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## How Accurate Is the Family History Method for Assessing Siblings' Sexual Orientation?

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*Previous studies investigating the familial nature of sexual orientation have often relied on the reports of siblings. They have generally obtained extremely high accuracy rates for proband rating of the sexual orientation of siblings. However, participants in these studies have probably been unusually open about their sexual orientation, and thus it is uncertain if more representative participants would have as accurate knowledge about their families. An unselected sample of twins from the Australian Twin Registry rated their own, their cotwins', and their siblings' sexual orientations. We examined accuracy of heterosexual and homosexual probands' assessments of their twins' sexual orientations, as well as cotwins' agreement about other siblings' orientations. Concordance between twins' ratings of their cotwins' orientations with the cotwins' self-rated orientations was considerably lower than that found in previous studies, as was the level of agreement between members of a twin pair in the assessment of other siblings' sexual orientations. Marital history as a proxy variable for determining the sexual orientation of older subjects did not support its use with women, though its use for older men received some weak support.*

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**KEY WORDS:** sexual orientation; family history method; reliability; twins; siblings.

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### INTRODUCTION

Family studies (Pillard and Weinrich, 1986; Bailey and Benishay, 1993; Hamer *et al.*, 1993) and twin studies (Bailey and Pillard, 1991; Bailey *et al.*, 1993)

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exploring familial influences on sexual orientation have frequently asked probands to report on the sexual orientation of relatives, particularly siblings. Accuracy of the proband report is evaluated by comparison with the self-report of the relative. Prior studies have found these assessments to be accurate as long as the proband expresses a high degree of confidence (Bailey and Pillard, 1991; Bailey and Benishay, 1993; Bailey *et al.*, 1993; Pillard and Weinrich, 1986).

These studies have been subject to potential biases, however. Most important, they primarily recruited self-identified homosexual and bisexual probands through homosexual-oriented publications and organizations. Nonheterosexuals (homosexuals and bisexuals) recruited by these methods may be unrepresentative in important respects. In particular, these nonheterosexual probands are self-selected for openness and thus may be more knowledgeable about their siblings' sexual orientations (Bailey and Benishay, 1993). This may be particularly true of the studies we have cited, because probands were explicitly recruited for family and twin studies. It seems likely that probands answering an advertisement for a family or twin study of sexual orientation are especially open with, and knowledgeable about, their families. It is important to assess the accuracy of sibling reporting in less self-selected samples, because some recent family-genetic studies have used such samples and methods. For example, one recent study assessed, via proband reports, sexual orientation in the siblings of men who identified as homosexual recruited as consecutive admissions to an HIV clinic (Bailey *et al.*, 1997). The ideal sample in which to study familial-genetic aspects of sexual orientation would consist of a cohort of nonheterosexual individuals ascertained systematically from a representative, well-defined population. Although the family history method is much less expensive and intrusive than actually contacting siblings, it remains to be demonstrated that it would provide trustworthy data for samples such as these.

Blanchard and Bogaert (1997) proposed the use of marital history—whether a person had ever legally married or cohabited in a heterosexual relationship—as a reasonable proxy variable for sexual orientation in subjects over a certain age. Their results for self-identified homosexual and heterosexual male volunteers indicated that for a population prevalence of male homosexuality of 4%, the probability that a never-married man over age 40 being homosexual is 0.84, and for a population prevalence of 2% the probability of homosexuality would be 0.72.

In the context of a large twin study of sexual behavior, we asked twins to rate their own, their cotwins', and their siblings' sexual orientation. The aim of this paper is to use these data to examine the accuracy of reporting on cotwin sexual orientation, and the reliability of reporting on sibling sexual orientation in a sample likely to be much more representative than past studies that have explored the accuracy of sibling reports. Furthermore, we evaluate the use of marital history as a proxy variable for sexual orientation for male and female subjects.

