Negative Symptoms in Schizophrenia: Their Longitudinal Course and Prognostic Importance

by Michael F. Pogue-Geile and Martin Harrow

Abstract

Negative and positive symptoms were investigated longitudinally in 39 young schizophrenic patients at two followup assessments approximately 2.5 and 5 years after hospital discharge. Negative symptoms, such as flat affect and poverty of speech, which were assessed at the first followup, were found to be effective prognostic signs in schizophrenic patients for predicting later poor role functioning at the second followup. The prognostic importance of negative symptoms was predominantly due to their tendency to occur in patients who were already functioning poorly in social and instrumental areas at the first followup, and who tended to continue doing poorly at the second followup. Contrary to some current hypotheses, positive symptoms, such as delusions and hallucinations, were also found to be prognostic of later deficits in role functioning at the second followup. Negative symptoms appeared to be generally persistent over time, although there was some tendency toward remission. Potential models of the etiology of negative symptoms and their role in schizophrenia are proposed.

The construct of negative symptoms has come to play an important role in recent theorizing about schizophrenia (e.g., Strauss, Carpenter, and Bartko 1974; Crow 1980; Andreasen and Olsen 1982; Lewine, Fogg, and Meltzer 1983; Pogue-Geile and Harrow 1984a). Negative symptoms, such as flat affect and poverty of speech, have been proposed to be important behavioral individual differences among schizophrenic patients that have both pathophysiological and psychopathological correlates. Much of this theorizing concerning negative symptoms has been in the general tradition surrounding other individual differences that also have been hypothesized to be important within schizophrenia, such as the paranoid/nonparanoid dimension (e.g., Kendler and Davis 1981) and the process/reactive dimension (e.g., Garmezy 1968; Zubin et al. 1961; Stofflemayr, Dillavaou, and Hunter 1983).

More specifically, negative symptoms have been proposed by several investigators (e.g., Strauss, Carpenter, and Bartko 1974; Crow 1980) to be persistent over time, prognostic of poor outcome, associated with intellectual deficits, and unresponsive to antipsychotic medication. Crow (1980) has further proposed an anatomical model for negative symptoms to mediate the relationships hypothesized above, in which negative symptoms (his type II symptom syndrome) represent a behavioral manifestation of some structural brain abnormality, such as cortical atrophy. Several studies have explored this hypothesized association between negative symptoms and ventricular enlargement on computed tomography scans (Johnstone et al. 1976; Andreasen et al. 1982; Nasrallah et al. 1983; Luchins, Lewine, and Meltzer 1984; Pearlson et al. 1984) and other biological variables, such as platelet monoamine oxidase (Lewine and Meltzer 1984), with somewhat mixed results. Studies have been generally more unequivocal in finding negative
symptoms to be associated with intellectual deficits in chronic schizophrenic patients (Johnstone et al. 1978, 1981; Owens and Johnstone 1980; Pogue-Geile and Harrow, in press). Similarly, negative symptoms appear to be generally unresponsive to antipsychotic medication (Johnstone et al. 1978; Angrist, Rotrosen, and Gershon 1980).

Although the results of these studies have generally supported the potential utility of further study of the negative symptom construct, few studies have investigated either the longitudinal course or the prognostic value of negative symptoms, both of which are key hypotheses in theory concerning negative symptoms. Earlier studies have suggested that restricted affect during the inpatient phase may be a poor prognostic sign for later outcome in schizophrenia (e.g., Carpenter et al. 1978). However, more recent work on negative symptoms has focused almost exclusively on schizophrenic inpatients (cf. Johnstone et al. 1979).

Therefore, one of the primary purposes of the present research was to investigate these issues of the longitudinal course and prognostic importance of negative symptoms within the context of a prospective followup study of young schizophrenic patients.

Positive psychotic symptoms, such as hallucinations and delusions, are generally distinguished from negative symptoms. In contrast to the hypothesized persistence and poor prognostic implications of negative symptoms, positive symptoms during the acute phase have been theorized to fluctuate over time and to have relatively less prognostic importance (Strauss, Carpenter, and Bartko 1974; Crow 1980). Zubin and colleagues have also proposed a model for the course of schizophrenia in which positive psychotic symptoms are predominantly episodic (Zubin and Spring 1977; Zubin, Magaziner, and Steinhauser 1983). Crow (1980) has suggested that positive symptoms (his type I symptom syndrome) may be caused by a fluctuating, functional dopamine excess, in contrast with the structural brain abnormality hypothesized to underlie negative symptoms. Because of these differing predictions concerning the longitudinal characteristics of negative and positive symptoms, the present study also investigated the prognostic importance of positive symptoms.

