Schizophrenia Bulletin vol. 34 no. 6 pp. 1035–1041, 2008
doi:10.1093/schbul/sbn028
Advance Access publication on April 25, 2008

Impairments in Cognition Across the Spectrum of Psychiatric Disorders: Evidence From a Swedish Conscript Cohort

Anthony S. David[1,2], Stanley Zammit[3], Glyn Lewis[4], Christina Dalman[5], and Peter Allebeck[6]

[2]Section of Cognitive Neuropsychiatry, Institute of Psychiatry, King's College, PO Box 68, London SE5 8AF, UK; [3]Department of Psychological Medicine, University Hospital of Wales, Cardiff CF14 4XN, UK; [4]Division of Psychiatry, University of Bristol, Bristol, UK; [5]Department of Psychiatric Epidemiology, Stockholm Centre of Public Health, Stockholm, Sweden; [6]Department of Social Medicine, Karolinska Institute, Stockholm, Sweden

It is well established that cognitive deficits are an almost invariable component of the schizophrenia syndrome. Much less is known about the association of cognitive deficits and the range of psychiatric disorders. The current study made use of a Swedish conscript cohort which included an IQ assessment and full psychiatric evaluation at conscription of all 18- to 19-year-old males. It was found that reduced intellectual functioning was found in association with psychosis and neurotic disorders including depression, personality disorders, alcoholism, and drug dependence. The effect was particularly strong for alcoholism. This presumably represents a combination of premorbid deficits (as demonstrated in those who developed schizophrenia some years later) plus coincident impairments. The direction of causality of this latter association is likely to be both forward and reverse. Different cognitive subtests showed varied strengths of association: "mechanical ability/knowledge," which might reflect planning and reasoning more than the other subtests, had the strongest effect. Cognitive deficits are widespread in psychiatric disorders and should be taken into account in clinical interactions.

Key words: IQ/psychosis/cognition/premorbid

Introduction

Cognitive deficits have become an important focus for psychiatric research in major psychiatric disorders, especially schizophrenia.[1–5] By using designs which make use of cognitive assessment data collected prior to outcome, such deficits can be clearly shown to predate the onset of the disorder. This discovery has played an important role in formulating neurodevelopmental models of schizophrenia and contrasting these with the affective disorder spectrum.[6]

However, any group of psychiatrically disordered patients may be found to have cognitive impairments in comparison to a control population.[7,8] The reasons for this may be complex and multiple. For example, relative cognitive impairment may have been present premorbidly in the patient group, thus representing a putative risk factor or developmental vulnerability, or may be directly related to the onset of the disorder, say following a brain injury or insult, lying directly on the causal path. Alternatively, the disorder itself might cause cognitive impairment—reverse causality. This may be either through direct effects on cognitive systems or indirectly through effects on motivation (the person with depression seeing no point in exerting effort to complete a test) or attention (preoccupations and abnormal experiences may act as internal distracters), or the disorder leads to behaviors which then lead to cognitive impairments, eg, through substance misuse, poor diet, head trauma, etc, or conceivably because of unwanted side effects of treatment. Other possibilities include confounding: eg, the disorder in question may be associated with social deprivation which also reduces educational opportunities and hence attainment. Finally, selection bias: patients with the disorder and low IQ being more likely to be identified as cases or more likely themselves to present to health-care services than those with average or superior IQ.

The current study made use of a conscript cohort to investigate the influence of cognitive abilities on the range of psychiatric disorders while remaining mindful of the pitfalls and ambiguities in interpretation outlined above. The assessment at conscription of all 18- to 19-year-old males amounted to a population survey of psychiatric disorder. Hence the problem of selection bias was eliminated and that of reverse causality through behavioral effects of psychiatric illness on cognition greatly reduced due to the youth of the subjects and hence lack of time for secondary consequences of the disorder to exert their effects. It was possible to control for some important potential confounders such as social class and place of

[1]To whom correspondence should be addressed; tel: +44 (0)20 7 848 0138, fax: +44 (0)20 7 848 0572, e-mail: a.david@iop.kcl.ac.uk.

