The Search for Symptoms Predictive of Schizophrenia

by Loren J. Chapman and Jean P. Chapman

Abstract

Of several scales developed in our laboratory for identifying psychosis-prone young adults, the most promising appears to be the Perceptual Aberration-Magical Ideation Scale. High-scoring subjects (2 SD > the mean) report many psychotic-like and isolated psychotic symptoms. Subjects were seen for a followup interview 25 months after the initial identification and interview. Three of 162 high-scoring perceptual aberration-magical ideation subjects reported having received their first clinical attention for psychosis during the followup period. Additional measures are being used in attempts to eliminate the false positives as well as to distinguish persons prone to schizophrenia from those prone to affective disorder with psychosis.

For several years we have been trying to identify and study individuals who are at higher than normal risk for psychosis and, in particular, for schizophrenia. Our approach is not the usual one of studying the relatives of schizophrenics. Instead, we use measures of symptoms that are thought to precede schizophrenia. If successful, this method might make possible the study of a broader variety of future schizophrenics than does the study of relatives. The evidence suggests that not all schizophrenic and schizophrenia-like disorders have a strong genetic component. Only about 5-15 percent of schizophrenics have a schizophrenic parent. It appears from the Danish adoption studies that the disorder called schizophreniform in DSM-III (American Psychiatric Association 1980) has little genetic component (Kety et al. 1968). Even DSM-III schizophrenia appears heterogeneous with respect to genetic contribution to etiology (Kinney and Jacobsen 1978).

The use of symptoms to select future schizophrenics may identify some individuals whose future psychosis does not have a strong genetic contribution, as well as those whose disorder is predominantly genetic. The chief problem in this strategy is that researchers still disagree about what symptoms are the precursors of schizophrenia and how to measure those symptoms. As a result, the work that we describe is based on the tentative identification of persons at risk for schizophrenia.

A second major goal is that of finding different symptoms that may mark diverse pathways to schizophrenia. We hope to use such symptoms to identify different syndromes of schizophrenia-proneness. If such distinct syndromes can be found in the preschizophrenic, we might reasonably look for other evidence that these syndromes correspond to distinct disorders within schizophrenia. But that sort of achievement is far in the future.

Choice of Symptoms of Schizophrenia Proneness

We selected candidate symptoms of schizophrenia-proneness relying on Meehl's (1964) description of schizotypy and Hoch and Cattell's (1959) description of pseudoneurotic schizophrenia. We also relied on the description of "early schizophrenia" offered by psychoanalysts (Fenichel 1945), since their early schizophrenics included patients whom many other workers would call preschizophrenics.

Reprint requests should be sent to Dr. L.J. Chapman, Dept. of Psychology, University of Wisconsin-Madison, Madison, WI 53706.
We began with mass-screening instruments that are true-false inventories of symptoms hypothesized to precede schizophrenia. Although we have data on the correlates of several predictors, we are still working to improve our choice of predictors. The scales that we have used most often measure physical anhedonia (deficiency of pleasure from physical experiences); perceptual aberration (distortion in the perception of one's own body and of other objects); impulsive nonconformity (impulsivity, together with the failure to conform to societal expectations about the rights of other people); and magical ideation (the tendency to accept forms of causality that are not viewed as valid in our culture). A subject who scored at least 2 SD > the mean on more than one scale was assigned to a single group on the basis of the highest of these deviant scores. Because the Perceptual Aberration Scale and the Magical Ideation Scale have a substantial correlation, we have often combined them as the Perceptual Aberration-Magical Ideation Scale (Per-Mag Scale). The development of these screening inventories is described in detail in Chapman et al. (1976, 1978, 1984) and Eckblad and Chapman (1983).

Each year we administer these screening scales to approximately 3,500 college students in the introductory psychology course at the University of Wisconsin. We select for further study subjects who score at least 2 SD > the mean on one of the screening scales. Our subjects are limited to white persons whose native language is English because so few other subjects are available at the University of Wisconsin.

