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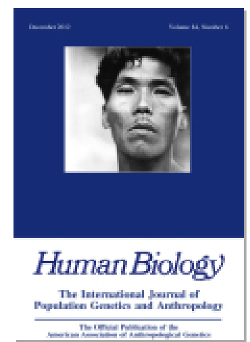


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# *Evidence against a Relationship between Dermatoglyphic Asymmetry and Male Sexual Orientation*

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*Abstract* Hall and Kimura (1994) studied the relation between dermatoglyphic asymmetry and male sexual orientation in a sample of 66 homosexual and 182 heterosexual men. They found that more homosexual men possessed a leftward dermatoglyphic asymmetry than did heterosexual men. In this paper, we report a comparative study about the relationship between sexual orientation and dermatoglyphic characteristics, including 60 homosexual men, 76 heterosexual men, and 60 heterosexual women, recruited from the general population, and also from a gay-rights nongovernmental organization, in Salvador, Brazil. Ulnar loops were the most frequent dermatoglyphic pattern in all groups, followed by whorls, arches, and radial loops. A chi-square analysis comparing the frequencies of the patterns in the three groups only showed an excess of ulnar loops in women ($p < 0.05$) and arches in men ($p < 0.01$), but did not reveal significant differences between homosexuals and the other groups studied. There was no significant difference between gay and straight men on total ridge count. We found a preponderance of rightward asymmetry in homosexual and heterosexual men, as well as in heterosexual women. Our results do not agree with Hall and Kimura's data indicating that more gay men possessed the minority leftward asymmetry than did straight men. There was no significant difference in leftward asymmetry in the sample studied. The results reported in this paper do not support any relation between dermatoglyphic asymmetry and male sexual orientation, and, thus, any hypothesis concerning a biological intrauterine contribution to adult sexual orientation somehow associated with dermatoglyphic development.

Since the middle of the 19th century, the etiology of sexual orientation has been the subject of an enduring controversy. For a long time, the debate on this issue has been marked by a conflict between the extremes of biological and environmental determinism: was sexual orientation determined by the biology of the in-

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dividual or was it the result of social learning? The social learning model, claiming that the main source of variation is to be found, in this case, in the familial, social, and cultural environments, has been the strongest influence in this field of research for most of the 20th century. Environmental determinism has been such a pervasive view because of both the influence of psychoanalytic theory (Hart and Richardson 1983) and the regrettable attempts of physicians and biologists in the slippery ground of the therapy of homosexuality (Herrn 1995; Blurr 1996). The research program on biological influences over the development of sexual orientation has been recently revitalized, bringing a new light on the topic and providing counter-evidences to the environmentalist models. Family studies (Pillard and Weinrich 1986; Bailey and Bell 1993; Bailey and Benishay 1993) and twin and adopted sibling studies (Bailey and Pillard 1991; Buhrich et al. 1991; King and McDonald 1992; Bailey et al. 1993a; Whitam et al. 1993) produced a great deal of evidence for the familial concentration of both male and female homosexuality as well as for the contribution of genetic factors in the development of sexual orientation. Other recent studies supported, in varying degrees, the hypothesis that biological factors have some important role in the etiology of sexual orientation, such as the highly controversial neuroanatomic investigations focused on several hypothalamic nuclei, as INAH-3 and SDN-POA (LeVay 1991, 1993; Swaab and Hofman 1991), and the search for a putative gene in the region Xq28, which could be involved in the origin of variability in sexual orientation (Hamer et al. 1993; Hamer and Copeland 1994).

Currently, interactionist models, taking due account of both biological (and, particularly, genetic) and environmental factors, seem to be the most reasonable choice for an explanation of how sexual orientation develops in the human species (Byne and Parsons 1993; El-Hani et al. 1997). Twin and adopted sibling studies have clearly shown that the heritability of sexual orientation is not zero, so that it is likely that genetic causes play a role in its development. Nevertheless, those very same studies have shown that environmental causes, especially as regards nonshared environment, are also important in this respect (Bailey and Pillard 1991; Bailey et al. 1993a). One may even say that research on sexual orientation has challenged the everlasting nature-nurture controversy: it is not that one ought to answer if nature or nurture is the most important influence in the development of sexual orientation; rather, the question is one of recognizing that sexual orientation is a product of both nature and nurture as well as of understanding how nature acts via nurture, and nurture acts via nature.

