

Homosexuality in Monozygotic Twins Reared Apart

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We describe six pairs of monozygotic twins, in which at least one member of five pairs were homosexual, and one of the remaining pair was bisexual, from a series of 55 pairs, reared apart from infancy; all the female pairs were discordant for homosexual behaviour. This and other evidence suggest that female homosexuality may be an acquired trait. One male pair was concordant for homosexuality, while the other was not clearly concordant or discordant; this suggests that male homosexuality may be associated with a complex interaction, in which genes play some part.

There have been a few reports of homosexuality in male twins ascertained as part of a series. Kallmann (1953) reported 100% concordance in 37 monozygotic (MZ) pairs, compared to 12% in 26 dizygotic (DZ) pairs, but came to regard that rate for MZ pairs as excessive, because the twins were recruited from the 'clandestine world' of New York City homosexuals of the 1940s, which might favour over-inclusion of concordant pairs. In a series of 14 MZ pairs ascertained because of criminality, Lange (1931) found homosexuals in one concordant and one discordant pair. Sanders (1934) located twins through homosexual probands, and found five of six MZ male pairs concordant. Habel (1950) started with five MZ and five DZ probands in German prisons; he found three of the MZ and none of the DZ co-twins to be homosexual. In an unselected series of 495 German twins, Koch (1965) found one pair of discordant DZ males, and one pair of discordant MZ females. Heston & Shields (1968) obtained proband twins from consecutive admissions to London psychiatric facilities. They described five MZ pairs, two definitely concordant, two definitely discordant, and one equivocal; among seven DZ pairs, one was concordant. In addition, they described a family with 14 siblings, including three sets of male MZ twins; all of the twin pairs were concordant—two for homosexuality, and one for heterosexuality. A family in which six out of ten siblings were homosexual was later described by Dank (1971). However, we know of no systematic studies of sexual orientation based on a series of twins, which included either female twins, or twins reared apart.

The use of twins to estimate the relative contribution of genetic and environmental factors to phenotypic traits is well known, and authoritative reviews are available (Hrubec & Robinette, 1984; Gottesman & Carey, 1983). Only one special prob-

lem of analysis will be discussed here—the search for specific environmental factors which might reasonably be associated with specific phenotypic dissimilarities between members of an MZ pair. Such dissimilarities, which are evident in all pairs examined, must be non-genetic, and should in principle, be traceable to environment. In typical studies, the heritability of behavioural traits has been estimated at about 0.5, leaving sufficient scope for environmental effects (Bouchard, 1984). Yet assiduous searches, albeit mainly retrospective, for specific environments which affected only one member of a pair, and which therefore might underlie discordance, have yielded few findings (Hrubec & Robinette, 1984; Pollin *et al.*, 1965). In large part, this failure might be due to the special environments of twins reared together, which include the presence of a genetically identical individual. They may be so similar for each member of a pair that differences in environment possibly associated with phenotypic differences may be too fine to be caught in the crude nets provided by our instruments for assessing environments.

The study of twins reared apart from infancy removes the confounding effects of environmental similarity. Thus similar outcomes for MZ pairs reared apart may be more confidently associated with shared genes, and dissimilar outcomes may be more clearly associated with environmental factors, because the early environments are more likely to be definably different. Further, one major confounding environmental factor will be eliminated—the other identical twin.

Method

At the University of Minnesota, we have recruited twin pairs who had been reared apart, and have brought them to Minneapolis for a week of intensive psychological and

TABLE I
Clinical details of male pairs

Twin 1a

Examination

Age 25, weight 58.3 kg, height 180 cm.

Development

1st born, weight 2.67 kg, height 49.5 cm. Pubic hair, age 12; facial hair, age 14; masturbation, age 13; first aware of his homosexuality, age 13; limited heterosexual petting, age 14; no heterosexual dating.

Sex practice

No heterosexual intercourse; homosexual experience starting age 13. Less active sexually than twin; estimates he has had homosexual contact with 25–30 men. Homosexual partner to twin, age 24.

Other

Learning disability, hyperactive, speech impediment with lisp as child. Emotionally labile, subject to episodes of anxiety and depression.

