ORIGINAl ARTICLE

Psychopathology in children of schizophrenics

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ABSTRACT

The higher prevalence of schizophrenia in children of schizophrenics than in the general population has generated an interest in pinpointing those behaviors that may precede the disorder and serve as an index of vulnerability to the disorder. Signs of neurobehavioral dysfunction in areas of neurocognitive functioning and social behavior have been found in school-age children of schizophrenic parents. This study assessed the neurobehavioral functioning, social behavior, cognitive functioning, attention and intelligence in children with a schizophrenic parent and compared the same parameters with children of mentally healthy parents. The children aged 12-15 years, were assessed with a battery of neurobehavioral tests. The children with a schizophrenic parent performed more poorly in the tests as compared to the children of mentally healthy parents. The children with a schizophrenic parent were seen to have more behavioral problems, especially withdrawn behavior and more social problems when compared to the other children in the study. Poor attention, disordered thoughts and lower intelligence were also observed to be more in the children of the schizophrenic parent.

Key words: Children, schizophrenic parents, intelligence, attention, thought disorder.

INTRODUCTION

The prevalence of schizophrenia in the general population is 1 to 2%. As compared to that, the child with one schizophrenic parent has a lifetime risk of 12%. One of the major goals of schizophrenia research in the past three decades has been the identification of precursor symptoms and areas of dysfunction before the manifestation of schizophrenia. Childhood neurobehavioral deficits in offspring of schizophrenic parents can be predictors of schizophrenia-related psychoses in adulthood. Psychological and neurodevelopmental abnormalities in preschizophrenic persons have repeatedly been described, and it is now well established that early signs of the disorder can be found during infancy and childhood. Presumably, these neurophysiological domains influence the individual's interpersonal functioning and behavior. Two areas of behavior, neurocognitive functioning and social behavior, have been of particular interest to high-risk researchers (high risk in this context refers to those individuals who are considered to have a higher statistical risk of developing schizophrenia than the general population), since disturbances in both these areas have been documented. Debate continues about which specific neurobehavioral signs show the greatest sensitivities and specificity to schizophrenia, and whether specific or general deficits are better indicators of vulnerability to schizophrenia. Although risk is elevated for the biological offspring of schizophrenic parents (Kendler and Diehl, 1993), most children of schizophrenic parents will never develop schizophrenia. This underscores the need to refine our ability to identify those individuals within at risk groups who are at highest risk for the disorder. Mirsky et al. (1995) conducted a 25-year follow-up of children at genetic risk for schizophrenia, where they noted that the children, who eventually developed schizophrenia-spectrum disorders including schizophrenia, were identifiable by cognitive-psycho physiological, neurointegrative and social traits in the preteen age period. Children at risk for schizophrenia, by virtue of having at least one schizophrenic parent, behave differently at school from other children, in that they present greater disharmony, less scholastic motivation, and more emotional instability than comparison subjects (Watt et al. 1982). The present paper is a report of the neurobehavioral functioning, intellectual functioning and the social behavior of school-age offspring of schizophrenic parents. It is hypothesized that signs of neurobehavioral dysfunction will occur more frequently in offspring of schizophrenic parents than in children whose parents are mentally healthy. It is expected that the social behavior of children of schizophrenics will be more problematic than that of children with mentally healthy parents.

AIMS

The aims of the study were;

1. To assess the prevalence of behavioral problems, social competence, thought disorders, reaction times and intelligence in children borne to a schizophrenic parent.

2. To assess the above parameters in children borne to mentally healthy parents.

3. To compare the above-mentioned parameters in the two groups.

MATERIALS

The sample included 60 children, which were divided into two groups.