## METHOD

Participants in this study were twins drawn from the Australian National Health and Medical Research Council Twin Registry (ATR). Details of participant recruitment and questionnaire administration appear elsewhere (Bailey *et al.*, submitted). Of 9112 people approached regarding their willingness to complete a questionnaire regarding sex, 28% explicitly refused to participate. A total of 1908 complete pairs (980 MZ, 928 DZ), and 1085 singles completed the questionnaire (54%). The respondent group consisted of 3077 females and 1824 males, with an age range of 19 to 52 years ( $\bar{x}$  age  $30.9 \pm 8.4$ ). Twins in a prior study from which the current cohort of participants was drawn were slightly better educated than the general population (Baker *et al.*, 1996), although this was suggested to stem from age biases rather than level of schooling. They were also somewhat more likely to be married (Miller *et al.*, 1997).

Respondents were asked to provide information on a range of items, including their marital status, sexual orientation (heterosexual, bisexual, or homosexual), present sexual feelings, sexual behavior during the last year, and sexual fantasies. The last three of these had a 7-point scale, ranging from sexual feelings/behaviors/fantasies involving only the opposite sex, to those involving only the same sex. An overall Kinsey score for each respondent was obtained by averaging responses to the items pertaining to feelings and fantasies (Bailey *et al.*, submitted). Respondents were also asked to provide information on the sexual orientation of each sibling at least 18 years old (including cotwin) and rate their certainty of their assessment (absolutely certain, virtually certain, moderately certain, very uncertain).

One difficulty encountered in determining marital history was that the questionnaire item relating to marital status referred to current status only. Hence, the option "never married" would include those who had separated after having lived in a heterosexual relationship without having been married. To correct this problem, information regarding partners in current and past marriages/de facto relationships was used to eliminate people who had previously lived in heterosexual relationships. A second problem was the small numbers of survey respondents over age 40 who had never been married or lived in a heterosexual relationship (10 male and 16 female). As a result, a lower age cutoff of 35 years of age has also been used.

## RESULTS

### Twin Cross-Reporting of Sexual Orientation

Self-report and cotwin report of a subject's sexual orientation were available for 3564 individuals (1262 male and 2302 female). Table I contains a comparison

**Table 1.** Comparison of Sexual Orientation Self-Reports and Cotwin Reports, by Cotwin Self-Reported Sexuality<sup>a</sup>

	Self-rating by twin	Rating of twin by heterosexual cotwin			Rating of twin by nonheterosexual cotwin		
		Rated twin as heterosexual	Rated twin as nonheterosexual	Kappa ± ASE	Rated twin as heterosexual	Rated twin as nonheterosexual	Kappa ± ASE
Male	Heterosexual	818	0	0.56 ± 0.07	47	2	0.70 ± 0.17
	Nonheterosexual	28	19		1	4	
Female	Heterosexual	1851	5	0.55 ± 0.08	39	2	0.44 ± 0.14
	Nonheterosexual	24	18		8	6	
Opposite sex	Heterosexual	624	1	0.38 ± 0.10	30	1	0.28 ± 0.26
	Nonheterosexual	24	8		3	1	
All twins	Heterosexual	3293	6	0.51 ± 0.05	116	5	0.50 ± 0.10
	Nonheterosexual	76	45		12	11	

<sup>a</sup>Nonheterosexual includes ratings of "bisexual" and "gay"/"lesbian".

of the self- and cotwin reports, separated into two groups depending on whether the cotwin considered him/herself heterosexual or nonheterosexual. Kinsey scale ratings were not used in determining whether the cotwin considered him/herself to be heterosexual or nonheterosexual. Of the 3420 self-identified heterosexual twins, 3409 were correctly identified, with only 11 incorrectly identified as nonheterosexual. Inspection of other survey information indicates that of these 11 subjects, 5 have Kinsey scale ratings of 1 or 2, indicating that they have some nonheterosexual tendencies despite their self-rating of heterosexuality. However, only 56 of the 144 self-identified nonheterosexual twins were correctly identified by their cotwins, with 88 incorrectly identified as heterosexual.