© The Author 2008. Published by Oxford University Press on behalf of the Maryland Psychiatric Research Center. All rights reserved.
For permissions, please email: journals.permissions@oxfordjournals.org.

Downloaded from https://academic.oup.com/schizophreniabulletin/article/34/6/1035/1939163 by guest on 21 August 2022

upbringing given the demographic information included in the database. The conscription induction included detailed psychological and cognitive assessments enabling us to map cognitive function with a contemporaneous psychiatric diagnosis.

The other aim of this article was to make use of the data hitherto discarded on those young men diagnosed with psychosis for the first time at conscription. We will compare the association between relative cognitive impairment in these individuals with the association between cognitive function in those who were free of psychiatric disorder at conscription but who later developed schizophrenia. This will enable us to compare, at least at a descriptive level, the degree of cognitive impairment which is premorbid and that which is part and parcel of the manifest disorder.

Subjects and Method

Subjects

A total of 52 768 18- to 20-year-old Swedish males conscripted for compulsory military training during 1969–1970 formed the cohort. Only 2%–3% of the male population were excused conscription on account of severe mental or physical handicap. The conscription procedure takes 1½ days for each subject and consists of a series of tests of physical and mental health status, personality, and intellectual capacity. A full medical examination is carried out and if any disease or disability is reported or discovered, a more thorough examination is performed. This includes a diagnostic assessment by a psychiatrist whenever a mental disorder is reported or suspected. Each subject answers self-administered questionnaires on family, social background, and behavior during adolescence. All are given a structured interview by a graduate-level psychologist, and those reporting any psychiatric symptoms or current problem under treatment are interviewed by a psychiatrist and, in this cohort, given a diagnosis according to *International Statistical Classification of Diseases, Eighth Revision* (*ICD-8*)[9] where applicable. The whole procedure is aimed at detecting disease as well as identifying persons suitable for higher military training.

Permission to use the database for research was granted by Research Ethics Committee of the Karolinska Institute and the Swedish Data Inspection Board.

Intellectual and Cognitive Tests

IQ and other cognitive tests were available on the majority of the cohort (49 915 [95%]). There were 4 main subtests which each yielded a 9-point summary score. These were aggregated to give an overall intelligence score. All tests were progressive, beginning with relatively simple questions and becoming more difficult.

The subtests were as follows:

Verbal IQ. This lasted 7 min and consisted of 40 questions. Subjects were given rows of 5 words and told to underline the odd one out, eg, ''teapot, sandwich, milk, egg, meat.''

Visuospatial Ability. Tests took 40 min and took the form of a probe geometric shape (eg, an isosceles triangle bisected by a vertical line) followed by 4 items consisting of different pairs of triangles of different sizes and in different orientations. Subjects were asked to state which of the choices could make up the probe item.

General Knowledge. This test consisted of 40 items and took 12 min. Subjects would be presented with an array of shapes and letters in combination, and the question would run as follows: ''Put a line through the square under the longest word'' (out of 5). More difficult: ''Fill in the square furthest up to the right and the second square from the left in the lowest row. After that fill in each 4th square from the left in the second row from the bottom and every other square from the right in the second row from the top'' (presentation of a grid of small squares). Also included were miscellaneous and general knowledge questions and simple and more complex arithmetic. The entire test taps many integrative cognitive functions.

Mechanical Ability. The fourth subtest comprised diagrams representing complex problems requiring mechanical ability and a knowledge of basic physics, eg, a 100 kg bail of hay and 100 kg of sand both resting on a sharp incline. The question was which would tip over the more easily? Other questions were based on weights and levers, projectiles and trajectories, simple electricity, momentum, etc.