As to the biological effects after fecundation, Blanchard and Bogaert (1996) and Jones and Blanchard (1998) showed that the birth of a male child in a kinship makes more likely that the next male child will be homosexual. This effect was not observed in the female sex (Blanchard et al. 1998). Incidentally, it should be noted that there are several lines of evidence suggesting that male and female sexual orientations can have distinct etiologies. Surprisingly enough, Blanchard and Bogaert (1998) and Lalumière et al. (1998) found this very same feature, older brothers in excess, in convicted sexual aggressors, suggesting that, whatever the cause of this effect, it acts on a biological mechanism that broadly affects sexual preferences.

Dörner and colleagues (1983) reported a remarkable increase in gestational stress in male homosexuals' mothers as compared to heterosexuals' mothers. These data made them propose the controversial hypothesis that male homosexuality could result from gestational stress. Nevertheless, Bailey et al. (1993b) did not find similar differences in a comparable study.

Hall and Kimura (1994) examined the relation between dermatoglyphic asymmetry and male sexual orientation. Dermatoglyphics are the characteristics of the ridged skin on the fingertips, palms, toes, and soles of primates (including human beings) and some other mammals. They consist of the alignment of the sweat glands' pores and are shaped in the first trimester of gestation. Dermal ridges complete their development about the 16th week of fetal life (Holt 1968). They have been used as predictors of human fate without much success for at least five thousand years (Flores et al. 1994). Notwithstanding, they have an important role in genetics, for entirely different reasons. Dermal ridges are largely influenced, during fetal development, by genetic factors (Mi and Rashad 1977; Bener and Erck 1979), but also by environmental factors, such as the level of prenatal testosterone (Jamison et al. 1993, 1994) and maternal psychological stress (Newell-Morris et al. 1989). Anticonvulsants (Andermann et al. 1981) and alcohol (Quazi et al. 1980) ingested by pregnant mothers alter dermal ridge configuration. Asymmetry in dermatoglyphics as well as in other phenotypic traits is thought to be related to disorders in fetal development.

In their study, Hall and Kimura (1994) examined the following dermatoglyphic characteristics of 66 homosexual and 182 heterosexual men: total ridge count (TRC) and directional ridge asymmetry. All heterosexual men and 20 of the homosexual men were paid undergraduate students recruited through campus newspaper and poster advertisements in two Canadian Universities (Western Ontario and Toronto). The remaining homosexual men were volunteers recruited during Gay Pride festivities in West Hollywood, California. Because the three middle fingers showed a high incidence of a pattern with no triradiate point, resulting in a count equal to 0, Hall and Kimura have only scored the thumb and little fingers (that is, fingers I and V). They claimed that this would be a valid indication of TRC, since the ridges on the fingers of each hand are highly correlated (Holt 1968). One should notice, however, that Shaumann and Alter (1976) do not accept the idea that the nonexistence of a point at the center of the triradius entails the absence of patterns and, then, a count equal to 0. Hall and Kimura found no significant difference between gay and straight men on TRC. Homosexual men, like heterosexual men and women, showed a preponderance of rightward directional asymmetry. Nonetheless, more homosexual men possessed the minority leftward asymmetry than did heterosexual men. They also performed a test for the direction of ridge asymmetry between the homosexual men and an archival group of 128 heterosexual women, but found no significant differences, although a slightly larger percentage of homosexual men than heterosexual women demonstrated leftward asymmetry. Another relevant result obtained by Hall and Kimura is that adextrality and an increased incidence of leftward asymmetry seemed to be associated in homosexual men, but not in heterosexual men and women.