Comparable rates of correct identification of heterosexual cotwins and misidentification of nonheterosexual cotwins were observed for heterosexual twins where only ratings of at least "virtually certain" were considered (Table II). A slight trend for nonheterosexual twins to rate less heterosexual twins incorrectly was observed for the stricter rating criterion, although the numbers were small (2 of 91 compared with 5 of 121).

Cohen's kappa statistic (1960) was used to quantify the agreement between self-rating of sexual orientation and cotwin assessment. Following the kappa statistic interpretation scale of Landis and Koch (1977), moderate agreement was demonstrated in most cases, with only fair agreement observed for opposite sex twin pairs. Substantial agreement was observed only for male twin pairs where the cotwin is nonheterosexual. When only cotwin ratings of "absolute" or "virtual" certainty were considered, kappa values for agreement between opposite sex pairs increased slightly, but the result was not statistically significant.

Comparison of the accuracy of sexual orientation ratings given by the two groups of cotwins using Fisher's exact test (two-tailed) indicated that subjects who regarded themselves as heterosexual were more likely to be rated as nonheterosexual by nonheterosexual cotwins than by heterosexual cotwins ( $p < 0.001$ ). However, where cotwins were required to be at least "virtually certain" of their rating, the difference was only significant at the 0.05 level.

### **Twin Reporting of Sibling Sexual Orientation**

The results of comparisons between twins' reports of the sexual orientation of siblings appear in Table III. When all responses were considered, no significant differences were observed between the level of agreement on the sexual orientation of brothers and sisters, which ranged from moderate to substantial (Landis and Koch, 1977). When only responses given with "absolute" or "virtual" certainty were considered, slightly greater agreement was shown between male twins with regard to the sexual orientation of sisters, and between female twins with regard to the sexual orientation of their brothers. However, these trends were not statistically significant.

**Table II.** Comparison of Sexual Orientation Self-Reports and Cotwin Reports with Certainty, by Cotwin Self-Reported Sexuality<sup>a</sup>

	Twin self-rating	Heterosexual cotwin certain of their rating				Nonheterosexual cotwin certain of their rating			
		Rated twin as heterosexual		Rated twin as nonheterosexual		Rated twin as heterosexual		Rated twin as nonheterosexual	
		Count	Kappa ± ASE	Count	Kappa ± ASE	Count	Kappa ± ASE	Count	Kappa ± ASE
Male	Heterosexual	737	0.54 ± 0.08	0	0	36	0.79 ± 0.21	1	
	Nonheterosexual	23		14	0	0		2	
Female	Heterosexual	1694	0.53 ± 0.08	5	1	32	0.47 ± 0.14	1	
	Nonheterosexual	19		14	6	8		6	
Opposite sex	Heterosexual	560	0.42 ± 0.18	1	0	21	0.36 ± 0.27	0	
	Nonheterosexual	15		6	1	3		1	
All twins	Heterosexual	2991	0.51 ± 0.05	6	2	89	0.52 ± 0.11	2	
	Nonheterosexual	57		34	9	11		9	

<sup>a</sup>Nonheterosexual includes ratings of "bisexual" and "gay"/"lesbian".

**Table III.** Reported Sexual Orientations of Siblings of Twins

	Number reported bisexual or homosexual				Number reported bisexual or homosexual with certainty			
	n	By at least		Kappa ± ASE	n	By at least		Kappa ± ASE
		one twin	By both twins			one twin	By both twins	
Male twins—brothers	513	21	9	0.59 ± 0.11	14	7	0.66 ± 0.12	
Male twins—sisters	525	10	4	0.57 ± 0.16	4	3	0.86 ± 0.14	
Female twins—brothers	1040	29	15	0.68 ± 0.08	25	14	0.71 ± 0.08	
Female twins—sisters	959	18	8	0.61 ± 0.11	10	4	0.57 ± 0.16	
Opp. sex twins—brothers	362	12	5	0.58 ± 0.14	9	5	0.71 ± 0.14	
Opp. sex twins—sisters	342	6	2	0.49 ± 0.22	3	2	0.80 ± 0.20	
All twins—brothers	1915	62	29	0.63 ± 0.06	48	26	0.70 ± 0.06	
All twins—sisters	1826	34	14	0.58 ± 0.09	17	9	0.69 ± 0.10	

