Thought Disorder in Schizophrenia and Mania: Impaired Context

by Martin Harrow, Kristin E. Green, James R. Sands, Thomas H. Jobe, Joseph F. Goldberg, Kalman J. Kaplan, and Eileen M. Martin

Abstract

This research studied hypotheses that positive thought disorder in schizophrenia is influenced by patients’ not taking in immediate target contextual material, thereby losing vital cues that guide thought processes. We assessed 164 acute inpatients (including 55 schizophrenia and 31 bipolar disorder patients), using standardized measures of thought disorder. We also used new measures that assessed (1) total ignoring of context, and (2) straying from the context. Results were as follows: (1) only 9 percent of the schizophrenia patients showed strong evidence of completely ignoring the external context; (2) straying from the external context while simultaneously maintaining part of the context was significantly more common than complete absence of context \( p < 0.01 \); (3) patients with thought disorder strayed from the context significantly more than patients without thought disorder \( p < 0.001 \); and (4) straying from the context was involved in the thought disorder of some, but not all, schizophrenia and mania patients. The data suggest that thought disorder in schizophrenia is not typically due to a failure to “hear” or to take in the relevant contextual material necessary for an appropriate response. It was also designed to explore related hypotheses proposing that schizophrenia patients fail to maintain the internal representations of contextual material in working memory needed to produce an appropriate response.

Various definitions of context have been used by different investigators, with some of the research in this area linked to modality-specific types of context. In recent research on the role of internal representations of context in disordered cognition, Cohen and Servan-Schreiber have defined it as “information held in mind in such a form that it can be used to mediate an appropriate behavioral response” (1992, p. 46). This definition has included the background instructions and stored knowledge that guide a response and also includes target stimuli that may be processed and interpreted (e.g., “the interpretation resulting from processing a sequence of words in a sentence,” Cohen and Servan-Schreiber 1992, p. 46).

While there have been a number of hypotheses about the role of loss of context in thought disorder in schizophrenia patients and innovative research on context by major investigators such as Cohen, Servan-Schreiber, and others (Cohen and Servan-Schreiber 1992; Rizzo et al. 1996), related formulations also have been advanced about schizophrenia patients’ difficulty in holding contextual material in memory to form an appropriate response (Park and Holtzman 1992; Goldman-Rakic 1994; Gold et al. 1997). Formulations such as these have been based in part on two major trends advancing theory on working memory. The first of these includes important conceptualizations derived from cognitive psychology by Baddeley, Hitch, and others (Baddeley and Hitch 1974, 1994; Baddeley 1986) emphasizing working memory not as a unitary short-term memory device alone, but rather as a device for the simultaneous storage and processing of information from several subsys-
tems controlled by a central executive processor. The second major trend includes new neuroscience research by Goldman-Rakic and others that provides evidence about specific types of working memory (Goldman-Rakic 1987; Park and Holtzman 1992; Paulesu et al. 1993; Smith et al. 1995; Gold et al. 1997). In addition to the major formulations of Goldman-Rakic (1994), many other theorists include views about the importance of context, working memory, or both in their formulations about positive symptoms in schizophrenia (Park and Holtzman 1992; Rizzo et al. 1996; Gold et al. 1997).

Many key formulations include the relationships between disorders in handling contextual material and thought disorder and between a weakened working memory and thought disorder. However, it is possible that some patients may have thought disorder, impaired context processing, or both without having a working memory deficit. At present there is little direct empirical investigation to discern whether loss of context plays a significant role in thought disorder. Empirical studies of context and working memory in schizophrenia have often focused on potential impairment in performance tests (such as the Continuous Performance Test, the Stroop Test, and the Wisconsin Card Sorting Test), and these tests may tap important deficits that need to be analyzed. Nevertheless, this is not the type of material where signs of positive thought disorder usually arise. A weakened working memory may be important in some major types of cognitive deficits without being central to thought disorder or to all types of cognitive aberrations.

On an empirical level, crucial for theoretical models about potential loss of context and thought disorder is whether schizophrenia patients with thought disorder fail to take in the context (e.g., they do not respond to the question). An alternate theoretical model is that schizophrenia patients with thought disorder take in the context, but "go astray" in processing contextual information (e.g., their responses are partly influenced by the external question and partly by other irrelevant personal or nonpersonal material).

In the current research, we investigated a large sample of acutely disturbed patients to determine whether some or all schizophrenia patients with thought disorder show major difficulty in handling contextual material and whether schizophrenia patients differ in this area from patients with bipolar disorder. We sought to study the importance of context as a major factor in schizophrenic thought disorder by addressing the following specific questions:

1. Is thought disorder in schizophrenia influenced by patients' totally ignoring the immediate external context? Or in contrast, do they stray from the external context despite being able to incorporate part or all of this context?

2. Do schizophrenia patients show more loss of context in their thought-disordered responses than is shown by bipolar mania patients?

3. Is thought disorder in schizophrenia influenced by these patients' inability to hold contextual material in working memory?