Thus, the present prospective, longitudinal study of young schizophrenic patients early in the course of their disorder is among the first to investigate the prognostic importance in schizophrenia of negative symptoms and their relationship with positive symptoms. The following specific research questions are addressed:

- Are negative symptoms prognostically important for the future adjustment of schizophrenia?
- If negative symptoms are prognostically important, do they identify schizophrenic patients before a decline in functioning, or do they characterize patients who are already functioning poorly?
- Do some of the major positive symptoms, such as hallucinations and delusions, have less prognostic utility than negative symptoms?
- What is the relationship between negative and positive symptoms in predicting later functioning?
- What is the longitudinal course of negative symptoms in schizophrenia?

**Methods**

**Patient Sample.** Thirty-nine young schizophrenic patients who had been prospectively assessed at three points during the early course of their disorder participated in this study. Subjects were selected from consecutive inpatient admissions between the ages of 18 and 30 years old, to either Michael Reese Medical Center (n = 21), a private hospital, or to the Illinois State Psychiatric Institute (ISPI) (n = 18), a State research institution. The subjects were part of a larger project, the Chicago Followup Study, based at Michael Reese Medical Center and The University of Chicago, which is investigating the longitudinal course of negative symptoms, thought disorder, psychosis, and functioning in schizophrenia and other major psychopathology (Harrow and Quinlan 1985; Harrow, Silverstein, and Marengo 1983; Pogue-Geile and Harrow 1984a). Within several weeks of their index admission, patients were assessed with the Schedule for Affective Disorders and Schizophrenia (SADS) (Spitzer and Endicott 1978) or with the Schizophrenia State Inventory (SSI), a taped, structured interview (Grinker and Holzman 1973). Based on these interviews and inpatient charts, the patients were diagnosed by a trained diagnostic team, unaware of other test and outcome data, using the Research Diagnostic Criteria (RDC) (Spitzer, Endicott, and Robins 1978).

The current sample of 39 schizophrenic patients diagnosed according to RDC was composed of patients who had been followed up twice after their index hospitalization and who had negative symptom behavior ratings available at the first followup. These subjects had been followed up for the first time a median of 2.6 years after their index hospitalization discharge. The second followup took place a median of 2.1 years after the first followup, for a median total of 4.9 years after their
index hospitalization discharge. All followups involved in-person interviews averaging 3-4 hours. Both first and second followups consisted of an interview with a revised version of the SADS, negative symptom behavior ratings, the Harrow Functioning Interview (used to rate outcome measures), and select other measures of symptomatology and thought disorder. Twenty-nine schizophrenic patients in the current sample were also included in a previous report on negative symptoms at the first followup (Pogue-Geile and Harrow 1984a). The current study includes 10 schizophrenic patients in addition to the initial 29 and presents data on the second followup.

The 39 schizophrenic patients in the present sample were from the following RDC subtypes: 19 paranoid, 1 disorganized, 18 undifferentiated, and 1 catatonic. All except four of these patients also met DSM-III criteria for schizophrenia (American Psychiatric Association 1980). The remaining four were diagnosed as DSM-III schizoaffective disorders.

Table 1 presents further characteristics of the patient sample. In general, this was a group of young patients who were in the early course of their disorder. Their average age at index hospitalization was 23.8 years old. Thirty-nine percent (15) of the patients were first admissions and an additional 31 percent (12) had only one or two prior hospitalizations. Sixty-seven percent of the patients were male and most were from middle-class homes. The average amount of education by index hospitalization was approximately 12 years. Fifty-four percent of the subjects at the first followup and 56 percent at the second followup were taking antipsychotic medication. Five subjects were rehospitalized at the time of the first followup and none of them were rehospitalized at the second followup.

