Age Disorientation in Chronic Schizophrenia is Associated with Global Intellectual Impairment

P. F. LIDDLE and T. J. CROW

Summary: From a population of long-stay patients with a diagnosis of schizophrenia according to the St Louis criteria, a group of 21 patients with 'age disorientation' was selected, and compared on a series of tests of intellect and learning capacity with a matched control group of 21 schizophrenic patients without this feature. The age-disorientated patients demonstrated substantial impairments on tests of orientation and general knowledge, associational learning, the 'famous personality' test, tests of vocabulary and aphasia, Raven's matrices, the digit-symbol substitution test and the mental test score. We conclude that profound 'organic-type' psychological deficits (global impairment of intellectual function associated with temporal disorientation) undoubtedly occur in chronic schizophrenia. The findings on the 'famous personality' test and the Peabody vocabulary test did not exclude the possibility that such impairment arises early in life, at a time preceding the onset of the illness which leads to hospital admission.

Approximately 25 per cent of the in-patient population of chronic schizophrenics estimate their age incorrectly by a margin of five years or more (Crow and Mitchell, 1975; Stevens et al., 1978; Smith and Oswald, 1976). This 'age disorientation' has the following features:

(i) In the majority of cases the patient's estimate of age is an underestimate. Crow and Mitchell (1975) and Crow and Stevens (1978) found that in 40–50 per cent of cases of age disorientation subjective age was within five years of age on first hospital admission, although the patients had been in hospital for a mean of approximately 30 years.

(ii) Age disorientation is associated with temporal disorientation. Age-disorientated patients systematically underestimate the present year, and also the duration of their hospital stay. For some individuals the errors in temporal information are consistent with their concept of their own age (Crow and Stevens, 1978).

The pattern of age and temporal disorientation exhibited by a sub-group of chronic schizophrenics is thus consistent with the hypothesis that these patients have failed to update their concepts with the passage of time.

The present study was designed to determine whether the defects of temporal orientation in chronic schizophrenia are part of a more general intellectual impairment or are related to specific learning deficits. This issue is relevant to the question of whether intellectual impairments are commonly seen in chronic schizophrenia. Kraepelin and Bleuler apparently believed that true intellectual impairment does not occur: thus Bleuler (1950) stated that 'in contrast to the organic psychoses, we find in schizophrenia... that sensation, memory, consciousness and motility are not directly disturbed' (p. 55) and 'memory as such does not suffer in this disease' (p. 59). Kraepelin (1919) thought that intellectual functions (orientation, consciousness and memory—p. 17) were unimpaired but made an exception for some chronic states: see e.g. Kraepelin (1919) p. 190 and pp. 197–8. Recently Klonoff et al., (1970) applied the Halstead-Reitan test battery to a group of chronic schizophrenics and concluded that 'the test results certainly appear to indicate the presence of organic deficit in these patients'. In a review of psychological test findings, Heaton et al., (1978) concluded that groups of chronic or process schizophrenics 'may look organic on neuro-psychological tests because a significant proportion of such patients are organic' (our italics).

The phenomenon of age disorientation may be of significance if it is a relatively simple index of more general and profound intellectual loss. The present study investigated the relationship between age dis-
orientation and other aspects of neuropsychological function: the performance of a group of 21 age-disorientated chronic schizophrenic patients was compared with that of a group of 21 age-orientated schizophrenic patients on a battery of tests of intellectual and learning performance.

**Method**

**Selection of Patients and Controls**

A study of long-stay patients at Shenley Hospital carried out in 1976-78 (Owens and Johnstone, 1980) identified 510 cases satisfying the St Louis criteria for a diagnosis of probable schizophrenia (Feighner et al., 1972). Of these, 84 estimated their age incorrectly by five years or more. Of these, 22 stated their age at the time of the survey to be within five years of their age at first admission to a mental hospital: this relatively homogenous group was considered for the present study. One refused to take part, leaving a group of 21 age-disorientated patients.

Controls were selected from the other 426 patients satisfying the St Louis criteria who were not age-disorientated at the time of the 1976-78 survey. For each age-disorientated patient, the best available match in terms of age, sex and time since first admission was selected. After selection, both groups contained 13 males and 8 females. The mean age was 56.7 years for the age-disorientated and 57.3 years for the control patients, and the mean time since first admission to a mental hospital was 33.4 years for the age-disorientated and 32.8 years for the controls. In both groups the mean age of the female patients was 10 years greater than that of the males, and the mean length of time since admission was 8.5 years longer for females.