GROUP A (INDEX GROUP)

This group consisted of 30 children borne to a schizophrenic parent (either mother or father). This group was collected from patients attending the Psychiatry outpatient department in a general teaching hospital of a cosmopolitan city.
The inclusion criteria being:
* School going children between ages 12-15 years
* The diagnosis of schizophrenia-residual type (i.e. no active symptoms) in the affected parent by using the DSM-IV criteria
* Duration of illness in the affected parent — more than two years
* No psychiatric disorder in the other parent

The exclusion criteria being:
* Any physical illness in the parents or the child

**GROUP B (CONTROL GROUP)**

This group consisted of 30 children of mentally healthy parents. Normal comparison families (matched for age, socioeconomic status) were secured through a municipal school, which was chosen to reflect the characteristics of the community from which the index group was selected.

The inclusion criteria being:
* No psychiatric disorder in either parent

The exclusion criteria being:
* Any physical illness in the parents or the child

The written consent for participation in the study was taken from the mentally healthy parent/s, and whenever possible from the children, after providing details of the procedure.

Thus a total of 180 individuals (60 children and both parents of each child-120) took part in this study.

This project protocol received the approval of the Ethics Committee of our institution.

The following instruments were applied to the sample:

**A. TO THE PARENTS**

1. A semi-structured Performa: This was compiled for recording the sociodemographic variables, details of parental illness, birth and childhood details and medical history.

2. DSM-IV Criteria (1994): This was used for the diagnosis of schizophrenia in the parent.

3. Achenbach's Child Behavior Checklist (CBCL) 4-18 (Achenbach, 1991): This scale was used to assess the behavior problems in the children. This scale consists of 113 items, about behavior symptoms, which can be grouped under 8 syndromes. These syndromes include: withdrawn behavior, aggressive behavior, somatic complaints, anxious/depressed, attention problems, delinquent behavior and social problems. The symptoms can be scored for behavior at present or dating back as far as 6 months. The items comprising each syndrome are listed under the title of the scale. Each item can be scored from 0 (not true) to 2 (very/often true). A total syndrome score is computed by adding the scores of the items of that syndrome. A total scale score is obtained by adding the scores of all 8 items. Low scores represent no/few behavioral problems and high scores represent more behavioral problems. An additional syndrome of sex problems was not scored for the study. The social competence scale score was assessed for the study.

4. The Social Adjustment Inventory for Children and Adolescents (SAICA) (John, et al., 1987): This is a semi-structured interview schedule that assesses social competence and problems. This scale assesses the child's functioning in different social settings. This scale covers social behavior under four areas of role performance, namely; peer relations, school, spare time activities and home functioning. A global rating was made using 4-point scales, with higher scores indicating poorer adjustment, based on responses to items in the social role areas.

**B. TO THE CHILDREN**

1. Malin's Intelligence Scale for Indian Children (MISIC) (Indian Adaptation of Weschler's Intelligence Scale for Children) (1965): This test was used to measure the child's Intelligence Quotient (IQ) (both verbal and performance components). This scale is the Indian adaptation of the Weschler's Intelligence Scale for Children, and has been standardized for the Indian population. The verbal component includes information, digit span, comprehension, vocabulary, similarities and arithmetic. The performance component includes picture completion, digit symbol, picture arrangement, block design and object assembly. Thus a full scale, verbal and performance IQ were obtained.

2. Scale for Assessment of Positive Symptoms (SAPS) (Andreasen, 1984): This scale which evaluates thought and behavior problems, consists of 35 items which can be grouped under five domains, namely; delusions, hallucinations, bizarre behavior, positive formal thought disorder and inappropriate affect. Each item can be scored from 0-5 (0-absence of symptoms and 5-presence of severe symptoms). A global score for each domain can be obtained. Only the domain of positive formal thought disorder was considered for this study.

3. The Audiovisual Reaction Time Apparatus RTM-608: This instrument was used to assess the attention and concentration (cognitive functioning) of the child through reaction times. The auditory stimulus was provided as a continuous sound on the speaker, while the visual stimulus was in the form of a soothing coloured light.

The CBCL, SAPS, MISIC and SAICA were translated into the local language i.e. Marathi. The English version was first translated into Marathi, which was later back translated to English, to ensure as close as an approximation to the original questionnaire as possible.