4. Are there schizophrenia patients with severe thought disorder who do not show loss of context?

Method

The current research is part of a program designed to study course and outcome over time and thought pathology and positive and negative symptoms over different phases of illness in patients with schizophrenia and affective disorder (Harrow et al. 1990; Carone et al. 1991; Sands and Harrow 1994; Goldberg et al. 1995; Harrow et al. 1997; Marengo and Harrow 1997). It also was designed to explore mechanisms that may be involved in positive and negative symptoms in schizophrenia (Gordon et al. 1982; Harrow and Quinlan 1985; Pogüé-Geile and Harrow 1985; Harrow et al. 1989; Harrow and Silverstein 1991; Harrow et al. 1995; Port et al. 1997).

The present sample of 164 inpatients includes 55 schizophrenia patients, 31 bipolar mania patients, and a control group of 78 nonpsychotic psychiatric patients. All of the schizophrenia patients had delusional activity, hallucinatory activity, or both (psychosis) during index hospitalization, and 78 percent of the bipolar patients showed psychosis during hospitalization. All of the bipolar patients had full manic syndromes during index hospitalization. The control patients did not have delusions or hallucinations, and 54 of these patients had nonpsychotic unipolar depressive disorders. Patients were consecutive inpatient admissions from within these three diagnostic types and had no overt brain injuries. Research diagnoses were used (the Research Diagnostic Criteria; Spitzer et al. 1978a) based on structured clinical interviews (the Schedule for Affective Disorders and Schizophrenia [Spitzer et al. 1978b], the Schizophrenic State Interview [Grinker and Harrow 1987], or both) and inpatient information. Interrater reliability for the diagnosis of schizophrenia was \( \kappa = 0.88 \). Informed written consent was obtained from each patient.

To obtain a sample of young acute patients studied early in the course of the disease, we tested subjects at the acute phase of hospitalization, using standardized measures of thought disorder and newly developed measures of context that had been pretested for interrater reliability. The sample included 47 percent men and 53 percent women. The mean age for the sample was 23.8 years. In this relatively early, young sample, 50 percent (82 patients) were first hospital admissions, another 24 per-
cent had only one previous hospitalization, 11 percent had two previous hospitalizations, and 15 percent had more than two previous hospitalizations. The mean educational level was 13 years. The three diagnostic groups did not differ significantly in age or education. More of the schizophrenia patients were males and more of the control patients were females \((p < 0.05)\). However, within each diagnostic group, there were no sex differences in severity of thought disorder.

Two tests were administered to each patient to examine thought disorder, and a third test was administered to assess use of the external context.

Assessment of Thought Disorder. The patients were scored for the presence of positive thought disorder based on their performances on two standardized instruments: the comprehension subtest of the Wechsler Adult Intelligence Scale (Wechsler 1955) and the Goldstein-Scheerer Object Sorting Test (Goldstein and Scheerer 1941). These tests were scored for bizarre-idiiosyncratic thinking, a comprehensive measure of positive thought disorder. This index of thought pathology, based on a composite score derived from the two tests, encompasses most of the classical qualities of positive thought disorder usually considered important by diverse theorists. Among other qualities, it includes incoherence, loose associations, derailment, illogical thinking, and neologisms. Thought disorder scores were assigned according to detailed manuals (Marengo et al. 1986; Harrow et al. 1998), with inter-rater reliabilities of \(r = 0.71\) and \(r = 0.89\) for the comprehension test, and \(r = 0.85\) for the object sorting test. The overall system for assessing positive thought disorder on the comprehension test has shown significant and high correlations \((r = 0.61)\) with the composite measure of thought pathology given in Johnston and Holzman’s (1979) Comprehensive Thought Disorder Index. The manual for the comprehension test and the manual for the object sorting test also contain further information on interrater reliability and internal consistency obtained by the present research team using this scoring system. Stability and test-retest reliability for this assessment system also are indicated by relatively high correlations of thought disorder scores for schizophrenia patients over time (Marengo et al. 1986; Marengo and Harrow 1997).

The discriminating power and validity of these measures of thought disorder have been demonstrated in multiple studies assessing various types of psychotic and nonpsychotic samples at different phases of disorder (Andreasen and Powers 1975; Harrow and Quinlan 1985; Harrow et al. 1989; Landre and Taylor 1995; Grossman and Harrow 1996; Marengo and Harrow 1997; Port et al. 1997).

For the present sample of 164 patients, the composite score from the two tests of thought disorder was based on a five-point scale (1-5) with a score of “5” for very severe thought disorder. Mean score for the 55 schizophrenia patients was 3.29 (standard deviation [SD] = 1.17); for the 31 mania patients, 3.10 (SD = 1.40); and for the 78 control patients, 2.09 (SD = 1.05), with significant diagnostic differences \((F = 19.75, df = 2.161, p < 0.001)\). The composite score for thought disorder from the two tests also allows separating patients according to three different levels of thought pathology as follows: (1) none or mild, (2) moderate thought disorder or evidence of abnormal thinking, and (3) severe or very severe thought disorder. This system of categorizing patients for thought disorder allowed us to separate out 49 patients with severe thought disorder to study this particular subsample’s use (or lack of use) of the external context on a different test (the Gorham Proverbs Test). The subgroup of patients with severe thought disorder showed demographic characteristics that were similar to the larger sample. Their mean age was 23.75 years, their mean educational level was 12.65 years, and 51 percent of the subsample was male. Within diagnostic groups, the group with severe thought disorder did not differ significantly in age, sex ratio, or educational level from the group of patients without severe thought disorder.

