HEREDITY OF SCALP WHORL

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In the mapping of human chromosomes, it is desirable to have as many common traits as possible which may act as "marker" genes for specific chromosomes. A good common trait for such linkage studies should have some hereditary factors contributing to its variation between individuals. With the more recent methods for detecting human linkage, it is not necessary to know the exact mode of hereditary transmission involved.

The purpose of the present study is to determine whether or not hereditary factors play a part in causing variability in direction of scalp hair whorl. Individuals having double crowns and individuals whose hair whorl was not definitely clockwise or counterclockwise were not included in the present study. In 1925 Bernstein[1] made a study of the heredity of scalp whorls by parent offspring comparisons. He suggested that clockwise direction tended to be dominant to counterclockwise direction. In 1933 Rife[2] studied the direction of hair whorl in identical twins. He found considerable variability indicating environment may also contribute to variation in direction of hair whorl. So much doubt has been cast concerning the possibility of hereditary factors in the transmission of hair whorl direction that the trait was never used in comparisons for linkage until 1942 by Kloepfer[3].

The offspring are arranged according to parental matings in Table 1. For the application of the Chi-square test to be valid, it was necessary to group together the offspring of all matings other than those in which both parents had clockwise whorls. By summing the marginal totals and applying the Chi-square test for significance by use of the formula,

[1]Bernstein, Felix, 1925b, Heredity of scalp whorls. Sitzungberechte der Preussischen Akademie der Wissenschaften Physikalisch—Mathematische Klasse. 61-82.

[2]Rife, D. C., 1933. A genetic study of monozygotic twins. Dissertation, The Ohio State University.

[3]Kloepfer, H. W., 1942. An investigation of 171 possible linkage relationships in man. Dissertation, The Ohio State University.

TABLE 1

Distribution of direction of Hair Whorl in Offspring according to Parental Mating

(Data from present study)

Parental mating	Offspring		Total
	right	left	
right x right	88	12	100
right x right and left x left	14	9	23
Total	102	21	123

$X^2 = 9.721^{**}$

TABLE 2

Distribution of direction of Hair Whorl in Offspring according to Parental Mating

(Data from Bernstein)

Parental mating	Offspring		Total
	right	left	
right x right	58	12	70
right x right and left x left	35	15	50
Total	93	27	120
	$X^2 = 28^{**}$		
	right	left	

$$X^2 = \frac{n\ (ad - bc)^2}{(a+b)\ (c+d)\ (a+c)\ (b+d)}$$

we obtain a value of 9.721 which is highly significant. If there were no relation between direction of hair whorl and type of parental mating, for one degree of freedom the odds are 100:1 against a X^2 value of 6.635 or greater (Fisher, 1938)[4]. Since there is no known environmental reason why offspring should resemble parents as to direction of hair whorl, we may presume hereditary factors are present.

Since the Chi-square statistic was not applied by Bernstein, I have arranged his data in Table 2, just as my own data were arranged in Table 1. Upon applying the Chi-square statistic, a value of 28 is obtained which likewise is highly significant.

According to parent-offspring comparisons, one is justified in assuming the presence of hereditary factors in causing variations in direction of hair whorl. The study of identical twins shows that environmental factors maye likewise contribute to the variation. Although the exact mode of inheritance may be in doubt, the trait can be recommended as suitable for use in linkage studies.

[4]Fisher, R. A., 1938. Statistical methods for research workers. Edinburgh: Oliver and Boyd. xv plus 356 pp.