Verbal Learning and Memory in Schizotypal Personality Disorder

by Andrea J. Bergman, Philip D. Harvey, Sonia Lees Roitman, Richard C. Mohs, Dova Marder, Jeremy M. Silverman, and Larry J. Siever

Abstract

The investigation of cognitive deficits in patients with schizotypal personality disorder (SPD) is important both to establish commonalities between SPD and schizophrenia and to clarify the significance of these cognitive deficits for schizophrenic disorders. The purpose of this study was to examine verbal learning and memory with the California Verbal Learning Test (CVLT) in a group of patients with SPD (n = 24) and a group of patients with personality disorders other than SPD (OPD; n = 25). The results indicated that SPD patients learned significantly fewer words with practice on the CVLT than OPD patients (F = 4.32, df = 1,47, p < 0.05), and their rate of learning was reduced relative to normative standards. These findings suggest that SPD patients have a deficit in verbal learning that is similar to, although not as severe as, the impairments seen in schizophrenia.

Key words: Schizotypal personality disorder, verbal learning, memory.


Deficits in cognitive functioning have been one of the most consistent findings in research on schizophrenia. The potential etiological implications of these deficits, however, are often obscured by confounds such as long-term neuroleptic treatment, negative and psychotic symptoms, and chronic hospitalization. Schizotypal personality disorder (SPD) offers an opportunity to minimize these potential artifacts associated with the study of chronic schizophrenia.

Learning and memory are one domain of cognitive functioning that has been consistently implicated in schizophrenia. Deficits in memory have been reported in patients with schizophrenia relative to normal controls (e.g., Saykin et al. 1991), relative to subjects with affective disturbances (Landro et al. 1993), and relative to the patients’ own concurrent overall intelligence level (Gold et al. 1992; Tamlyn et al. 1992). Studies of memory impairments have found deficient performance in verbal (Calev 1984; Paulsen et al. 1995) and spatial (Heaton et al. 1994) learning, recall, and recognition performance. More specific difficulties have included reduced rate of learning (Guzelik et al. 1988), poor spontaneous utilization of encoding strategies (Harvey et al. 1986; Gold et al. 1992), and rapid forgetting (Calev et al. 1983). It has been argued that there are distinct patterns of memory impairment for patients with different levels of symptom severity and chronicity of illness. Calev et al. (1983) found chronic schizophrenia subjects to have a postencoding deficit (associated with later stages of processing such as memory loss and retrieval deficits) in addition to an encoding deficit (associated with early stages of processing involved in entering of information prior to memory consolidation) that is found in both acute and chronic schizophrenia patients. In contrast, using clinical neuropsychological measures, Saykin et al. (1994) found that acute and chronic patients were essentially indistinguishable in their impaired learning performance. Recent research has suggested that deficits in recall memory are the strongest correlates of global cognitive impairment measured by the Mini-Mental State Exam (Folstein et al. 1975) from a neuropsychological battery in chronically hospitalized geriatric schizophrenia patients (Harvey et al. 1996). Magnetic resonance imaging studies of schizophrenia patients have indicated that decreases in the volume of specific temporal lobe regions may be associated with greater verbal memory impairment. These studies link deficits in verbal learning with abnormalities of brain structure (Nestor et al. 1993).

There have been relatively few studies of memory functioning in the schizophrenia spectrum. Reductions in verbal learning have been reported in subjects with SPD (Thaker et al. 1991; Voglmaier et al. 1994). For example, Voglmaier et al. (1994) found that patients with SPD...
tested with the California Verbal Learning Test (CVLT; Delis et al. 1987) performed worse than normal control subjects on the first trial of the test and used less semantic clustering than the normal group. However, the SPD patients’ learning rate and the proportion of successfully learned information that they retained at delayed recall were similar to those of the control group. These preliminary data implicate either a deficit in the initial focusing of attention on the material to be acquired or a reduced primary memory capacity, but do not suggest that rate of learning is impaired in SPD to the degree observed in schizophrenia patients (Heaton et al. 1994).

While there is some evidence indicating deficits in verbal memory for subjects with SPD compared to normal control subjects, few studies with reasonable sample sizes have compared clinically identified SPD patients with patients with other personality disorders (OPDs). Patient controls are necessary to establish deficits specific to the schizophrenia spectrum as opposed to nonspecific deficits associated with personality disorders in general. In addition, the previous research using the CVLT did not use the normative data provided in the CVLT Research Edition (Delis et al. 1987) to calculate standard scores based on an extensive normative sample. Use of the CVLT norms allows a comparison of an individual’s CVLT scores and the scores of a sample of normal individuals of similar age and sex. The CVLT standardization sample appears to be high functioning and requires cautious clinical interpretation of standardized scores (Randolph et al. 1994). Nevertheless, the use of standardized scores for research purposes provides age and gender corrected scores that have been used in previous studies of schizophrenia (Paulsen et al. 1995). The purpose of the current study was to investigate verbal learning and memory as measured by the CVLT in patients with SPD compared with patients with personality disorders unrelated to SPD.