**Measures of Negative Symptoms.** Negative symptoms were rated by trained interviewers from behavior shown during the 3- to 4-hour followup assessment interviews. Behavior rating scales based on items from Strauss and Carpenter’s Psychiatric Assessment Interview (PAI) (Carpenter et al. 1976) were used to rate the three negative symptoms (1) poverty of speech, (2) flat affect, and (3) psychomotor retardation. The item content of the scales is similar to that proposed by Andreasen (1982). Table 2 presents the item content of the scales. Each of the 13 scale items was rated as either: 0, absent; 1, present but in mild form; or 2, present in marked form. In addition to the individual subscales of poverty of speech, flat affect, and psychomotor retardation, a negative symptom total score was also computed as an estimate of the severity of the overall negative symptom syndrome, which was a sum of the subscale scores. In order to estimate the prevalence of the negative symptom syndrome in addition to its severity, a categorical negative symptom index was also developed. For this purpose, the negative symptom syndrome was considered to be present whenever one or more of the three subscales was scored 2 or greater.

The three subscales were quite internally consistent, with Cronbach alphas ranging from .48 to .75. Similarly, the subscales were all significantly intercorrelated and the Cronbach alpha for the total score was .81, indicating that the items...
Table 2. Item composition of negative symptom behavior rating scales

<table>
<thead>
<tr>
<th>Poverty of speech</th>
<th>Flat affect</th>
<th>Psychomotor retardation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Long lapses before replying to questions</td>
<td>1. Avoids looking at interviewer</td>
<td>1. Slowed in movements</td>
</tr>
<tr>
<td>2. Restriction of quantity of speech</td>
<td>2. Blank, expressionless face</td>
<td>2. Reduction of voluntary movements</td>
</tr>
<tr>
<td>3. Patient fails to answer</td>
<td>3. Reduced emotion shown when emotional material discussed</td>
<td></td>
</tr>
<tr>
<td>4. Speech slowed</td>
<td>4. Apathetic &amp; uninterested</td>
<td></td>
</tr>
<tr>
<td>5. Blocking</td>
<td>5. Monotonous voice</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6. Low voice, difficult to hear</td>
<td></td>
</tr>
</tbody>
</table>

Note. — Items are from the Behavior Rating Inventory of the Psychiatric Assessment Interview (Carpenter et al. 1976).

Loaded on a common factor. The negative symptom scales also showed satisfactory interjudge reliability. Intraclass correlations between two independent raters for a sample of 20 videotaped interviews ranged from .67 to .88. Further details concerning the development of the negative symptom behavior rating scales can be found in Pogue-Geile and Harrow (1984a).

Measures of Positive Symptoms. In addition to these measures of negative symptoms, two major types of positive symptoms were also assessed at both followup interviews. The presence of (1) hallucinations or (2) delusions of any type during the past month was rated from the revised SADS interview. Both of these symptoms were rated on a 3-point scale of: 1, absent; 2, mild or equivocal; or 3, definitely present. Further details on this rating scheme are available in Harrow and Silverstein (1977). As a parallel to the negative symptom total score, an overall positive symptom index was developed based on the presence of either hallucinations or delusions. This index was scaled as: 1, hallucinations or delusions absent; 2, at least one mild or equivocal, but no definite ratings; or 3, at least one definite rating of a hallucination or delusion.

Measures of Functioning at Followup. The measures of role functioning at both followups were based on our structured Functioning Interview (Harrow et al. 1978). The Levensstein, Klein, and Pollack (1966) (LKP) scale was used to rate overall functioning in the past year. This scale was originally constructed for use in a large study of the posthospital adjustment of discharged psychiatric patients. It is based on employment, symptomatology, social functioning, independence of functioning, and rehospitalizations. In addition, the multidimensional scales developed by Strauss and Carpenter (1972) for instrumental work functioning, social functioning, and rehospitalization were also used to provide more detailed assessments of functioning at both followups during the year preceding each followup.

Results

Negative Symptoms at the First Followup: Prevalence and Cross-Sectional Correlates. In a previous study, we examined several major issues concerning negative symptoms during the posthospital phase of schizophrenia (Pogue-Geile and Harrow 1984a). In order to clarify the comparability with this previous work and to partially replicate our prior results, we have repeated the main analyses conducted on our earlier sample (Pogue-Geile and Harrow 1984a). These analyses were also performed on the current sample at the first followup and are presented in summary form herein. Although the majority of subjects (29) are shared in both studies, the current sample includes 10 additional subjects and data from the second followup.