**Use of Marital History as an Indicator of Sexual Orientation**

Table IV lists the proportions of heterosexual and nonheterosexual males and females over the age of 35 who had never been married or lived in a heterosexual relationship. Of the 25 males meeting this criterion, just under half (48%) regarded themselves as nonheterosexual. This could be expected to increase at least slightly with age, and in fact 70% of those over 40 years of age regarded themselves as nonheterosexual. However, these proportions are not significantly different. For females over age 35 who had never been married or lived in a heterosexual relationship, only 6 out of 40 regarded themselves as nonheterosexual. This is significantly different from the proportion seen in males (two-tailed Fisher's exact test:  $p < 0.01$ ). Again, no statistically significant difference was observed between these results and those only including females over age 40 years.

**DISCUSSION**

The degree of concordance observed in this study between a twin's stated sexual orientation and their cotwin's assessment is considerably lower than expected

**Table IV.** Proportions of Heterosexual and Nonheterosexual Male and Female Subjects Over 35 and 40 Years of Age

	Over 35 years of age		Over 40 years of age	
	Male (n = 25)	Female (n = 40)	Male (n = 10)	Female (n = 16)
Heterosexual	0.52	0.85	0.30	0.81
Nonheterosexual	0.48	0.15	0.70	0.19

from the results of previously conducted sibling studies (Pillard and Weinrich, 1986; Bailey and Pillard, 1991), where prediction rates for heterosexuality and nonheterosexuality have been as high as 97.5%. In the present study, there is a less than a 50% chance that a twin will know if their cotwin is nonheterosexual. Comparisons between twin and cotwin ratings of sibling sexual orientation in this study similarly demonstrate lower levels of concordance.

These results have a number of implications for future research on sexual orientation. Prior studies have suggested that openly homosexual or bisexual men who volunteer for family-genetic studies tend to report accurately about their siblings' sexual orientation. However, our results indicate that in less selected samples such reporting may be considerably less accurate. Reliance on such data may yield inaccurate recurrence rates for use in genetic and environmental modeling. In addition, comparison of nonheterosexual and heterosexual probands' reports may be especially perilous due to the evidence that nonheterosexual people have a higher rate of erroneously identifying heterosexual siblings as nonheterosexual. Even lower accuracy could be expected in studies utilizing reports about more distant relatives (e.g., cousins and uncles).

Although the number of subjects in this study of the appropriate age was small, the use of marital history as a proxy variable for sexual orientation in older men received some support, with 48% of men over 35 and 70% of men over 40 considering themselves to be nonheterosexual. The second value is close to the lower estimate of 72% given by Blanchard and Bogaert (1997). However, for female subjects the results were extremely poor, with less than 20% of older women considering themselves nonheterosexual. An additional point of concern in the use of marital history as a proxy variable for sexual orientation is the potential biasing of sample by not including nonheterosexuals previously involved in heterosexual marriages or de facto relationships.

There are, however, limitations to this study. First, it is possible that twins may be unrepresentative in some respects (Bailey *et al.*, submitted). However, it seems likely that twins would know each other at least as well as nontwin siblings and other relatives. If so, the observed accuracy in this study would provide an upper bound of the trustworthiness of such data, when there is no a priori indication that probands are not especially open with their families (as might be the case, for example, with a sample ascertained from a "Gay Pride" rally). Second, Australian probands might differ from those of previous studies (mostly American) with respect to openness about homosexuality. If so, the present results would probably underestimate the accuracy of the American studies. Until further research clarifies these issues, our results suggest that the family history method for assessing siblings' sexual orientation has some validity, but is much less accurate than past research has indicated.



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