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Book reviews

The Alcoholic Brain: CT Scan and Psychological Findings By Maria A. Ron. (Pp. 33; illustrated; £2.50.) *Psychological Medicine* Monograph Supplement 3. Cambridge University Press: Cambridge. 1983.

A revolution is taking place in neuropsychology, the implications of which have hardly been considered by many research workers. The effects can be well seen in the study of the effects of alcohol on the brain. Until a few years ago the only data available consisted of occasional *post-mortem* findings on patients with poorly documented histories, probably no psychometric testing and, of course, no chance of longitudinal follow-up. Despite such difficulties, the classical syndromes of Wernicke, Korsakoff, Machiafava and Bignami were described, and since then it could be argued that little significant progress has been made. The invention of computerized axial tomography (CT) has completely changed all that. It is now possible not only to view the living brain at quite a high degree of structural detail, but also to carry out longitudinal studies of the development of change in the brain. Dr Ron's useful little monograph describes both transverse and longitudinal CT studies of the brain in alcoholism.

The problems generated by this new technology fall into the area of causation; two types of question may be asked, and must be clearly distinguished. Are the brains of alcoholics different from those of controls? And can these differences be said to be the *cause* of psychometric abnormalities in alcoholics? The difficulties of proving the latter hypothesis can be clearly shown; if in a group of alcoholics we find both cerebral pathology and psychometric impairment, it is natural to assume that the former causes the latter. However, this reasoning is likely to be fallacious for if, in the same group of alcoholics, we were to find both spider naevi and psychometric impairment there is no sense in which most of us would say that the naevi have *caused* the impairment. Just because, to use Huxley's phrase, the brain secretes thought in the same way that the kidney secretes urine, it is not possible to prove that abnormalities of thought are necessarily a simple result of apparent abnormalities of brain, or that the abnormal glycosuria of the diabetic is simply a result of an abnormal kidney (and in the latter case there may well, of course, be a secondary nephropathy to confuse the causal picture). Cutting the Gordian knot of causality is difficult, and in a Popperian sense it is, of course, only possible to disprove the causal hypothesis, not to prove it. Two possibilities arise: the method of double dissociation, showing that *different* types of impairment are associated with *different* cerebral lesions; and longitudinal approaches, analysing the change in cerebral pathology and associating it with change in psychometric impairment, perhaps by such means as cross-lagged panel correlation, or one of the more sophisticated path-analytic structural modelling techniques.

Clearly, the first necessity of any such approach is data, and Dr Ron's monograph provides that in detail. She has approached the alcoholic from three perspectives, collecting a number of measures in each domain: radiological measures from the CT scans, clinico-social measures of the history of alcoholism, and psychometric measures. The CT scan was assessed in terms of sulcal widening, Sylvian fissure widening, interhemispheric fissure widening, cerebellar sulcal widening, and the ventricular/brain (V/B) ratio. I could not help feeling surprised that a computer-based technique which produces a number of tomographic slices, each based on a 160×160 matrix of pixels, should have eventually to be reduced to such a small number of rating scales (often, as in the case of cerebellar sulcal widening, to a single binary variable, visible or not visible) on the basis of two independent radiologist's assessments. If the CT revolution is to take place then clearly the digitized images will have to be processed automatically, using some of the image-processing techniques which are used so successfully in visual psychophysics and, indeed, which were the fundamental basis for the invention of CT itself. Thus a larger number of more accurate and more meaningful variables could be produced without

the computer output having to be re-processed through several radiologists.

The clinico-social set comprised seven variables describing the drinking history (including age). The psychometric data set comprised seventeen variables based on the Wechsler Adult Intelligence Scale, memory tests, Block Design and other perceptual and motor skills, the Wisconsin Card Sorting Test, measures of verbal fluency, and, in addition, the New Adult Reading Test (NART), which assesses ability to read aloud words with irregular spelling. On the basis that the NART is resistant to deterioration in patients suffering from dementia, and is independent of age and social class, this test is taken to be a measure of 'pre-morbid intelligence'. This seems a particularly dubious manoeuvre, and it would perhaps have been better just to have accepted, as in so many clinical studies, that one simply had no pre-morbid measures, rather than trying to make a silk purse out of a sow's ear.

The measures were made in 100 alcoholic patients and 50 controls, who, due to the nature of such studies, were of higher social class and intelligence. The alcoholics showed impaired results on all of the radiological measures (albeit that one of the chi-squared values in Table 3 is clearly erroneous). On the psychometric tests the alcoholics were particularly poor on memory tests, and on tests of perceptual ability and of abstracting.

Given these differences, we must ask whether the psychometric results can be related to the radiological measures. The author looks at all possible correlations between the three CT measures and the psychometric results; 'some unexpected correlations were found'. However, since there were eight results significant at the 5% level, and one significant at the 1% level, and 60 tests had been carried out, it would be tempting to conclude that these unexpected results were merely type I statistical errors. However, the author avoids that unpleasant conclusion by the use of a canonical correlation analysis between all psychometric and all radiological measures; since this is a single global test for any relationship, and it gives a highly significant result, we may conclude that type I errors are not the cause of the small number of significant simple correlations. The major relationship seems to be that an increasing V/B ratio correlates with poor memory performance.

A canonical correlation between the clinico-social measures and the radiological measures revealed a highly significant relationship; however, the main conclusion seemed to be that age and length of history of drinking related primarily to sulcal and Sylvian fissure width. Surprisingly, therefore, the major correlate of the psychometric tests, the V/B ratio, does not relate at all to the history of alcoholism. This must surely be awkward for any causal theory linking alcohol consumption, brain damage, and psychometric impairment. The association would be easier to interpret if we knew the association between the clinico-social variables and the psychometric tests; however, no canonical analysis is given for these data sets. Of the 100 simple correlations reported, 12 are significant at the 5% level, and 5 at the 1% level, making type I errors possible but unlikely. The impression from those results is that those tests which in the previous canonical analysis related to radiological abnormalities showed no association at all with clinico-social variables, reinforcing the difficulties of a causal hypothesis.

An exceptionally interesting aspect of the investigation is the longitudinal study of some of the alcoholics, which confirms the intriguing result of other workers that abstainers show an improved V/B ratio, while those continuing to drink show no change in that ratio. The implications of this reversal of apparent cortical atrophy are surely profound; they imply that the initial atrophy may not be due to a disappearance of unregenerative neuronal tissue, but perhaps is either a result of glial atrophy, or else is a shrinkage secondary to a loss of fluid from the brain. Regrettably, the most interesting question of all has not been studied in the follow-up: do the changes in V/B ratio relate to concomitant changes in psychometric tests? If there were evidence of psychometric improvement in parallel with radiological improvement, then it would surely be of the greatest consequence, both theoretically and therapeutically.

In summary, this is a useful and stimulating monograph, with an adequate literature review (121 references), which presents a large amount of data from a new, exciting and rapidly changing research area.

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