The level of negative symptoms at the first followup in the current sample was very similar to that in our earlier schizophrenic sample (Pogue-Geile and Harrow 1984a). The mean negative symptom total score was 2.44 (SD = 3.35) and the prevalence of overall negative symptoms, using our dichotomized negative symptom index described above, was 41 percent (16). In the current sample, the negative symptom total score was significantly associated with Hollingshead and Redlich’s (1958) index of parental social class (r = .43, p < .01), such that negative symptoms were more severe in schizophrenic patients from...
lower socioeconomic status families. Similar to our previous results, negative symptoms did not differ significantly between those schizophrenic patients who were taking antipsychotic medications at the first followup and those who were not. There was also a nonsignificant trend for the negative symptom total score to be more severe in schizophrenic patients who were currently rehospitalized at the time of the first followup compared with those who were living in the community (t = 2.00, df = 36, p < .06). As before, negative symptoms at the first followup in schizophrenic patients were not significantly associated with the demographic variables of: age at first followup, sex, number or duration of hospitalizations before index admission, number of years between first hospitalization and index admission, or length of time between index hospitalization and the first followup.

In terms of measures of functioning before index hospitalization, the negative symptom total score at the first followup was significantly associated with the number of years of education completed before index admission (r = −0.43, p < .01) and with ratings of poor social functioning before index admission (r = 0.38, p < .02).

Negative symptoms at the first followup were also associated with concurrent measures of poor functioning at the first followup in the current sample. The negative symptom total score was significantly associated with poor functioning at the first followup for the LKP scale, which measures overall functioning (r = 0.35, p < .05), and the Strauss-Carpenter individual indexes of instrumental work functioning (r = −0.39, p < .02) and rehospitalization (r = −0.32, p < .05).

Analyses in the current sample also produced similar results to those from our previous sample concerning the cross-sectional relationship within schizophrenia between negative and positive symptoms at the first followup. We found no significant association between the total negative symptom score and our positive symptom index based on the presence of delusions or hallucinations (r = 0.02, p < .90).

Prognostic Importance of Negative Symptoms for Later Functioning. The results that follow represent the next step in our investigation of negative symptoms, focusing on the prognostic importance of negative symptoms, and build upon our previous work in this area (Pogue-Geile and Harrow 1984a). Table 3 presents data on the prognostic relationship between negative symptoms assessed at the first followup and later outcome functioning at the second followup.

<table>
<thead>
<tr>
<th>Functioning at 2nd followup</th>
<th>Strauss-Carpenter scales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative symptom at 1st followup</td>
<td>Overall functioning (LKP scale)</td>
</tr>
<tr>
<td>Psychomotor retardation</td>
<td>.19</td>
</tr>
<tr>
<td>Flat affect</td>
<td>.14</td>
</tr>
<tr>
<td>Poverty of speech</td>
<td>.24</td>
</tr>
<tr>
<td>Negative symptom total score</td>
<td>.24</td>
</tr>
<tr>
<td>Dichotomized negative symptom index</td>
<td>.31</td>
</tr>
<tr>
<td>Poorest</td>
<td>.03</td>
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</table>

Note.—Schizophrenic patients, n = 39. Pearson correlations (probabilities). High scores on functioning scales indicate poor functioning (Strauss-Carpenter scoring reversed).
correlated with later poor functioning at the second followup on the Strauss-Carpenter scales of rehospitalization and instrumental functioning, with a nonsignificant trend on the LKP scale of overall functioning. As an estimate of the prognostic importance of the prevalence of the overall negative symptom syndrome, table 3 also presents the predictive relationship between the dichotomized negative symptom index and later functioning. This categorical negative symptom index also significantly predicted later poor overall functioning, as measured by the LKP scale and Strauss-Carpenter instrumental functioning ratings, with a nonsignificant trend to predict later Strauss-Carpenter rehospitalization rating.

In order to evaluate any potential confounding effects of chronicity that may have been already established before index admission (Strauss and Carpenter 1974, 1977) on the prognostic relation of negative symptoms to later functioning, control analyses were performed based only on that subsample of schizophrenic patients with no hospital admissions before index admission (n = 15). Among these first-admission schizophrenic patients, the dichotomized negative symptom index at the first followup continued to be a significant predictor of later poor functioning at the second followup on the overall LKP scale (r = .54, p < .02), and on the Strauss-Carpenter social functioning scale (r = −.59, p < .01). There were also nonsignificant trends toward predicting instrumental functioning (r = −.28, p < .16) and rehospitalization (r = −.21, p < .22). There were also no significant differences in the prognostic value of negative symptoms between those schizophrenic patients who were taking antipsychotic medication at the first followup and those who were not. In addition, for the current sample, there were no significant differences in the prognostic importance of negative symptoms between males and females.