**METHODS**

The parent/s and the child were interviewed together and separately, by giving adequate time in each case, which also included assessment using a semi-structured performa and the afore mentioned instruments. The scales were applied to the parent/s and the children as applicable, by a qualified and experienced psychiatrist. The reaction time apparatus was used to assess...
the child’s attention and concentration. After a thorough explanation, the child was given a trial round for each of the two stimuli (visual and auditory). This was followed by three stimuli for each sensory modality and a mean of the three time spans was taken as the final time duration of reaction time (RT).

A qualified and experienced psychologist, using the MISIC, assessed the child’s full-scale intelligence quotient (IQ). Total, verbal and performance IQ scores were assessed.

**TABLE 1 : Sociodemographic Profile**

| Variable            | Index Group | Control Group |
|---------------------|-------------|---------------|
| Age (in years)      |             |               |
| 12                  | 12(40%)     | 13(43.3%)     |
| 13                  | 4(13.3%)    | 5(16.6%)      |
| 14                  | 5(16.6%)    | 5(16.6%)      |
| 15                  | 9(30%)      | 7(23.3%)      |
| Sex                 |             |               |
| Male                | 14(46.6%)   | 17(56.6%)     |
| Female              | 16(53.3%)   | 13(43.3%)     |
| Education           |             |               |
| 7th class           | 12(40%)     | 13(43.3%)     |
| 8th class           | 4(13.3%)    | 5(16.6%)      |
| 9th class           | 5(16.6%)    | 5(16.6%)      |
| 10th class          | 9(30%)      | 7(23.3%)      |
| Family Structure    |             |               |
| Nuclear             | 21(70%)     | 24(80%)       |
| Joint               | 2(6.66%)    | 2(6.66%)      |
| Extended            | 7(23.3%)    | 4(13.3%)      |

The total scores for all the parameters in the two groups were obtained and these were compared using statistical analysis. Statistical analysis was done using the Mann Whitney Test.

**RESULTS**

**A. SOCIODEMOGRAPHIC DATA**

Majority of the children in the study i.e. 43% of the index group and 40% of the control group were 12 years of age. 56% of the children in the index group were boys. More than 40% of the children in both groups were studying in standard 7. Seventy percent of the index group and 80% of the children in the control group belonged to nuclear families.

In the index group, 46.6% of the children had their father as the affected parent, while 53.3% had their mothers as schizophrenic patients. Both the parents of the two groups were interviewed, however no statistical difference was noted.

No statistically significant differences were noted when comparing for length of pregnancy, physical illness during pregnancy, obstetric complications or drugs in the mother and birth weight or type of feeding in the child, between the two groups.

**TABLE 2 : Behavioral Problems by CBCL**

| Assessment          | INDEX GROUP (Mean +/- S.D.) | CONTROL GROUP (Mean +/- S.D.) | U statistic | P value |
|---------------------|------------------------------|---------------------------------|-------------|---------|
| Withdrawn Behavior  | 2.50 +/- 1.53                | 1.23 +/- 0.82                   | 250.0       | p<0.001 |
| Aggressive Behavior | 4.50 +/- 4.72                | 2.43 +/- 2.69                   | 389.0       | NS      |
| Social Problems     | 2.80 +/- 1.10                | 1.50 +/- 0.82                   | 172.5       | p<0.0001|
| Thought Problems    | 0.50 +/- 0.51                | 0.17 +/- 0.38                   | 300.0       | p<0.05  |
| Attention Problems  | 3.70 +/- 2.87                | 2.10 +/- 1.65                   | 307.5       | p<0.05  |
| Delinquent Behavior | 0.27 +/- 0.58                | 0.27 +/- 0.64                   | 439.0       | NS      |
| Anxious/Depressed   | 0.27 +/- 0.74                | 0.27 +/- 0.52                   | 414.0       | NS      |
| Somatic Complaints  | 0.13 +/- 0.35                | 0.13 +/- 0.35                   | 450.0       | NS      |
| Total Problem Score | 18.33 +/- 7.55               | 12.10 +/- 3.87                  | 223.0       | p<0.001 |

B. BEHAVIORAL FUNCTIONING

The set of behavioral problems assessed by Achenbach's Child Behavior Checklist can be grouped under 8 syndromes; which include aggressive/delinquent/withdrawn behavior, somatic complaints, anxious/depressed, social problems, attention problems and thought problems.

