index (number of older brothers/total number of brothers) and (ii) sororal index (number of older sisters/total number of sisters).

3. RESULTS

Table 1 presents descriptive statistics regarding the total number of siblings as well as the number of older brothers, older sisters, younger brothers and younger sisters for *fa'afafine* and gynephilic males. *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, $F=9.07, p<0.01; t_{141.19}=5.27, p<0.001$).

Slater's index values could not be computed for five gynephilic males who did not have any siblings. Two-tailed one-sample *t*-tests were conducted to assess whether *fa'afafine* or the 109 remaining gynephilic males were biased in terms of their birth orders. The mean Slater's index value for each group was compared against a value of 0.5, the expected mean Slater's index value for samples drawn from a hypothetical stable population. *Fa'afafine* were significantly more likely to be later born (mean ± s.d. = 0.66 ± 0.33, $t_{82}=4.54, p<0.001$), whereas gynephilic males did not differ significantly from the 0.5 value (mean ± s.d. = 0.55 ± 0.33, $t_{108}=1.66, p=0.10$). *Fa'afafine* were also significantly more likely to be later born than gynephilic males (two-tailed independent *t*-test, $t_{190}=-2.32, p<0.05$).

Fraternal index values could not be computed for five *fa'afafine* and 15 gynephilic males who did not have any brothers. Two-tailed one-sample *t*-tests were conducted to assess whether the remaining *fa'afafine* or gynephilic males were biased in terms of their fraternal birth orders. The mean fraternal index value for each group was compared against a value of 0.5. *Fa'afafine* were significantly more likely to be later born among their brothers (mean ±

Table 1. Descriptive statistics (means and standard deviations) for the total number of siblings, as well as the number of older brothers, older sisters, younger brothers and younger sisters of *fa'afafine* and gynephilic males.

sibling category	<i>fa'afafine</i> M (s.d.)	gynephilic males M (s.d.)
all siblings	6.42 (3.02)	4.37 (2.18)
older brothers	2.27 (1.84)	1.23 (1.37)
older sisters	2.08 (1.71)	1.25 (1.20)
younger brothers	1.10 (1.42)	0.82 (0.89)
younger sisters	0.98 (1.23)	1.07 (1.18)

Table 2. Logistic regression of sexual orientation on numbers of siblings: change in the model if term (predictor) removed. (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, older sisters and younger brothers all produced a statistically significant decrease in correct prediction of the groups' sexual orientations.)

predictor	ΔR^2	change in -2 log likelihood ^a	significance of the change ^b
older brothers	-0.059	13.55	0.0002
older sisters	-0.028	6.51	0.0107
younger brothers	-0.035	8.04	0.0046
younger sisters	<0.001	0.01	0.9203

^a Distributed as χ^2 with one degree of freedom.

^b Two-tailed *p*.

s.d. = 0.67 ± 0.35, $t_{77}=4.23, p<0.001$), whereas gynephilic males did not differ significantly from the 0.5 value (mean ± s.d. = 0.53 ± 0.41, $t_{98}=0.81, p=0.42$). *Fa'afafine* were also significantly more likely to be later born among their brothers than were gynephilic males (two-tailed independent *t*-test with between-group equality of variances not assumed; Levene's test for equality of variances, $F=5.5, p<0.05; t_{173.8}=-2.35, p<0.05$).

Sororal index values could not be computed for five *fa'afafine* and 11 gynephilic males who did not have any sisters. Two-tailed one-sample *t*-tests were conducted to assess whether the remaining *fa'afafine* or gynephilic males were biased in terms of their sororal birth orders. The mean sororal index value for each group was compared against a value of 0.5. *Fa'afafine* were significantly more likely to be later born among their sisters (mean ± s.d. = 0.68 ± 0.37, $t_{77}=4.28, p<0.001$), whereas gynephilic males did not differ significantly from the 0.5 value (mean ± s.d. = 0.53 ± 0.39, $t_{102}=0.69, p=0.49$). *Fa'afafine* were also significantly more likely to be later born among their sisters than were gynephilic males (two-tailed independent *t*-test, $t_{179}=-2.68, p<0.01$).

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 16.1% of the variance in sexual orientation. Table 2 shows the results of the logistic regression analysis. The results indicated that older brothers, older sisters and younger brothers were all statistically significant predictors of sexual orientation.

