

Personality and Neuropsychological Performance of High-Risk Children

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Abstract

The present article reports findings on intelligence and personality functioning during the school period and at adolescence in a sample of kibbutz and urban Israeli children at risk for schizophrenia, as measured by a standard psychological test battery. On the first round of testing it was found that the index subjects, when compared with their controls, showed a significantly lower level in arithmetic proficiency, perceptual-motor functioning, and several specific verbal and thought patterns. These findings suggest an overall pattern of attentional dysfunctioning and a basic distortion in cognitive integration. Followup data did not show intergroup differences in perceptual-motor functioning, but did indicate a consistent picture of a significantly lower overall intelligence level and several indices of clear personality problems. No consistent sex or kibbutz-city differences were found. Findings are interpreted in the framework of a developmental model of vulnerability in subjects at risk for schizophrenia.

As part of our overall research design, we selected a battery of standard psychological tests that were individually administered in two different sessions on the same day. The data presented here are based on the tests that were used during the first round of testing and on part of the tests of the followup study.

During the early stages of devising our test battery, our basic methodological problem was the lack of a more or less specific and clear behavioral model of "children at high risk for schizophrenia." Considerable progress has been made recently in this direction (Garmezy 1974, 1978;

Garmezy and Streitman 1974; Garmezy 1978; Wynne, Cromwell, and Matthysse 1978; Kestenbaum 1980); however, during the early 1960s when we first started to conceptualize our research objectives, we knew much less. In a more specific sense, systematic empirical data on children of schizophrenic parents, as distinct from schizophrenic or preschizophrenic children (Rosenthal 1963), were virtually nonexistent. From the beginning, we reasoned, of course, that within a high-risk population of children of schizophrenic parents only a certain percentage of the subjects would develop schizophrenia, while the others would become normal adults (Rosenthal, personal communication, 1966; Rosenthal 1971; Bleuler 1971). Obviously, one of the most challenging problems in high-risk research is why *certain* children in the course of their development show symptoms of a psychotic breakdown, while others continue to lead a normal life. To approach this question in a meaningful way, we intended to investigate the level of psychological functioning of our high-risk subjects and their control counterparts at different stages of development. We decided, therefore, to devise a broad and fairly general test battery to get an overall picture of various relevant cognitive and personality characteristics of the child at different times without being influenced too much by the then existing literature on behavioral variables of preschizophrenic and schizophrenic subjects.

In accordance with our overall research design, each of our index

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subjects and his control counterpart were individually tested on the same day by the same psychologist. To avoid any possible halo effects, we decided to postpone the usual process of test scoring and analysis until the last pair of our sample had been seen by all members of our research team. After this, the test protocols were blindly scored and analyzed test by test to prevent any possible artifacts that might have influenced the results. By this procedure, we intended to minimize possible sources of bias and to put the hypothesis of intergroup differences to a test that would be as strong as possible.

Methods

During the first round of examinations we used the following tests: (1) Wechsler Intelligence Scale for Children Verbal Scale, without Digit Span, because the latter subtest was used in a modified way by another member of our research team. (2) Bender-Gestalt Test. (3) Taylor Closure Test. (4) Draw-a-Man Test. (5) Sarason General Anxiety Scale for Children. (6) Rorschach Test. (7) Thematic Apperception Test. (8) A specially designed Sentence Completion Test, results of which will be published separately.

Our followup measures include the following instruments: (9) Primary Mental Abilities Test (PMA). (10) Tennessee Self-Concept Scale. Additional followup data will be published separately.

The reasons for selecting these specific tests are described below:

Wechsler Intelligence Scale for Children (WISC). Because the level and quality of cognitive functioning is one of the most distinctive psychological characteristics of a child's behavior, we decided to compare our

subjects on various indices of their verbal and nonverbal intelligence.¹

In studies on schizophrenia, both in adults and in children, signs of intellectual deficit are often mentioned (Weiner 1966; Pollack 1967; Goldfarb 1970; Roff and Ricks 1970; Wynne, Cromwell, and Matthysse 1978). One should be aware, however, of possible sampling and other problems that could obscure the data (Bender 1967; Lane and Albee 1968). Therefore, it might be of considerable importance to look for intergroup differences in comparing a sample of high-risk subjects and their controls.