Clinically, the group with severe thought disorder consisted primarily of schizophrenia and mania patients (42 of the 49 patients with severe thought disorder were schizophrenia or mania patients), although it also included a small (9%) subsample of control patients. Previous research from multiple different settings has also found that many mania patients and select nonpsychotic patients have thought disorder (e.g., Andreasen and Powers 1975; Harrow and Quinlan 1977; Johnston and Holzman 1979; Harrow et al. 1982; Harvey 1983, 1985; Marengo and Harrow 1985; Holzman et al. 1986).

It should be noted that in the present research we have treated thought disorder as a unitary construct. A number of investigators have viewed formal thought disorder as a unitary construct, and some evidence could support this (e.g., Harrow and Quinlan 1985). However, other major investigators have proposed that thought disorder may not be a unitary construct and have presented evidence to support the hypothesis that thought disorder may have multiple components (Berenbaum and Barch 1995; Barch and Berenbaum 1996). This issue is still an open one that deserves further analysis.

Assessment of Disordered Use of the External Context. To measure patients’ use of external context, we directly assessed whether some form of the overt external context was incorporated into their responses, using the Gorham Proverbs Test. Looked at from one viewpoint, any new approach to studying an important theoretical model would have to be considered exploratory. Looked at from
Another viewpoint, if patients employ the specific external context in their responses, it provides some evidence that they “heard” and used at least part of this external context. In the current research, each response to the Gorham Proverbs Test was scored on five-point scales to obtain two standardized systems of assessment: (1) whether the specific proverbs response completely ignored the immediate external context, in terms of the response showing no trace of either the proverb question or of the concept(s) involved in the proverb; and (2) whether the response strayed from the immediate external context (or proverb) even though the same response may have also showed signs of incorporating or using part of the external context. Solution of the proverbs task fits in with Cohen and Servan-Schreiber’s definition of tasks requiring use of an internal representation of context, with the meaning of the words in each proverb mediating and constraining each other (Cohen and Servan-Schreiber 1992; Servan-Schreiber et al. 1996). Thus in the proverbs task, the subject must process a sequence of words, with the translation of the words and their meaning depending on the other words in the proverb.

**Dimension 1: Complete absence of context.**

Scoring context dimension 1 involved rating each response as to whether it totally ignored the immediate external context by not attending to the context (the proverb question) at any point in the response, even in the best part of the response (i.e., the part of the response that is most in context). The use of context can include (1) the original words, phrases, or ideas from the proverb question; (2) similar words, phrases, or ideas derived from the proverb question; or (3) a translation of the proverb words, phrases, or ideas into other correct or incorrect ideas that are more abstract or more general. The scale to rate the responses on complete absence of context consists of a continuum from 0 to 4, with 0 representing at least some clear use of context and 4 representing complete absence of any signs or evidence of any use of the external context in the response.

One example of a proverb response that did not show any overt use of the context and was scored a 4 occurred when a patient with thought disorder responded to the proverb “A stream cannot rise higher than its source” with the response: “If your eyes hurt, people are glad. They like to see fatts suffering, you know.”

**Dimension 2: Straying from the context, while maintaining part of the context, within the same response.**

For context dimension 2, straying from the context, each response was rated on a five-point scale (0–4) according to whether the patient deviated or strayed from the external context. Straying from the context often involves moving away from the context or proverb question at the worst part of the response (i.e., the part that is the least in context), even though part of the context may be used in the best part of the response. Thus, the subject receives a score of 0 if his or her response did not stray from the context and a score of 1–4 if at the worst part of the response, the subject strayed or deviated from the proverb question. In this category the subject received a score of 1 or 2 if at the worst, while straying from the context, he or she still showed some use of part of the context at some point in the response. The subject received a score of 3 or 4 if, at the worst, the response strayed from the external context while showing no evidence of the use of even part of the context or proverb question at any point in the response.

An example of a response scored 0 on this dimension occurred when a patient responded to the proverb “The used key is always bright” with “I wouldn’t say it’s bright. I’d say it should be dull. Cause it’s being used. Cause an unused key is bright. Like you go to the key shop and get a key made. If you use it, it’s breaking itself in.” This response is scored 0 on Context 2, because even though it is a concrete response and incorrect, the entire response adheres to the external context.

