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IQ tests as aids to diagnosis and management in early schizophrenia

Phil Harrison-Read

Abstract Intellectual and other more specific neurocognitive impairments in schizophrenia are important for understanding the aetiology of the condition and its likely outcome. However, these impairments are not usually considered important for supporting a diagnosis in suspected early schizophrenia. IQ testing is widely available and probably acceptable to most people likely to be experiencing the early stages of psychosis and who might be unable or unwilling to disclose details of their history and mental state or to cooperate with more comprehensive neuropsychological assessment. Although in general IQ tests have only limited diagnostic value in schizophrenia, the finding of a substantial decline in IQ score from the estimated premorbid level may be helpful in supporting a provisional diagnosis of early schizophrenia in cases without organic signs in which the clinical picture is unclear or incomplete. More important, the results of IQ tests may contribute to a better understanding of patients' impairments and assist clinical management in a number of ways, as illustrated here by three fictional case studies.

Diagnostic criteria for schizophrenia are relatively broad and vague, and inconsistent with respect to the duration of illness required by ICD–10 and DSM–IV (1 *v.* 6 months respectively; World Health Organization, 1992; American Psychiatric Association, 1994). Except for the exclusion of obvious brain disease or toxicity as causal factors, diagnostic criteria for schizophrenia are based entirely on clinical signs and symptoms and duration and course of illness. Objective tests or special investigations are not usually considered helpful for arriving at a diagnosis.

However, diagnostic difficulty and uncertainty often arise in suspected cases of early schizophrenia because information about the development and nature of symptoms may be unclear, unreliable or falsified, or because putative aetiological factors of importance for a differential diagnosis, for example exposure to psychotomimetic substances or extreme environmental stressors, may be missed, denied or exaggerated. In such cases, objective measures which are strongly associated with the clinical parameters used to define schizophrenia might be useful.

In everyday practice with individuals who are suspected of having early schizophrenia, the need is not so much for a definitive diagnostic test, but more for objective measures that are easily carried out and acceptable to patients, and that will help clinch a strong clinical impression that already exists for or against the diagnosis. This is often necessary to help convince patients and their relatives that a particular type of management (e.g. persisting with close psychiatric monitoring, or antipsychotic medication) is indicated and justified.

Positive predictive value of diagnostic tests

The positive predictive value (Warner, 2004) of a diagnostic test or investigation which is not a gold-standard indicator of the disorder in question is highly dependent on the individual being tested and the specific circumstances and context in which the test is carried out. For example, a host of structural neuroimaging studies involving computed tomography (CT) and magnetic resonance imaging (MRI) scans suggest that people with schizophrenia have reduced volumes of various parts of the brain, especially the temporal lobes, findings which may be evident early on in the illness (Johnstone *et al*, 1976; Lawrie *et al*, 2001; Keshavan *et al*, 2005). Reduced whole brain volume and enlargement of the cerebral ventricles that is obvious on a CT scan, for example, is therefore likely to have a high positive predictive value for schizophrenia in a young adult with a family history of the disorder who is also showing

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non-specific features of a first-episode psychotic illness. However, in practice carrying out a CT brain scan is unlikely to be helpful diagnostically because an obviously abnormal scan is rare, and an apparently normal scan does not undermine support for the diagnosis in an individual who is likely to have schizophrenia, i.e. a CT brain scan that is within normal limits will have a low negative predictive value (Warner, 2004).

IQ as a measure of cognitive impairment in schizophrenia

It is now well established that people with schizophrenia have on average a lower IQ than mentally healthy people or people with other forms of functional mental illness such as bipolar disorder (Heinrichs & Zakzanis, 1998; McIntosh *et al*, 2005). However, taken in isolation, this fact has little or no value for diagnosing schizophrenia in individual cases because low IQ may be an incidental finding unrelated to mental illness, and there is marked overlap of IQ scores of people with schizophrenia with those of healthy people. Although in the past at least, IQ was often measured as part of routine clinical assessment in schizophrenia, this was probably not to establish or confirm the diagnosis, but apparently to help predict the negative impact of the disorder on the individual's future behaviour and social functioning. The generally low IQs of people with the disorder were, until relatively recently, usually explained away as being entirely due to temporarily impaired concentration, cooperation and motivation, or the distracting effect of psychotic symptoms, rather than providing evidence of genuine and sustained intellectual impairment (McKenna, 1995).