The Verbal Scale of the WISC was chosen as our main instrument for evaluating verbal intelligence because of its well-established merits as a valid, reliable, and widely used intelligence test (Anastasi 1976; Cronbach 1970) that has been carefully validated in Israel (Ortar 1952). An important additional reason for choosing the WISC was that both Mednick and Schulsinger (1965, 1968, 1970) and Landau et al. (1972) used the WISC, so that we would be able to relate our own findings in a more meaningful way to the few existing empirical studies that deal with verbal intelligence of high-risk children of school age.

Bender-Gestalt Test. The Bender-Gestalt Test is a well-known test dealing especially with the assessment of visual-motor behavior. The rationale for including perceptual-motor functioning in our testing program was that schizophrenic children are often reported to perform less well on tests of sensory

perception than normals, and often have a lower level of perceptual discrimination and motor coordination (Goldfarb 1961, 1970). According to Ornitz (1971), a specific symptom of perceptual dysfunction might be an antecedent pattern in schizophrenia, even before the actual occurrence of more severe behavioral problems. The Bender-Gestalt Test was chosen as our main instrument for evaluating perceptual-motor functioning because schizophrenic children have shown several deficits on this instrument, like indications of plasticity and an overall maturational lag (Bender 1967).

Our decision to use the Bender-Gestalt Test was facilitated by the existence of a well-designed normative study by Koppitz (1964) that included an objective scoring system. We made use of the Koppitz scoring system and, for the purpose of the present study, refrained from any projective or clinical analyses of the Bender test performance. Moreover, we included in our analysis of the Bender protocols an evaluation of Koppitz's "Emotional Indicators," such as wavy lines, rotations, and other features of a child's performance as defined by Koppitz's scoring system.

Taylor Perceptual Closure Scale. This scale is intended to evaluate some additional features of perceptual-motor functioning. The first part of the scale, as used in our test battery, consists of two line drawings of a boy and a house, and a third one consisting of four tick-tack-toe's. In each figure there are eight gaps of 20 millimeters each. Below each one of the three figures is a partial reproduction of the same figure, but without the gaps, and the subject is asked to copy the figure exactly as he or she sees it in the original drawing. According to

¹ To evaluate nonverbal intelligence, we used Raven's Standard Progressive Matrices, Revised Order (1956). Findings are reported in our report on group tests.

Gestalt theory, the tendency to complete an incomplete configuration and to perceive stimuli in an organized way is one of the basic characteristics of perception (Koffka 1935), and this so-called phenomenon of "closure" might well be an important aspect of perceptual-motor functioning in comparing normal subjects with various clinical populations. Past work with this scale indicates that schizophrenic patients tend to differ from normal subjects in their closure patterns (Snyder, Rosenthal, and Taylor 1961; Rosenthal, personal communication, 1966). In a second study (Taylor, Rosenthal, and Snyder 1963), it was found that when asked to draw big and little stick men and trees, schizophrenic adult patients showed significantly less variability of performance than normal subjects, although on the big drawings a subsample of unmedicated schizophrenic patients showed a higher level of variability.

The Taylor scale, using essentially meaningful drawings, in addition to the more abstract designs of the Bender-Gestalt Test, might possibly help us to obtain a more balanced understanding of a child's visual-motor functioning under different conditions. The Taylor protocols were scored with respect to the size of big and little man and tree drawings, closure patterns, and the level of integration vs. disintegration of the designs drawn by the child. Closure patterns and instances of disintegration, distortion, and omission were determined on the basis of objectively scorable, operational definitions of each one of these categories. Care was taken to maintain independent scoring procedures when dealing with each one of these different categories.

Draw-A-Man Test. The Harris-Goodenough Draw-A-Man Test is

one of the oldest and most widely used tests of nonverbal intelligence (Harris 1963). Apart from the test's usefulness as an easily administered intelligence test, there have been a large number of clinically oriented studies trying to use human figure drawings as a projective personality test, by interpreting the style of drawing as indicative of particular adjustment problems. However, the validity of this approach appears to be quite equivocal (Murstein 1965; Koppitz 1968; Anastasi 1976). On the other hand, it appears justified to hypothesize that in schizophrenia the body image can be very disturbed (Murstein 1965; Weiner 1966; Goldfarb 1970). Therefore, we decided to use Koppitz's (1968) list of objectively scorable "emotional indicators" and to determine whether there were any significant intergroup differences in certain qualitative characteristics of Man drawings, Woman drawings, and Self-drawings, apart from any possible differences in the overall score.

The Draw-A-Man protocols were scored independently, both in terms of nonverbal IQ and with regard to the criteria of "emotional indicators," as delineated by Koppitz (1968).