**Overall Assessment of Use of Context and Interrater Reliability.**

A patient’s scores on each of the two dimensions assessed was based on the sum of the scores for all 12 responses on that particular dimension, with the total scores placed on a continuum extending from no loss of context on any of the 12 responses (a total score of 0) to very severe loss of context as the scores increase. Cutoff scores were developed to facilitate the placing of patients into categories according to whether they showed no to mild impairment in context, moderate impairment in context, or severe impairment in context. For a subject to fit into the category of severe impairment on dimension 1, which assesses complete absence of context, the patient had to have a total score of 6 or higher, and also had to have at least 2 of the 12 responses scored at 3 or 4, showing complete or almost complete absence of context. The means presented and the diagnostic comparisons in the results section are based on the grouped or categorized data. Thus, the summed categorized context scores of each subject from each diagnostic group were combined to form means for each type of context. A more detailed explanation of the scoring system for each context dimension assessed, along with many examples of contextually disordered responses, is presented in a detailed manual (Rappole et al. 1995) that is available to readers upon request.

The two types of contextual problems show some overlap. Thus the presence of one type of contextual problem increased the likelihood that the other might also be rated. However, the final scores from the two types of contextual problems did differ significantly (this comparison...
is reported in the Results section). That the total scores for both categories were significantly different does not necessarily imply that there was no overlap. Despite some overlap, and the occurrence of some similarities between the two types of context in the scoring of more severe contextual problems, the later between-diagnostic comparisons that emerged between schizophrenia and bipolar patients (also presented in the Results section) differed according to the type of contextual problem addressed.

Interrater reliability was obtained for this system of assessing the use of the external context. The evaluation of three trained raters on ten sets of proverb responses of acute patients on the Gorham Proverbs Test (each set having 12 proverbs) produced mean interrater reliabilities of \( r = 0.95 \) for dimension 1 (complete absence of context) and \( r = 0.89 \) for dimension 2 (straying from the context).

Medications. At the time of acute assessment, 83 percent of the schizophrenia patients were on neuroleptics (with or without other medications), and a small percentage (17%) of the schizophrenia patients were on other medications or unmedicated. Fifty-nine percent of the bipolar mania patients were on neuroleptics, with or without lithium. Fifty-seven percent of the mania patients were on lithium, alone or with other medications, and 10 percent were unmedicated. In the Results section, we have presented analyses of the results on context when medications are controlled by studying the medicated sample and the unmedicated sample separately, in relation to the context scores.

## Results

**Complete Absence of Context.** Table 1 presents the mean scores on complete absence or ignoring of context for the overall sample. Table 2 presents the means for the patients with severe and moderate thought disorder when these two subsamples were analyzed separately. The data in table 2 involve an analysis of context scores derived from the proverbs test, as compared to the patients’ thought disorder scores derived from an index from two other tests (the comprehension and object sorting tests). Tables 1 and 2 also report the percentage of patients in each diagnostic group who showed severe impairment on total absence of the external context.

To analyze potential diagnostic differences, a \( 3 \times 2 \) analysis of variance (ANOVA, 3 diagnostic groups \( \times 2 \) levels of thought disorder) was conducted on the data on

### Table 1. Scores for overall sample on complete absence of context

<table>
<thead>
<tr>
<th>Sample</th>
<th>( M (SD) )</th>
<th>Patients with severe signs of complete absence of context, %(^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schizophrenia patients (( n = 55 ))</td>
<td>1.20 (0.59)</td>
<td>9</td>
</tr>
<tr>
<td>Bipolar mania patients (( n = 31 ))</td>
<td>1.16 (0.45)</td>
<td>3</td>
</tr>
<tr>
<td>Control patients (( n = 78 ))</td>
<td>1.04 (0.19)</td>
<td>0</td>
</tr>
</tbody>
</table>

*Note.—* \( M \) = mean score; SD = standard deviation.

\(^1\) All patients in the “severe” category showed overall scores of 6 or more and individual scores of 3 or 4 for complete absence of context on 2 or more of their 12 proverb responses.

### Table 2. Scores of patients with moderate and severe thought disorder on complete absence of context

<table>
<thead>
<tr>
<th>Sample</th>
<th>Patients With Moderate Thought Disorder</th>
<th>Patients With Severe Thought Disorder</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Patients with severe signs of complete absence of context, %(^1)</td>
<td>Patients with severe signs of complete absence of context, %(^1)</td>
</tr>
<tr>
<td></td>
<td>( M )</td>
<td>SD</td>
</tr>
<tr>
<td>Schizophrenia patients</td>
<td>1.0</td>
<td>0</td>
</tr>
<tr>
<td>Bipolar mania patients</td>
<td>1.0</td>
<td>0</td>
</tr>
<tr>
<td>Control patients</td>
<td>1.1</td>
<td>0.25</td>
</tr>
</tbody>
</table>

*Note.—* \( M \) = mean score; SD = standard deviation.