Twin 1b

Examination

Age 25, weight 59.8 kg, height 175 cm.

Development

Second born, weight 2.56 kg, height 49.5 cm, pubic hair, age 12; facial hair, age 14; masturbation, age 12; some heterosexual petting and dating starting in late teens.

Sex practice

Several heterosexual contacts with intercourse starting age 19; homosexual experiences starting age 13. More sexually active than twin, estimates he had had homosexual contact with about 500 men. Homosexual partner to twin age 24.

Other

Learning disability, hyperactive, speech impediment with lisp as child. Emotionally labile and subject to episodes of anxiety and depression. Hospitalized three times for depression, anxiety, and anger outbursts.

Twin 2a

Examination

Age 35, weight 71.0 kg, height 175 cm.

Development

Birth order, wt, ht, unknown (but said to be larger than twin at birth). Pubic hair, age 14, facial hair, age 17; masturbation, age 13. Some heterosexual dating in high school, but no sexual contact.

Sex practice

First homosexual contact age 12. Two brief heterosexual contacts age 17–18. Regarded himself as bisexual until age 19 when he became exclusively homosexual. Has had homosexual contact with seven men; prolonged contact with one man. Feels sexually attracted to twin, but no sexual contact with him.

Other

Enuretic until his teens. Adopted into large family on east coast.

Twin 2b

Examination

Age 35, weight 76.2 kg, height 173.5 cm.

Development

Birth order, ht, unknown, weight 1.9 kg, pubic hair, age 15; facial hair, age 15; masturbation, age 15; some heterosexual dating and petting in high school.

Sexual practice

Homosexual affair with an older man between ages 15–18. First heterosexual experience, age 20, with future spouse. No heterosexual contact, except with spouse. Married age 20, four children. Regards himself as exclusively heterosexual. Sexual relations once or twice a month. Happy with his sexual adjustment.

Other

Adopted and reared by a family in a small southern farming community.

medical study. The procedure included standardised medical–psychiatric interviews and examinations, and questionnaires and interviews concerning current and past sexual practices. Zygosity was established through blood typing. A complete description of the recruiting and study methods was given by Bouchard *et al* (1981). Among the 55 pairs so far studied (counting two sets of triplets as three pairs each), members of five MZ pairs, two male and three female, described themselves as homosexual. A member of a sixth pair of MZ females has extensive homosexual experience, and is regarded as bisexual. The twin who first became known to our group was the homosexual member of a female pair in one case. In the other three female pairs, both members were approached at the same time, and were persuaded to participate in the study by one of the investigators (TJB); while both members of the concordant male pair agreed to participate after discussion with their parents. In the other male pair, contact was first made with the twin who regarded himself as exclusively heterosexual; these twins agreed between themselves to participate. The exclusively homosexual twin volunteered information about his homosexuality in his first telephone contact with one of the investigators (TJB). None of the 16 DZ pairs included a homosexual.

That the twins are highly selected cannot be doubted; they are not representative of twins or homosexuals. Nevertheless, study of them has yielded clues which warrant description. In the following descriptions, details have been changed in order to protect the twins identities.

Results

The male pairs

A male pair, seen by us shortly after their reunion at age 25, was the result of a normal pregnancy. After an unremarkable postnatal course, they were adopted by different families of similar middle-class status, who lived in different suburbs of a major western city. Neither twin

TABLE II
Clinical details of female pairs

*Twin 1a**Examination*

Age 35, weight 63.2 kg, height 164 cm

Development

Birth order, wt, ht unknown; tomboy before puberty; menarche age 12–13; breast budding, age 10; masturbation age 10; limited heterosexual petting, age 16; but no dating.

Sex practice

Age 19 had heterosexual intercourse, not pleasurable, and during same year, realised that she was homosexual. First organism, mid 20's. Has had affairs with five women, the last and current eight years in duration.

Other

Enuretic to age 12, probable addiction to sedative drugs age 25.

*Twin 1b**Examination*

Age 35, weight 62.2 kg, height, 158 cm

Development

Birth order, wt, ht, unknown; menarche age 10.5; breast budding, age 8; masturbation age 11; heterosexual dating and petting in teens.