Sarason General Anxiety Scale for Children (GASC). There can be little doubt that anxiety is one of the most frequently mentioned characteristics of preschizophrenic and schizophrenic subjects (Mednick 1958; Rosenthal 1963; Pollack et al. 1966; Fleming and Ricks 1970; Wolman 1970). On the other hand, although anxiety and other indices of vulnerability are often related to preschizophrenic behavioral patterns, these schizotaxic feelings need not develop into full-blown schizophrenic behavior (Roff and Ricks 1970). Nevertheless, because anxiety occupies such a central place in

schizophrenia, we decided to measure this variable with the GASC, an objective scale of known validity and reliability (Sarason 1960).

The Rorschach Test. Although the Rorschach Test is one of the classic tools of clinical and dynamic psychology—including clinical diagnosis in schizophrenia (Weiner 1966; Wolman 1970)—this test has not yet proved itself as a fully reliable and valid instrument for systematic research purposes (Cronbach 1965; Murstein 1965). Because of the somewhat problematic psychometric features of the Rorschach, we decided to refrain from the traditional clinical interpretation and to look for an operationally defined, objective scheme of analysis. From the beginning, we decided to concentrate on an analysis of the child's verbalization patterns because disturbances and distortions of thinking and verbalizing are, of course, among the most characteristic features of schizoid and schizophrenic pathology (Bleuler 1950; Coleman, Butcher, and Carson 1980). Because of these basic distortions in thinking patterns, one could speak of a cognitive nonintegration (Rosenthal 1963). According to Rosenthal, the Rorschach can be seen as involving complex patterns of perceptual-cognitive-integrative functions. Since the disorganization of these integrative functions is characteristic of schizophrenia, we hypothesized that an analysis of verbalization patterns in Rorschach performance might be a potentially useful approach.

According to Singer and Wynne (1966), communication patterns of parents of schizophrenic subjects are related to specific distortions in their Rorschach and Thematic Apperception Test (TAT) responses. We decided to adopt their classification

system of communication defects, as revealed by Rorschach and TAT response patterns, and to determine empirically whether similar characteristics could be found in a sample of high-risk subjects.

The scoring system involves the following three broad categories of communication defects in Rorschach and TAT responses: (1) "closure problems," referring to a characteristic difficulty in sharing a common focus of attention with others, such as instances of unintelligible or inconsistent responses and comments; (2) "disruptive behavior" as shown in an inability to maintain a given task set, such as interruptions of the examiner or extraneous and odd reaction patterns; and (3) "peculiar language and logic," referring to idiosyncratic ways of using verbal patterns, such as peculiar private terms, clang associations, or various forms of peculiar logic.

Each one of these instances of thought disturbances and verbalization patterns has its own operational definition in Rorschach terms and can be scored reliably (Singer and Wynne 1966).

Thematic Apperception Test (TAT). In terms of psychometric characteristics, much of what has been said about the Rorschach Test applies to the TAT (Murstein 1965; Zubin, Eron, and Schumer 1965). On the other hand, it appeared that TAT protocols could be used in a more restricted way by adopting concrete, well-defined scoring categories, as has been done, for instance, in the field of achievement motivation (Atkinson 1958). Therefore, we decided to approach the TAT stories in much the same way as the Rorschach protocols, by analyzing verbalization and thinking patterns. It is well known that there are some

basic differences between the relatively ambiguous and unstructured Rorschach cards and the more structured TAT figures, which deal with a variety of interpersonal relations and situations. By administering both tests, we intended to get a wider range of verbalization and communication patterns that could be analyzed using the Singer and Wynne (1966) scoring system.

Followup Study. In the framework of our followup study, we need a number of psychological instruments. In this article, we report findings on the performance of our index and control subjects on the Taylor scale (retest), the Primary Mental Abilities Test, and the Tennessee Self-Concept Scale.

