

Differential survey response rates in right- and left-handers

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In a questionnaire survey of left-handedness in a student population it is shown that left-handers return questionnaires significantly more quickly than do right-handers. Such differential responding may bias estimates of the rate of left-handedness in the population.

Left-handedness is present in about 10 per cent of the population, and is an important polymorphism since it relates to cerebral dominance for language (Bryden, 1982), and is probably under genetic control (Annett, 1985; McManus, 1985*a*). Variation in the incidence of left-handedness between the sexes and between populations has important implications for understanding the origin of the gene and its mode of maintenance in the gene pool, since a constant incidence across time and space would imply the existence of a balanced polymorphism which is maintained by strong selective forces. By contrast, variation between populations would imply the existence of genetic drift and weaker selective pressures (as for instance has been found in hand clasping; McManus & Mascie-Taylor, 1979).

Left-handedness is a trait which individuals are necessarily aware of in themselves, and whose origins are also of some interest to those in the minority who show it. The possibility therefore arises that in surveys in which the principal interest is manifestly left-handedness, and in which measurement is typically by self-report, that there will be a response bias whereby left-handed individuals are more likely to respond. The problem would be particularly acute in studies with a low overall response rate, and would not occur at all in studies with a 100 per cent response rate. If such an effect indeed occurs then it would bias estimated population rates of left-handedness. It might also interact with the recognized effect whereby women are more likely to respond to questionnaire surveys than are men (Rosenthal & Rosnow, 1975), and perhaps thereby in part account for the common, but by no means universal, observation of a higher reported rate of left-handedness in males than females (Beaton, 1985).

The present survey was designed to assess whether differential response rates by right- and left-handers would be found in a questionnaire survey which was manifestly concerned with left-handedness, and which required the voluntary return

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of questionnaires. Response rate was assessed both in terms of the overall response rate and also, as suggested by Rosenthal & Rosnow (1975), in terms of the latency to respond.

Method

Three hundred and ninety-nine pre-clinical medical students in the first and second years at the University College and Middlesex School of Medicine took part. On day 1 each was given a short questionnaire (two sides of A4 paper) by means of a personally addressed envelope placed in the student pigeon holes, which are visited frequently by students. On the same day E.C. (herself a student in the medical school) made an announcement to the students in each year, at a well-attended lecture, explaining that a survey was taking place, and informing students that their own copy of the questionnaire would be found in the pigeon holes.

Students were asked to place completed questionnaires in a marked box in the student common room. On each working day the box was emptied and the date of return of each questionnaire noted. On the seventh working day a second announcement was made in lectures informing students that the survey would continue for another six working days, after which the box would be removed.

On day 13 the box was removed from the common room and the pigeon holes were checked to find which questionnaires had not been collected due to sickness, absence, etc.

The questionnaire contained a nine-item handedness inventory which has been used in other recent research into handedness (Marchant-Haycox, McManus & Wilson, 1991; McManus, Naylor & Booker, 1990), along with a number of other items concerning family history and other lateralities such as hand clasping and eye dominance. For the purposes of the present study, left-handedness was classified entirely on the basis of the first question, which asked about the hand normally used for writing.

Results

The first- and second-year students together totalled 399 individuals (216 male, 183 female). Overall 266 replies were received (66.7 per cent), a response rate typical of large-scale surveys of handedness. At the end of the survey, nine questionnaires had not been removed from pigeon holes, giving a corrected response rate of 68.2 per cent. Twenty-eight replies were from individuals using their left hand for writing, giving a crude incidence of 10.5 per cent, a value which is typical of many surveys. The apparent incidence of left-handedness was higher in females (13.7 per cent) than in males (7.8 per cent), which would have been an atypical result. However, the difference between the sexes is not significant.

Figure 1 shows the cumulative response rate of those who replied to the survey, by handedness and sex. There is no hint of different response rates between the sexes. However, as had been expected, the left-handers seemed to respond more quickly than did the right-handers. Of the 142 individuals replying on days 1 and 2, 21 (14.8 per cent) were left-handed, compared with seven of the 83 replying on days 3-7 (8.4 per cent), and none of the 41 replying from days 8-13 (0.0 per cent). The difference between groups is significant ($\chi^2(2) = 7.775, p < .025$). Survival analysis by means of the Lee-Desu statistic (Lee & Desu, 1972) in the SPSS-X program suite (SPSS, 1988) confirmed both that the survival curves differed between right- and left-handers (Lee-Desu $\chi^2(1) = 4.204, p < .05$), and that there was no difference between the males and females (Lee-Desu $\chi^2(1) = 0.040, n.s.$). Replies were received from 142 out of 216 males (65.7 per cent) and 124 out of 183 females (67.8 per cent), a non-significant difference.