Methods

Subjects. All patients participated in this study as part of an ongoing program of research on mood and personality disorders. They were recruited from the outpatient and inpatient clinics of the Bronx Veterans Affairs Medical Center and Mount Sinai Hospital or were referred to the program by local practitioners. The sample consisted of 49 patients who provided informed consent before testing. Of the 49 patients, 24 (15 males, 9 females) met DSM-III (American Psychiatric Association 1980) criteria for SPD and 25 (13 males and 12 females) met DSM-III criteria for personality disorders other than SPD, schizoid personality disorder, or paranoid personality disorder. The specific diagnoses for the OPD group are listed in table 1. The mean age for the SPD group was 35.91 years (standard deviation [SD] = 10.71) and for the OPD group was 39.00 years (SD = 9.99); the difference in age between the two groups was not statistically significant. Although all patients were tested while free of medication, many patients had a history of medication use: 23 had taken antidepressants, 9 had taken antipsychotics, and 21 had taken other medications. The mean number of days free from antipsychotic medication was 328 days (SD = 328.55); the minimum was 14 days.

All subjects underwent a medical screening, including physical examination, x-ray films, blood chemistry, hematologic indices, thyroid function tests, and review by an internist. The purpose of the screening was to rule out subjects with medical illness.

Diagnostic Assessment. Axis I diagnoses for the patients were generated using Research Diagnostic Criteria (RDC; Spitzer et al. 1978a) and the Schedule for Affective Disorders and Schizophrenia (Spitzer et al. 1978b; K = 1.00 for schizophrenia). Patients meeting RDC or DSM-III Axis I criteria for the major psychiatric syndromes (except major depressive disorder [MDD]) either current or past, current substance abuse, or any history of substance dependence were excluded from the study. Thirty-five patients met criteria, either current or past, for MDD. A diagnosis of MDD was related to group ($\chi^2 = 3.95$, df = 1, $p = 0.047$) such that the OPD group had a higher percentage of patients diagnosed with MDD (43%) than the SPD group (29%). All 49 patients were interviewed with the Schedule for Interviewing DSM-III Personality Disorders (SIDP; Pfahl et al. 1982) by one or two raters ($K = 0.73$ for SPD, $n = 59$). When possible, one of these raters also interviewed an informant close to the patient. Final consensus personality disorder diagnoses were determined in a meeting of all raters with an expert clinician, according to DSM-III criteria. Because this program of research was initiated before the publication of DSM-III-R (American Psychiatric Association 1987), the

### Table 1. Diagnoses of other personality disorder (OPD) patients

<table>
<thead>
<tr>
<th>Personality Disorder</th>
<th>Count</th>
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<tbody>
<tr>
<td>Borderline</td>
<td>9</td>
</tr>
<tr>
<td>Histrionic</td>
<td>9</td>
</tr>
<tr>
<td>Compulsive</td>
<td>7</td>
</tr>
<tr>
<td>Mixed</td>
<td>4</td>
</tr>
<tr>
<td>Antisocial</td>
<td>3</td>
</tr>
<tr>
<td>Avoidant</td>
<td>3</td>
</tr>
<tr>
<td>Passive-aggressive</td>
<td>1</td>
</tr>
<tr>
<td>Dependent</td>
<td>0</td>
</tr>
<tr>
<td>Narcissistic</td>
<td>0</td>
</tr>
</tbody>
</table>

Note.—Nine patients received more than one DSM-III personality disorder diagnosis. DSM-III = Diagnostic and Statistical Manual of Mental Disorders, 3rd ed. (American Psychiatric Association 1980).
Recalled, the clustering ratio scores were converted to percentages by dividing the cluster score by the number of words learned over the five trials. For retention, analyses included trial 5 and long delay free recall, and then a measure of recognition memory/discriminability, which takes into account both hits and false alarms. All analyses involving trial 1, trial 5, total of 1-5, and long delay free recall were conducted in two ways: one analysis used the raw scores and the other involved standard scores based on the norms provided in the CVLT manual (research edition). This analysis was conducted because no normal control group was used in the current study. The analyses of the raw scores provide a direct comparison between the two patient groups, and the analyses of the standard scores indicate how each of the patient groups performed relative to the normative data published in the manual, which is based on a nonclinical “reference group” of 273 neurologically intact individuals (Delis et al. 1987).

Semantic clustering ratio scores were computed using the standard method of scoring one point for every pair of successively recalled words from any of the four semantic categories. This score is then compared with the expected score based on chance (Delis et al. 1987). Because the amount of clustering was limited by the number of words recalled, the clustering ratio scores were converted to percentages by dividing the cluster score by the number of correctly recalled words.

Results

The means and SDs for CVLT performance for the SPD and OPD groups are presented in table 2.