Table 4 presents a closer examination of the prognostic relationship between negative symptoms and later role functioning. This table details the association between the dichotomized negative symptom index at the first followup and the LKP scale of overall functioning at the second followup. It again illustrates the significant prognostic importance of negative symptoms (Kendall’s Tau C = .29, p < .04), as 69 percent of those schizophrenic patients with negative symptoms at the first followup showed severe overall functioning impairment at the second followup. The severe impairment range on the LKP scale of overall functioning indicates very poor functioning in the past year with continuous marked symptoms, very low level of self-support, and possible rehospitalization. However, table 4 also indicates that negative symptoms represent only one of several possible pathways to such poor functioning in schizophrenia, as 39 percent of schizophrenic patients who did not initially have negative symptoms at the first followup also showed severe functioning impairment at the second followup. Thus, although the risk for later poor functioning in schizophrenic patients without initial negative symptoms was quite high (39 percent), the presence of negative symptoms at the first followup almost doubled this risk for later poor functioning (69 percent).

Detailed Analysis of the Prognostic Importance of Negative Symptoms. Given the prognostic importance of negative symptoms for predicting later functioning, it becomes important to explore possible factors that may influence this association over time. Specifically, we were interested in whether negative symptoms at the first followup were occurring in schizophrenic patients who were currently functioning adequately but then declined in functioning by the second followup. In this case, negative symptoms might predate a later decline in functioning. Alternatively, even in this sample of young schizophrenic patients who are in the relatively early course of their disorder,

<table>
<thead>
<tr>
<th>Overall negative symptom index at 1st followup</th>
<th>Overall functioning at 2nd followup (LKP scale)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Good (1-2)</td>
</tr>
<tr>
<td>Absent</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>(26%)</td>
</tr>
<tr>
<td>Present</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>(12%)</td>
</tr>
</tbody>
</table>

Note.—Schizophrenic patients, n = 39. Row percentages presented.
negative symptoms may be occurring primarily in subjects who were already functioning poorly at the first followup and would tend to remain at this level by the second followup. Stated another way, does the presence of negative symptoms at the first followup still contribute to the prediction of outcome functioning at the second followup after controlling for the initial level of functioning at the first followup?

To investigate this question, we completed partial correlations between the overall negative symptoms syndrome at the first followup and the LKP scale of overall functioning at the second followup, after removing the shared variance of overall outcome at the first followup. The partial correlation between the negative symptom total score at the first followup and the LKP measure of overall functioning at the second followup, controlling for the initial level of overall functioning at the first followup, was not significant ($r = .02, p < .45$). This result suggests that the prognostic importance of negative symptoms during the early posthospital course of schizophrenia predominantly overlaps with the longitudinal stability of poor functioning. The prognostic value of negative symptoms seems to be largely enhanced by their tendency to occur in schizophrenic patients who are already functioning poorly at the first followup and who tend to continue to function poorly by the second followup.

Table 5 illustrates these interrelationships in cross-tabular form. The upper portion of the table presents the association between negative symptoms at the first followup and subsequent overall functioning at the second followup for those schizophrenic patients who were initially functioning adequately at the first followup. Among these schizophrenic patients who were functioning adequately at the first followup, negative symptoms were relatively infrequent (26 percent; $n = 5$), and although they increased the risk for later poor functioning at the second followup (40 percent vs. 14 percent) the relationship was not significant. Thus, although there may be some tendency during this phase of the disorder for negative symptoms to predate a decline in functioning, it is probably not the major factor accounting for their prognostic importance. The lower portion of table 5 presents the association between negative symptoms at the first followup and overall functioning at the second followup for those schizophrenic patients who were initially functioning poorly at the first followup. Among these patients, negative symptoms were more frequent (present in 55 percent) than in patients who showed better functioning at the first followup. However, the presence of negative symptoms in this group of already poorly functioning schizophrenic