**Provisional Criteria of Schizophrenia-Proneness**

If we were to postpone evaluating our measures of schizophrenia-proneness until after our subjects had passed the age of risk, we could make little headway on improving our choice of measures within a single investigator's lifetime. Thus, we use provisional criteria for assessing the validity of our predictors. The principal criteria are cognitive slippage (mild thought disorder), poor social adjustment, schizotypal symptoms, and psychotic-like symptoms (attenuated versions of full-fledged schizophrenic symptoms). These choices are based on clinical reports that many schizophrenic patients, before they develop full-fledged schizophrenia, show milder forms of the psychotic symptoms that develop later (Bleuler 1950; Gillies 1958; J. Chapman 1966; Strauss 1969).

**Psychotic-like and Schizotypal Symptoms.** We have relied most heavily on psychotic-like symptoms because we believe that these symptoms, which closely resemble those of clinical schizophrenia, are frequent precursors of it, although they could also be precursors of other psychoses, including affective psychoses. These symptoms are attenuated forms of thought-transmission experiences, passivity experiences, voice experiences and other auditory hallucinations, thought withdrawal, aberrant beliefs, and visual experiences. We evaluate psychotic-like and other symptoms using a modified version of Spitzer and Endicott's (1977) Schedule for Affective Disorders and Schizophrenia—Lifetime Version (SADS-L), supplemented with additional questions about psychotic-like and schizotypal symptoms. We evaluate social adjustment using a modified version of the Weissman and Paykel (1974) Social Adjustment Scale interview. The interviews are tape-recorded and scored without knowledge of the subject's group membership. Psychotic-like experiences are scored on continua of deviance from 1 to 11 using a rating manual (Chapman and Chapman 1980). Scores of 3 to 5 are for moderately severe psychotic-like symptoms. Scores ≥ 6 are in the psychotic range, although the person having the psychotic symptoms need not qualify for a clinical diagnosis of psychosis. The list of schizotypal symptoms, which was gleaned from several clinical writers, has been reported elsewhere (Eckblad and Chapman 1986).

**Procedures for Assessment of Candidate Schizophrenia-Prone Subjects**

We have previously reported on the symptoms of the first groups of subjects chosen by our screening scales (Chapman and Chapman 1985; Chapman et al. 1980, 1983, 1984; Eckblad and Chapman 1983). Here we report findings for larger groups of subjects who were chosen for a long-term followup. The subjects in the per-mag and physical anhedonic groups do not overlap with the groups in the earlier articles, but those in the impulsive nonconformity groups overlap in part with those reported by Chapman et al. (1984).

The followup groups consisted of 469 subjects: 162 per-mag subjects (76 male, 86 female); 74 impulsive nonconformity subjects (27 male, 47 female); 74 physical anhedonia subjects (41 male, 33 female); and 158 control subjects (84 male, 74 female). The control subjects were chosen from among students who scored no higher than .5 SD > the mean on any of the scales.

At followup, 25 months after the first interview, a sizable portion of our subjects were still in school. We
succeeded in locating and reinter-
viewing 439 subjects (a 94 percent
success rate), with roughly equi-
valent success for the two sexes and
the various groups.

Initial Assessment

Psychotic and Psychotic-like Experi-
ences. Table 1 gives initial interview
data for subjects who were later suc-
cessfully followed. The per-mag
subjects were the most deviant: over
half had at least one psychotic-like
symptom with a deviancy rating \( \geq 3 \),
a percentage three or four times that
of the control group. Among
females, but not males, the impul-
sive nonconformity group also ex-
ceeded the control group. The per-
mag group also exceeded the control
group on the number of subjects
who reported psychotic-like symp-
toms with a deviancy rating \( \geq 6 \). (The
data for the two sexes were com-
bined to avoid violating the assump-
tions of \( \chi^2 \).) The difference was
significant (\( \chi^2 = 9.66, p < .01 \).

