



Received 9 June 1978
Final 30 August 1978

Short Note

Association of Handedness and Birth Order in Monozygotic Twins

J.C. Christian, D.S. Hunter*, M.M. Evans, F.M. Standeford

Department of Medical Genetics, Indiana University School of Medicine, Indianapolis

In a random sample of 104 pairs of middle-class Caucasian, handedness-discordant twins six years of age or older, a significant relationship has been found between birth order and handedness in monozygotic twins, there being an excess of left-handed among first-born twins ($P < 0.01$). No such relation has been found in dizygotic twins.

Key words: Handedness, Birth order, Monozygotic twins, Asymmetry

Handedness in man has been the subject of numerous investigations, ranging from mythology to the behavioral sciences. Twins have been shown to have a greater frequency of left-handedness than singletons [1] and twins have been used extensively to investigate the inheritance of handedness [2].

In a study of asymmetry we tabulated the hand preference of 1251 twin pairs in the Indiana University twin panel predominantly Caucasian middle- and upper-middle-class individuals from Indiana. Only twins six years of age and older were used, and hand preference was ascertained by having the twin or a parent complete a questionnaire asking whether the twin was right or left-handed. Only those twin pairs in which both members were classified as right or left handed were analyzed. Birth order was also obtained by questionnaire and confirmed when possible by hospital records. Zygosity was determined by 12 blood groups and electrophoretic markers. This report concerns 104 pairs of twins discordant for handedness. The Table shows a striking relationship between first-born and left-handed twins in both male and female MZ twins ($\chi^2 P < 0.01$) but not DZ twins.

Koch [3] found no significant relationship between handedness and birth order in 32 pairs of handedness-discordant twin-pairs, but she did not separate the twins according to

*Present address: Department of Medicine, Evanston Memorial Hospital, Evanston, Illinois.

TABLE. Birth Order and Handedness in Handedness-Discordant Twins

Twin type	Handedness of first-born twin		
	Right	Left	
Monozygotic			
Male	3	16	
Female	<u>5</u>	<u>28</u>	P < 0.01
	8	44	
Dizygotic			
Male	8	8	
Female	12	10	
Opposite sexed	<u>7</u>	<u>7</u>	
	27	25	NS

zygosity. Koch [3], however, did find the left-handed member of the pair generally was the dominant one (23 vs 9).

Bakan [4] proposed the hypothesis that left-handedness was related to stressful prenatal and birth conditions based upon an increased frequency of left-handedness in first as well as fourth and higher birth orders for singletons. This hypothesis has since been supported by Leviton [5]. MacGillivray et al [6] point out, however, that most reports have indicated that the second-born twin is often subjected to a more stressful birth than the first-born.

If this finding of the relationship between first-born twins and left-handedness is more than an extreme sampling deviation or some bias of ascertainment we are unaware of, it may provide an important clue to further understanding the etiology and importance of asymmetry in man.

Acknowledgments. Supported in part by grant PHS P50 GM21054 and a grant by the John A. Hartford Foundation, Inc.

REFERENCES

1. Carter-Saltzman L, Scarr-Salapatek S, Baker WB, Katz S (1975): Left-handedness in twins: Incidence and patterns of performance in an adolescent sample. *Behav Genet* 6:189–203.
2. Levy J (1975): A review of evidence for a genetic component in the determination of handedness. *Behav Genet* 6:429–453.
3. Koch HL (1966): "Twins and Twin Relationships." Chicago: University of Chicago Press, p 77 ff.
4. Bakan P (1971): Handedness and birth order. *Nature* 229:195.
5. Leviton A (1976): Birth order and left-handedness. *Arch Neurol* 33:664.
6. MacGillivray I, Nylander PPS, Comey G (1975): "Human Multiple Reproduction." Philadelphia: WB Saunders, p 159.

Correspondence: Dr. Joe C. Christian, Department of Medical Genetics, 1100 West Michigan Street, Indianapolis, IN 46202, USA.