Scores on these tests had been standardized against an entire conscript cohort from a previous year and were placed in 9 bands. The 9 bands corresponded to 4%, 7%, 12%, 17%, 20%, 17%, 12%, 7%, and 4% of the distribution. Expressed as an IQ score, the bands approximately correspond to less than 74, 74 through 81, 82 through 89, 90 through 95, 96 through 104, 105 through 110, 111 through 118, 119 through 126, and more than 126.[5]

Psychiatric Diagnosis. The patients were given clinical diagnoses according to the Nordic version of *ICD-8*.[9] These were, from more severe to less severe: schizophrenia and other psychosis (295–299); neuroses (300), including depressive neuroses (304); alcoholism (303); drug dependence (304); personality disorders (301); other diagnoses (302, 305–309). Diagnoses have been found to have approximately 85% specificity and sensitivity when measured against *Diagnostic and Statistical Manual of Mental Disorders, Third Edition*[10] and *ICD-9*.[11] In addition, a random selection of schizophrenia cases from the National Register was recently retrieved and diagnoses

Downloaded from https://academic.oup.com/schizophreniabulletin/article/34/6/1035/1939163 by guest on 21 August 2022

Table 1. Frequency of Diagnoses

	N (% of cohort—excluding missing)
Psychoses	34 (0.07)
Neuroses	
Depression	650 (1.32)
Other neuroses	2031 (4.13)
All neuroses	2681 (5.46)
Personality disorder	1260 (2.56)
Alcoholism	195 (0.40)
Drug dependence	331 (0.67)
Other diagnoses	931 (1.89)
Missing diagnosis at conscription	943 (1.9)
No diagnosis at conscription (baseline group for all analyses)	43 712 (88.95)

checked and the sensitivity and specificity were both >80%.[3] Where there was the possibility of more than one diagnosis being applied, a hierarchical strategy was used so that the diagnosis at the higher end of the severity hierarchy was taken.

Statistical Analysis

Odds ratios (ORs) and 95% confidence intervals (CIs) were calculated with logistic regression using the program Stata.[12] Adjustment for potential confounders was performed by adding variables to a logistic regression model containing the IQ variable. Logistic regression models were compared using likelihood ratio tests. This was done when comparing models containing linear terms for IQ with those in which the 9 IQ categories were represented by separate dummy variables. Likelihood ratio tests were also used to test for statistical significance when the 4 IQ subscales were investigated. The tests compared models containing all 4 subscales with the 3 remaining variables. For some analyses, the effects of IQ were modeled as a continuous variable, so the ORs reported are those for an increase of 1 in the 9-point scale.

A number of variables have been shown previously to be associated with the risk of schizophrenia and other major psychiatric disorders and have been examined as potential confounders between IQ and risk of psychiatric disorder, including drug use,[13] place of upbringing,[14] paternal age,[15] and disturbed behavior in childhood.[16] Father's occupation as a proxy for social class was also considered. Some subjects (<3%) had missing data for one or more of these items.

Results

The diagnostic breakdown of the cohort at conscription is given in table 1. Eighty-nine percent were free from any psychiatric disorder (excluding 1.9% whose diagnoses were missing). The commonest diagnoses were in the "neurosis" category (5.46%). Thirty-four (0.07%) had psychosis.

Table 2. Crude and Adjusted ORs and 95% CIs for Developing Psychiatric Disorders According to Premorbid IQ (scored 1–9; 1 = highest)

	OR (95% CI)	
	Crude	Adjusted[a]
Psychoses	1.28 (1.09, 1.51)	1.29 (1.09, 1.52)
Neuroses		
Depression	1.08 (1.04, 1.12)	1.06 (1.02, 1.11)
Other	1.15 (1.13, 1.17)	1.14 (1.12, 1.17)
All	1.13 (1.11, 1.15)	1.13 (1.10, 1.15)
Personality disorder	1.29 (1.25, 1.33)	1.26 (1.22, 1.30)
Alcoholism	1.53 (1.42, 1.64)	1.49 (1.38, 1.62)
Drug dependence	1.16 (1.10, 1.23)	1.08 (1.02, 1.15)[b]
Other diagnoses	1.28 (1.24, 1.32)	1.27 (1.23, 1.31)

Note: OR, odds ratio; CI, confidence interval. All crude and all adjusted results are $P < 0.001$.
[a]Adjusted for drug use, smoking, disturbed behavior, and place of upbringing.
[b]Not adjusted for drug use.