Schizotypal Symptoms. Both the
per-mag subjects and the impulsive
nonconformity subjects of both
sexes were more deviant than con-
trol subjects on number of schizoty-
pal symptoms. Table 1 gives the
mean scores and \( p \) values for Dun-
nett \( t \) tests.

Affective Disorder. The subjects
also showed considerable affective
disorder (table 1). The SADS-L diag-
nostic system was used for these di-
gnooses. Nearly one-third of the
per-mag group had a history of
either one or more episodes of major
depression or four or more episodes
of minor depression. Among males,
the per-mag subjects exceeded the
control subjects on this measure, but
the two groups did not differ among
females, due to the high incidence
of depression in the female control
subjects. The male impulsive-non-
conformity subjects also reported
more such depression than did con-
trol subjects.

The physical anhedonia subjects
reported less depression than con-
trol subjects, which we interpret as
perhaps indicating that physical
anhedonics among college students
experience a fairly invariant level of
pleasure deficit, whereas depressive
episodes of nonanhedonics are
marked by a temporary and, hence,
more noticeable reduction in
hedonic level. The per-mag group
also exceeded the control group on
the percentage of subjects who re-
ported either hypomanic or manic
episodes, cyclothymia, and intermit-
tent depression. (Four of the per-
mag subjects met the SADS-L cri-
teria for manic episodes.)

Drug and Alcohol Use. The score
for street drug usage was obtained
from ratings (0–8) assigned to each
of five types of drugs (marijuana,
cocaine, sedatives or amphetamines,
hallucinogens, and narcotics). The
ratings reflect both frequency of use,
regularity of use, and seriousness of
the drug. The subject’s ratings
across the five classes of drugs are
summed to form a total score. The
score for alcohol use weights the

Table 1. Initial interview: Percentage of subjects having symptoms and diagnoses, and mean number of
schizotypal symptoms

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Per-Mag</td>
<td>Impulsive nonconformity</td>
</tr>
<tr>
<td>Psychotic-like symptom</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \geq 3 )</td>
<td>55.4(^3)</td>
<td>19.2</td>
</tr>
<tr>
<td>( \geq 6 )</td>
<td>13.5(^5)</td>
<td>3.9</td>
</tr>
<tr>
<td>Depression(^4)</td>
<td>31.0(^1)</td>
<td>34.6(^1)</td>
</tr>
<tr>
<td>Hypomania &amp; mania</td>
<td>17.6(^3)</td>
<td>7.7</td>
</tr>
<tr>
<td>Cyclothymia</td>
<td>11.0(^1)</td>
<td>19.2(^2)</td>
</tr>
<tr>
<td>Intermittent depression</td>
<td>13.9(^2)</td>
<td>7.7</td>
</tr>
<tr>
<td>Schizotypal symptoms</td>
<td>3.6(^2)</td>
<td>3.1(^2)</td>
</tr>
<tr>
<td>( n )</td>
<td>74</td>
<td>26</td>
</tr>
</tbody>
</table>

Note.—The \( p \) values are for the comparison of each of the 3 groups with the control group using \( \chi^2 \). In each case of a significant difference, the overall \( \chi^2 \)
using all 4 groups was also significant. Higher scores always indicate greater pathology or poorer adjustment. Per-Mag = Perceptual aberration-Magical ideation.

\(^1\)\( p < .05 \).

\(^2\)\( p < .01 \).

\(^3\)\( p < .001 \).

\(^4\)Major depression or recurrent minor depression.

\(^5\)Combining males and females, the per-mag and control groups differed, \( p < .01 \).
subject's average frequency of drinking and average number of drinks on each occasion.