Primary Mental Abilities Test (PMA). The Primary Mental Abilities Test (Thurstone and Thurstone 1962) is based on factor analysis and includes several subtests that are intended to represent more or less distinct mental abilities—like verbal, number, and spacial abilities. This instrument appears to be especially useful when it is important to obtain a more differentiated profile of mental abilities, instead of a global indication of verbal and nonverbal abilities. During adolescence, such a more differentiated profile seems to be especially appropriate for at least two reasons. One is that during adolescence cognitive functioning tends to be more differentiated than during the school age period; specific tests of abilities like the PMA can be used to predict performance in various fields of academic achievement (Ausubel 1968; Ausubel and Sullivan 1970). A second reason is that in planning our followup study we expected that during adolescence the index subjects would show a higher level of intellectual dysfunction, and we wished to get a

clear and differentiated picture of this hypothesized trend of development. The PMA has been published in a Hebrew translation and adaptation.²

Tennessee Self-Concept Scale. This scale includes 100 self-description items that are related to various features of self-concept and self-esteem, like self-satisfaction and level of self-esteem concerning physical self, personal self, family self, and social self. A number of subscales are intended to measure general or specific aspects of maladjustment, such as neurotic and psychotic patterns and various levels of defensiveness. The Tennessee scale has fairly high correlations with a number of Minnesota Multiphasic Personality Inventory (MMPI) scales, and test-retest reliability is reported to be in the high .80's (Fitts 1964). The scale has been extensively used in Israel, and we used the Hebrew version based on Frenkel's standardization of the scale.³

Results

We did not find any statistically significant intergroup differences in overall WISC intelligence. The only exception was the Arithmetic subtest, on which the index subjects scored significantly lower than the control subjects. By contrast, all four subgroups reached a quite normal,

² We wish to thank Professor Reuven Feuerstein from the School of Education at Bar Ilan University for his kind permission to use the Hebrew version of the PMA.

³ We wish to express our appreciation to our dear colleague and friend, the late Professor Yaakov Frenkel from the Department of Psychology at Bar Ilan University, for his permission to use the Hebrew version of the Tennessee scale and for his help in the analysis of the data.

somewhat better than average level of verbal intelligence (see table 1). Town subjects performed better than kibbutz subjects on the comprehension subtest, although there was no difference between groups in overall verbal IQ.

No significant intergroup differences were found on the Bender-Gestalt Test, either in overall performance or with regard to Koppitz's

(1964) "emotional indicators" (see table 2). It is of interest to note, however, that on card A ($p < .10$), card III ($p < .06$), and card VII ($p < .05$), based on two-tailed t tests, the index subjects tended to greater disintegration in their copies of the Bender figures.

The data in table 3 indicate that on the Taylor Perceptual Closure Scale the index subjects showed a signifi-

cantly higher level of omissions, disintegration, and distortion than the controls. In addition, it was found that the index children showed a significantly higher level of intra-individual variability in closing the gaps in the tick-tack-toe ($p < .05$) and boy ($p < .10$) drawings (two-tailed t tests).

We did not find any significant intergroup differences on the Harris-

Table 1. Wechsler Intelligence Scale for Children—Verbal Scale

Variables		IK	CK	IT	CT	T ₁ Index vs. control	T ₂ Kibbutz vs. town	T ₃ Interaction
Information	Mean	14.24	14.08	14.56	15.40	-.62	-.98	.77
	SD	3.44	2.87	4.09	3.12			
Comprehension	Mean	11.20	10.20	11.56	12.44	.10	-2.14'	1.58
	SD	2.22	3.04	3.91	2.31			
Arithmetic	Mean	10.32	11.32	10.44	11.80	-2.08'	.43	.25
	SD	3.61	3.58	3.63	2.61			
Similarities	Mean	12.32	10.36	10.56	11.04	1.43	.74	2.33'
	SD	3.11	3.38	3.22	2.72			
Verbal IQ	Mean	112.96	110.58	111.40	117.75	-.59	-.75	1.55
	SD	15.45	14.53	18.57	10.12			
Range of IQs		79-144	79-140	72-144	99-137			

' $p < .05$, two-tailed t test.

IK = Index-Kibbutz; CK = Control-Kibbutz

IT = Index-Town; CT = Control-Town

Same abbreviations used in tables 2-7 and 9.

Table 2. Bender-Gestalt Test scores of Index and control children

		IK	CK	IT	CT	T ₁ Index vs. control	T ₂ Kibbutz vs. town	T ₃ Interaction
Total Bender score	Mean	3.72	3.00	4.16	3.20	1.25	-.69	-.20
	SD	2.92	2.55	3.59	2.92			
Number of "emotional indicators"	Mean	1.48	1.72	1.76	1.40	.24	.09	-1.1
	SD	1.25	1.24	1.51	1.00			

All t tests are two-tailed.