As seen in Table 2, the children in the index group showed a greater number of behavior problems with a greater total problem score. When compared with the scores of the children in the control group, it showed a statistically significant difference with a p value of p<0.001. Of the 8 syndromes, social problems were noted to be significantly more in the children in the index group (p<0.0001). This was followed by withdrawn behavior (p<0.001), thought problems (p<0.05), and attention problems (p<0.05). No statistically significant differences were found on the syndromes of aggressive behavior (p>0.05), somatic complaints (p>0.05), anxious/depressed (p>0.05) and delinquent behavior (p>0.05) between the 2 groups. There was no statistically significant difference noted when comparing for sexwise distribution in the index group for total problems (p>0.05), and the syndrome of withdrawn behavior (p>0.05) and aggressive behavior (p>0.05). Although not statistically significant, the syndrome of aggressive behavior showed an upward trend, with a greater mean score on aggressive behavior in the index group.

C. SOCIAL FUNCTIONING

The children in the index group showed
a greater number of social problems in the form of not being liked, being overweight, showing clinging or dependent behavior, clumsy behavior, getting teased a lot and acts too young for his/her age. This was seen as a greater mean score of 2.80+/−1.10 as compared to a mean of 1.50+/−0.82 in the children in the control group. This when compared to the control group was statistically significant with a p value of p<0.05.

D. THOUGHT PROBLEMS
As seen in Table 2, the children in the index group had a greater number of thought problems when assessed on the Achenbach’s Child Behavior Checklist (CBCL). This was statistically significant with p<0.05. Using the Positive Formal Thought Disorder score on the Scale for Assessment of Positive Symptoms (SAPS) further corroborated this finding. Table 4 shows that the children in the index group had more positive formal thought disorder symptoms (mean 2.8+/-3.11) as compared to the children in the control group (mean 0.8+/-1.92). This was statistically significant with a p value of p<0.05.

E. ATTENTION PROBLEMS
Attention problems such as decreased concentration, poor attention span, often daydreaming, confused behavior staring blankly and clumsy behavior were noted to be more in the children in the index group (Table 2). This was statistically significant with p<0.05. To substantiate these findings we assessed the attention and concentration of the children using the auditory and visual reaction time apparatus (Table 5). Auditory and visual reaction times were longer in the index group as compared to the control group (p<0.0001 and p<0.0001 respectively), with this difference being more pronounced for reaction times to visual than to auditory stimuli. The digits forward and backward components of the Digit span subtest of the verbal component of MISIC also assessed the attention and concentration. Although this subtest showed a difference with the children of the index group showing a poor digit span than the controls, it was not statistically significant (p>0.05).

| TABLE 3 : Social Competence |
|-----------------------------|
| INDEX GROUP (Mean+/−S.D.) | CONTROL GROUP (Mean+/−S.D.) | U Statistic | P value |
| Social Competence Score (CBCL) | 4.60+/−1.65 | 5.70+/−1.51 | 271.5 | p<0.001 |
| Social Competence Score (SAICA) | 0.32+/−0.13 | 0.24+/−0.06 | 301.0 | p<0.05 |

| TABLE 4 : Thought Problems |
|-----------------------------|
| INDEX GROUP (Mean+/−S.D.) | CONTROL GROUP (Mean+/−S.D.) | U Statistic | P value |
| Thought Problems (CBCL) | 0.50+/−0.51 | 0.17+/−0.38 | 300.0 | p<0.05 |
| Positive formal Thought disorder Score (SAPS) | 2.80+/−3.11 | 0.8+/−1.92 | 290.5 | p<0.05 |