Table 3. 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	s.d.	<i>z</i>	<i>p</i> ^b	total	expected	s.d.	<i>z</i>	<i>p</i> ^b
all	279	277	11.53	0.17	0.8650	233	259	11.15	-2.33	0.0198
older	188	187	9.48	0.11	0.9124	140	147	8.40	-0.83	0.4065
younger	91	89	6.55	0.31	0.7566	93	112	7.33	-2.59	0.0096

^a Calculated 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).

^b Two-tailed *p*.

We conducted further analyses to assess whether the effects of older brothers, older sisters and younger brothers 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 the statistically significant predictor variables, while controlling for all of the other sibling categories. The partial correlations between sexual orientation and older brothers, older sisters and younger brothers were 0.26, 0.18 and 0.20, respectively. One-tailed analyses revealed no statistically significant differences in the magnitudes of any of the effects: older brothers versus older sisters ($z=1.18$, $p=0.12$); older brothers versus younger brothers ($z=0.89$, $p=0.19$); and older sisters versus younger brothers ($z=-0.3$, $p=0.38$).

Expected sex ratios were obtained from the Samoan Statistical Service Division of the Ministry of Finance (2006), which indicated 109 male live births for every 100 female live births. Table 3 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. Analyses revealed that, for gynephilic males, the number of younger brothers, but not older 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, we also performed analyses in which we 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.

4. DISCUSSION

Our results indicated that *fa'afafine* have more siblings than gynephilic males. Similar fecundity effects have been described in Western cultures (Camperio-Ciani *et al.* 2004; King *et al.* 2005; Blanchard & Lippa *in press*). The present study is the first to demonstrate the fecundity effect in a non-Western sample.

When birth order was quantified using the Slater, fraternal and sororal indices, *fa'afafine* tended to be later born relative to: (i) gynephilic males and (ii) theoretical expectations based on the null model of a hypothetical

stable population. The *fa'afafine* tended to have a greater number of older brothers when compared with gynephilic males, thus providing the strongest evidence to date for an older brother effect in a non-Western sample. These findings are consistent with the conclusion that culturally invariant biological mechanisms underlie the development of androphilia in males.

Fa'afafine also tended to have more older sisters than did gynephilic males. In a study of non-Caucasian North American men, Bogaert (1998) reported a similar older sister effect. However, only two other studies, in addition to the present one, have reported a significant older sister effect that occurs *independent* of an older brother effect (King *et al.* 2005; Blanchard & Lippa *in press*). These two studies also reported a greater number of siblings for androphilic males, relative to gynephilic males, in combination with older sister effects. Blanchard & Lippa (*in press*) interpreted their older sister effect as a consequence of larger family size.

Finally, *fa'afafine* tended to have significantly more younger brothers than did gynephilic males. Blanchard (1997) reported a younger brother effect for feminine male-to-female androphilic transsexuals and argued that this effect occurred separately from an older brother effect found for the same sample.

We propose that the sibship patterns documented in this study can be accounted for, in part, by elevated fecundity among the mothers of *fa'afafine*. The older brother effect observed in Western samples is driven by a higher than expected sex ratio among the older siblings of androphilic males based on known population parameters, as well as a tendency for androphilic males to be later born (Blanchard 2004). In contrast, the sex ratios of older siblings for both *fa'afafine* and gynephilic males did not differ from expected population values. As such, the only avenue by which the older brother effect may have arisen is through a tendency for the *fa'afafine's* mothers to produce more children, and for *fa'afafine* to have been later born relative to the gynephilic male control group. In the context of the maternal immune hypothesis (Blanchard & Bogaert 1996; Blanchard & Klassen 1997), the consequence of producing a large number 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 societies relative to Samoa, the underlying mechanism that results in the developmental endpoint of male androphilia may be the same.

The older sister effect observed in this study can be explained within the same framework. The mothers of *fa'afafine* are producing more children and the sex ratio of these offspring does not deviate from expected population

values. Consequently, *fa'afafine*, who tend to be later born, have a greater number of older sisters, on average, than their gynephilic counterparts. There is a widespread notion, in both the social sciences and popular literature, that Samoan parents decide that a male infant will be raised as a *fa'afafine* when there is an insufficient number of girls in the family to carry out the traditional female chores (Danielsson *et al.* 1978; Mageo 1992). The finding that *fa'afafine* actually have more older sisters than gynephilic males furnishes empirical evidence against this 'social construction of *fa'afafine*' hypothesis.