The female per-mag group scored higher on use of street drugs than did the control group (p < .05) and the impulsive-nonconformity subjects of both sexes exceeded control subjects on use of drugs and alcohol (p < .01 in each case). These findings raise the question of whether the frequent psychotic-like and schizotypal experiences of these groups might be drug effects. We took considerable care to rule out drug experiences and alcohol experiences in scoring psychotic-like symptoms. In each case we asked whether the symptom had occurred previous to the person's first taking drugs. We also asked if the symptoms occurred at times when the person was not using drugs or alcohol. We did not score any experience that appeared to be an effect of alcohol or drugs. Further evidence that these experiences are not primarily alcohol or drug effects is the finding that the group with the greatest use of both alcohol and street drugs, the male impulsive-nonconformity subjects, did not exceed the control subjects on schizotypal and psychotic-like symptoms. We cannot, however, rule out the possibility, in every case, that an experience may have been an unrecognized flashback experience or a long-term effect of such drugs.

Social Adjustment. Among male subjects, all three groups had poorer overall adjustment than did control subjects (p < .01 in each case). Among females the difference was significant for the impulsive nonconformity group (p < .01) and the physical anhedonic group (p < .05) but not for the per-mag group.

Subsequent Assessment

The followup interview asked only about experiences during the 25-month period since the first interview. As at the first interview, the per-mag subjects showed more signs of serious psychopathology than did the other groups: 22 percent had sought professional help for their problems during the followup period, compared to only 7 percent of the physical anhedonic group, 10 percent of the impulsive nonconformity group, and 7 percent of the control group. The differences among the four groups and the difference between the per-mag and control groups were significant (p < .001). The reasons given for seeking help were highly varied and included depression, interpersonal difficulties, anxiety, and ill-defined adjustment problems.

Psychotic-like symptoms declined in all groups, but the per-mag group continued to have psychotic and psychotic-like symptoms far more frequently than the control group. (See Table 2.) The percentage of subjects who had experienced psychotic-like symptoms with a deviancy rating ≥ 3 was significantly greater for the per-mag group than

Table 2. Followup interview: Percentage of subjects having symptoms and diagnoses, and mean number of schizotypal symptoms

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Males</th>
<th></th>
<th></th>
<th></th>
<th>Females</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Impulsive</td>
<td>Physical</td>
<td>Controls</td>
<td></td>
<td>Impulsive</td>
<td>Physical</td>
<td>Controls</td>
</tr>
<tr>
<td></td>
<td></td>
<td>nonconformity</td>
<td>anhedonia</td>
<td></td>
<td></td>
<td>nonconformity</td>
<td>anhedonia</td>
<td></td>
</tr>
<tr>
<td>Psychotic-like symptom ≥3</td>
<td>25.7^2</td>
<td>11.5</td>
<td>5.1</td>
<td>2.7</td>
<td>31.7^2</td>
<td>14.9</td>
<td>0</td>
<td>4.5</td>
</tr>
<tr>
<td>≥6</td>
<td>9.5^2</td>
<td>3.8</td>
<td>0</td>
<td>0</td>
<td>9.8^2</td>
<td>2.1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Depression^4</td>
<td>17.6</td>
<td>3.8</td>
<td>5.1</td>
<td>10.7</td>
<td>30.5^2</td>
<td>19.2^1</td>
<td>10.3</td>
<td>6.0</td>
</tr>
<tr>
<td>Hypomania &amp; mania</td>
<td>14.9</td>
<td>7.7</td>
<td>2.6</td>
<td>6.7</td>
<td>13.4</td>
<td>12.8</td>
<td>13.8</td>
<td>6.0</td>
</tr>
<tr>
<td>Cyclothymia</td>
<td>4.1</td>
<td>15.4</td>
<td>0</td>
<td>1.3</td>
<td>3.7</td>
<td>6.4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Intermittent depression</td>
<td>5.4</td>
<td>11.5</td>
<td>2.6</td>
<td>1.3</td>
<td>2.4</td>
<td>4.2</td>
<td>10.3</td>
<td>4.5</td>
</tr>
<tr>
<td>Schizotypal symptoms</td>
<td>2.5^2</td>
<td>2.4^2</td>
<td>0.9</td>
<td>1.1</td>
<td>3.1^2</td>
<td>2.3^2</td>
<td>1.5</td>
<td>1.2</td>
</tr>
<tr>
<td>n</td>
<td>74</td>
<td>26</td>
<td>39</td>
<td>75</td>
<td>82</td>
<td>47</td>
<td>29</td>
<td>67</td>
</tr>
</tbody>
</table>

Note.—The p values are for the comparison of each of the three groups with the control group using x^2. In each case of a significant difference, the overall x^2 using all 4 groups was also significant. Higher scores always indicate greater pathology or poorer adjustment. Per-Mag = Perceptual aberration-Magical ideation.