| TABLE 5 : Attention Problems |
|-----------------------------|
| INDEX GROUP (Mean+/−S.D.) | CONTROL GROUP (Mean+/−S.D.) | U Statistic | P value |
| Attention problems (CBCL) | 3.70+/−2.87 | 2.10+/−1.65 | 307.5 | p<0.05 |
| Auditory Reaction Time | 0.77+/−0.08 | 0.67+/−0.05 | 164.0 | p<0.0001 |
| Visual Reaction Time | 0.67+/−0.08 | 0.57+/−0.06 | 193.0 | p<0.0001 |
| Digit span subtest of VQ (MISIC) | 91.97+/−1.19 | 93.17+/−2.72 | 397.0 | p>0.05 |

resulted in a statistically significant difference of p<0.0001 (Table 2). Evaluating the social competence score on the Achenbach’s Child Behavior Checklist (CBCL) (Table 3) assessed the social competence. The social competence score in the index group had a mean of 4.60+/−1.65, as compared to a mean of 5.70+/−1.51 in the control group. A lower score implies a poor social competence. The 2 groups when compared showed a statistically significant difference of p<0.001. Assessing social competence using the Social Adjustment Inventory for Children and Adolescents (SAICA) further corroborated the findings of a poor social functioning. As seen in Table 3, the children in the index group showed a higher score signifying poor social competence. This
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F. INTELLIGENCE

The Intelligence Quotient (IQ) in the two groups was assessed using the Malin's Intelligence Scale for Indian Children (MISIC). The children in the index group had a lower intelligence quotient (full scale) than the control group children (p<0.0001) (Table 6). Although the performance component of the IQ (Table 6) revealed no significant difference (p>0.05), the verbal component (Table 6) showed a statistically significant difference (p<0.0001), which resulted in the difference in the total intelligence quotient (verbal + performance components), between the two groups. The subtests of the verbal component i.e. information (p<0.0001), arithmetic (p<0.0001), comprehension (p<0.0001), similarities (p<0.0001) and vocabulary (p<0.001), showed significant differences when comparing the two groups (Table 7). Although not statistically significant, the subtest of digit span showed an upward trend.

TABLE 6: Intelligence Quotient (IQ)

| ASSESSMENT | INDEX GROUP (Mean±/S.D.) | CONTROL GROUP (Mean±/S.D.) | U Statistic | P value |
|------------|--------------------------|-----------------------------|-------------|---------|
| Total IQ   | 88.07+/-1.28             | 92.03+/-2.40                | 70.5        | p<0.0001<br>Very highly significant |
| Performance IQ | 91.27+/-2.45          | 92.07+/-2.50                | 369.5       | p>0.05<br>not significant |
| Verbal IQ  | 85.27+/-0.64             | 92.30+/-2.68                | 2.5         | p<0.0001<br>Very highly significant |

Table 7: Subtests of Verbal IQ

| ASSESSMENT | INDEX GROUP (Mean±/S.D.) | CONTROL GROUP (Mean±/S.D.) | U Statistic | P value |
|------------|--------------------------|-----------------------------|-------------|---------|
| Information | 81.27 +/- 1.34           | 91.57 +/- 3.78              | 10.0        | p<0.0001 |
| Comprehension | 81.23 +/- 1.19          | 93.80 +/- 2.64              | 0.0         | p<0.0001 |
| Arithmetic | 85.97 +/- 2.14           | 92.60 +/- 3.07              | 58.5        | p<0.0001 |
| Similarities | 82.43 +/- 0.50          | 93.47 +/- 3.14              | 0.0         | p<0.0001 |
| Vocabulary | 89.83 +/- 1.23           | 92.10 +/- 3.14              | 257.0       | p<0.001  |
| Digit Span | 91.97 +/- 1.19           | 93.17 +/- 2.72              | 397.0       | NS      |

DISCUSSION

Births to individuals with schizophrenia incur an increased risk of pregnancy and birth complications, and these are associated with an increased risk in children genetically predisposed to schizophrenia (Bennedsen, 1995). The present study noted no significant differences between the two groups when comparing for pregnancy and birth related complications, which are similar to the findings noted by Mortensen (2001).

