

Intellectual function and schizophrenia[†]

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There is now little doubt that there is an association between a broad range of neuropsychological abnormalities and schizophrenia. However, the nature of this relationship is not yet fully understood. For example, are the cognitive abnormalities observed just before or shortly after the onset of psychotic illness risk factors for or markers of the illness? In this month's *Journal*, Gunnell *et al* (2002, this issue) seek to clarify the exact nature of this relationship. In a cohort study which examined cognitive function at 18 years of age in 109 643 Swedish conscripts, they sought to clarify whether any relationship between poor cognitive function and the subsequent onset of schizophrenia was mediated or explained by prenatal and early childhood adversity. Their main findings were that the association between cognitive function and schizophrenia appears to be genuine and is independent of such early life events, at least in so far as they were able to measure the latter.

Their paper raises a number of additional issues which merit our attention. First, the authors found that the best predictor of schizophrenia was not any one specific test, but rather a semi-structured interview by a psychologist to assess suitability for officer status. Second, they failed to find a linear association between most tests of intellectual functioning and the risk for schizophrenia. Finally, they found that the association was stronger for schizophrenia than for non-schizophrenic non-affective psychosis.

THE 'OFFICER' INTERVIEW

Of the test items examined, the most striking predictor of later schizophrenia was poor scoring at the interview on suitability for officer status. This interview was based on a loosely structured questionnaire and,

although we have few details of its precise nature, it is likely that it covered a number of domains of both psychological and social functioning. It is therefore unsurprising that this proved to be the strongest predictor of later psychotic illness, since there is now good evidence that the predictive power of multiple variables grouped together is much stronger than any single variable for schizophrenia, regardless of the domain (biological, psychological or psychosocial) (Ismail *et al*, 1998; Davidson *et al*, 1999). For example, combining an attentional screen with behavioural ratings in the New York High-Risk Project enhanced measurably the overall accuracy of the attentional model, reducing false positives by half (Cornblatt *et al*, 1999). Similarly, combining deficits in attention, verbal memory and gross motor skills in the same study achieved higher precision than any of the contributing variables alone (Erlenmeyer-Kimling *et al*, 2000). Furthermore, in the national Israeli cohort of 16- to 17-year-old males (Davidson *et al*, 1999), combining intellectual ratings with measures of social functioning and organisational ability gave rise to an impressive prediction model with 75% sensitivity, 100% specificity and 72% positive predictive value.

LINEARITY

With the exception of the officer test and a logic test, Gunnell *et al* found that the relationship between intellectual functioning and schizophrenia was non-linear. Risk was markedly higher in the lowest-performing group, in a broadly exponential manner. This is somewhat at odds with much of the published literature, which suggests linearity in risk (i.e. risk being a function of performance over the entire range of population scores, increasing progressively as ability declines). The Philadelphia birth cohort study (Cannon *et al*, 2000), for

example, reported a 30 to 60% increase in schizophrenia risk per unit decrease in ability category (divided into five performance levels), such that an individual scoring in the deficient range was 5 to 6 times more likely to develop schizophrenia than one scoring in the high average to superior range. Similarly, David *et al* (1997) reported a nine-fold increase in schizophrenia risk among conscripts scoring in the lowest IQ band compared with those falling within the highest IQ band.

However, any cinema-goer knows that schizophrenia can occur in extremely clever individuals such as John Nash. Furthermore, findings from the Northern Finland 1996 birth cohort (Isohanni *et al*, 1999) failed to confirm linearity in the association between educational attainment and schizophrenia outcome, raising the possibility that it is distance from the cognitive norm – in either direction – that increases the odds for the disorder. Excellent school performance among 16-year-old males in the latter cohort was associated with a nearly four-fold increase in schizophrenia risk; 11% of pre-schizophrenia cases, compared with only 3% of the comparison group (with no hospital-treated psychiatric outcome), obtained excellent mean school marks. In keeping with this finding, the proportion of pre-schizophrenia cases falling within the highest IQ category among the Israeli 16- to 17-year-old male conscripts was six times higher than that of the comparison subjects (with no hospital-treated psychiatric outcome) (Davidson *et al*, 1999).

DIAGNOSTIC SPECIFICITY

The association between impaired intellectual functioning and psychosis was strongest for schizophrenia when compared with other non-affective psychoses. This is consistent with the view of van Os *et al* (1998), who suggest that 'there is little evidence that any risk factor is specific to any diagnostic category within the functional psychoses'. Impairments in general ability have also been recorded in the early biographies of individuals with affective psychoses and anxiety or depressive disorders, with any distinction between these respective groups simply being one of magnitude. Thus pre-schizophrenia cases usually perform worse than the other patient groups, which also perform below the norm; patients with bipolar illness,

[†]See pp. 298–305, this issue.

whose psychomotor and intellectual development appears normal, are a possible exception (Cannon *et al*, 2002). Indeed, the association between receiving special education or repeating a school grade and the diagnostic category of 'other psychoses' in the Finnish cohort was even stronger than that with schizophrenia. A possible exception to this rather undifferentiated pattern of associations is between speech difficulties and future schizophrenia: the only school-based assessment which distinguished the pre-schizophrenia cases from the other patient groups in the 1958 British birth cohort was the cognitive evaluation of 'speech difficulties', at both 7 and 11 years of age (Jones & Done, 1997). Thus, it could be the magnitude of the effect of some risk factors, rather than their qualitative difference, that projects an individual towards a schizophrenic rather than a non-schizophrenic psychotic illness.

CONCLUSIONS

Gunnell *et al* (2002, this issue) further clarify the nature of the relationship between poor intellectual functioning and schizophrenia. Although their sample was confined to early-onset male cases and the period of follow-up is, as yet, relatively short, this study none the less presents good evidence that this relationship is robust and is not confounded by early adversity. The specificity of these abnormalities to schizophrenia is still unclear and unlikely to be exclusive, and it is still unlikely that any one single psychological or biological test will prove a useful screening tool for

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predicting the disorder. The best predictor so far remains quasi-psychotic symptoms, whose presence in 11-year-old children was found by Poulton *et al* (2000) to carry a sixteen-fold increase in risk of later schizophreniform disorder.

DECLARATION OF INTEREST

None.

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