\(^1\) All patients in the “severe” category showed overall scores of 6 or more and individual scores of 3 or 4 for complete absence of context on 2 or more of their 12 proverb responses.
complete absence of context. There was no significant main effect for diagnosis ($F = 0.707, df = 2,158, p > 0.30$). There was a significant main effect for level of thought disorder ($F = 13.29, df = 1,158, p < 0.001$). Fitting in with the nonsignificant results on diagnosis, while the schizophrenia patients showed slightly higher scores (more pathology) on complete absence of context than the mania patients, there were no significant differences between bipolar and schizophrenia patients ($t = 0.58, df = 84, p > 0.50$). Nor were there significant differences on complete absence of context between the subgroups of schizophrenia and mania patients who were on neuroleptics ($t = 0.57, df = 59, p > 0.50$) and between the smaller subgroups not on neuroleptics ($t = 1.20, df = 19, p > 0.20$).

When the total sample of all patients with and without thought disorder was analyzed (table 1), the mean scores for complete absence of context for the schizophrenia patients were relatively low. Rather surprisingly, 90 percent of the schizophrenia patients did not show strong signs of total ignoring of context on any of their 12 responses.

The relationship between total ignoring of context on the proverb test and scores on the index of thought disorder from the other two tests was significant (complete absence of context was more frequent among patients with thought disorder) but only moderately high ($r = 0.28, df = 162, p < 0.001$). The parallel correlations for the schizophrenia patients when considered alone ($r = 0.31, df = 53, p < 0.02$) and for the bipolar mania patients ($r = 0.32, df = 29, p = 0.075$) were similar. The relationship between complete absence of context and thought disorder was similar for the combined sample of schizophrenia and mania patients on neuroleptics ($r = 0.32, df = 59, p = 0.01$), and for those patients not on neuroleptics ($r = 0.43, df = 19, p = 0.055$).

When only the subsample of patients with severe thought disorder from each group was compared (table 2), the three diagnostic groups showed almost no differences on complete absence of context ($F = 0.36, df = 2,46, p > 0.30$).

Eighteen percent of the subsample of schizophrenia patients with severe thought disorder showed at least some signs of complete absence of context, on 2 or more of their 12 responses, as compared to none of the schizophrenia patients without severe thought disorder (Fisher's exact test: $p = 0.05$). Similarly, 21 percent of the bipolar mania patients with severe thought disorder showed some signs of complete absence of context on 2 or more of their 12 responses, as compared to none of the mania patients without severe thought disorder (Fisher’s exact test: $p = 0.08$).

**Straying From the Context.** The relationship between straying from the context on the proverb test and thought disorder as derived from the index of thought disorder from the other two tests was significant ($r = 0.47, df = 162, p < 0.001$). The parallel correlations for the schizophrenia subsample ($r = 0.42, df = 53, p < 0.001$) and for the bipolar mania subsample ($r = 0.51, df = 29, p < 0.005$) were similar. The relationship between straying from the context and thought disorder was also significant for the combined sample of schizophrenia and mania patients who were on neuroleptics ($r = 0.36, df = 59, p < 0.01$) and for those not on neuroleptics ($r = 0.59, df = 19, p < 0.01$).

Tables 3 and 4 report the data on the mean scores and percent of patients who showed some incorporation and use of the external context in their responses but in these same responses also strayed from the context. Patients were more likely to stray from the context while also using part of the context within the same response than they were to completely ignore the context, for the overall sample ($r = 7.55, df = 163, p < 0.001$).

A $3 \times 2$ ANOVA of the data on straying from the context (3 diagnostic groups $\times 2$ levels of thought disorder) found significant main effects for diagnosis ($F = 5.39, df = 2,158, p < 0.01$) and for level of thought disorder ($F = 23.07, df = 1,158, p < 0.001$), with patients with severe thought disorder straying from the context more frequently. There was no significant interaction between diagnostic group and thought disorder ($F = 0.387, df = 2,158$, nonsignificant). Separate comparisons of the three diagnostic groups indicated that mania patients showed significantly more straying from the context than schizophrenia patients ($p < 0.05$). Both the schizophrenia patients and the mania patients showed significantly more straying from the context than the control patients ($p < 0.05$).

When only the patients with severe thought disorder were analyzed using a one-way ANOVA, there were no diagnostic differences in extent of straying from the context ($F = 1.8, df = 2,46, p > 0.15$).

Overall, among the subsample of patients with severe thought disorder, almost 60 percent of the bipolar patients showed strong evidence of their responses partly incorporating and partly straying from the context. However, using Newman Keuls tests, these diagnostic differences were not significant among the subsample of patients with severe thought disorder.

Although a number of the schizophrenia patients with severe thought disorder did not show severe straying from the context (i.e., a score of 6 or higher), most of them (68%) showed evidence of some straying on at least one of their responses. Similarly, 86 percent of the bipolar mania patients with severe thought disorder and 71 percent of the small subsample of control patients with severe thought disorder showed evidence of some straying on at least one of their responses.
Table 3. Scores for overall sample on mixture of both maintenance of context and straying from context

<table>
<thead>
<tr>
<th>Sample</th>
<th>M (SD)</th>
<th>Patients with severe signs of straying from context, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schizophrenia patients (n = 55)</td>
<td>1.40 (0.74)</td>
<td>15</td>
</tr>
<tr>
<td>Bipolar mania patients (n = 31)</td>
<td>1.81 (0.91)</td>
<td>32</td>
</tr>
<tr>
<td>Control patients (n = 78)</td>
<td>1.19 (0.49)</td>
<td>4</td>
</tr>
</tbody>
</table>

Note.—M = mean score; SD = standard deviation.