Sex practice

Age 18, heterosexual intercourse. Age 25, only marriage, which has continued to date. No homosexual experience. Heterosexual intercourse two to three times weekly, enjoyed.

*Twin 2a**Examination*

Age 40, weight 82.1 kg, height 163 cm

Development

Birth order, first; birth wt, 3.38 kg; menarche age 14; breast budding and pubic hair age 13; masturbation, age 13.

Sex practice

Age 16 had heterosexual intercourse, then with several men through age 18; 'could take it or leave it' ... 'boring'; one induced abortion. By 18, knew self to be homosexual and has had affairs with several females.

Other

Alcohol problem in past—described loss of control drinking; also amphetamine abuse. Major depression after suicide of female lover.

*Twin 2b**Examination*

Age 40, weight 65.6 kg, 160 cm

Development

Second born; birth wt 2.0 kg; menarche age 11.0; breast budding and pubic hair, age 11; 'tomboy' before puberty; dating age 18; no masturbation.

Sex practice

First intercourse age 18, exclusively heterosexual. Marriage age 22, three children. Describes current sex as 'somewhat important'.

Other

Reared in small, geographically isolated community

which, together with strict religious practice in home, limited opportunity for early dating. Age 16 suspended from school for fighting.

*Twin 3a**Examination*

Age 35, weight 55.6 kg, height, 163 cm

Development

Second born; weight 3.0 kg and length 45.25 cm. Menarche at age 13; age 10 breast budding and pubic hair; masturbation age 17; heterosexual dating through last one to two years of high school (age 17+); age 20, first heterosexual intercourse. Through age 24 to 25, heterosexual contact with about 12 males; never married or engaged. Age 27, first homosexual affair—'knew' she was homosexual.

Sex practice

Living with female sexual partner since age 28 toward whom she expresses deep emotional attachment.

*Twin 3b**Examination*

Age 35, weight 53.5 kg, height 162 cm.

Development

First born, 2.7 kg, 42 cm. Menarche age 11; pubic hair age 11; breast budding age 12; dated age 15; first intercourse age 17; married age 18, four children. No homosexual contacts or feelings.

Sex practice

'Very satisfied' with sex life in marriage.

*Twin 4a**Examination*

Age 48, 79.5 kg, 165 cm.

Development

First born; menarche age 10.3; breast budding and pubic hair age 9. No dating until age 21; heterosexual intercourse age 22; age 23, first marriage from which one child. Age 25, first homosexual contact; then three years with two successive female partners. Age 29, second heterosexual marriage, which has lasted to date with no homosexual contacts; second child.

Sex practice

Since age 29 regards herself as exclusively heterosexual with good heterosexual marriage and active sex life. At same time, feels sexually attracted to both males and females.

*Twin 4b**Examination*

Age 48; 92.5 kg, 164 cm.

Development

As child of 7, vagina was penetrated by adoptive brother, who was then age 9; menarche age 9.5; breast budding and pubic hair age 8; heterosexual intercourse, age 12; child at age 14; first orgasm and first marriage age 16. Divorced and remarried age 35.

Sex practice

Active heterosexual sex life, never homosexual contact. Was prostitute for one year between marriages.

Other

Significant depression after divorce.

knew that the other existed until one went into a bar frequented by homosexuals in a neighbouring city, and there was mistakenly identified as his brother. Their histories were strikingly similar. As children, both had been hyperactive, had learning disabilities, and had speech impediments, mainly lisps. Both were emotionally labile and subject to episodes of anxiety and depression. Both had been active homosexuals since age 13, starting with boys in their neighbourhoods. Although the second-born had had a few heterosexual contacts, both had been aware of being intensely attracted to males and indifferent to females since late childhood. After discovering each other, they became sexual partners.