Of the variables initially investigated as potential confounders, the 4 that had an effect on the adjusted results were tabulated against IQ. For the purposes of this analysis only, the combined IQ scores were collapsed into 3 categories: low (19%), medium (49%), and high (32%). Disturbed behavior in childhood was treated as a dichotomous variable (consistent with the other confounders) using the 95th percentile as the cutoff point for coding. Additional adjustments were also carried out for the following: poor social integration, father's occupation, alcohol units per week, and parental divorce, but these had no effect on the results. The only findings of note were that smoking was present on 68% of the high IQ group compared with 62% and 68% of the medium and low IQ groups, respectively. Regarding city upbringing, this applied to 25% of the high IQ group (vs 21% and 15% or medium and low groups, respectively). Curiously, drug use was lower in the low IQ group (9%) compared with 13% in the medium and 14% in the high IQ group. Disturbed behavior was only recorded in 7% of the low IQ group vs 5% and 3% of the medium and high IQ groups, respectively.

Next we examined each ICD-8[9] diagnosis in relation to overall IQ, expressed as an OR with the highest IQ band taken as the baseline. Adjustment for potential confounders made little difference to the results with the exception that the association with drug dependence was reduced. Note that this association was not adjusted for drug use.

As shown in table 2, lower IQ was associated with all the psychiatric diagnoses. The strongest association

Downloaded from https://academic.oup.com/schizophreniabulletin/article/34/6/1035/1939163 by guest on 21 August 2022

was with alcoholism (adjusted OR = 1.49; 95% CI = 1.38–1.62), and the lowest adjusted OR was 1.06 (95% CI = 1.02–1.11) for depressive neurosis. The risk for psychosis gave an adjusted OR of 1.29 (95% CI = 1.09–1.52).

We then carried out analyses looking at the individual cognitive subtests: verbal, visuospatial, general knowledge, and mechanical ability. In order to discern whether there were specific effects according to cognitive domain, we adjust individual subscores for all other subscores (table 3). The verbal and general knowledge subscales seem to be least associated with all diagnoses with the notable exception of alcoholism, which is most strongly associated with general knowledge performance deficits (unadjusted OR = 1.52; adjusted OR = 1.23 [95% CI = 1.11–1.36]). Performance decrements on the mechanical ability subtests seem to be related to the range of other disorders even when the confounding effect of performance more generally (ie, on the remaining subtests) is taken into account in the analysis. Visuospatial performance is most strongly related to psychosis (adjusted OR = 1.33 [95% CI = 1.06–1.68]), followed closely by mechanical ability.

Follow-up

Follow-up of the cohort relied upon subsequent hospitalization within the Swedish health-care system. The Swedish National Register of Psychiatric Care recorded about 70% of all admissions in 1970 rising to 83% in 1973. From 1974 to the end of 1983, the coverage was between 97% and 98%. Coverage varied between 80% and 95% in 1984–1986 but has been virtually complete since 1987. The linkage from which the data here were taken was for the period 1970–1996—ie 26–27 years follow-up. It is of some interest, purely for illustrative purposes, to compare the size of the ORs for low IQ and future schizophrenia (excluding the 34 cases with psychosis at conscription), as reported by Zammit et al.,[5] with those of the 34 cases. The adjusted figures are 1.26 vs 1.29.