^p < .05.
^p < .01.
^p < .001.

^Major depression or recurrent minor depression.

^Combining males and females, the per-mag and control groups differed, p < .001.
for the control group, as was the percentage who reported experiences in the psychotic range (a rating ≥ 6).

The per-mag group was also markedly more deviant than the control subjects on number of schizotypal symptoms (p < .01 for each sex). The female per-mag subjects differed from control subjects on depression (p < .001). The pattern of social adjustment resembled that seen at the initial interview. The male per-mag subjects differed from the control subjects on overall global adjustment (p < .05). The per-mag subjects of both sexes exceeded control subjects on the use of street drugs (males, p < .05; females, p < .01), but not on the use of alcohol. Among the males, the impulsive nonconformity subjects exceeded the control subjects on both drug and alcohol use (p < .05 in each case), and among females, they did so on drug use (p < .01).

Nonpsychiatric Hospitalizations. One surprising finding was that the per-mag subjects also exceeded the control subjects on nonpsychiatric hospitalizations (per-mag, 36 percent; control, 18 percent, \( \chi^2 = 11.33, p < .001 \)). The hospitalization rate for accidents and injuries alone did not differ significantly between the two groups, but the hospitalization rate for illness alone did (per-mag, 19 percent; control, 7 percent, \( \chi^2 = 8.44, p < .01 \)). This finding does not appear to be attributable to drug or alcohol use because the impulsive nonconformity group, which reported greater drug and alcohol use, did not have a higher rate of hospitalization.

First Treatment for Psychosis. Our strongest interest, of course, was in the incidence of first clinical attention for psychosis during the followup period. We would not expect very much breakdown for psychosis because this 25-month interval was only a small portion of the subjects' total period of risk. Loranger’s (1984) data on first episode of DSM-III schizophrenia indicate that about 12 percent of future schizophrenics would be expected to have their first episode during this period, given the ages of our subjects. The comparable value from Slater and Cowie’s (1971) data is about 11 percent. For affective illness with psychotic features, the percentage of total lifetime risk during this period would be even lower because such illness is less a disorder of youth.

Three of our subjects received their first clinical attention for psychosis during the 25-month followup period, and all three were in the per-mag group. One subject became a schizophrenic with a chronic course. He not only qualified for the per-mag group but also had a somewhat high score (z = 1.51) on the Physical Anhedonia Scale. His most striking symptom at the initial interview was the disorganization of his discourse. In the year following the interview, he was hospitalized twice for a range of bizarre psychotic symptoms, including religious hallucinations, delusions, passivity experiences, social withdrawal, affective blunting, and thought disorder.

A second subject, whom we diagnosed as having suffered from paranoia, was not hospitalized but received outpatient therapy for a delusion. A third subject was a bipolar patient. She was hospitalized twice, once each for mania and major depression; both episodes were accompanied by delusions and hallucinations. She remitted and had returned to the university at the time of the followup.

Continuity of Psychotic and Pre-morbid Symptoms. Our three subjects who received clinical attention for psychosis between the first and second interview had all reported psychotic-like symptoms at the first interview that were similar to but milder than their later symptoms during psychotic episodes. For example, the patient who developed chronic schizophrenia reported at the first interview that he had occasional auditory hallucinations, including that of his deceased grandfather's voice coming from a corner of the basement. He also frequently heard moral admonitions from an inner voice which he attributed to an archangel. Both of these voice experiences are on the margin between psychotic-like and psychotic in our scoring system. At the time of his psychosis, his voice experiences were more frequent and more deviant. He heard the picture of Christ in his local church speaking to him as an outer voice, saw the lips move, and believed that Christ was truly speaking. In response to instructions from the voice, he ran naked through the snow. He heard a hallucinatory voice during the second interview and expressed disbelief that the interviewer could not hear it also.