Table 4. Scores of patients with moderate and severe thought disorder on mixture of both maintenance of context and straying from context

<table>
<thead>
<tr>
<th>Sample</th>
<th>Patients With Moderate Thought Disorder</th>
<th>Patients With Severe Thought Disorder</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD) n</td>
<td>Patients with severe signs of straying from context, %</td>
</tr>
<tr>
<td>Schizophrenia patients</td>
<td>1.30 0.48 10</td>
<td>0</td>
</tr>
<tr>
<td>Bipolar mania patients</td>
<td>1.57 0.79 7</td>
<td>14</td>
</tr>
<tr>
<td>Control patients</td>
<td>1.25 0.58 16</td>
<td>6</td>
</tr>
</tbody>
</table>

Note.—M = mean score; SD = standard deviation.

Discussion

In the field of computational neuroscience, Cohen and Servan-Schreiber have developed an important model of schizophrenic thought disorder that emphasizes the role of context (Servan-Schreiber et al. 1996). They propose that schizophrenia patients have difficulty maintaining internal representations of context and link this to dopamine function in the prefrontal cortex (Cohen and Servan-Schreiber 1992; Servan-Schreiber et al. 1996). They have proposed a thought-provoking outlook in which the context module can be looked at more broadly as one type of cognitive mechanism (Cohen and Servan-Schreiber 1992; Servan-Schreiber et al. 1996).

Views about schizophrenia patients' difficulties in holding context in mind in the absence of overt stimuli, or their inability to maintain context, also have been proposed as involving problems in working memory (Goldman-Rakic 1994). Working memory is important in human cognition and is one of several central features involved in many cognitive functions. However, there are other major aspects of information processing, and working memory is not automatically a central feature of all aspects of pathology involved in cognitive disorders. Some of the hypotheses in this area on thought disorder have been studied using performance tests to assess deficits. Data from other techniques should also be studied in evaluating these hypotheses on thought disorder. The current investigation is one of the first studying context processing, and specific types of loss of context, in schizophrenia in conjunction with tasks that tap thought disorder directly.

The research, employing tasks that allowed direct measures of the overt use of the external context, found data providing mixed support about the centrality of a difficulty in maintaining internal representations of the external context in working memory as the main factor involved in thought disorder in schizophrenia. However, additional analyses are needed before definitive conclusions can be made about the “contextual processing” construct. No single test of an important model is definitive, and other assessments are called for using other verbal techniques and using nonverbal techniques. Thus, difficulty in holding material in mind is probably a major factor in some or many types of performance decrements in schizophrenia. If this is the case, the issue that remains to be solved concerning schizophrenia is which types of performance deficits are closely linked to major problems in holding information in mind.

Complete Absence of Context. The results did not support hypotheses that schizophrenia patients totally ignore the context. Not attending at all to the immediate external
context plays a role for select schizophrenia patients. It was one pathway for patients to show severe thought disorder. However, it was an infrequent pathway.

Older notions that schizophrenia patients show strange thinking and strange behavior because they do not "hear" the external context or do not know what the external context is were not supported. Previous data, derived from other types of tests and studying deviant associations, also have suggested that thought disorder in schizophrenia is not primarily a result of mishearing or misinterpretation of stimuli (Silverstein and Harrow 1980) and also that problems in selective attention that involve being distracted by irrelevant stimuli are not exclusive to schizophrenia (Harrow et al. 1972; Harrow and Quinlan 1985). The data indicate that when schizophrenia patients show thought-disordered responses, they typically are aware of the external context or question they are responding to and use material from some or all of the question in their response.

An example of this can be seen when a 23-year-old female schizophrenia patient with severe thought disorder gave the following thought-disordered response to the proverb "Don't cast pearls before swine." Her answer was "Cast a swirl before a shit." On the one hand, this patient gave a strange, thought-disordered response. However, her response, incorporating the concepts of "cast" and "before," and perhaps substituting the concept of "swirl" or "shit" for "swine," indicated an awareness of the proverb question. Her response used material from the proverb question. In general, the number of schizophrenia patients showing complete ignoring of context was relatively small.

Ignoring the context, or total absence of context, also has been proposed as a feature linked more closely to the psychopathology found in schizophrenia than to the psychopathology found in other patient groups. The results suggest that ignoring the context is more common in schizophrenia patients, but because of its relative infrequency among all diagnostic groups, the schizophrenia patients did not differ significantly from the mania or control patients.