Discussion

We used data from a Swedish conscript cohort to explore the association between cognition and psychiatric illness in 2 new ways. First, we sought to examine the association between cognition and diagnosis, across the whole range of psychiatric disorders from psychosis through affective to personality and substance abuse disorders. At the time of conscription, around 9% of 50 000 young 18- to 19-year-old men attracted an ICD-8[9] diagnosis. We found a general association between lower intellectual functioning and psychiatric disorder. These results are in line with work by Weiser et al.[7] on 262 582 male Israeli conscripts aged 16–17 years. They found just over 19 000 (7.3%) to have been assigned an ICD-9 diagnosis, using broadly similar procedures. As in the current study, virtually all were associated with cognitive impairment, expressed as a lowering in IQ against the population average. The degree of lowering was similar in those identified as psychotic at conscription as those who subsequently developed a psychosis. The results also broadly concur with those of Mortensen et al.[8] Their design was somewhat different in that they performed a 3-way Danish record linkage between a birth cohort, a national psychiatric register, and an IQ assessment performed on men at conscription at age 18–19 years old. This yielded 350 psychiatric cases across the range of disorders. As a group the cases had cognitive scores equivalent to an IQ of about 90 compared with a control IQ of 100. Within the diagnostic categories, all had below average IQ, although the difference did not reach significance in the mood disorder and neuroses groups. Of relevance to the current study which considers the relationship between IQ and concurrent psychiatric disorder in young men, Mortensen et al.[8] stratified their sample by interval between testing and first admission which yielded 75 who were admitted within <1year. This group would be considered to be at least in the prodrome of their disorder if not already affected. The pattern of results showed that IQ score tended to be lowest in this group compared with those whose first admission occurred several years after the IQ assessment. Again, schizophrenia, personality, alcohol-related, and substance use disorders had lower mean IQs than those with neuroses and mood disorders, although these too were below average.

In sum, the cohort method is a powerful one for demonstrating the presence of premorbid IQ deficits in relation to later psychiatric disorder. However, other designs with multiple prospective follow-ups are required to exclude admixtures of pre- and postmorbid changes.

A possible exception to the rule that lower IQ is associated with all psychiatric illnesses is bipolar affective disorder,[5] presumed to be subsumed under manic-depressive psychosis in this cohort, which shows no association with low IQ, and in other studies may even be associated with slightly higher premorbid IQ.[17] In the current study, we had a single category of "psychosis" which will have included affective and nonaffective types, so at best, the effect will have "diluted" the general lowering of IQ seen in tandem with the more common diagnosis of schizophrenia.

Within the general association there are bound to be many specific mechanisms which explain the effect. Alcoholism or alcohol dependence is a particular case in point. The OR for the association with low IQ was the highest of all disorders examined (1.53 unadjusted) for each IQ band lower than the population highest. While low IQ may be a true risk factor for the disorder,[18,19] the neurotoxic effects of alcohol are very well known.[20] We would suggest that a person of 18 or 19 years who merits this diagnosis will have begun drinking at an early age and would have been in a particularly severe group to have

Downloaded from https://academic.oup.com/schizophreniabulletin/article/34/6/1035/1939163 by guest on 21 August 2022

Table 3. Crude and Adjusted ORs and 95% CIs for Risk of Developing Psychiatric Disorders for the 4 Intelligence Subtests