Nine per-mag subjects who were not treated for psychosis also reported isolated psychotic and psychotic-like symptoms that were more deviant than similar symptoms they had reported at the first interview. We speculate that these subjects may be moving toward overt psychosis. For example, one female subject, at her first interview, entertained tentatively the possibility that other people could read her mind. At her second interview, she reported, with full belief, the more deviant experiences of other people hearing her thoughts through their ears just as though she were saying
them out loud. Later followup will enable us to determine whether this subject and the other eight subjects were truly decompensating into clinical psychosis.

Physical Anhedonia and Impulsive Nonconformity Groups. At this time, our findings do not clearly support the hypothesis that high scorers on these two scales are especially psychosis-prone, although we are not prepared to abandon the hypothesis until we obtain data from a second followup. Some of the subjects in both groups had very poor social adjustment. Most extreme was a physical-anhedonic young man who, at the time of the second followup, had abandoned most of the activities of life, despite the fact that he appeared neither psychotic nor depressed, nor physically ill. This man, as well as a few other physical anhedonics, may be reasonable candidates for psychosis.

Supportive evidence that some subjects with high scores on the Physical Anhedonia Scale may be psychosis-prone comes from recent findings of Simons and Katkin (1985) on smooth-pursuit eye movement. These investigators found that a portion of anhedonics showed eye tracking that was worse than that of the poorest control subject. There is a need to find measures from other mass-screening devices to pinpoint which physical anhedonics are deviant on smooth-pursuit eye movement as well as on other indicators of schizophrenia-proneness.

Predictors of Vulnerability Within the Per-Mag Group

The results thus far are consistent with the hypothesis that the per-mag group includes subjects who are at higher than normal risk for psychosis, but the group is heterogeneous with respect to the kind of psychosis to which the subjects are prone. Also, the per-mag group undoubtedly contains many false positives who are not prone toward any psychosis. We have recently been studying the usefulness of additional measures for reducing the incidence of these false positives. Subjects within the per-mag group who also score above the group median on the Impulsive Nonconformity Scale have been found to be the more deviant subjects on measures thought to characterize the pre-psychotic—namely, continued word association (Miller and Chapman 1983), a measure of communication skills (Martin and Chapman 1982), and psychotic-like symptoms (Allen et al. 1987). Similarly, among male subjects, the Revised Scale of Social Anhedonia (Eckblad et al. 1982) has been found to identify those per-mag subjects who report psychotic-like experiences and schizotypal symptoms (Mishlove and Chapman 1985).

We also are seeking methods of distinguishing those per-mag subjects who are prone to affective disorder rather than schizophrenia.

Scores on the Revised Scale of Social Anhedonia were found to have no relationship to affective symptoms for either sex (Mishlove and Chapman 1985) and hence may identify subjects who are not specifically prone to affective disorder. In addition, Eckblad and Chapman (1986) have used a scale of hypomanic personality that correlates positively with the Per-Mag Scale and identifies subjects with a history of SADS-L hypomanic episodes. We suspect that per-mag subjects who score high on this scale are prone to bipolar disorder rather than schizophrenia.

Future Plans

We will follow up our subjects with full interviews in 2 or 3 years. Those interview data should give us considerable information on the psychopathological outcomes for persons with various patterns of scores on scales of psychosis-proneness.

References


**Acknowledgments**

This research was supported by NIMH grant MH-31067. The authors are indebted to Terry Ann Fujioka, Laurie Frost, and Rebecca Laird for their critical comments on an earlier draft of the manuscript.

**The Authors**

Loren J. Chapman, Ph.D., and Jean P. Chapman, Ph.D., are both Professors in the Psychology Department of the University of Wisconsin-Madison, Madison, WI.