The review of literature on this topic reveals that many studies have noted the presence of a large number of behavioral, emotional, cognitive and social problems, in the children of schizophrenic parents. Similar findings were also noted in our study.

In our study, the children in the index group showed a large number of behavioral problems with, withdrawn behavior being the most significant amongst these. This study also noted increased aggressive behavior in the children in the index group, although not statistically significant. This was in keeping with the study by Auerbach et al. (1993), who noted that the strongest discrimination of the children of schizophrenics from the comparison groups lay in social withdrawal, and the effect was strongest in the males. This study, however noted no such sex differences in aggressive or withdrawn behavior in the children in the index group. Most high-risk studies have found impairment in interpersonal functioning in the offspring of schizophrenic parents in terms of social withdrawal (Hans et al., 1992), aggressive behavior (Watt et al., 1982; Weintraub et al., 1978; Rolf, 1972; Beisser et al., 1975) or both withdrawn and aggressive behavior (Mednick, 1970; Rolf, 1972; Schulsinger, 1976; Weintraub et al. 1975). However other studies (Sameroff and Seifer, 1983; Weintraub and Neale, 1984) suggest that poor interpersonal functioning is not specific to children with schizophrenic parents, but rather that children with interpersonal difficulties occur with a greater frequency in children of parents with various types of mental illness. Social withdrawal behavior could reflect a biological risk for schizophrenia, and/or to the environmental influences such as poor modeling and teaching of social skills, stigmatization by peers related to the parents illness, or lack of opportunity for socialization with peers.

Silverton et al. (1988) noted children in the high-risk (index) group to exhibit more antisocial behavior than those in the low-risk (control) group. However, our study found no significant differences with regards to delinquent behavior between the two groups.

Our study noted that the children in the index group had more social problems in terms of acting young, often getting teased, not getting along with other kids, being
clumsy, being overweight, and not being liked by other kids. These findings have been replicated in other studies such as those by Hans et al., (2000), Dworkin et al., (1990) and Dworkin et al., (1994). Hans et al., (2000) using the SAICA as the assessment tool, reported that adolescents at-risk for schizophrenia showed problems in social adjustment especially in the area of quality of relations with other young people, and concluded that at-risk children might be characterized by immaturity or rejection in their social relationships, including failure to relate in age-typical ways. Dworkin et al., (1994) noted that various aspects of poor social competence may precede the onset of schizophrenia and may play an important role in its development, and that childhood attention dysfunction predicted adolescent social deficits.

Data from several sources support the view that social impairments may be vulnerability markers. Retrospective patient and parent reports suggest that the premorbid behavior of individuals who develop schizophrenia as adults is, marked by a tendency to seclusion and lack of sociability (Baum and Walker, 1995; Bleuler, 1950; Cannon et al., 1997; Neumann and Walker, 1998).