	General Knowledge		Verbal IQ		Visuospatial Ability		Mechanical Ability	
	Crude	Adjusted[a]	Crude	Adjusted	Crude	Adjusted	Crude	Adjusted
Psychoses	1.16 (0.97, 1.38)	0.92 (0.70, 1.22)	1.14 (0.96, 1.36)	0.91 (0.70, 1.20)	1.39 (1.15, 1.66)	1.33 (1.06, 1.68)	1.36 (1.13, 1.63)	1.30 (1.02, 1.65)
Depressive neuroses	1.05 (1.01, 1.10)	0.99 (0.93, 1.06)	1.04 (1.00, 1.08)	0.97 (0.91, 1.03)	1.10 (1.05, 1.15)	1.08 (1.02, 1.13)	1.10 (1.05, 1.15)	1.08 (1.03, 1.14)
Other neuroses	1.14 (1.11, 1.17)	1.08 (1.04, 1.12)	1.11 (1.08, 1.14)	0.98 (0.95, 1.02)	1.12 (1.09, 1.15)	1.03 (1.00, 1.06)	1.16 (1.13, 1.19)	1.10 (1.07, 1.14)
All neuroses	1.12 (1.10, 1.14)	1.06 (1.02, 1.09)	1.09 (1.07, 1.11)	0.98 (0.95, 1.01)	1.11 (1.09, 1.14)	1.04 (1.01, 1.07)	1.14 (1.12, 1.17)	1.10 (1.07, 1.13)
Personality disorder	1.27 (1.24, 1.31)	1.11 (1.06, 1.16)	1.25 (1.22, 1.29)	1.06 (1.01, 1.11)	1.24 (1.20, 1.27)	1.08 (1.04, 1.12)	1.25 (1.21, 1.29)	1.09 (1.05, 1.13)
Alcoholism	1.57 (1.45, 1.69)	1.39 (1.22, 1.57)	1.44 (1.33, 1.55)	0.98 (0.87, 1.10)	1.36 (1.25, 1.47)	1.02 (0.94, 1.12)	1.52 (1.40, 1.65)	1.23 (1.11, 1.36)
Drug dependence	1.14 (1.08, 1.21)	1.01 (0.93, 1.11)	1.14 (1.07, 1.20)	1.03 (0.93, 1.11)	1.08 (1.02, 1.14)	0.94 (0.87, 1.01)	1.26 (1.19, 1.33)	1.26 (1.17, 1.36)
Other diagnoses	1.30 (1.25, 1.34)	1.15 (1.08, 1.21)	1.29 (1.25, 1.34)	1.13 (1.07, 1.19)	1.20 (1.16, 1.24)	1.00 (0.97, 1.06)	1.23 (1.19, 1.27)	1.05 (1.00, 1.09)

Note: OR, odds ratio; CI, confidence.
[a]Adjusted for the three other subtests. An OR of x is interpreted as the increase in risk for each successive IQ category. Because IQ score is coded on a 9-point scale for each subtest, the OR comparing the lowest IQ with highest IQ subjects is $(x)^9$.

manifested problems so early. We might also speculate whether the effects of intoxication may have contributed to the lowering in IQ scores. There is also the question of comorbidity with other diagnoses which we are not able to address here.

In fact, it would clearly be unwise in the extreme to consider these figures as an accurate reflection of the lifetime prevalence of conditions such as alcohol dependence and personality disorder. These 2 conditions generally reflect established patterns of behavior over many years. Similarly, none of the disorders in question would have been expected to reach its maximum incidence before age 20. So, while a large proportion of future cases will have become evident over the years following the index assessment, the standardization of the conscript induction procedure would act to limit the number of false positives. Having said that, it must be acknowledged that certain kinds of adult antisocial personality disorders show strong continuities with conduct disorder in children and adolescents. Research on such children has established that low IQ is a consistent risk factor for the disorder itself and for its persistence.[21] Of note, the prevalence of all personality disorders including antisocial type was around half that of the Israeli cohort, again suggesting conservative application of this diagnostic label. Furthermore, gathering information about substance misuse in the setting of conscription may lead to under-reporting (although exaggeration may also be possible). An obvious limitation of our data in terms of generalizability is the unusual circumstances of the diagnostic assessment as compared with clinical practice. However, the consistency of the procedures and the uniformity of the setting is an advantage in terms of reliability.

Although the test battery administered to the Swedish conscripts was not drawn from well-established psychometric tests, the data as a whole benefit from the population base, from which it is possible to standardize scores as is traditional in IQ research. However, we attempted a more neuropsychological approach by breaking down the subtests into broad cognitive domains such as verbal, visual spatial, and mechanical knowledge. This division was based purely on face validity without any concurrent validation. Nevertheless, some interesting trends emerged. The tests we labeled ‘‘mechanical knowledge’’ have previously emerged as particularly relevant to schizophrenia in that reduced performance on these tests was a risk factor for developing the disorder even when the other tests were taken into account.[3] In the current study, a similar pattern could be discerned for the neuroses and drug dependence with the adjusted ORs for mechanical knowledge and all the psychiatric diagnoses considered. The verbal tests had the weakest association with all diagnoses becoming nonsignificant after adjustment for all groups with the exception of personality disorder and the ‘‘other diagnosis’’ category. We have