Table 3. Taylor Perceptual Closure Scale performance of index and control children

		IK	CK	IT	CT	T ₁ Index vs. control	T ₂ Kibbutz vs. town	T ₃ Interaction
Size of big man (cm)	Mean	12.23	11.16	10.36	9.54	1.03	1.29	.10
	SD	6.99	6.03	6.26	3.88			
Size of little man (cm)	Mean	3.40	2.50	2.70	2.50	1.00	.62	.51
	SD	3.10	3.30	3.20	1.40			
Size of big tree (cm)	Mean	10.40	10.26	9.12	7.72	.82	2.02 ¹	-.58
	SD	6.56	5.60	5.58	3.49			
Size of little tree (cm)	Mean	3.78	2.89	3.09	3.03	1.19	.84	.88
	SD	2.65	2.17	1.85	.85			
Disintegration in tick-tack-toe	Mean	1.56	.16	.76	.64	1.84 ¹	.26	1.67
	SD	3.76	.62	2.18	2.43			
Disintegration in boy	Mean	1.12	.48	2.04	.72	2.68 ²	-1.21	-.88
	SD	1.72	1.16	3.05	1.54			
Disintegration in house	Mean	2.24	1.60	3.08	1.64	1.88 ¹	-.62	-.85
	SD	3.03	2.00	4.52	2.72			
Omission in in tick-tack-toe	Mean	.00	.04	.04	.00	.00	.00	-1.43
	SD	.00	.20	.20	.00			
Omission in boy	Mean	.80	.20	1.52	.40	2.67 ²	-1.26	-.71
	SD	1.26	.50	2.73	1.23			
Omission in house	Mean	1.16	1.12	1.52	.76	1.26	.00	-1.05
	SD	1.75	1.45	2.73	1.23			
Distortion in tick-tac-toe	Mean	.20	.04	.12	.12	1.26	.00	1.26
	SD	.50	.20	.33	10.33			
Distortion in boy	Mean	.40	.20	.40	.20	2.40 ³	.00	.00
	SD	.50	.41	.50	.41			
Distortion in house	Mean	.36	.28	.44	.028	1.51	-.39	-.39
	SD	.49	.45	.51	.046			
Gaps tick-tack-toe (mm)	Mean	176.28	190.16	182.64	183.48	-.90	.03	-.59
	SD	3.21	2.75	3.23	2.56			
Gaps boy (mm)	Mean	136.12	133.40	139.68	128.52	.52	.05	-.50
	SD	5.91	4.22	4.96	4.40			
Gaps house (mm)	Mean	143.52	159.88	151.24	139.68	-.17	.60	-1.29
	SD	6.57	7.37	8.53	5.27			

¹ $p < .10$, two-tailed.² $p < .01$, two-tailed.³ $p < .05$, two-tailed.

Goodenough Draw-A-Man Test (table 4). However, kibbutz children showed a greater number of emotional indicators than their town counterparts. Similarly, there were no significant intergroup differences in anxiety level, as measured by the

Sarason Scale (table 5).

The index subjects did tend to show several specific dysfunctional verbalization patterns in their Rorschach performance, such as the Singer and Wynne (1966) dimensions of "closure problems" and "disruptive

behavior" (table 6). Similar differences between index and control children were not found on the TAT (table 7).

The main results from the first round of examinations, as indicated in tables 1-7, are summarized in

Table 4. Draw-a-Man Performance of Index and control children

		IK	CK	IT	CT	T ₁ Index vs. control	T ₂ Kibbutz vs. town	T ₃ Interaction
Harris-Goodenough	Mean	96.96	92.44	95.12	95.48	.46	-.11	.57
Man IQ	SD	24.44	25.44	23.76	21.25			
Harris-Goodenough	Mean	100.36	98.12	99.96	101.16	.12	-.25	.40
Woman IQ	SD	23.36	26.99	23.92	19.82			
Number of "emotional indicators" (Man)	Mean	2.48	3.00	1.96	1.88	-.058	2.47 ¹	-.68
	SD	2.01	2.38	1.74	1.81			
Number of "emotional indicators" (Woman)	Mean	1.88	2.04	1.68	1.24	.63	1.83 ²	-.75
	SD	1.71	1.69	1.55	1.27			
Number of "emotional indicators" (Self)	Mean	2.56	2.20	1.84	1.52	.95	2.99 ³	.00
	SD	1.64	1.68	1.57	1.50			

¹ $p < .05$, two-tailed t test.

² $p < .10$, two-tailed t test.

³ $p < .01$, two-tailed t test.