What cognitive processes are involved when a patient's responses seem to totally ignore the external context or proverb question? A number of different factors may be involved. Thus, total ignoring of context by the patient may mean that the patient did not "hear" the context at all, possibly as a result of attending to other stimuli or other events. However, other possibilities may be, or often are, involved. Thus the patient may have "heard" the proverb question but not be able to "hold" it in his or her head or cognitive capacity at the moment; or he or she may be able to hold it in his or her head for a short period but not for a sufficiently sustained period to deal with the question. A third possibility is that the patient heard the proverb, was able to hold the material in his or her head, and used the contextual material as a basis for the response, although the response shows no overt relationship to the original question. In this case, the patient may believe that the strange and seemingly totally unrelated answer is a relevant answer to that particular question. In those cases of seemingly complete absence of context, any of these three possibilities may be relevant for some patients. However, informal interviews of this sample and other data of ours on deviant associations (Gordon et al. 1982) lead us to believe that the third possibility may be the most common of the three potential background contributors.

**Straying From the Context Versus Total Ignoring of Context.** While much previous discussion and research has focused on loss of context as a factor in thought disorder in schizophrenia, a central issue is the type and extent of loss of context in those cases where it is involved. This issue has not been resolved in the past, but the present research provides data bearing on this issue. Straying from the immediate external target context, while within the same response also incorporating part of the immediate external context (i.e., the proverb material), was the most common type of contextual problem evidenced by the mania and schizophrenia patients and significantly more common than total ignoring of the context. The data suggest that patients with thought disorder are more likely to stray from the context than are those without thought disorder, as indicated by the results showing significant correlations between loss of context on one test and thought disorder on other tests, and significantly higher mean scores on straying from the context, based on the results from the ANOVA.

Straying from the context is often involved in thought disorder. However, thought disorder is not just a matter of straying from the context, since a number of patients with thought disorder and thought-disordered responses did not stray from the context. Thus, the data indicating that not all patients with thought disorder show extensive straying from the context and the absolute size of the correlations together indicate that straying is one mechanism, but not the only mechanism, involved in thought disorder.

An example of a thought-disordered response that did not stray from the context can be seen in the response by a 23-year-old mania patient to the proverb, "The wife is the key to the house." His response was "No. She's everything—the body, soul, and spirit. If she could impregnate herself she'd be perfect. She's the master of them all. Like in a beehive, there's only one queen bee."

**The Link Between Straying From the Context and Thought Disorder in Mania and Schizophrenia.** Whatever factors are involved in straying from the con-
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thought disorder can and at times does occur without loss of context, as in the example above. Other types of examples from our data would include the neologisms that occurred, since it is hard to ascribe neologisms to loss of context primarily. Similarly, it is hard to explain some other features such as clang associations, perseverations, and autistic logic as being due solely to straying from the context. One outlook that could fit the data is that thought disorder has several different subcomponents, with some of these being related to disturbances in context processing (e.g., loose associations, derailment) and others not related to straying from the context.

If one uses a working memory model, then during acute episodes with heightened cognitive arousal, mania and schizophrenia patients are more likely to include non-contextual personal material and other irrelevant material in their responses, possibly because a weakened working memory makes it more difficult to hold on line, or hold focus on, the relevant contextual material for a sufficiently long period of time. A second possibility is that constraints and inhibitions diminish for these patients, and as a result other personal material becomes more forceful and can intrude and interfere when working memory is weakened. In this alternative, the problem in straying from the context for mania and schizophrenia patients would be a consequence of a combination of both a weakened working memory and strong pushes from other, less relevant, material that intrudes and interferes.

A third possibility is that for some mania and schizophrenia patients with thought disorder (and possibly to an even greater extent for normals) working memory is not impaired, but during periods of upset and heightened cognitive arousal, inhibitory processes are weakened and other noncontextual material, especially emotional material, becomes more dominant and is more likely to intrude into working memory. The mixed response results from the strong tendency during heightened cognitive arousal for internal material to intrude more forcefully into an adequate or normal working memory. The response then often includes a mixture of both the external contextual material and personal or other emotional material that is not directly relevant to the external context but that has intruded into working memory.

While the data that may be related to holding information on line in working memory show some mixed and some positive results, working memory is viewed by many as involving both holding material on line and processing material (Baddeley and Hitch 1974; Goldman-Rakic 1987; Baddeley 1988). Impaired working memory could play a major role in thought disorder through difficulties in processing context, integrating it with relevant aspects of stored knowledge or long-term memory, and inhibiting noncontextual material. Several views that relate straying from the context to impaired processing are possible, including the outlook that straying is a result of contextual processing deficits, with the test context failing to serve as an “inhibitory frame” for response selection.

In addition, while dorsolateral prefrontal cortex (DLPFC) systems and working memory are emphasized by many, to provide a balanced account, it should be noted that there is evidence that temporal lobe systems may be involved in thought disorder and other positive symptoms, according to data from Shenton, Wible, McCarley, and colleagues (Shenton et al. 1992; Wible et al. 1995) and others (Breier et al. 1992; Barta et al. 1997; Buckley 1998). Also, Wernicke’s aphasia involves impairment in language comprehension and on occasion even neologisms, again suggesting the possible involvement of temporal lobe functioning. It is probable that systems from multiple areas are involved in complex disturbances such as thought disorder and psychosis.