Dworkin et al. (1990) reported that high-risk adolescents had significantly higher levels of positive formal thought disorder (as assessed by the SAPS) than the comparison group of normal adolescents. The score for positive formal thought disorder on SAPS and a greater number of thought problems on the CBCL were also noted to be high in the index group in the present study. Arboleda and Holzman (1985) reported that the level of thought disorder in high-risk children was three times higher than that of the normal children, as assessed by the Thought Disorder Index. This was in contrast to the findings by Arbelle et al. (1997) who found no statistically significant differences in the formal thought disorder scores in the high risk group, but noted an association between high formal thought disorder scores and impaired cognitive functioning in the index group. Mirsky (1988) demonstrated that the vulnerability markers were poor attention skills in preschoolers to early teenage years and were highly correlated to the development of schizophrenia spectrum disorders in early adulthood. These findings were duplicated in studies by Mirsky (1991), Erlenmeyer-Kimling and Cornblatt (1978), and Rutter et al. (1986). Hobson and Brazy (1980) felt that attentional disturbances could represent the sequelae of early injury to the brain stem integrating systems that regulate motor, sensory and arousal functions. Lifshitz et al. (1995) noted that index cases showed poor visual motor coordination and were more distractible in the performance of an attention-cancellation task than controls. Similar trends were noted by Mirsky et al. (1995) in the IHRS (Israeli High-Risk Study). This study also noted the children in the index group to have significant attention problems. The index group showed poor attention and concentration when measuring reaction time through auditory and visual stimuli as well as on scores on the CBCL. This is in keeping with other studies such as those by Grunebaum et al. (1974), Gamer et al. (1977), Herman et al. (1977) and Nuechterlein, 1983. Mirsky et al. (1995) suggested that impaired attention in high-risk children might represent a biobehavioral marker for the disorder. However, contrasting findings with negative results in high-risk children have also been reported, with the conclusion that the reaction time data point to is that not a single variable, but more complex psychological demands involving especially sustained attention and visual processing seem to be able to uncover information-processing deficits associated with a schizophrenic disposition. This interpretation is in line with concepts that deficits in the management of high processing load should be considered central within the framework of schizophrenic vulnerability (Erlenmeyer-Kimling and Cornblatt, 1984; Nuechterlein and Dawson, 1984). It has been hypothesized that the dysfunctions in schizophrenia might essentially be caused by a cognitive deficit. Mental deterioration, which is known to occur commonly in schizophrenia, has not only been found as a result of chronic schizophrenia (Schreiber et al., 1992), but also as an early concomitant of the disease (Aylward et al., 1984; Erlenmeyer-Kimling et al., 1989) and even as a premorbid indicator (Schreiber et al., 1992; Aylward et al., 1984). However, the importance of an IQ deficit for schizophrenic vulnerability is a subject of controversy, since findings of IQ deficits in children at risk (Mednick and Sculslinger, 1968; Watt et al., 1982; Fish, 1987; Schreiber et al., 1992) have not been replicated in other studies (Rieder et al., 1979; Worland et al., 1984). Data on general intellectual functioning show greater evidence of impairment in high-risk children as they enter adolescence and move closer to the risk period for schizophrenia. Jones et al., (1994) found that low educational test scores at age 8, 11 and 15 were risk factors for the development of schizophrenia. The present study also noted lower IQ scores (total and verbal) in the children in the index group. Arithmetic was noted to be a problem area in the index group. Similar findings were also noted in studies by Sohlig, (1985) and Sohlig and Yarin, (1985). According to the IHRS, the above authors noted that the index cases had a significantly lower level of arithmetic proficiency, perceptual motor functioning and overall cognitive functioning. They also reported impairment in several specific verbal and thought patterns and in concentration. The findings of a lower IQ have been interpreted as the possible presence of minimal brain damage (Offord and Gross, 1971).

It is daunting to try to condense all of these characteristics into a few simple summary statements. However, the themes that seem to thread through many of the descriptors are concerned with i) behavioral problems, ii) social competence, iii) cognitive dysfunction, and iv) attention and/or concentration.

It should thus be noted that there seems to be a definite psychopathology that exists in children of schizophrenic parents in comparison to children of mentally healthy parents. It is essential to identify the specific nature of this pathology that may contribute in adjustment problems in these children leading to more stressors in their life. This can be a vicious cycle where current psychopathology may contribute to more stressors leading to further psychopathological decompensation in these children.

**CLINICAL IMPLICATIONS**

The present study stresses the importance of evaluation of offspring of schizo-
phrenic parents and identifying early neurobehavioral dysfunctions. These dysfunctions are probably endophenotypic indicators of schizophrenia susceptibility genes, strong predictors of schizophrenia-related psychoses in the offspring and comparatively specific to the liability for schizophrenia contrasted with other psychiatric disorders.

The findings from this and other at-risk studies eventually may enable clinicians to use profiles of child behavior to identify which children at familial risk for schizophrenia should be targets for secondary prevention. The study also stresses the importance of a follow up of these at-risk children.

Health care delivery systems could better meet the needs of women with severe mental illness by providing social skills training, family planning and more consistent screening for pregnancy. In addition, parenting training should be incorporated into psychosocial rehabilitation programs for mentally ill parents.

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