Simultaneous estimate of premorbid and current intellectual functioning

Premorbid IQ can be estimated retrospectively, at the same time as current IQ is measured, by performing reading tests such as the National Adult Reading Test (NART; Nelson & Willison, 1991). The NART is based on assessing ability to read and pronounce certain words, which reflects previous familiarity with the meaning of the words even when currently this understanding is lost because of intellectual impairment. As expected, in healthy controls, premorbid IQ estimated by the NART is usually very similar to current IQ (e.g. Joyce *et al*, 2005) as measured by tests such as the Wechsler Adult Intelligence Scale – Revised (WAIS–R; Wechsler, 1981), supporting the validity of the NART. The NART also probably gives a valid measure of premorbid IQ in most people with schizophrenia (Frith *et al*, 1991; Crawford *et al*, 1992). An average reduction of 10 or more IQ points between estimated premorbid and current IQ is usually found in samples with long-standing established diagnoses of schizophrenia (e.g. Frith *et al*, 1991; McIntosh *et al*, 2005). Weickert *et al* (2000) reported reduced IQ in about 50% of such individuals. The average IQ decline in samples with first-episode illness is generally less than in groups with chronic schizophrenia (Bilder *et al*, 1992, 2000), and may not even be detectable (Johnstone *et al*, 2005). However, a decline of 10 or more points in a young adult who is showing emerging or overt psychotic features is indicative of acquired intellectual impairment, and, in the absence of coarse brain disease, is likely to be strongly supportive of a diagnosis of early schizophrenia or another closely related psychotic disorder (Bilginer *et al*, 2005).

Unfortunately, the potentially high positive predictive value for schizophrenia of a substantial decline in IQ is counterbalanced by the relatively low negative predictive value of a lack of IQ decline. This is because a substantial proportion of people with established schizophrenia show no evidence of overall intellectual decline, especially in the early stages of the illness. Thus, more than half of a sample with first-episode schizophrenia showed no substantial IQ decline (Joyce *et al*, 2005), and in a sample with recently diagnosed schizophrenia (Johnstone *et al*, 2005), the mean values for premorbid and present IQ were almost identical, suggesting that most if not all individuals showed no substantial IQ decline. An additional limitation is that the NART may overestimate IQ decline in some people with schizophrenia and spuriously identify IQ decline in a small proportion of healthy people (Crawford *et al*, 1990; Russell *et al*, 2000).

Considering the likelihood that certain features of schizophrenia (e.g. distraction by psychotic symptoms) may have an adverse effect on patients' performance on IQ tests that is independent of intellectual decline, it might be advisable in practice to use a more stringent criterion of a decline of at least 15 points (one standard deviation) in IQ score as evidence for enduring, organically based intellectual impairment. Another reason for using this more stringent criterion is that the NART and commonly used measures of current IQ such as the WAIS–R relate to different normative populations, which will reduce the accuracy of estimates of IQ decline in schizophrenia. This drawback could be overcome if premorbid and current IQ were estimated using assessment tools based on the same normative populations. Box 1 summarises the diagnostic value of comparisons of premorbid and current IQ.

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Box 1 Diagnostic value of IQ comparisons

In a patient suspected of having early schizophrenia, but where there is diagnostic doubt due, say, to inadequate or unobtainable history or mental state examination, finding a substantial IQ decline (≥15 points) strongly supports a diagnosis of the disorder, whereas a lack of IQ decline neither supports nor excludes the diagnosis.

Pragmatic value of IQ tests in differential diagnosis and early management

Unlike detailed neuropsychological tests for memory, executive function and psychomotor performance, routine IQ-testing is widely available in most general psychiatric services. Although it is likely to take up to an hour or two, it is usually acceptable even to people who are otherwise not likely to agree to comprehensive psychological scrutiny and examination. The discovery of a substantial decline in IQ in an individual with a suspected or probable diagnosis of schizophrenia not only makes the diagnosis very likely; it may also be helpful for a better understanding of the patient's impairments and for making important decisions regarding early management of the illness. This is illustrated by the three fictional cases that follow. These are drawn from my clinical experience, but they do not describe or refer to actual patients.

Case example 1: Drug-induced psychosis

It is not uncommon for patients to present with reports of ill-defined and inconsistent psychotic symptoms lasting for weeks or months and associated with heavy use of psychotomimetic illicit drugs such as cannabis, cocaine, amphetamine and ketamine.

A 19-year-old university student presented with a 1-year history of depressed mood, with vague, mood-incongruent psychotic symptoms (ideas and delusions of reference and possible auditory hallucinations). His behaviour and thinking showed some disorganisation, with social withdrawal and signs of self-neglect (poor hygiene and diet). His attendance at classes had become erratic, and almost ceased in the 3 months before he was first assessed. He was known to have been a heavy user of cannabis on a more or less continuous basis since the age of 15. However, if anything, his substance misuse had declined more recently as he was reluctant to go out of doors to buy cannabis. There appeared to be quite marked fluctuations in his mental state and behaviour, but it was unclear to what extent these changes reflected variation in his intake of cannabis. His WAIS–R full-scale IQ score was 89 and his estimated premorbid (NART) IQ score was 107.