Straying From the Context and Associative Processes: A Theoretical View. The data on straying from the context in many severely thought-disordered responses from the current research could fit in with a theoretical viewpoint advanced previously about the influence of heightened cognitive arousal during acute or active stages of disorder (Gjerde 1983; Harrow et al. 1989). In the view we have proposed, during heightened cognitive arousal, material from the patient’s affective or emotional life becomes more dominant and enters into and merges with the patient’s overall set (Shakow 1962), or attentional focus, which normally guides the direction of associative activity (Jobe and Harrow, 2000), with this often leading to thought disorder in schizophrenia and mania. This interference with the guiding set or attentional focus can result in a new set or focus containing a mixture of material from the external context and material from the patient’s internal emotional life (possibly amygdaloid-driven material), with this new focus influencing the direction of associations and leading to straying from the context and idiosyncratic associations.

In general, arousal systems in the brains of normals, and their connection to emotional life, have been subject to considerable discussion (Thayer 1989; Gallagher and Holland 1994; LeDoux 1995) and to empirical research (Thayer 1989; Kapp et al. 1992; LeDoux 1996). In addition, arousal has been studied in schizophrenia in the past (Venables 1977) and is currently being studied in relation
to other modern models of schizophrenia and schizotypy (e.g., Gruzelier and Doig 1996).

In regard to the current results on straying from the context, the data indicated that schizophrenia patients do not stray from the context more than mania patients. Rather, the mania patients tended to show more straying from the context, although at least some straying from the context was also found among the majority of schizophrenia patients with thought disorder. The large amount of straying from the context by many mania patients, even though there is as much idiosyncratic thinking or thought disorder by schizophrenia patients, is in accord with the two-factor associative view we have proposed. In this associative view, both thought disorder and straying from the context are linked (1) to deviant or idiosyncratic associations resulting from a shift in the overall set or attentional focus that normally provides directional guidance to a person's associative activity, and (2) to a lesser extent to excessive associative activity.

In terms of diagnostic groups that most frequently manifest thought disorder, acute mania patients show both considerably more associative activity, or excessive associative activity (in the current research they tend to show more straying), and somewhat more idiosyncratic associations. Most acute schizophrenia patients do not show excessive associative activity, but many show considerably more idiosyncratic associations (linked to a shift in the overall set or attentional focus that guides associative activity). Each of these two different constellations can lead to straying from the context and to thought disorder, although idiosyncratic associations resulting from a shift in the overall guiding set is the most important factor.

Increased cognitive arousal, or cognitive overload, also may lead to a more diffuse and less precise spread of activation of neural networks or sets of nodes, including activation of only peripherally relevant sets of nodes that are not as closely linked to the external context (Plagnol et al. 1996; Port et al. 1997). This can result in less efficient spread from semantic associative networks, in less precision in finding, combining, and coordinating conceptual material from different nodes in the head, and in more confused and disorganized responses (Silverstein et al. 2000). Often both (1) the disruption or altering of sets and (2) the less precise spread of activation occur in the same responses.

In accord with the overall view emphasizing that during heightened cognitive arousal patients' affective lives are more likely to interfere with their guiding set and its influence on the direction of their associations, other research by our group has suggested that the seemingly deviant or idiosyncratic associations by schizophrenia and mania patients are not random. Rather, they often involve intermingling of personal affective material and are based on a rationale that usually makes sense to the patient (Harrow and Prosen 1979; Gordon et al. 1982; Harrow et al. 1983).

Other factors involved in loss of context include disorganization-confusion and impaired monitoring of one's own responses, or impaired self-monitoring (Frith and Done 1988; Harrow et al. 1989; Frith 1995). During heightened cognitive arousal, self-monitoring, which is based on the effective use of long-term memory, becomes less effective for both patients and normal people, partly due to the influence of current affective life on stored knowledge (e.g., when normals argue vehemently with loved ones, their self-monitoring also becomes poorer). The impaired self-monitoring is a consequence of ineffective use of knowledge stored in long-term memory, including standards about what types of behavior are socially inappropriate (Harrow et al. 1989). The effective use of stored knowledge or long-term memory about what types of behaviors are socially appropriate helps inhibit inappropriate behavior, guides responses, and keeps people "on track" in terms of the immediate external context (Harrow et al. 1989; Harrow and Silverstein 1991; Frith 1995).

References


Breier, A.; Buchanan, R.W.; Elkashef, A.; Munson, R.C.; Kirkpatrick, B.; and Gellad, F. Brain morphology and


Silverstein, S.M.; Kovacs, I.; Corry, R.; and Valone, C. Perceptual organization, the disorganization syndrome, and context processing in chronic schizophrenia. Schizophrenia Research, 43:11–20, 2000.


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