Table 5. Sarason General Anxiety Scale for Children: Scores of index and control children¹

Scores		IK	CK	IT	CT	T ₁ Index vs. control	T ₂ Kibbutz vs. town	T ₃ Interaction
Total GASC score	Mean	15.32	15.88	18.40	17.56	.11	-1.47	-.44
	SD	8.28	6.35	6.58	7.09			
Lie score	Mean	6.16	6.92	6.52	6.08	-.35	.57	-1.11
	SD	3.00	1.91	2.22	1.96			

¹ All t tests are two-tailed.

table 8. The overwhelming majority of significant findings are between index and control children. There were few consistent differences between kibbutz and town children; contrary to our expectations, the few that were found are in the direction of poor performance in the kibbutz group. Perhaps more important is the almost total lack of interaction between genetic background and type of rearing.

Followup Data. In our followup study we did not find any statistically significant intergroup differences on the Taylor Perceptual Closure Scale.

On four out of six subtests of the Primary Mental Abilities Test, the index subjects scored significantly lower than the controls (table 9). These tests include Number Facility, Letter Series, Number Series, and Spatial Relations. Only one

significant difference was found between kibbutz and city subjects, with kibbutz children below town children in Number Facility. There were no interactions between genetic and environmental factors.

As measured by the Tennessee Self-Concept Scale, index subjects showed significantly more confusion, contradiction, and conflict in their self-perception ($p < .01$), and their overall level of self-esteem was

Table 6. Rorschach Test performance of index and control children

		IK	CK	IT	CT	T ₁ Index vs. control	T ₂ Kibbutz vs. town	T ₃ Interaction
Total number of responses	Mean	13.88	14.28	14.12	13.36	.24	.27	-.54
	SD	3.75	6.00	6.30	4.32			
Closure problems total score	Mean	4.48	2.64	3.68	1.40	2.39 ¹	1.41	-.26
	SD	4.64	3.33	4.35	2.45			
"Disruptive behavior"— Temporary card rejection followed by a response	Mean	.28	.00	.24	.04	2.56 ¹	.00	.52
	SD	.68	.00	.50	.20			
"Disruptive behavior" total score	Mean	1.80	1.28	2.64	1.64	1.08	-1.11	-.34
	SD	2.34	1.72	3.58	4.00			
"Peculiar verbalizations" total score	Mean	3.08	3.64	3.16	1.48	.59	1.06	-1.26
	SD	3.70	6.35	4.56	2.47			

¹ $p < .05$, two-tailed t test.

significantly lower than that of their control counterparts ($p < .01$). In addition, they showed a significantly higher level of defensiveness about their self-concept ($p < .01$). In terms of self-perception, index subjects showed a significantly higher level of maladjustment ($p < .01$) and significantly less personality integration ($p < .01$). The Tennessee data showed a consistent picture of personality problems in the index group.

Again, no significant differences or interactions including the kibbutz-city dimension were found.

Discussion

On the first round of testing our main finding was that, on a large and fairly comprehensive test battery, our index subjects, by and large, showed much the same cognitive and personality functioning as their controls. We found only a

small number of specific dimensions—namely (1) arithmetic proficiency, (2) perceptual-motor functioning, and (3) some specific verbalization and thought patterns—on which the index group showed a significantly poorer performance than the control group. There were no consistent differences between kibbutz and town children on interactions. Male and female subjects also did not differ in these measures. One may argue, however, that exactly because of the careful matching of our two main subsamples, and because of the absence of any significant intergroup differences in IQ level or anxiety, the few existing differences that were found deserve our special attention.

It appears to us that our findings point in the direction of a basic distortion in cognitive integration, as has been described in both preschizophrenic and schizophrenic behavior (Bleuler 1950; Rosenthal 1963; Goldfarb 1970; Wynne, Cromwell,

and Matthyse 1978).