Comment The estimated IQ decline of 18 points strengthened confidence in the provisional diagnosis of schizophrenia, and the individual was advised to defer his studies and start treatment with an atypical antipsychotic drug, as well as being offered help to reduce and stop his misuse of recreational drugs. He failed to qualify for help from a specialist 'early intervention in psychosis' service, which required for inclusion a definite diagnosis of schizophrenia or a clearly defined related condition, and so instead he was offered intensive care management by the local community mental health team (CMHT).

Case example 2: Denial of psychotic symptoms

Patients sometimes deny or retract previous disclosure and description of mental symptoms that would otherwise fulfil diagnostic criteria for first-episode schizophrenia.

A 23-year-old student teacher with a family history of schizophrenia became anxious and low in mood over a period of 6–8 months, with occasional panic attacks and episodes of derealisation. These symptoms were associated with interpersonal difficulties and failing academic performance. She showed episodic overuse of alcohol, apparently in response to worry about having further panic attacks. Then over a period of a few weeks, she complained to her GP of frank psychotic symptoms, which resulted in an assessment by her local CMHT that included a mental state examination by an experienced psychiatric registrar. The patient appeared mildly intoxicated with alcohol and was anxious and guarded. She disclosed that people were reading her thoughts, which were also being 'played back aloud' to her as though from a recording heard over earphones. She also heard hallucinatory voices in external space, whispering about her and saying that she should kill herself as this was her only means of escaping the interference with her thoughts, which she believed was the work of the Devil. She had indeed considered taking her own life, but felt too afraid to carry through any plans.

On subsequent assessments over the next week or two, after a provisional diagnosis of schizophrenia had been discussed with her and her family, she became more reticent about her symptoms, and declined to take antipsychotic medication that was recommended. She was, however, able to moderate and then cease her alcohol consumption, with a noticeable improvement in her mood and demeanour. Two months after first assessment, she denied ever having experienced psychotic symptoms, and claimed that the psychiatrist was mistaken in claiming that she had been 'hearing voices', saying that this was a symptom shown by her older brother, who had an established diagnosis of schizophrenia. Her WAIS–R full-scale IQ score was 94 and her NART IQ score was 101.

Comment The psychiatrist had made a provisional diagnosis of paranoid schizophrenia after the first

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assessment, but this diagnosis was withdrawn, partly on the patient's insistence and also in acceptance of the patient's later denial of psychotic symptoms, especially those of first-rank significance for the diagnosis of schizophrenia. The failure to detect a substantial IQ decline was neither a support of nor an obstacle to the diagnosis of schizophrenia. A revised diagnosis was made of a moderate depressive episode with secondary anxiety symptoms and exacerbation by alcohol misuse. She was offered and accepted antidepressant medication, but was monitored and managed more intensively than if she had an uncomplicated mood disorder.

Case example 3: Ambiguous IQ test results

Even when using brief versions of IQ tests (Frith *et al*, 1991), there may be difficulties in obtaining reliable estimates of IQ in uncooperative people with a possible or probable diagnosis of schizophrenia. In the case of the NART, a particular problem will arise when testing patients for whom English is not their first language.

An 18-year-old schoolboy who had emigrated from his home country of Somalia at the age of 4 presented with a 3-year history of increasingly severe symptoms of obsessive–compulsive disorder (OCD), which initially had mainly involved contamination fears and cleansing rituals. The patient had a brother who was 5 years older and who had developed a very severe schizophrenic illness at the age of 15 or 16. This brother lived at home with the patient and was severely disabled by a deficit state with marked self-neglect. The patient started to worry that his arms were 'growing longer', so that even when standing in a normal posture, his hands 'might' come into contact with the floor, which he believed was contaminated because of his brother's lack of hygiene. As well as continuing with prolonged hand-washing rituals, the patient would sit for hours in a huddled posture with his arms wrapped around himself in an attempt to prevent his hands from becoming contaminated. He became increasingly hostile towards his brother, whom he accused of casting an 'evil spell' on him. The patient seemed much less disturbed when at school, although there was clear evidence that his academic performance had deteriorated over the previous year. On mental state examination, the patient was quite articulate with an excellent command of English, but he answered questions in a clipped, perfunctory manner amounting to poverty of speech. His affect seemed flat and mildly blunted. In discussing his contamination fears and related hostility towards his brother, the patient showed little overt emotion. He believed that his brother's negligence and poor hygiene were deliberate and could seriously harm him in some way. He did not seem to appreciate that his concerns about this and his belief that his hands might touch the floor without his meaning it to happen were irrational; neither did he attempt to resist his thoughts about these matters. On the WAIS–R, the full-scale IQ score was 97, verbal IQ was 109 and performance IQ was 84. The NART IQ was 106.

