

Elevated Sinistrality in Transsexuals

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Abstract: *On the basis of both Geschwind and Behan's (1984) theory—that at least part of the genesis of left-handedness can be ascribed to overexposure to testosterone during fetal development—and Dorner's (1980; Dorner et al., 1991) theory—that transsexuality emerges from prenatal over- or underexposure to androgens in female-to-male (FTM) and male-to-female (MTF) transsexuals, respectively—it was predicted that the frequency of left-handedness in FTM transsexuals would be higher than in the general population. In MTF transsexuals, by contrast, the frequency of left-handedness was expected to be lower or the same as in the general population. Results showed that the prevalence of left-handedness in both FTM and MTF transsexuals is nearly two times higher than in the general population. The generally higher prevalence of left-handedness among transsexuals, combined with the absence of the predicted sex difference, indicates that either Dorner's theory on the etiology of transsexuality or Geschwind's model of the genesis of left-handedness, or both, need to be revised.*

Keywords: Transsexuality, left-handedness, gender.

Although there is no consensus with regard to the degree (if any) of hereditary influences on the genesis of left-handedness, there is general agreement that part of the prevalence of left-handedness is pathological in nature; that is, it is due to one or more unfavorable conditions

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during fetal development. Geschwind and Behan (1984) proposed that one such condition could be an atypical hormonal environment during fetal development. More specifically, they ascribed pathological left-handedness to prenatal exposure to high levels of testosterone. This theory was supported by Nass et al. (1987), who found a substantially higher prevalence of left-handedness in female patients with congenital adrenal hyperplasia, a pathological condition that is characterized (amongst others) by a high prenatal testosterone production, which is atypical for the female sex.

With regard to transsexuality, it has been proposed that in men this condition is due to a lower than normal exposure to androgens during sexual differentiation of the brain, whereas in women it is due to a higher than normal exposure to androgens (Dorner, 1980; Dorner, Poppe, Stahl, Kolzsch, & Uebelhack, 1991). Recently, however, Gooren (1990) seriously questioned Dorner's theory.

The combination of Geschwind and Behan's (1984) theory on left-handedness with Dorner's (1980; Dorner et al., 1991) hypothesis on the etiology of transsexuality led us to the prediction that the prevalence of left-handedness in female-to-male (FTM) transsexuals would be higher than that in the general population and that the prevalence of left-handedness in male-to-female (MTF) transsexuals would be lower or no different than in the general population. A comparable hypothesis was tested by McCormick, Witelson, and Kingstone (1990) for homosexuality. Assuming that male homosexuality emerges from prenatal underexposure to testosterone and female homosexuality from overexposure, McCormick et al. predicted a higher prevalence of left-handedness in the latter group and a lower prevalence in the former. They found a significantly greater prevalence of left-handedness among homosexual women and a trend in the same direction for homosexual men.

Method

To test the present hypothesis with regard to transsexuality, we assessed hand preference in a group of 93 MTF and 44 FTM transsexuals. These 137 subjects were left from a total of about 180 individuals who had contacted the gender team of the hospital of Vrije University in Amsterdam with gender identity problems in the period between January 1989 and March 1991. Forty to 45 of these individuals decided not to go on with treatment after a couple of interviews. The remaining 137 individuals were all treated (in a 1-year program conducted by the Dutch Gender Foundation) either with hormones only or with a combination of hormones and surgery. Hand preference was assessed before treatment took place. The mean age of the MTF subjects was 28 years, and the mean age of the FTM subjects was 22 years.

Hand preference was assessed with a six-item questionnaire. Included were the five most reliable items (i.e., low probability of erroneous answers because of visualization errors) from a scale developed by Oldfield (1971); the items asked about hand preferences for writing, throwing, cutting with scissors, teeth brushing, and drawing. We added a sixth item: foot preference for kicking a ball. Each item contributed either 1 (left hand preferred) or 0 (right hand preferred) points to the maximum score of 6. Right-handedness was defined as a score of 0, 1, or 2; left-handedness was defined as a score of 4, 5, or 6. Ambidexterity was defined as a score of 3. Table 1 presents the prevalence of left-handedness, right-handedness, and ambidexterity among the MTF and FTM subjects. Since the end of the 1950s, it has been common practice in Dutch education to let children write with their preferred hand (J. A. M. Carpay, personal communication, 1992). Therefore, it is very likely that there were no cases of "forced" right-handed writing in the present sample.

Table 1
Hand Preference as a Function of Transsexuality Type

Hand preference	MTF		FTM		Total	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Right	72	77.4	34	77.3	106	77.4
Ambidextrous	3	3.3	2	4.5	5	3.6
Left	18	19.3	8	18.2	26	19.0

Note. MTF = male-to-female transsexuality; FTM = female-to-male transsexuality.