**Cognitive Function Tests**

A battery of ten tests was administered to each patient. To avoid undue stress and fatigue each test lasted only a few minutes, and the battery was administered in three separate interviews, each of approximately twenty minutes' duration.

**Age orientation**

Patients were asked:

(a) their age
(b) their date of birth
(c) the present year
(d) the length of their current hospital stay
(e) the year of their admission
(f) their age at admission

Answers were accepted as correct if they agreed with information in the case notes—to within one year for the first three questions, to within five years for the remaining questions.

After being asked these questions, the patient was told his correct date of birth, and if necessary, the current year, and given the opportunity to calculate his age. If required, assistance was given with the calculation, so that in each case the patient's true age was demonstrated to him. Finally, he was asked his age once again. Thus for each patient it was possible to assess the constancy of his belief about his age between the time of the earlier survey (1976-78) and the present survey (1979); also the constancy of his belief after a demonstration of his true age.

**Orientation and general knowledge**

The orientation and general knowledge questionnaire was designed to assess orientation (e.g. the day of the week, and the time of day), local information (e.g. the name of the hospital, the name of a staff nurse, and the time of breakfast) and knowledge of recent events and general information (e.g. the name of the Prime Minister, the capital of Italy).

**Estimation questionnaire**

The estimation questionnaire assesses the ability to make a numerical estimate of various quantities, making use of knowledge acquired through previous experience. Shallice and Evans (1978) have claimed that performance of this type of task is impaired in frontal lobe lesions. The questionnaire used included (1) questions concerning time (e.g. 'How long is it since the end of the Second World War?', and requests to estimate the age of the interviewer and of individuals in photographs), (2) an estimation of local quantities (e.g. distance to a nearby village); and (3) some more general questions from Shallice's questionnaire.

**Face-name learning**

In this test (Frith, personal communication) the patient is asked to associate names with faces in photographs. The test assesses memory over a time interval of 1–3 minutes, incorporating an opportunity for improved performance in successive trials. Scoring performance in the relatively easy task of distinguishing the familiar from the unfamiliar in addition to performance in the more exacting task of making the correct identification allows discrimination between patients over a wide ability-range.

**Peabody picture vocabulary**

This test is described in detail by Dunn (1959). It has been shown that performance correlates well with premorbid intellectual level.
'Famous personality' test

Long-term memory was assessed by a modification of the 'famous personality' test devised by Stevens (1979). The patient is presented with a list of names—some fictitious, some of famous people—and asked to indicate whether or not he recognises each name in turn. The difference between the patient's familiarity with the real and the fictitious names is a measure of the patient's long-term memory.

In this survey, the list (selected from those previously investigated by Stevens) consisted of ten very famous names, well known to normal controls of all age groups; ten names of people famous in the period 1960–65; ten names famous in the years preceding the patient's first hospital admission but out of public awareness since that time; and 10 fictitious names.

Boston naming test

In this test of nominal dysphasia (Kaplan et al., 1976), the patient is asked to name objects presented as line drawings.

Digit–symbol test

This test is a component of the WAIS battery (Wechsler, 1958) and is a measure of ability to learn a new task.

Raven matrices

Sets A and B of Raven's progressive matrices were employed (Raven, 1965).

Mental test score

The mental test score, a rapid assessment for dementia (Denham and Jeffreys, 1972) consists of 15 questions that test orientation in place and time, short-term memory, long-term memory, and general knowledge.

Results

The results obtained in the various tests are presented in Tables I and II and in Fig 1. Compliance was not always 100 per cent but it is unlikely that bias was introduced by the omission of one or two patients and their controls in certain tests.

In all tests, the age-disorientated group performed significantly worse than the age-orientated group, and in most cases the differences were highly significant statistically. When the scores were compared for each sex separately, the differences between age-disorientated and age-orientated were less marked for females than for males. This may be a reflection of the greater average age of the female patients.

Age-orientation

Only 12 of the 21 age-disorientated patients gave their age as being within five years of their age at first admission. Of the nine giving a substantially different answer, three did not know their age, two gave estimates younger than their previous estimate, two gave ages intermediate between their age at admission and their true age, one claimed he was 100 years old, and one gave approximately her correct age. Six gave exactly the same answer as they had given in the 1976–78 survey.

After the demonstration of their true age by subtraction of year of birth from the current year, twelve still gave exactly the same age as they had initially, and three modified their answer by less than 5 years. Some patients who had initially been significantly disorientated changed their answer to the correct age or something near it. An example was a 45-year-old man who had been admitted at the age of 17 and had given his age as 17 in both 1975 and 1977. In our trial he once again stated that he was 17, yet after demonstration of his true age he gave his age as 47, apparently persevering with the digit 7 while approximating to his true age. Several days later he once again gave his age as 17.

