

Ultrasonography and handedness

Don't confuse direction with degree

EDITOR,—Kjell Salvesen and colleagues claim, on the basis of a randomised controlled trial, that ultrasound examination in utero is associated with subsequent "non-right handedness."¹ The term non-right handedness has generated much confusion in the literature on handedness since it is very different from its seemingly commonsense equivalent of left handedness. When assessed by questionnaire, handedness shows a symmetric bivariate mixture distribution,² within which it is necessary to distinguish between direction of handedness (right *v* left) and degree of handedness (strong *v* weak handedness, be it in right or left handers). Non-right handedness is confusing because it lumps together strong left handers, weak left handers, and weak right handers, with the latter group typically being larger than the other two groups. The problem is then that it is not clear if an association is with direction of handedness or degree of handedness. Furthermore, the problem cannot be resolved simply by the use of non-parametric statistics but actually requires a more complex parametric approach.

In Salvesen and colleagues' study most of the effect shown seems to be due to differences in degree of handedness. Effects are non-significant for items such as drawing, writing, and use of scissors, for which "mixed" responses are very rare, and for those items which show significant effects the difference is principally in the proportion of mixed responses rather than left responses (items 3, 12, 16, and 17).

The implications of an effect on degree of handedness are different from those on an effect on direction of handedness; in particular, the Satz model of pathological left handedness³ applies only to direction of handedness. Degree of handedness has been relatively little studied, but it is known to increase with age in children.⁴ It is therefore important for the authors to confirm that differences in age at assessment cannot explain the differences between the screened and control groups.

Recent work in humans and animals suggests that differences in degree of lateralisation may reflect developmental instability resulting either from a lack of heterosis, or from fluctuating asymmetry due to "developmental noise" originating in a range of sources.⁵ If the effect of ultrasound on degree of handedness can be repli-

cated then it may be construed as a literal effect of noise on development.

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- 2 McManus IC. The interpretation of laterality. *Cortex* 1983;19:187-214.
- 3 Satz P. Pathological left-handedness: an explanatory model. *Cortex* 1972;8:121-35.
- 4 McManus IC, Sik G, Cole DR, Mellon AF, Wong J, Kloss J. The development of handedness in children. *Br J Develop Psychol* 1988;6:257-73.
- 5 McManus IC. Are paw preference differences in HI and LO mice the result of specific genes or of heterosis and fluctuating asymmetry? *Behavior Genetics* 1992;22:435-51.

Link with left handedness may be artefact

EDITOR,—The mothers in Kjell Å Salvesen and colleagues' study group must have known that they had had ultrasonography and that some effect of this on the child—possibly left handedness—was suspected.¹ This may have affected their response in two ways. Firstly, any anxiety might have biased their answers to the left. Secondly, mothers of left handed children in the study group would have been more likely to reply, and to reply promptly, than the others. Either effect would distort the reported ratio of non-right handedness between the study group and the control group.

It would be interesting to know if there was a difference in the rate of left handedness between those who replied immediately and those who needed chasing.

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- 1 Salvesen KA, Vatten LJ, Eik-Nes SH, Hugdahl K, Bakketeig LS. Routine ultrasonography in utero and subsequent handedness and neurological development. *BMJ* 1993;307:159-64. (17 July.)