<table>
<thead>
<tr>
<th>Negative symptoms at 1st followup</th>
<th>Good/equivocal (1-6)</th>
<th>Poor (7-8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absent</td>
<td>12 (86%)</td>
<td>2 (14%)</td>
</tr>
<tr>
<td>Present</td>
<td>3 (60%)</td>
<td>2 (40%)</td>
</tr>
<tr>
<td>Fisher's Exact Test, $p &lt; .27$.</td>
<td></td>
<td></td>
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<tr>
<td>Row percentages.</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Negative symptoms at 1st followup</th>
<th>Good/equivocal (1-6)</th>
<th>Poor (7-8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absent</td>
<td>2 (22%)</td>
<td>7 (78%)</td>
</tr>
<tr>
<td>Present</td>
<td>2 (18%)</td>
<td>9 (82%)</td>
</tr>
<tr>
<td>Fisher's Exact Test, $p &lt; .63$.</td>
<td></td>
<td></td>
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<tr>
<td>Row percentages.</td>
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</table>
patients did not significantly increase the risk for later poor functioning at the second followup (82 percent vs. 78 percent). Therefore, these analyses suggest that much of the prognostic importance of negative symptoms reflects the fact that they tend to occur in a subgroup of schizophrenic patients who are already functioning poorly at the first followup and who then tend to continue to function poorly at the second followup. It is possible that at earlier phases of the schizophrenic disorder, such as the inpatient phase, negative symptoms may more frequently predate declines in general functioning. However, it may be even more likely that negative symptoms and general role functioning deficits are both influenced by some shared factors and thus tend to occur most often concurrently.

Longitudinal Course of Negative Symptoms. Table 6 presents the longitudinal course of the severity of each individual negative symptom subscale at both the first and second followups. Each negative symptom subscale showed a decline from the first to second followups, although these declines were not statistically significant. Table 7 presents the longitudinal course of the prevalence of the dichotomized overall negative symptom index. There was a significant longitudinal association for this categorical index of the negative symptom syndrome ($\chi^2 = 9.97, df = 1, p < .002$) and the odds-ratio measure of association was 22.8. Among those schizophrenic patients who experienced negative symptoms at the first followup, 55 percent also showed negative symptoms at the second followup. In contrast, only 5 percent of those patients who did not initially show negative symptoms at the first followup showed later negative symptoms at the second followup. However, within the context of this significant stability, it also appears that some schizophrenic patients showed a reduction in negative symptoms. Forty-five percent of those schizophrenic patients with initial negative symptoms at the first followup showed a remission of negative symptoms by the second followup. In contrast, only 5 percent of those schizophrenics without initial negative symptoms developed them by the second followup. This overall pattern of remission of negative symptoms for some schizophrenic patients, with few patients increasing in negative symptoms, may differ at later phases of schizophrenia. This sample is still in the relatively early stages of disorder, and perhaps during later phases negative symptoms may become irreversible in more patients. Alternatively, it may be that negative symptoms tend to fluctuate in some schizophrenic patients and to be relatively irreversible in only a subgroup.

Prognostic Importance of Positive Symptoms. Because of the contrasts that have been drawn at times between positive and negative symptoms, we also examined the prognostic importance of the positive psychotic symptoms of delusions and
hallucinations. As was the case for negative symptoms, the presence at the first followup of the positive symptoms of hallucinations or delusions, using our overall index of positive symptoms, was significantly predictive of later overall poor functioning at the second followup ($r = .60, p < .0001$). Table 8 illustrates the specific nature of this prognostic relationship. The majority (78 percent) of schizophrenic patients who experienced definite hallucinations or delusions at the first followup showed poor functioning at the second followup. However, as was also the case for negative symptoms, a subgroup of schizophrenic patients (29 percent) who did not experience positive symptoms at the first followup nevertheless showed later poor functioning. Thus, although positive symptoms occurring at the first followup also have significant prognostic importance for later functioning, they also do not represent the only pathway to poor functioning during this phase of schizophrenia.