Despite the use of a criterion intended to select a group with a uniform degree of age disorientation, it was clear that there was substantial variation. Approximately half of the group showed consistency in their stated age over an interval of 3 years and in the face of evidence to the contrary. Others gave variable but incorrect answers, while a few gave at least approximately correct answers on some occasions.

Table I shows that the age-disorientated patients gave significantly fewer correct answers than the controls for all of the age-related questions except that concerning age on first admission to hospital.

All 13 age-disorientated patients able to give an estimation of the length of time since their first admission underestimated it. The mean estimated duration for this group was 5.8 years (actual mean duration was 33.6 years). In contrast, the 19 controls gave a mean estimated duration of 26 years (actual mean duration 34.6 years). This finding supports the suggestion that time has 'stood still' for the age-disorientated patients. However it is not merely a matter of time standing still, since only two of these patients (compared with eight controls) knew the year of their first admission to within five years.

Date of birth was the best-known age-related item for both the age-disorientated patients and the controls. Twelve of the age-disorientated patients knew their date of birth to within one year, nine of them giving day, month and year exactly. However, age-disorientated patients were more likely to answer 'don't know', even though in many cases the required answer could have been deduced from the answers
Table I

<table>
<thead>
<tr>
<th>Comparison of the performances of 21 age-disorientated patients and 21 controls on the Age Orientation Questionnaire</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of correct answers</strong></td>
</tr>
<tr>
<td>Age-disorientated</td>
</tr>
<tr>
<td>Date of birth</td>
</tr>
<tr>
<td>Current year</td>
</tr>
<tr>
<td>Time since first admission</td>
</tr>
<tr>
<td>Year of first admission</td>
</tr>
<tr>
<td>Age at first admission</td>
</tr>
</tbody>
</table>

*Calculated using Yates’s correction for small numbers

given to other questions. They showed less consistency than the controls in the answers they gave: for only six of the age-disorientated patients was the stated age consistent with their estimate of the length of time since admission.

To summarize, age-disorientation is associated with a poor knowledge of facts related to age. Although no single pattern of disorientation embraced all of the patients, the group included (1) those who had a varying idea of their current age together with a chaotic knowledge of age-related facts (eight cases); (2) those with a firmly fixed delusion concerning their age and an impaired knowledge of age-related facts, inconsistent with their belief concerning their age (seven cases); (3) those with a quite coherent system of delusions regarding age and closely related facts (consistent with the conception that for these patients time has stood still since first hospital admission) (six cases). Contrary to expectation, comparison between these three groups revealed no significant difference in performance in any of the other tests.

**Orientation and general knowledge**

In this 19-item questionnaire, the age-disorientated patients achieved a mean score of 6.86 (S.D. 3.6) compared with 15.7 (S.D. 2.2) for the controls (P <0.001). In each of the four sub-tests, the difference in score between age-disorientated and age-orientated was significant at the level P <0.001. It is of interest that the sub-test performed least well by the age-disorientated was that involving recent knowledge, for which they scored a mean of 0.45 out of 5 items whereas the age-orientated scored a mean of 3.75.

**Estimation questionnaire**

In this 12-item questionnaire, the mean score achieved by the age-disorientated was 3.5 (S.D. 2.1) compared with 8.5 (S.D. 2.4) achieved by the age-orientated (P <0.001). In the estimation of time-intervals the difference between the two groups achieved significance at P <0.01, and for the other three sub-tests P was less than 0.001.

**Face-name learning test**

From Fig 1 it can be seen that the age-disorientated patients had an impairment of learning ability relative to the controls on this test. Although the difference appears less marked than in the other tests, this probably reflects the fact that both groups obtained low scores.

**Famous personality test**

The age-disorientated patients performed less well than the controls in all three sub-divisions of the ‘famous personality' test. For names famous before admission, the statistic for detectability (d′) was 0.67 for the age-disorientated compared to 1.93 in the age-orientated and 2.46 in the general population (P = 0.005); for very famous names these figures were 1.16 compared to 2.94 and 3.63 (P = 0.014); and for names famous in 1970–75 the figures were 0.80 compared to 2.27 and 2.24 (P = 0.0014). Thus age-disorientated patients have an impairment of long-term memory which does not seem to be confined to the period following the onset of illness.

**Peabody, Boston, Raven Matrices and digit-symbol tests**

For each of these tests the scores obtained by the age-disorientated patients were very significantly lower than those obtained by the controls (Table II).