Hall and Kimura (1994) claimed that their findings were consistent with suggestions of an early biological contribution to adult sexual orientation in men. As ridge differentiation seems to be under both genetic and epigenetic influences, they argued that either or both factors might contribute to the increased leftward asymmetry in the homosexual men investigated. They also emphasized that an increased leftward asymmetry is not, in itself, indicative of sexual orientation, since both homosexual and heterosexual men (as well as heterosexual women) most often show rightward dermatoglyphic asymmetry. Another claim of interest is that dermatoglyphics of homosexual men are composites of some male-typical (TRC) and some female-typical (directional asymmetry) characteristics.

We report in this paper results concerning the relationship between sexual orientation and dermatoglyphic characteristics in homosexual men, and heterosexual men and women recruited in Salvador, a large city located in the northeast region of Brazil, which is the capital of one of the Brazilian states, Bahia.

## Materials and Methods

We carried out a comparative study of the relationship between sexual orientation and dermatoglyphic characteristics, including 60 homosexual men, 76 heterosexual men, and 60 heterosexual women, recruited from the general population, and also from a gay-rights nongovernmental organization (Grupo Gay da Bahia—"Bahia Gay Group"), in Salvador, Brazil. All subjects were demographically matched for age, income, and race. All the participants gave written informed consent for the handling of the data. All of the homosexual and heterosexual subjects made a self-declaration of their sexual orientation, answering to Kinsey scales, including sexual attraction, fantasies, behavior, and orientation (Kinsey et al. 1948). Hand and finger prints were obtained by the following method: first, both hands were cleaned with alcohol (98°GL), and then a 2:1 mixture of glycerin and ink was applied to the palm of each hand. Any excess of ink was avoided. The impressions were collected on writing paper. The same procedure was carried out for each of the ten fingers. The dermatoglyphic characteristics of both hands were counted and analyzed using a magnifying glass. We did not observe, as did Hall and Kimura (1994), a high incidence of a pattern presumably with no triradius in fingers II, III, and IV; thus, we have scored all fingers, and also fingers I and V, as Hall and Kimura did. The researchers who counted the ridges were not aware of the subjects' sexual orientations.

The following measures were used in the dermatoglyphic analysis: (1) TRC was obtained by drawing a line between the triradiate and core points and counting all intersecting ridges in all the fingers of both hands; (2) dermatoglyphic patterns were analyzed, being classified as arches, whorls, ulnar loops, and radial loops (Holt 1968; Penrose 1968).

Statistical analysis was performed using the software NCSS 6.0 (Hintze 1996).

## Results

**Total Ridge Count (TRC).** Table 1 shows the total ridge count and fingers I and V ridge count for heterosexual and homosexual men, as well as heterosexual women.

These results are in good agreement with those obtained by Saldanha (1968) for the general population of another Brazilian city, São Paulo (data not shown).

An analysis of the three groups (ANOVA) did not show any significant differences in the TRC, fingers I and V ridge count, and a-b ridge count, between them. A factor analysis considering all the studied measures—TRC, uRC, rRC (all fingers and fingers I and V), and right/left differences—did not improve the discrimination between the groups.

**Dermatoglyphic Asymmetry.** The results concerning the dermatoglyphic asymmetry in all fingers, in a-b ridge count, and in the fingers I and V, for the three groups studied are shown in Table 2. Table 3 shows the percentage of individuals in each group presenting rightward or leftward asymmetry. The data concerning only fingers I and V are shown in Table 4. There were no significant differences between the homosexual and heterosexual men.

**Analysis of Dermatoglyphic Patterns.** Tables 5, 6, and 7 show the frequencies of the four types of dermatoglyphic patterns in the groups studied. Ulnar loops were the most frequent pattern in all groups, followed by whorls, arches, and radial loops. A chi-square analysis ($\chi^2$) comparing the frequencies of the patterns in the three groups only showed an excess of ulnar loops in women ($p < 0.05$) and arches in men ($p < 0.01$), but did not reveal significant differences be-

**Table 1.** Total Ridge Count (TRC) for the Ten Fingers and Fingers I and V in the Groups Studied

| *Group* | *TRC All Fingers Mean ± Standard Deviation* | *TRC Fingers I and V Mean ± Standard Deviation* |
|---|---|---|
| Heterosexual men ($N = 76$) | 124.80 ± 45.61 | 57.07 ± 20.22 |
| Homosexual men ($N = 60$) | 133.35 ± 48.90 | 60.27 ± 16.70 |
| Heterosexual women ($N = 60$) | 123.82 ± 43.57 | 52.98 ± 18.93 |

*Note:* ANOVA: NS.