Blanchard (1997) attributed the younger brother effect he found in a sample of male-to-female androphilic transsexuals to a higher than expected younger sibling sex ratio, given the predictions derived from Western population parameters. In contrast, the younger brother effect described here appears to be driven by two factors that differ from the one identified by Blanchard (1997). First, as mentioned, the mothers of *fa'afafine* are producing more children relative to the mothers of gynephilic males. As such, the larger sibships of *fa'afafine* are characterized by a greater number of younger brothers compared with those of gynephilic males. However, this raises the obvious question as to why *fa'afafine* do not have a greater number of younger sisters relative to gynephilic males. This question points to a second important factor that appears to drive the younger brother effect and account for the absence of a younger sister effect. Our data indicated that the sex ratio for the younger siblings of *fa'afafine* did not differ from expected population values, but that of gynephilic males did. The mothers of gynephilic males appeared to bias offspring production towards later-born females, thus driving the younger brother effect and mitigating a younger sister effect. These observations regarding the sibships of our gynephilic male participants are consistent with previous reports in the literature indicating that offspring with a low birth order have a higher probability of being male, whereas later-born offspring have a higher probability of being female (James 1987; Chahnazarian 1988; Blanchard 2004).

Because our gynephilic male sample was younger, on average, some may argue that a subset of these gynephilic males' mothers may still be reproducing, which could potentially mitigate the younger brother effect we documented. However, the mothers of gynephilic males appear to have a bias towards producing daughters later in their reproductive careers. As such, we would expect that if the mothers of the gynephilic males in our sample continued to reproduce, they would tend to produce daughters, thus having a negligible effect on the younger brother effect observed here.

In previously described 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 overall sibling sex ratio for *fa'afafine* did not differ from the expected sex ratio. The lack of a higher than expected sex ratio among the siblings of *fa'afafine*, coupled with their larger sibships, is consistent with mathematical models presented by Suarez & 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, deviate from the expected population-based

values. Specifically, gynephilic males had significantly fewer brothers than would have been expected.

Given that the expected 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 overall sibling sex ratio, whereas those of *fa'afafine* conform to the expected pattern. One possibility is that the Samoan participants were recruited in a somewhat biased manner. This possibility seems unlikely, however, because this study replicated the older brother effect found in Western populations and the proportion of unique variance in sexual orientation predicted by the number of older brothers (5.9%) was virtually identical to that described in previous studies (e.g. Blanchard 2004; Camperio-Ciani *et al.* 2004). Moreover, because a network sampling procedure was employed to recruit participants, both *fa'afafine* and gynephilic males were enlisted for the study in an identical manner and from the same social circles.

Alternatively, it is theoretically possible that a certain proportion of Samoan families are similar in composition to those of the *fa'afafine* (i.e. greater number of children, expected offspring sex ratio). If so, this would compensate for the effect of those families that are similar in composition to those of the gynephilic males (i.e. smaller number of children, lower offspring sex ratio), thereby creating the population-wide male-to-female sex ratio observed in Samoa (i.e. 109 : 100). This conjecture dovetails with recently published empirical findings, which indicate that the mothers of androphilic and gynephilic males may follow different reproductive strategies (Camperio-Ciani *et al.* 2004; King *et al.* 2005). Furthermore, *fa'afafine* may facilitate the increased reproductive success of their female relatives via the elevated levels of avuncular tendencies they exhibit (Vasey *et al.* in press). 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 further investigation.

It is difficult to discern whether the older brother effect we observed here for androphilic males is simply due to the fecundity effect that was also documented for the mothers of these males. One reason why this is the case is that number of older brothers is naturally confounded with number of siblings. The magnitude of the older brother effect was not significantly larger than the older sister effect or the younger brother effect. However, our sample size may have been too small to properly assess differences in the relative magnitudes of these effects. In light of other recent studies that have reported older brother effects alongside fecundity effects (Camperio-Ciani *et al.* 2004; King *et al.* 2005; Blanchard & Lippa in press), there is a need to discern whether number of older brothers influences male sexual orientation above and beyond maternal fecundity. Thus, future studies based on Western or non-Western populations in which fecundity and older brother effects are observed in conjunction with other sibling category effects should assess the relative magnitude of the older brother effect.

This being said, the older brother effect remains one of the most reliable correlates of male sexual orientation. In

addition, the older brother and fecundity effects documented for our Samoan sample are consistent with patterns previously described for Western samples (Camperio-Ciani *et al.* 2004; King *et al.* 2005; Blanchard & Lippa *in press*). Therefore, it may be most parsimonious to conclude, for the time being, that both phenomena are related to the development of male androphilia.

In conclusion, the data presented here must be interpreted with a degree of caution, because the sample sizes employed are small relative to those used for birth order studies in Western populations. Nevertheless, the fact that the results presented here were generated using relatively small samples indicates that the observed effects are robust.

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