Downloaded from https://academic.oup.com/schizophreniabulletin/article/34/6/1035/1939163 by guest on 21 August 2022

previously argued that these tests may tap into more executive functions than the other tests in that they require problem solving and reasoning, although some items clearly require factual, semantic knowledge also and few require working and episodic verbal memory—key functions related to schizophrenia.[22] Other work, in children at risk for substance misuse and other behavioral disorders, has shown a particular effect of executive dysfunction on later problems, particularly in relation to tests of inhibition,[23],[24] which supports our findings. Another limitation of the battery, apart from its lack of correspondence to commonly used IQ tests is its lack of comprehensiveness with verbal memory in particular being unrepresented.

So, how do we interpret the findings? As outlined in ''Introduction'', a degree of cognitive impairment may precede psychiatric disorder in general. Clearly confounders, particularly social and demographic factors, may be relevant here but we attempted to control for these in the analysis. Apart from confounding, the association may occur if both psychiatric disorder and low IQ reflect a neurocognitive disadvantage—ie, a subtle form of developmental or acquired disorder to the brain may underlie inefficient information processing and also impaired emotional processing and social cognition, the latter 2 being more proximally related to psychiatric disturbance of all kinds. Similarly, inefficient information processing may lead to the misinterpretation of the actions of others, rigidity in dealing with stress, a restricted repertoire of coping strategies, failure to inhibit drives, and failure to evaluate risk in terms of future adverse consequences—through ''psychological'' mechanisms without the need to refer to the brain or brain systems. In either case, all these putative psychological processes might lead plausibly to psychopathology, from psychosis, through interpersonal problems, to substance misuse. So, while cognitive impairment in the ''major'' disorders such as schizophrenia is now well known to be widespread[25] and our data might be interpreted as showing that the vast bulk of the association between IQ and psychosis or schizophrenia could be seen as a premorbid deficit, the possibility of impairments in other supposedly ''minor'' disorders is a somewhat new idea.

The other very likely explanation for the results is that psychiatric disturbances, of all kinds, not just the psychoses, may disrupt, at the very least, optimal performance on IQ tests or, at worst, may impair intellectual functioning across formal and informal settings. In addition to the theoretical implications of these models, there is a practical issue. We suggest that therapists may not be fully aware that all their client groups may have intellectual capabilities below the population average. This may reduce their appreciation of their disorders, limit their ability to overcome them, and may also interfere with their capacity to accept, remember, and participate in treatments.