**Table 2.** Means and Standard Deviations for the Right/Left Differences in All Fingers, in A-B Ridge Count, and in the Fingers I and V, in the Three Groups Included in the Study

| *Group* | *N* | *All Fingers*** | *A-B Ridge Count** | *Fingers I and V** |
|---|---|---|---|---|
| Heterosexual women | 60 | 6.6 ± 1.2 | 1.26 ± 0.51 | 3.2 ± 0.7 |
| Homosexual men | 60 | 3.0 ± 1.2 | 0.79 ± 0.63 | 3.3 ± 0.7 |
| Heterosexual men | 76 | 2.7 ± 1.1 | 1.45 ± 0.65 | 1.7 ± 0.6 |

*Note:* *ANOVA: NS; **ANOVA: $p = 0.036$; women ≠ men.

**Table 3.** Percentage of Individuals Presenting Rightward or Leftward Asymmetry in the Three Groups Studied (All Fingers)

| *Symmetry* | *Heterosexual Women (N = 60)* | *Heterosexual Men (N = 76)* | *Homosexual Men (N = 60)* |
|---|---|---|---|
| Leftward asymmetry | 25.0% | 30.3% | 26.7% |
| Symmetrical | 5.0% | 10.5% | 5.0% |
| Rightward asymmetry | 70.0% | 59.2% | 68.3% |

*Note:* $\chi^2$: NS.

**Table 4.** Percentage of Individuals Presenting Rightward or Leftward Asymmetry in the Three Groups Studied (Fingers I and V)

| *Symmetry* | *Heterosexual Women (N = 60)* | *Heterosexual Men (N = 76)* | *Homosexual Men (N = 60)* |
|---|---|---|---|
| Leftward asymmetry | 28.3% | 35.4% | 36.7% |
| Symmetrical | 8.3% | 6.3% | 3.3% |
| Rightward asymmetry | 63.3% | 58.2% | 60.0% |

*Note:* $\chi^2$: NS.

tween homosexuals and the other groups studied. Asymmetry was observed only in relation to a single pattern in women: arches ($p < 0.05$). An examination of the frequency of each pattern, per finger, in the three groups did not yield significant results.

## Discussion

As Naugler and Ludman (1996) stress, symmetry is known to be decreased in a variety of disorders of developmental origin. Fluctuating asymmetries, varying among individuals, can be seen as developmental residues, that is, they are what remain after the organism has become as symmetrical as possible. The greater symmetry in dermatoglyphic and nondermatoglyphic traits seems to

**Table 5.** Dermatoglyphic Patterns Observed in Heterosexual Women ($N = 60$), Fingers I through V

| | *Right Hand* | | | | | *Left Hand* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Pattern* | *I* | *II* | *III* | *IV* | *V* | *I* | *II* | *III* | *IV* | *V* |
| Arch | 6.7% | 8.3% | 3.3% | 1.7% | 0% | 8.4% | 16.7% | 10.0% | 5.0% | 3.3% |
| Ulnar loop | 51.6% | 46.7% | 83.3% | 55.0% | 86.7% | 53.3% | 35.0% | 65.0% | 50.0% | 81.7% |
| Radial loop | 1.7% | 8.3% | 0% | 0% | 0% | 0% | 8.3% | 1.7% | 1.7% | 0% |
| Whorl | 40% | 36.7% | 13.4% | 43.3% | 13.3% | 38.3% | 40.0% | 23.3% | 43.3% | 15.0% |

