The Relation Between Ocular Dominance, Handidness, and Visual Acuity

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Problem

It is of certain theoretical and academic interest to learn whether persons who are right handed also tend to be right-eyed or visa versa. The question often comes up as to whether one who has marked ocular dominance tends to use the better eye or whether the eye being used most gets weaker or stronger. Data were available that could be analyzed to throw light on these problems which might be formulated into the following questions:

1. Is there a tendency for right-handed persons to be right-eyed and left-handed persons to be left-eyed?
2. Is the dominant eye the strongest eye?

Method and Procedure

Data used for this study were obtained at Hartford, Connecticut from results of a study made by the Driving Research Laboratory at Iowa State College and the Harvard Bureau of Traffic Research in cooperation with the Motor Vehicle Department of Connecticut and the Highway Research Board. A part of the data were analyzed in the Driving Research Laboratory at Iowa State College as a basis of this study. The subjects used were tested for eye dominance, visual acuity besides certain other variables. In all, 1,671 records were analyzed although but 1,246 were used in the second part of the study. For comparison of eye dominance and acuity, only the scores of those subjects were used who out of twelve trials showed complete right eyed or left eyed dominance. The Parsons test was used to measure ocular dominance, the Smedley dynamometer to measure strength, used as criteria of handedness and the Clason acuity meter used to determine visual acuity. An analysis of 1,671 cases was made to determine the incidence of eye dominance and handedness using the criteria as given above. The results are shown in Table I.

Table I—The incidence of Handedness and Eyedness

	R. R. Number	R. L. Number	R. A. Number	%
Actual	570	178	166	9.93
Expected	542.01	194.2	177.8	11.62
			$x^2 = .93$	

	L. R. Number	%	L. L. Number	%	Number	%
Actual	339	20.28	138	8.26	118	7.06
Expected	352.9	21.12	126.4	7.56	115.7	6.93
	$x^2 = .29$		$x^2 = .16$		$x^2 = .67$	

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	A. R. Number	%	A. L. Number	%	A. A. Number	%
Actual	82	4.91	39	2.33	41	2.45
Expected	96.1	5.75	34.4	2.06	31.5	1.88
	$x^2 = .29$		$x^2 = .16$		$x^2 = .67$	

A listing of numbers in each category is given in Table II. The criterion for eye dominance was based on twelve trials; those showing 8 to 4, 6 to 5, or 6 to 6 right and left were classified as ambiocular.

Table II—Eye Dominance Ratio

Eye Preference	Number	Percentage
Right	914	54.70
Left	595	36.61
Ambiocular	162	9.69

Strength as measured by the dynamometer was used as a criterion instead of any verbal designation as right or left. Difference of less than one kilogram were classified as ambidexterous.

Table III—Handedness Ratio

Eye Preference	Number	Persentage
Right	991	59.31
Left	355	21.24
Ambidexterous	325	19.45

According to Snedecor (1940) a chi-square of .36 or larger will occur in more than half of all random samples whereas a chi-square of 1.2 or greater will occur in only about one-fourth of such samples. Since there is only one chance in 20 that a chi-square will be greater than 3.84, it follows that the data show practically no possibility of any association not explained by chance.

Further analysis was made to ascertain whether the dominant eye is higher in acuity, or conversely, whether the stronger eye tends to be dominant. Only 1,246 cases were used in which the subject used the left eye or the right eye exclusively in 12 trials with the Parsons test. Those having right eye-dominance numbered 776 or 63.5 percent while those registering left eye-dominance included but 476 or 35.7 percent.

Statistical evaluations of the visual acuity of subjects with right eye and left eye-dominance are shown in Tables IV and V. The right-eyed dominant group showed a mean of 80.60 percent vision for the right eye and 73.29 percent vision for the left eye. The left-eyed dominant group showed a mean of 76.79 for the right eye and 79.54 for the left eye.

Table IV
Visual Acuity of Subjects with Marked Right-Eyed Dominance

Number 766	Mean of percent vision
Right eye	80.60
Left eye	73.29
Critical ration 9.7—very highly significant.	

Visual Acuity of Subjects with Marked Left-Eyed Dominance

Number 470	Mean of percent vision
Right eye	76.79
Left eye	79.54
	2.75

Critical ratio slightly significant.

Summary and Conclusions

1. Analysis of 1,671 records made of handedness and eye dominance showed no association between eye dominance and handedness.
2. Of 1,246 persons showing right of left eye dominance revealed a significant difference in favor of the dominant eye.
3. In right-eye dominance the right eye is highly significantly better.
4. In left-eye dominance the left eye is significantly different.

Reference

1. Snedecor, George W. Statistical Methods. Iowa State College Press. p. 14. 1940.

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