References

1. Jones P, Rodgers B, Murray R, Marmot M. Child developmental risk factors for adult schizophrenia in the British 1946 birth cohort. *Lancet*. 1994;334:1393–1402.
2. Done DJ, Crow TJ, Johnstone EC, Sacker A. Childhood antecedents of schizophrenia and affective illness: social adjustment at ages 7 and 11. *Br Med J*. 1994;309:699–703.
3. David AS, Malmberg A, Brandt L, Allebeck P, Lewis G. IQ and risk for schizophrenia: a population-based cohort study. *Psychol Med*. 1997;27:1311–1323.
4. Reichenberg A, Weiser M, Rabinowitz J, et al. A population-based cohort study of premorbid intellectual, language, and behavioral functioning in patients with schizophrenia, schizoaffective disorder, and nonpsychotic bipolar disorder. *Am J Psychiatry*. 2002;15:2027–2035.
5. Zammit S, Allebeck P, David AS, et al. A longitudinal study of premorbid IQ score and risk of developing schizophrenia, bipolar disorder, severe depression and other non-affective psychoses. *Arch Gen Psychiatry*. 2004;61:354–360.
6. Murray RM, Sham P, Van Os J, Zanelli J, Cannon M, McDonald C. A developmental model for similarities and dissimilarities between schizophrenia and bipolar disorder. *Schizophr Res*. 2004;71:405–416.
7. Weiser M, Reichenberg A, Rabinowitz J, et al. Cognitive performance of male adolescents is lower than controls across psychiatric disorders: a population-based study. *Acta Psychiatr Scand*. 2004;110:471–475.
8. Mortensen EL, Sorensen HJ, Jensen HH, Reinisch JM, Mednick SA. IQ and mental disorder in young men. *Br J Psychiatry*. 2005;187:407–415.
9. World Health Organisation.*Glossary of Mental Disorders and Guide to Their Classification for Use in Conjunction with the International Classification of Diseases, 8th Revision 1974;Geneva, Switzerland: World Health Organisation.*
10. Kristjansson E, Allebeck P, Wistedt B. Validity of the diagnosis schizophrenia in a psychiatric inpatient register. *Nord Psykiatr Tidsskr*. 1986;43:229–234.
11. Dalman C, Broms J, Cullberg J, Allebeck P. Young cases of schizophrenia identified in a national inpatient register—are the diagnoses valid? *Soc Psychiatry Psychiatr Epidemiol*. 2002;37:527–531.
12. Stata Corporation.*Statistics Data Analysis, V4 1994;College Station, TXStata Corporation.*
13. Zammit S, Allebeck P, Andreasson S, Lundberg I, Lewis G. Self reported cannabis use as a risk factor for schizophrenia in Swedish conscripts of 1969: historical cohort study. *Br Med J*. 2002;325:1199–1201.
14. Lewis G, David A, Andreasson S, Allebeck P. Schizophrenia and city life. *Lancet*. 1992;340:137–140.
15. Zammit S, Allebeck P, Dalman C, Lundberg I, Hemmingsson T, Lewis G. Investigating the association between cigarette smoking and schizophrenia in a cohort study. *Am J Psychiatry*. 2003;160:2216–2221.
16. Malmberg A, Lewis G, David A, Allebeck P. Premorbid adjustment and personality in schizophrenia. *Br J Psychiatry*. 1998;172:308–313.
17. MacCabe JH, Lambe MP, Cnattingius S, et al. Scholastic achievement at age 16 and risk of schizophrenia and other psychoses: a national cohort study. *Psychol Med*. 2008; In press.
18. Poon E, Ellis DA, Fitzgerald HE, Zucker RA. Intellectual, cognitive, and academic performance among sons of alcoholics,

Downloaded from https://academic.oup.com/schizophreniabulletin/article/34/6/1035/1939163 by guest on 21 August 2022

during the early school years: differences related to subtypes of familial alcoholism. *Alcohol Clin Exp Res*. 2000; 24:1020–1027.

19. Nigg JT, Glass JM, Wong MM, et al. Neuropsychological executive functioning in children at elevated risk for alcoholism: findings in early adolescence. *J Abnorm Psychol*. 2004;113:302–314.
20. Lishman WA. *Organic Psychiatry.* 3rd ed Oxford: Blackwell Science Ltd; 1998.
21. Simonoff E, Elander J, Holmshaw J, Pickles A, Murray R, Rutter M. Predictors of antisocial personality. Continuities from childhood to adult life. *Br J Psychiatry*. 2004;184: 118–127.
22. Reichenberg A, Harvey PD. Neuropsychological impairments in schizophrenia: integration of performance-based and brain imaging findings. *Psychol Bull*. 2007;133:833–858.
23. Nigg JT, Wong MM, Martel MM, et al. Poor response inhibition as a predictor of problem drinking and illicit drug use in adolescents at risk for alcoholism and other substance use disorders. *J Am Acad Child Adolesc Psychiatry*. 2006;45:468–475.
24. Giancola PR, Martin CS, Tarter RE, Pelham WE, Moss HB. Executive cognitive functioning and aggressive behavior in preadolescent boys at high risk for substance abuse/dependence. *J Stud Alcohol*. 1996;57(4):352–359.
25. Sharma T, Harvey P, eds. *Cognitive Functioning in Schizophrenia.* Oxford: Oxford University Press; 2000.

Downloaded from https://academic.oup.com/schizophreniabulletin/article/34/6/1035/1939163 by guest on 21 August 2022