Comment This patient's family history of schizophrenia, and the atypical nature of his OCD, along with poverty of speech and affect and mood-incongruent hypochondriacal and persecutory abnormal beliefs possibly of a delusional nature, strongly suggested a diagnosis of early schizophrenia. Although there was only a 9-point difference between premorbid and current full-scale IQ, as English was not the patient's first language, and he did not speak English at home, it was likely that the NART IQ score and the IQ decline were underestimates. The marked discrepancy between current verbal and performance IQ was also striking and is commonly found in established schizophrenia. However, lower IQ scores on performance tests relative to verbal tests are also found in people with severe psychiatric conditions other than schizophrenia (Heinrichs & Zakzanis, 1998; McIntosh *et al*, 2005), so this finding is not likely to be helpful diagnostically in this case. Notwithstanding the continuing diagnostic uncertainty, the patient was advised to take an atypical antipsychotic drug (risperidone) along with an anti-obsessional drug (fluoxetine). He rejected this advice and withdrew from all further contact with mental health services. As with the individual in Case example 1, the patient did not meet the inclusion criteria for the early intervention service for first-episode psychosis. Had this service become involved, it might have been possible to use a more assertive approach to successfully engage him in treatment.

Discussion

The limitations of IQ tests for assisting diagnosis and management in early schizophrenia are clear, but I hope that I have demonstrated that IQ testing is still worth carrying out in circumstances in which a diagnosis of early schizophrenia seems possible or probable but when significant doubt remains. Perhaps the main value of IQ testing in this context is to enhance and supplement the assessment, understanding and management of individuals in the early stages of a schizophrenic illness.

Most general mental health services can easily carry out IQ testing and it is likely to be acceptable to most patients, even those who might not be able or willing to disclose and give details of psychotic symptoms necessary to meet diagnostic criteria for schizophrenia. The more widespread use of validated brief tests of current IQ, as used by Frith *et al* (1991), might further increase the acceptability and feasibility of testing for IQ decline in people with early schizophrenia. By contrast, structured interviews for psychological constructs such as schizotypal cognitions, which have relatively high positive and negative predictive value for schizophrenia (Johnstone *et al*, 2005), might not be so acceptable to individuals who are unwilling or afraid to reveal the true nature of their mental disturbance.

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As mentioned, in the past, IQ test results in people with a confirmed diagnosis of schizophrenia were most commonly used to help predict functional outcome (e.g. vocational rehabilitation). Despite the availability of more selective neuropsychological tests tapping aspects of memory, executive function and psychomotor performance, IQ tests may still be useful in this context as well (Gold *et al*, 2002).

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Declaration of interest

None.

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MCQs

1 Estimates of premorbid IQ are:

a usually lower than current IQ in people with early schizophrenia
b unaffected by the individual not having English as their first language
c based on the ability to read and pronounce certain words
d not likely to be valid in people with schizophrenia
e likely to be substantially higher than current IQ in 'normal' individuals.

2 An estimated decline of 10 or more IQ points:

a probably indicates acquired intellectual impairment
b occurs in about 90% of people with long-standing schizophrenia
c can be expected in 10% of the 'normal' population
d is associated with superior outcome in first-episode schizophrenia
e has no diagnostic significance.

3 For a definite diagnosis of schizophrenia:

a characteristic clinical features must persist for at least 2 weeks
b neuroimaging studies are not usually helpful
c IQ test results are irrelevant
d patients should be without evidence of intellectual impairment
e a history of substance misuse must be ruled out.

4 In cases of suspected early schizophrenia:

a careful history-taking and mental state examination are the mainstays of diagnosis
b active clinical management should be postponed until the diagnosis is certain
c the diagnosis is usually readily acceptable to patients and their families
d treatment with antipsychotic drugs is contra-indicated
e features of obsessive–compulsive disorder rule out the diagnosis of schizophrenia.

5 Results of physical investigations in cases of suspected early schizophrenia:

a may have a high positive predictive value for the diagnosis of schizophrenia
b typically have a high negative predictive value for the diagnosis of schizophrenia
c rarely overlap with results for 'normal' controls
d reflect the known causes of schizophrenia
e cannot exclude other diagnoses.

MCQ answers

1	2	3	4	5
a F	a T	a F	a T	a T
b F	b F	b T	b F	b F
c T	c F	c F	c F	c F
d F	d F	d F	d F	d F
e F	e F	e F	e F	e F

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