**Mental test score**

While the difference between the performances of the age-disorientated and control groups was statistically significant in all of the tests, it reached an outstandingly high level of significance for the mental test score (Table II). There was very little overlap
Discussion

Previous studies have drawn attention to notable features of age-disorientation such as the proportion of cases in which stated age is within five years of age on admission and a consistent tendency to underestimate the length of time since first admission. These features suggest there may be a specific defect in one aspect of intellectual function. This study affords little support for this hypothesis: for example, age-disorientated patients have an especially severe defect in recent knowledge. It is clear that age-disorientation does not arise as an isolated abnormality; it is part of a global deterioration in intellect (see Fig 1).

Furthermore, the form of intellectual impairment makes it difficult to exclude the possibility that this group of patients have suffered from life-long mental subnormality. In particular, the difference between the performance of the age-disorientated patients and the controls in the Peabody picture vocabulary test, which in principle is a measure of pre-morbid intellectual level, is similar in magnitude to the differences in the other tests. Moreover, in the 'famous personality' test the age-disorientated were as impaired in recalling names famous prior to their admission as in recalling names famous at later times. This suggests that the age-disorientated patients may have been handicapped throughout the years of their education, and raises the possibility that age-disorientation is the hallmark of a life-long pathological process affecting the brain, which presents in early adulthood as an illness satisfying the St. Louis criteria for schizophrenia. A. Rifkin has suggested (personal communication) that the population of schizophrenic patients described by Quikkin, Rifkin and Klein (1976) as 'childhood asocials'—i.e. those who fail to develop interpersonal relations and have poor educational attainments—may, after experiencing typical acute schizophrenic illness, progress to become age-disorientated. Alternatively, age-disorientation may result when schizophrenia and mental subnormality happen to coincide: however, the relatively high incidence of age-disorientation among schizophrenics makes this interpretation unlikely.

Although our selection criteria restricted the age-disorientated group to those who had on a previous occasion given an estimate of their age as being within five years of their age on admission, the significant
Table II
Comparison of the performances of age-disoriented patients and controls on five tests of cognitive function

<table>
<thead>
<tr>
<th>Test</th>
<th>Maximum score possible</th>
<th>Number of pairs of patients</th>
<th>Score: mean and (S.D.)</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peabody picture vocabulary</td>
<td>40</td>
<td>21</td>
<td>18.6 (5.5)</td>
<td>27.0 (6.3)</td>
<td>3.5</td>
</tr>
<tr>
<td>Boston naming test</td>
<td>30</td>
<td>20</td>
<td>11.5 (5.0)</td>
<td>18.2 (7.5)</td>
<td>3.3</td>
</tr>
<tr>
<td>Raven matrices</td>
<td>24</td>
<td>20</td>
<td>7.5 (4.3)</td>
<td>12.0 (3.1)</td>
<td>3.8</td>
</tr>
<tr>
<td>Mental test score</td>
<td>16</td>
<td>20</td>
<td>4.6 (1.6)</td>
<td>12.0 (2.9)</td>
<td>10</td>
</tr>
<tr>
<td>Digit-symbol substitution</td>
<td>90</td>
<td>19</td>
<td>7.25 (5)*</td>
<td>16.25 (14)*</td>
<td>8.5</td>
</tr>
</tbody>
</table>

*Number in brackets indicates number of patients scoring 12 or more
†Not t-test but \( \chi^2 \)

number giving a substantially different estimate in this survey suggests that the findings can be generalized to include a wider range of age-disoriented patients. Furthermore, the lack of significant difference in performance between those remaining constant in their age-estimation and those who changed their estimation gives no grounds for supposing that an age estimation within five years of that on first admission places a patient at one end of a continuum of increasing impairment. Similarly, there is no evidence that consistency in temporal information is associated with maximum impairment. Thus the significance of these particular features of age-disorientation remains uncertain.

In conclusion, age-disorientation appears to be a marker for a form of chronic schizophrenia characterized by a severe, wide-ranging impairment of intellect, and may possibly be a sequel of a pathological process active since early childhood. Our findings reinforce the conclusions of Klonoff et al (1970), Crow and Mitchell (1975) and Heaton et al (1978) that ‘organic-type’ psychological impairments do occur in chronic schizophrenia, and suggest that they may be readily detected by simple tests of temporal orientation. The relationship between temporal disorientation and structural changes in the brain which have already been associated with intellectual deficits (Johnstone et al, 1978; Crow and Johnstone, 1980) deserves further investigation.

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