Amongst the 181 second-year students there were 135 replies received to the questionnaire. An attempt was made to observe non-respondents in lectures to

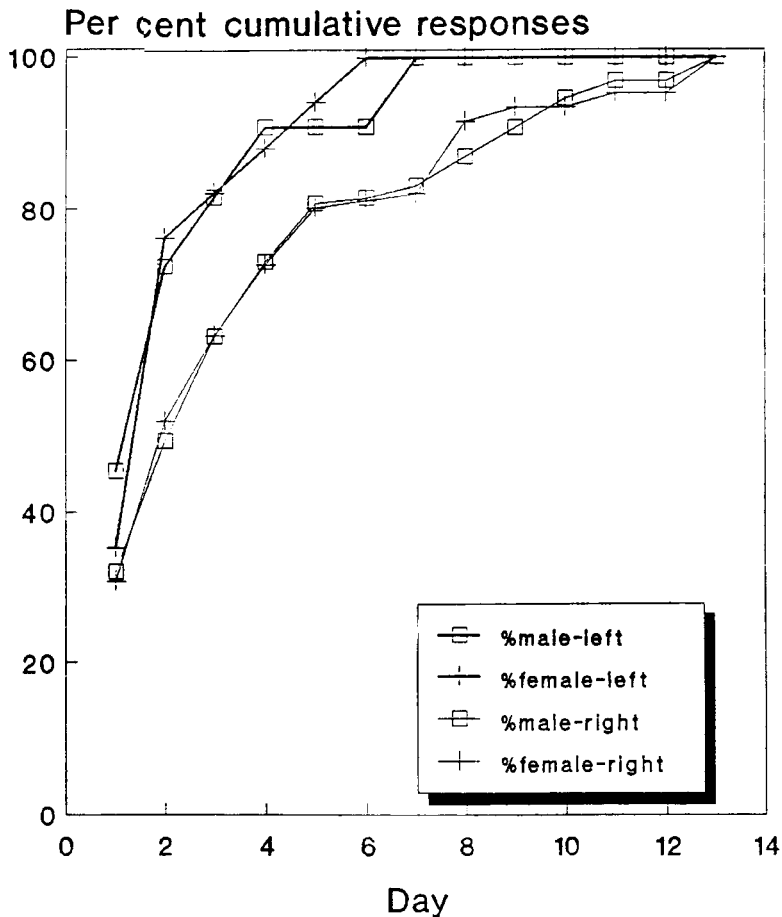


Figure 1. Shows the cumulative percentage of those male and female right- and left-handers who responded to the questionnaire survey who had replied by each day of the study.

determine the hand that they used for writing. Thirty individuals were observed, of whom 28 were right-handed and two (6.7 per cent) were left-handed, both of whom were male. A further 16 individuals were not successfully observed while writing. The rate of left-handedness therefore seemed lower among non-respondents (6.7 per cent) than in respondents (11.9 per cent), although the difference did not reach statistical significance ($\chi^2(1) = 0.68$, n.s.).

Discussion

This study has provided evidence that in a questionnaire study which was explicitly about left-handedness, and relied on voluntary responding, left-handers are more likely than right-handers to respond quickly, thereby resulting in a higher incidence of left-handers in early respondents. The overall rate of left-handedness was not

significantly higher in respondents than in non-respondents, and this is not surprising given the sample sizes used. A power calculation using the method of Kraemer & Thiemann (1987, pp. 76-77), suggests that in order to have an 80 per cent probability of detecting a significant effect of the size actually found (i.e. with left-handers about twice as likely to respond as right-handers), with a 5 per cent significance level on a one-tailed test, would require a total sample size of about 1450 (i.e. 1225 respondents and 225 non-respondents); the present study has a power of only about 20 per cent for detecting a significant difference. The actual incidence of left-handedness found in the questionnaire survey (10.5 per cent) may be corrected for the observed incidences of left-handedness in respondents and non-respondents, and gives an overall population incidence of 8.9 per cent. Such a difference has important implications for testing genetic models which attempt to estimate the true population incidence of left-handedness (McManus, 1985*a*).

This study has used the hand normally used for writing as a criterion of left-handedness. That choice was intentional since it was decided in advance that the handedness of non-respondents would be recorded by observing them writing in lectures, and hence a questionnaire-based measure was needed which corresponded as closely as possible to that observation. The classification of handedness is not entirely uncontroversial (see Annett, 1985; McManus, 1985*b*); nevertheless, writing hand is probably the single best criterion available, which correlates well with other measures.

Our survey found no evidence of differential rates of responding between males and females, nor of an overall difference in the proportions of males and females responding to the questionnaire. Our study was also unusual in finding that there was a (non-significant) tendency for females to have a higher rate of left-handedness than males. The result is of little consequence given the overall sample size; indeed it is worth noting that in order to find the conventional effect [which in a meta-analysis Seddon & McManus (in press) have shown is males having about a 25 per cent higher rate of left-handedness than females] would have required a sample size of about 3500, using the method of Kraemer & Thiemann (1987).

Bias in handedness surveys is likely to be increased if only a short time is allowed for questionnaires to be returned by respondents. If accurate estimates of the absolute rate of left-handedness are required then these are probably best obtained either by a 100 per cent response rate, in which voluntary return of questionnaires is avoided, or by embedding questions about handedness within a much larger questionnaire, the ostensible major interest of which does not include left-handedness.

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