**Table 6.** Dermatoglyphic Patterns Observed in Heterosexual Men ($N = 76$), Fingers I through V

| | *Right Hand* | | | | | *Left Hand* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Pattern* | *I* | *II* | *III* | *IV* | *V* | *I* | *II* | *III* | *IV* | *V* |
| Arch | 5.1% | 17.7% | 10.1% | 6.3% | 2.5% | 10.1% | 16.5% | 15.1% | 7.6% | 3.8% |
| Ulnar loop | 45.5% | 34.2% | 74.7% | 45.6% | 79.7% | 48.1% | 35.4% | 68.4% | 45.5% | 74.7% |
| Radial loop | 0% | 11.4% | 0% | 0% | 0% | 2.5% | 16.5% | 1.3% | 1.3% | 0% |
| Whorl | 49.4% | 36.7% | 15.2% | 48.1% | 17.7% | 39.2% | 31.6% | 15.2% | 45.6% | 21.5% |

**Table 7.** Dermatoglyphic Patterns Observed in Homosexual Men ($N = 60$), Fingers I through V

| | *Right Hand* | | | | | *Left Hand* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Pattern* | *I* | *II* | *III* | *IV* | *V* | *I* | *II* | *III* | *IV* | *V* |
| Arch | 0% | 8.4% | 13.3% | 1.7% | 3.3% | 3.3% | 6.6% | 8.3% | 3.3% | 0% |
| Ulnar loop | 46.7% | 43.3% | 68.3% | 41.6% | 83.3% | 51.7% | 51.7% | 70.0% | 56.7% | 80.0% |
| Radial loop | 3.3% | 10.0% | 0% | 1.7% | 0% | 0% | 10.0% | 3.4% | 0% | 0% |
| Whorl | 50.0% | 38.3% | 18.4% | 55.0% | 13.4% | 45.0% | 31.7% | 18.3% | 40.0% | 20.0% |

show, then, that women are less susceptible to adverse environmental influences during fetal development than men (Goodson and Meier 1986). Kobylianski and Micle (1988) also claim that, presumably, the higher sensitivity of the male sex to some environmental factors, or, in other words, its lower developmental stability, may explain the differences between the sexes. The data reported in this paper, however, are in the opposite direction, since women showed, in the sample studied, a higher asymmetry in the variables presenting significant differences. As those differences were not extreme, we tend to think that they are close to the results of Bener (1979), who did not find any effects of sex on the dermatoglyphic asymmetry in a sample of a thousand normal individuals.

As in Hall and Kimura's (1994) findings, there was no significant difference between gay and straight men on total ridge count (TRC). We also found a preponderance of rightward asymmetry in homosexual and heterosexual men, as well as in heterosexual women. This asymmetry can be directional instead of fluctuating. It may be explained by a dominance of the brain's left hemisphere, promoting a discrete increase in pattern complexity.

Our results do not agree, however, with Hall and Kimura's data indicating that more gay men possessed the minority leftward asymmetry than did straight men. There was no significant difference in leftward asymmetry in the sample we studied. This may be related, of course, to population differences. One should observe, for instance, that there are dermatoglyphic variations among the different ethnic groups (Gonçalves and Gonçalves 1984). Moreover, many dermatoglyphic investigations were not performed in highly mixed populations. Dermatoglyphic variations, however, tend to increase in mixed populations. Pereira da Silva (1971), for example, compared the frequencies of arches and whorls in individuals from different ethnic groups, observing that as mixing increased in the populations there were significant alterations in the figures initially found for the dermatoglyphic patterns. It is well known that Brazilian population is highly mixed (Salvador, particularly, shows a high degree of mixing between Caucasian and African races). Hall and Kimura's sample, recruited among undergraduate students from the University of Western Ontario and the University of Toronto, as well as in the Gay Pride festivities in West Hollywood, California, might be less mixed than the sample we gathered in Salvador, Brazil. This might explain, at least in part, the differences between our results and Hall and Kimura's findings.

Mustanski at al. (2002) also did not replicate part of the of Hall and Kimura's (1994) findings: TRC and directional and fluctuant asymmetry were not related to sexual orientation in a sample of 333 men

Anyway, one should notice that the results reported in this paper do not support any relation between dermatoglyphic asymmetry and male sexual orientation, and, thus, any hypothesis concerning a biological intrauterine contribution to adult sexual orientation somehow associated with dermatoglyphic development.

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