Prognostic Relationships Between Positive and Negative Symptoms. To explore further the relationship between the prognostic importance of positive and negative symptoms, schizophrenic patients were divided into the following four groups depending on their joint positive/negative symptom profile at the first followup: (1) mixed symptoms (both positive and negative symptoms); (2) pure negative symptoms (without definite positive symptoms); (3) pure positive symptoms (without definite negative symptoms); and (4) neither type of symptom (without definite positive or negative symptoms). Assignment to groups was based on the definite cutting scores for the overall positive symptom index and the overall negative symptom index described above. The means on the LKP scale of overall functioning at the second followup for the four groups were: (1) mixed symptoms, $M = 7.50$; (2) pure negative symptoms, $M = 4.83$; (3) pure positive symptoms, $M = 5.85$; and (4) neither symptom, $M = 3.64$. Higher scores on the LKP scale indicate poorer functioning. The two-way (negative by positive symptoms) analysis of variance of these data found significant main effects for both negative ($F = 3.96; \text{df} = 1, 35; p < .05$) and positive symptoms ($F = 11.93; \text{df} = 1, 35; p < .001$) in predicting later outcome. However, the interaction of positive and negative symptoms in predicting later overall functioning was not significant ($p < .76$). These results suggest that the prognostic effects of positive and negative symptoms are additive and do not statistically interact with one another. As can be seen, those schizophrenic patients who experienced both positive and negative symptoms at the first followup (mixed symptoms group) were functioning more poorly at the second followup than those schizophrenic patients who had only negative or only positive symptoms at the first followup.

### Implications

The present study is one of the few to investigate negative symptoms in relation to later outcome in schizophrenia using a prospective research design. The following major results emerged:

- Negative symptoms were more frequent at followup among schizophrenic patients who had poor educational achievement and poor social functioning before index hospitalization. Negative symptoms were also more common among schizophrenic patients from lower social class parental homes.

- Negative symptoms in schizophrenic patients were associated at followup with concurrent poor functioning in other areas (e.g., poorer instrumental work functioning and more rehospitalizations).

- Negative symptoms in schizophrenia during the postacute phase were prognostically important for later overall functioning and for functioning in the specific areas of instrumental work performance and rehospitalization.

- Negative symptoms tended to characterize schizophrenic patients

### Table 8. Prognostic relationship between overall positive symptoms at 1st followup and overall functioning at 2nd followup

<table>
<thead>
<tr>
<th>Overall positive symptoms at 1st followup</th>
<th>Good (1-2)</th>
<th>Equivocal (3-6)</th>
<th>Poor (7-8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absent/mild</td>
<td>7</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>(33%)</td>
<td>(38%)</td>
<td>(29%)</td>
<td></td>
</tr>
<tr>
<td>Definite</td>
<td>1</td>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>(5%)</td>
<td>(17%)</td>
<td>(78%)</td>
<td></td>
</tr>
</tbody>
</table>

who were already functioning poorly, rather than to precede a later decline.

- Negative symptoms were persistent during the early course of the disorder in many schizophrenic patients, although in some others negative symptoms remitted.
- Negative symptoms represented only one of several possible pathways to later poor functioning in schizophrenia.
- The presence of negative symptoms in this early phase of schizophrenia did not imply the absence of positive symptoms. Negative and positive symptoms were independent phenomena, and actually appeared to be positively associated from a longitudinal perspective.
- Positive symptoms during the postacute phase of schizophrenia were also prognostically important for later poor functioning.
- The prognostic importance of negative and positive symptoms was additive during the early course of schizophrenia.

The finding of the prognostic importance of negative symptoms for later functioning during the early posthospital period is consistent with theory concerning negative symptoms (Strauss, Carpenter, and Bartko 1974; Carpenter et al. 1978; Crow 1980). This result, in a sample of young schizophrenic patients, suggests that the occurrence of negative symptoms early in the course of the disorder may, in fact, delineate a subgroup of patients with a chronic course. Negative symptoms appeared to occur primarily in a subgroup of schizophrenic patients who had a history of poor functioning and who subsequently tended to remain impaired in their role performance. It is important to note that not all chronically poor functioning patients showed negative symptoms during this early phase of the disorder. The results also suggested a degree of overlap between negative symptoms and the traditional prognostic factors of poor "premorbid" functioning.

The finding of a tendency toward remission from negative symptoms in some schizophrenic patients is counter to theory which hypothesizes negative symptoms to be persistent over time. It may be that at later stages of the disorder negative symptoms will be more persistent. Perhaps during the earlier stages of the disorder, negative symptoms in some vulnerable patients may represent signs that remit especially slowly following an acute episode.