Results

The proportion of left-handed and right-handed subjects was not statistically different between MTF and FTM subjects, $\chi^2(1, N = 93, 44) = 0.00, p = 1.0$. The chi-square was calculated in a 2 (male vs. female) \times 2 (left- vs. right-handed) frequency table. MTF and FTM frequencies were therefore pooled to test the difference between the prevalence of left-handedness in the present sample of transsexuals (who came from all over the Netherlands; about 95% of all Dutch transsexuals receive treatment at the Vrije Universiteit hospital) and the aged-matched part of the Dutch population survey conducted by Van den Brekel (1986), comprising 4,906 subjects. Table 2 gives the prevalence figures concerned. The prevalence of left-handedness among transsexuals was significantly higher than that in the age-matched general population, $\chi^2(1, N = 137, 4769) = 7.27, p = .007$.

In this test, ambidextrous individuals were treated as right-handed. The outcome of the chi-square test is therefore conservative. In Van den Brekel's (1986) study, ambidextrous

Table 2
Hand Preference Frequencies in the Transsexual Sample
and in the General Dutch Population

Group	Hand preference	
	Right ^a	Left
Transsexuals		
<i>n</i>	111	26
%	81	19
Dutch general population		
<i>n</i>	4,236	533
%	88.8	11.2

Note. Figures for the Dutch population were obtained from Van den Brekel (1986).

^aIncludes ambidextrous subjects in the transsexual sample. Ambidextrous individuals were not distinguished in Van den Brekel's data.

individuals were not distinguished. The assessment of handedness in that study was based on the answer to only one question: "Do you consider yourself as predominantly right-handed or left-handed? [English translation]." When ambidextrous subjects in this study were considered as left-handed, then the number of right-handed transsexuals decreased from 111 to 106, and the number of left-handed transsexuals increased from 26 to 31. These figures, of course, deviate still further from the figures for the general Dutch population, $\chi^2(1, N = 137, 4769) = 17.17, p < .001$.

Discussion

This is the first study in which the relationship between transsexuality and hand preference has been investigated. The results do not confirm the prediction from endocrine theory that there is a high prevalence of left-handedness among FTM transsexuals and a lower or equal prevalence among MTF transsexuals relative to the prevalence in the general population: The prevalence of left-handedness was elevated in both groups. This finding remains intriguing and casts doubt on Dorner's (1980; Dorner et al., 1991) theory of the etiology of transsexuality or on Geschwind and Behan's (1984) ideas on the causation of pathological left-handedness or on both. On the other hand, the present data—in particular the absence of a sex difference with respect to enhanced prevalence of left-handedness in transsexuals—are in line with the observation that several other pathologies are associated with increased left-handedness, for example, epilepsy and atopic skin diseases. Among individuals with these chronic diseases, the prevalence of left-handedness is 2 to 3 times higher than in the population in general and occurs to the same degree or sometimes even more often in women as in men. Of children with extremely low birth weights (less than 1,000 g), about 50% are left-handed (O'Callaghan et al., 1987). The common feature behind all of these pathological conditions could be disturbances in the fetal development of the central nervous system, some of which may be caused by exposure to enhanced testosterone levels, and some of which (low birth weight, for instance) are very likely not caused by exposure to enhanced testosterone levels. The fact that the prevalence of left-handedness is higher in epileptic women than in epileptic men (Van den Brekel, 1986) must also be considered as an indication that pathological left-handedness may involve factors other than the degree of prenatal testosterone exposure alone.

In conclusion, we can say that the nature of our results—a similarly elevated prevalence of left-handedness among both FTM and MTF transsexuals—argues against abnormal prenatal testosterone exposure as a factor in the etiology of left-handedness among transsexuals. In fact, our results are similar to those of McCormick et al. (1990), who observed an elevated prevalence of left-handedness in both female and male homosexuals.

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Search Opens for Editor of New APA Journal

The Publications and Communications Board has opened nominations for the editorship of a new journal, *Journal of Experimental Psychology: Applied*, for the years 1995-2000. Candidates must be members of APA and should be prepared to start receiving manuscripts early in 1994 to prepare for issues published in 1995. Please note that the P&C Board encourages more participation by members of underrepresented groups in the publication process and would particularly welcome such nominees. To nominate candidates, prepare a statement of one page or less in support of each candidate. Submit nominations to

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The *Journal of Experimental Psychology: Applied* will publish original empirical investigations in experimental psychology that bridge practically oriented problems and psychological theory. The journal also will publish research aimed at developing and testing of models of cognitive processing or behavior in applied situations, including laboratory and field settings. Review articles will be considered for publication if they contribute significantly to important topics within applied experimental psychology.

Areas of interest include applications of perception, attention, decision making, reasoning, information processing, learning, and performance. Settings may be industrial (such as human-computer interface design), academic (such as intelligent computer-aided instruction), or consumer oriented (such as applications of text comprehension theory to the development or evaluation of product instructions).

First review of nominations will begin December 15, 1992.