The problem of cognitive functioning of high-risk vs. normal children is a very complex issue that can be approached from different perspectives. A common distinction in high-risk studies involves intergroup comparisons of overall IQ level vs. those based on more specific cognitive functions (Garmezy 1974; Garmezy and Streitman 1974; Garmezy 1978; Wynne, Cromwell, and Matthyse 1978; Chapman 1979). As mentioned before, subjects did not show any significant intergroup differences in overall verbal and nonverbal intelligence level on the first round of testing at ages 8–11 years. Very similar results were reported by Mednick and Schulsinger (1968) in their study on adolescent high-risk subjects. Landau et al. (1972), working with Israeli children of unspecified age, reported that their index subjects obtained lower WISC and WAIS (Wechsler Adult Intelligence Scale) IQs than their control

Table 7. Thematic Apperception Test performance of index and control children

		IK	CK	IT	CT	T ₁ Index vs. control	T ₂ Kibbutz vs. town	T ₃ Interaction
"Closure problems" total score	Mean	4.56	5.40	5.04	4.96	-.44	-.03	-.49
	SD	4.44	3.67	4.47	3.79			
"Disruptive behavior" total score	Mean	.96	1.04	1.04	.52	.91	.84	- 1.01
	SD	1.43	1.59	1.37	1.16			
"Peculiar verbal- izations" total score	Mean	2.60	3.72	3.44	2.76	-.21	.08	-.85
	SD	4.40	4.67	4.61	4.10			

All *t*-tests are two-tailed.

counterparts, although the intergroup differences were not statistically significant. In an additional analysis, on the basis of a classification of IQs into seven groups (below 70, 70-79, 80-89, 90-99, etc.), they report a significant difference between index and control subjects at the 1 percent level of significance. However, Landau et al. fail to provide any quantitative data to support this conclusion.

Furthermore, as pointed out by Worland and Hesselbrock (1980), the control group in the Landau et al. study had a higher socioeconomic status, which might have contaminated the results. In general, with the exception of the somewhat equivocal findings of Landau et al. (1972), most studies available in the literature support our finding of no statistically significant differences in overall IQ level in comparisons of children of schizophrenic parents with children of normal parents (Rutter 1966; Cohler et al. 1977; Rieder et al. 1977; Worland and Hesselbrock 1980).

As indicated in table 1, our index subjects scored significantly lower than their controls on the Arithmetic subtest of the WISC; this finding is consistent with the findings of Mednick and Schulsinger (1968) and Landau et al. (1972). It seems

reasonable to assume that this finding is related to problems of attentional functioning. In this context it is of interest to note that Wechsler (1949) in a sample of 13-year-old children found that the Arithmetic score correlated only .59 with the verbal WISC IQ, as contrasted with, for example, a correlation of .80 between information and verbal WISC IQ. This relatively low correlation probably indicates that performance on the Arithmetic subtest is closely related to attentional and motivational variables, a conclusion that is quite consistent with various recent studies indicating the presence of attentional dysfunction in high-risk subjects for schizophrenia (Wynne, Cromwell, and Matthyse 1978; Chapman 1979; Erlenmeyer-Kimling et al. 1980; Kestenbaum 1980).

Both the Arithmetic subtest of the WISC and perceptual-motor tests, such as the Bender-Gestalt Test and especially the Taylor Perceptual Closure Scale, are attention-demanding tests. The fact that attentional impairment appears to be a typical characteristic of high-risk subjects (Wynne, Cromwell, and Matthyse 1978; Chapman 1979) may explain, to a large degree, the significantly lower performance of our

index subjects on these tests. Our findings support the assumption that high-risk children may find it difficult to organize and integrate their cognitive and perceptual-motor activities quite irrespective of their overall IQ level. The relationship between these various components of cognitive performance should be further elaborated in studies on high-risk and normal subjects at various stages of their development.

It is important to emphasize that the intergroup differences found at ages 8-11 are related to several perceptual-motor and cognitive functions, whereas our index children, by and large, did not show any specific disturbances on a number of important personality dimensions. It is true that our behavioral observations suggested the index children to be somewhat restless in their outward appearance (see pp. 38-47, 85-100). However, neither in anxiety level as measured by the GASC nor with respect to Koppitz's (1964, 1968) "emotional indicators" did we find any statistically significant difference between index and control subjects.

Although there are some indications of distortions in body in our index children, this finding is probably contaminated with more

Table 8. Summary of findings: First examination

Dimension	Operational definition	Finding
Verbal intelligence	Verbal WISC IQ	No difference
Arithmetic	WISC Arithmetic	Index poorer
Visual-motor functioning	Bender-Gestalt Test overall score	No difference
	Performance of certain specific Bender cards	Index poorer
	Indices of disintegration, distortion, & omission on Taylor Closure Scale	Index poorer
	Intra-individual variability on Taylor Closure Scale	Index more variable
Verbalization & communication patterns	Analysis of Rorschach responses for dysfunctional communication patterns	Index poorer
Anxiety	GASC general score & lie score	No difference
Body image	Human Figure Drawings on the Harris-Goode-nough Draw-A-Man Test	Equivocal

general indices of cognitive and perceptual-motor disintegration. The same can be said about our finding that index subjects tended to display several specific communication disorders as described by Singer and Wynne (1966) on the Rorschach, while on the TAT no such characteristics were found. We assume that the reaction patterns on the Rorschach can be viewed as an additional manifestation of attentional dysfunction in high-risk subjects. At the same time, they may reflect some of the impact of dysfunctional patterns of communication that are related to family pathology (Singer and Wynne 1966;