In general, these results suggest that negative symptoms appear to be important individual differences in schizophrenic symptomatology with longitudinal and cross-situational correlates. More research is needed to investigate the potential role that negative symptoms might play in nonschizophrenic disorders. Preliminary data suggest that negative symptoms also are present in other psychotic disorders, such as schizoaffective disorder and perhaps to some extent in psychotic depression (Pogue-Geile and Harrow 1984a; Rosen et al. 1984; but cf. Andreasen and Olsen 1982). The distinction between the two groups of symptoms seems to be a useful one, although the terminology of "positive" and "negative" may imply an opposition between the two that does not appear to exist. Similarly, the terms can also lend themselves to an overly simplified dichotomous view of psychopathological symptoms. Clearly, it is unlikely that the broad range of psychopathological phenomena should be grouped into only two categories. Empirical approaches investigating the occurrence of signs and symptoms should provide a useful guide in grouping symptoms together (e.g., Farmer, McGuffin, and Spitznagel 1983).
Conjectures of Potential Etiologies of Negative Symptoms in Schizophrenia. While Crow (1980) has proposed several valuable hypotheses concerning the possible organic pathology of negative symptoms, less discussion has centered on the potential etiology of negative symptoms and their potential role in schizophrenia. Although there are few studies specifically relevant to this issue, the evidence to date appears to indicate that negative symptoms have enough important correlates that some attention to their etiology is warranted. Since severe negative symptoms are probably only relevant to a subgroup of schizophrenic patients, as they are currently diagnosed, we will outline three general etiological models that would be applicable to individual differences within schizophrenia such as negative symptoms (Pogue-Geile and Harrow, in press).

First, in a modifying influence model, negative symptoms would arise as the result of an interaction between some independent trait, such as low intelligence, and a more specific schizophrenic (or psychotic) diathesis. In this case, the independent trait would not actually increase the risk for schizophrenia itself, but would only serve to modulate the phenotypic manifestation of schizophrenia. The etiology of the independent trait itself could be genetic and/or environmental. In the case of such a modifying influence model, negative symptoms, although identifying a subgroup of schizophrenics, would not generally be considered to have identified a subtype of schizophrenia with a specific etiology.

A second etiological alternative is a contributing influence model in which negative symptoms represent the behavioral manifestation of some 'negative symptom specific' factor that not only leads to negative symptoms, but also directly contributes to the risk of schizophrenia. This negative symptom specific factor could itself be due to genetic and/or environmental influences. For example, within the context of a polygenic theory of schizophrenia in which three of five 'schizophrenia specific' genes (e.g., genes A, B, C, D, E) are necessary to produce clinical schizophrenia, then any schizophrenic patient who has the 'negative symptoms' gene (e.g., gene 'D') as one of his three genes leading to schizophrenia will show negative symptoms. In the extreme case where the 'D' gene is sufficient to produce a schizophrenic picture, then negative symptom schizophrenia would represent a distinct type of schizophrenia with its own specific etiology. A similar example could be fashioned for a putative environmental factor, such as viral infection, that could both lead to negative symptoms and also contribute to the risk of schizophrenia.

In the third, or threshold model, negative symptoms would represent a behavioral manifestation of a more severe threshold along a continuum of multifactorial liability to schizophrenia. In this case, negative symptoms would not be due to any specific influence, but would reflect only the accumulation of negative symptom nonspecific influences present for a given individual. Within the context of the polygenic example given above, where three schizophrenia specific genes were necessary to produce clinical schizophrenia, it could be that four of the five genes would be necessary to produce schizophrenia with negative symptoms (the negative symptom threshold). In this case, no one of the five genes would be specific for negative symptoms, but only the total number of genes present would be important.

To date, few studies addressing these issues have been performed. The two most relevant studies, which have involved reanalyses of twin samples, appear generally most supportive of the view that negative symptoms may represent a severity threshold on a continuum of liability to schizophrenia, although much more research is necessary in this area (Dworkin and Lenzenweger 1984; Farmer, McGuffin, and Gottesman 1984).

These three potential models for the etiology of negative symptoms and their role in schizophrenia do not exhaust all the possibilities. Although they are quite general, they can nevertheless provide a framework for investigating these issues and are specific enough to make different predictions in the context of family and twin studies. These models also have been discussed in reference to the traditional subtypes of schizophrenia (e.g., Gottesman and Shields 1982). Although much more needs to be understood concerning the behavioral and biological correlates of negative symptoms, studies of etiological questions may provide new insights into the role that negative symptoms might play in schizophrenia and other disorders.

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