confusion could account for the considerable number of ipsilateral errors that were still made. There was apparently little risk of confusion between the hand and foot signals for either side of the body, and the ipsilateral errors must, it seems, have been due to some inherent confusion in the selection of the response.

An interesting incidental finding arises from a comparison of the errors of the right-handed and left-handed subjects. 183 errors were made by the 15 right-handers (error-rate = 15.3 per cent), and 174 by the 10 left-handers (error-rate = 21.7 per cent). The distribution of the errors is given in Table 2. This shows that the contralateral error-rate (that is, right hand for left hand, left foot for right foot, etc.) was greater among left-handers than right-handers; and the left-handers produced a statistically significantly greater proportion of contralateral hand errors than did the right-handers (the difference being more than three times its standard error).

This difference is perhaps relevant to the indication from neurological and other evidence that cortical organization in left-handers may not be the 'mirror-image' of that in right-handers. The majority of left-handers are not as wholly left-handed as right-handers are right-handed², and it is now fairly well established that with most left-handers the right cortical hemisphere is not dominant to the extent that the left is dominant with right-handers^{3,4}. Critchley⁴ mentions the term 'bicerality' which has been used of left-handedness; but it seems that most of the evidence relates to the higher functions thought to depend on the dominant hemisphere. There is apparently no certain evidence whether, for example, laterality in the sensory and motor cortices is also less pronounced with left-handers than with right-handers.

Some evidence perhaps related to this question is given by Semmes *et al.*⁵. They showed, by their studies of somatosensory loss following brain injuries, that the sensory functions of the left hand are very much more diffusely represented in the two hemispheres than are those of the right hand; the normally accepted ideas of contralaterality of representation were found to apply to the right hand, but not to the left. They point out that, as only a few of their subjects were left-handed, their findings are perhaps typical of right-handers alone, and that the situation with left-handers would not necessarily be a straightforward reversal of this. Referring to the findings mentioned here on dominance in left-handers, they suggest that in fact such a reversal would be unlikely; the implication appears to be that in left-handers the representation of both hands might be more diffuse.

The greater proportion of contralateral hand errors made in the present experiment by the left-handed subjects may tentatively be taken as further indirect evidence of such diffuseness of cortical representation.

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⁴ Critchley, M., *The Parietal Lobes* (London, 1953).

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STATISTICS

Combining the Probabilities from Significance Tests

It is frequently useful to combine the probabilities resulting from two or more independent significance tests. The following simple method appears to do so directly in an unbiased manner.

Divide the probabilities into those greater and those less than 0.5. A probability of 0.5 can be put into either group or ignored. Subtract each of the larger probabilities (> 0.5) from 1. Double each probability now in the two groups and multiply the resulting probabilities within each group together, forming products R_a for the smaller and R_b for the larger original probabilities. If there were no original probabilities less than 0.5, then $R_a = 1$; if there were no probabilities greater than 0.5, then $R_b = 1$. Divide the smaller of the quantities R_a and R_b by twice the larger to produce a quotient Q . If R_a was larger than R_b subtract Q from 1. If $R_a = R_b$, then $Q = 0.5$, since this is the limiting case when either is larger. Q is in any event the combined probability desired.

This procedure may be justified as follows. The original probabilities must of course be multiplied together in some way to obtain a joint probability. Under the null hypothesis the original probabilities will have a rectangular distribution from 0 to 1. It is convenient to reduce the entire distribution of products to a single exponential-like distribution; this is done by subtracting the larger probabilities from 1. The probabilities are now doubled to restore the original range of the distribution.

If the smaller probabilities are $P_1, \dots, P_t, \dots, P_n$, where $P_i \leq 0.5$, and the larger probabilities are $P_1, \dots, P_j, \dots, P_m$, where $P_j \geq 0.5$, then the two products are:

$$R_a = 2^n \prod_{i=1}^n (P_i)$$

$$R_b = 2^m \prod_{j=1}^m (1 - P_j)$$

R_a represents the effect of those individual tests that tend to disprove the null hypothesis, while R_b represents the effect of the tests that tend to restore confidence in the null hypothesis. The ratio between R_a and R_b should therefore estimate the degree to which the null hypothesis has survived its tests. To restore the probabilities to their original ranges this ratio is divided by two and, if $R_a > R_b$ (that is, if efforts to disprove the null hypothesis have been less successful than would be expected half the time by chance), subtracted from 1.

The null hypothesis tested by the final probability Q is that the null hypothesis of none of the individual tests is false. No restriction as to the nature of the original populations sampled is necessary so long as some kind of valid test can be made on each. This test need not be the same for all the populations; in fact the union of several quite different hypotheses about the same or different populations can be tested by Q , so long as the significance tests are independent.

If N is the total sample size of a homogeneous population and n the number of significance tests of the same hypothesis on different parts of this population, then the efficiency of Q is:

$$\frac{N-n}{N-1}$$

as compared with combining the data into a single test on a parameter such as the mean or variance.

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