Singer, Wynne, and Toohy 1978). However, these are tentative conclusions, and our Rorschach findings do not indicate clear-cut signs of personality problems in our index subjects.

Our followup data indicate that some years later, at adolescence, the picture is quite different. Results on the Primary Mental Abilities Test indicate that the index subjects manifested a much lower intelligence level than the controls (table 9). Furthermore, findings on the Tennessee Self-Concept Scale show that their overall level of self-esteem was significantly lower than that of their controls. In addition, results on the Tennessee scale indicate that the

index subjects showed a significantly higher level of personality maladjustment than the control subjects. On the other hand, our followup data on the Taylor scale showed that at adolescence there were no intergroup differences in perceptual-motor functioning.

Our findings are quite consistent with a developmental model of vulnerable children (Garmezy 1976; Anthony 1978). In this model, high-risk children tend to present at an early stage of their development relatively minor symptoms that can be considered as identifying, antecedent, or reactive mechanisms reflecting the continuous interaction between a child's level of vulnerability and his competence in coping with his stressful life situation.

Anthony (1978) points out that these "micropsychoses" tend to be more frequent and intense when the child enters adolescence and adulthood, a speculation that is consistent with the findings in our followup study.

As mentioned before, during the followup stage, we failed to find any intergroup differences in perceptual-motor functioning. This finding may be related to the course of neurological development in high-risk subjects, as found in some samples (Garmezy 1976; Wynne, Cromwell, and Matthyse 1978) although the findings of Marcus et al. in the present population (this issue) indicate a considerable persistence of some areas of neurological dysfunction into the adolescent period.

Before summarizing our main conclusions, we should like to address ourselves to the fact that we failed to find any meaningful differences along the kibbutz-city dimension. When we first planned our research strategy, the kibbutz-city dimension was considered to be one of the main variables in

Table 9. Primary mental abilities scores of index and control children

		IK	CK	IT	CT	T ₁ Index vs. control	T ₂ Kibbutz vs. town	T ₃ Interaction
Verbal meaning	Mean	8.17	8.25	7.77	7.87	-.79	.87	.49
	SD	2.08	1.96	2.51	2.56			
Number facility	Mean	10.67	13.67	12.86	15.78	-2.82 ¹	-1.96 ²	-.41
	SD	6.38	5.20	5.73	6.53			
Letter series	Mean	7.50	9.50	8.23	9.52	3.33 ¹	.23	-.65
	SD	2.30	2.92	3.70	3.33			
Word grouping	Mean	14.83	15.67	14.59	14.78	-.063	.20	-.20
	SD	4.19	3.93	4.37	4.76			
Number series	Mean	5.92	7.04	5.50	7.22	-2.79 ¹	.03	.15
	SD	3.55	3.28	3.64	3.25			
Spatial relations	Mean	9.50	13.04	9.32	12.04	-4.03 ¹	.05	-.34
	SD	6.22	5.50	5.42	4.23			

¹ $p < .01$, two-tailed t test.

² $p < .05$, two-tailed t test.

behavioral research in this country. Our findings appear to be consistent with other more recent observations which suggest that on a number of relevant psychological dimensions, differences between kibbutz and city subjects are far less prominent than was once believed (Beit-Hallahmi and Rabin 1977). In summary, it seems that at ages 8-11, with the notable exceptions of arithmetic and perceptual-motor performance, our index children were not very different from their control counterparts. Manfred Bleuler (1971, p. 13) has made the point that "... if one considers the sad childhood of many children of schizophrenics, one is astonished that many more than half of them are healthy personalities." It is perhaps overly optimistic to speak about "superkids" (Kauffman et al. 1979). There is little doubt, however that at least at school age, some of the high-risk children appear to be remarkably invulnerable or stress-resistant (Garmezy 1976), even though some years later things are bound to be quite different. We are

planning some additional analyses of our data in order to obtain a clearer picture of variables that are related to this developmental process.

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