The second pair, tested four years after their reunion at age 35, was also the product of a normal pregnancy and delivery. One twin weighed 1.9 kg; his co-twin was said to be larger at birth and was 2 cm taller as an adult. The larger twin was adopted by a family living in a large city on the US east coast. He had homosexual relationships starting about age 12; at age 17–18, he had two brief heterosexual contacts which led him to regard himself as bisexual until age 19, when he became exclusively homosexual. He felt sexually attracted to his co-twin, who had been adopted and reared by a family living in a small southern farming community. He had married, had four children, and regarded himself as exclusively heterosexual. However, between ages 15–18, he had had a homosexual affair with an older man who lived in the same town. His only female partner has been his wife and, although intercourse is infrequent, he described his current sexual adjustment as a happy one. Table I contains further details.

The female pairs

Table II presents the major features of the four female pairs. Without reservation, three of the four pairs were discordant for sexual preference. One member of pair 4 had had a homosexual affair, which was intense and prolonged, so that we regard her as bisexual, although she describes herself as exclusively heterosexual since her second marriage in her late twenties. Her co-twin, like the other three co-twins, denied any homosexual experiences, and described herself as enthusiastically heterosexual.

All four pairs were adopted by ordinary families which did not have especially notable features. All were reared in medium-sized cities or suburbs, except for twin 2b, who was reared in a small town that was exceptional for its geographical and cultural isolation. In every pair, the homosexual member was the larger throughout life, but had experienced menarche later than her co-twin. The homosexual twin also lagged behind her co-twin in the development of secondary sex characteristics and in the age at which sexual experiences commenced. After menarche, the menstrual history of the two pairs for whom adequate information was available did not distinguish the homosexual from the heterosexual twin.

Discussion

The male pairs are typical of others which have been described, with the single main difference that they

were reared apart in different environments. One pair was clearly concordant for homosexuality. Whether to count the other pair concordant or discordant, or partially one or the other, is problematic; analogous problems of classification often occur in twin studies. It is notable that the male homosexuals said that they were attracted sexually by their co-twins. Twins reared together strongly deny such feelings according to Kallmann's experience, and ours (Heston & Shields, 1968), although exceptions have been reported (Meyers, 1982).

Overall, the male pairs tend to confirm earlier studies of twins and twin families: the concordance rate for sexual orientation among MZ pairs is consistently above that of DZ pairs, and despite all problems of ascertainment and diagnosis, it is hard to deny genetic factors an aetiological role.

The female pairs yield evidence leading in an opposite direction. Either three or all four of our female pairs were discordant, depending on how one classifies twin 4a. This evidence suggests that in the women, environmental factors were decisive. Moreover, in each pair, the homosexual twin was taller and heavier, but achieved menarche later. In our four pairs, the mean difference in age at menarche was two years, whereas in normative series, the mean difference is about 0.3 year (Fischbein, 1977; Stern, 1973 and Gedda & Brenci, 1975). In our series, the 15 heterosexual female MZ pairs averaged 0.9 years difference in age at menarche, or 1.1 years less than the homosexual twins. In the homosexual pairs, the interval between the menarche of the first and the second twin, was significantly greater than the comparable interval observed in either the normative series, or in our reared-apart heterosexual twins ($P < 0.05$, Mann-Whitney U statistic).

The difference of 0.6 years between members of our heterosexual pairs and normative pairs may well be associated with the separate rearing of our pairs. Shared rearing environments, or a tendency for twins reared together to compare notes when asked about developmental milestones, could logically explain the small difference in reported age at menarche between our heterosexual reared-apart twins and reared-together twins.

This pattern of findings suggests that female homosexuality is a trait acquired after conception, most likely after birth, but before menarche. It may be associated with delayed puberty and just possibly with larger physique. With this possibility in mind, we reviewed the medical history of the twins, but found no episodes of illness or other events which differentially affected the homosexuals.

These findings are descriptive only, and should be

regarded as clues upon which to base hypotheses; e.g. do lesbian women tend to have menarche at later ages than their heterosexual female siblings? If so, this would support our findings, and it would seem to warrant search for an acquired cause, perhaps an endocrinopathy. Neuroendocrine differences may be associated with male homosexuality (Gladue *et al.*, 1984). Our evidence, though based on

a small sample, implicates environmental factors as the major determinant of female homosexuality. If this remains a constant finding, it will, apart from general features of a culture such as language, be the strongest evidence known to us which attributes a major behavioural complex exclusively to environmental factors.

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