Verbal Learning. The first analysis was a repeated measures analysis of variance. The independent variables were group (SPD, OPD) and learning trial (trial 1 and trial 5) and the dependent variables were the number of words recalled. Two analyses were conducted: one using raw scores as the dependent measure and the other using standard scores. There was a significant main effect for group for both the analysis using raw scores (F = 5.35, df = 1.47, p = 0.025) and the analysis using standard scores (F = 6.98, df = 1.47, p = 0.011), indicating that the SPD group performed worse than the OPD group. There was also a significant main effect for learning trial for raw scores (F = 335.35, df = 1.47, p < 0.001), indicating that all subjects displayed learning over the trials, and for standard scores (F = 10.46, df = 1.47, p = 0.002), indicating changes in performance over trials relative to the standardization sample. Finally, the group X trial interaction was not significant with raw scores as the dependent measure, but it was significant with standard scores (F = 4.25, df = 1.47, p = 0.045). These findings indicate that, when compared with normative data, the SPD group differed from the OPD group both in baseline performance on trial 1 and cumulative learning over time (see figure 1).

In addition, t tests for independent samples were conducted to examine group differences in the total number of words learned over the five trials, using both raw scores and standardized scores (the CVLT manual provides only t scores for total words learned so these t scores were converted to z scores). The results indicated that the SPD group learned fewer total words than the OPD group with both raw score (t = 2.39, df = 47, p = 0.021) and standard score (t = 2.60, df = 47, p = 0.012) dependent measures.

Retention. The retention performance of the SPD and OPD groups was examined with a repeated measures analysis of variance. The independent variables were group (SPD, OPD) and condition (trial 5 and long delay).
free recall), and the dependent variables were the total number of words recalled. The long delay score was used instead of the short delay score because the correlation between the two was very high ($r = 0.94$) and because long delay is a better measure of retention. Two analyses were again conducted: one using raw scores as the dependent measure and the other using standard scores. At long delay free recall, the SPD patients retained 88.24 percent and the OPD patients retained 90.05 percent of the information learned by trial 5. There was a significant main effect for group for the analysis using standard scores ($F = 5.75$, $df = 1,47$, $p = 0.02$), indicating that the SPD group performed worse over both trials than the OPD group. There was also a significant main effect for condition using raw scores ($F = 22.26$, $df = 1,47$, $p < 0.001$), indicating that subjects recalled fewer words after the delay, and standard scores ($F = 5.77$, $df = 1,47$, $p = 0.02$), reflecting a general improvement in standard scores from trial 5 to long delay free recall (see figure 1). The group $\times$ trial interaction was not, however, significant with either raw scores or standard scores.

Group differences in recognition memory were examined using a $t$ test for independent samples with the discriminability index as the dependent variable. The results indicated that the two groups did not differ significantly on recognition discriminability ($t = -1.78$, $df = 47$, $p = 0.08$). The lack of statistical significance could, however, be a result of limited power as the above analysis indicated a medium effect size of 0.51.

**Semantic Clustering.** To examine group differences in clustering, a $t$ test for independent samples was conducted with the percent clustering scores. The results indicated that the groups did not differ significantly in clustering ($t = 0.24$, $df = 47$, $p = 0.81$).

**Additional Analyses.** Some additional analyses were conducted to address a number of issues. To examine the specificity of the results to SPD, three repeated measures analyses were conducted with groups of patients diagnosed with the OPDs represented in the sample: a subgroup of patients meeting *DSM–III* diagnosis for borderline personality disorder (BPD; $n = 16$) versus non-BPD patients ($n = 33$), a subgroup of patients meeting *DSM–III* diagnosis for histrionic personality disorder (HPD; $n = 15$) versus non-HPD patients ($n = 34$), and a subgroup of patients meeting *DSM–III* criteria for MDD ($n = 35$) versus non-MDD patients ($n = 14$). (These analyses were not independent because some patients had more than one diagnosis.) There were no significant group differences for any of the analyses. In addition, group differences were examined for those patients with a history of using antipsychotic medications, antidepressant medications, and other medications, examined in separate analyses, and no group differences on any CVLT variable (trial 1, trial 5, and long delay free recall) were found.

Analyses were also conducted to explore the relationship between verbal learning and symptoms of SPD. Siever and Gunderson (1983) and Widiger et al. (1986) have conceptualized schizotypal symptoms using two dimensions: a cognitive-perceptual distortion dimension

### Table 2. Verbal learning performance: Means (standard deviations) for CVLT scores

<table>
<thead>
<tr>
<th></th>
<th>CVLT Trial 1</th>
<th>CVLT Trial 5</th>
<th>CVLT Total 1–5</th>
<th>CVLT Short delay</th>
<th>CVLT Long delay</th>
<th>Recognition/discrimination</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPD $n = 24$</td>
<td>6.38 (2.12)</td>
<td>11.17 (2.84)</td>
<td>46.00 (12.19)</td>
<td>9.96 (3.43)</td>
<td>9.96 (3.36)</td>
<td>89.88 (8.36)</td>
</tr>
<tr>
<td>OPD $n = 25$</td>
<td>7.76 (2.20)</td>
<td>12.88 (2.85)</td>
<td>54.56 (12.80)</td>
<td>11.68 (2.98)</td>
<td>11.68 (3.54)</td>
<td>93.60 (6.13)</td>
</tr>
</tbody>
</table>

*Note.—SPD = schizotypal personality disorder patients; OPD = other personality disorder patients. CVLT = California Verbal Learning Test Manual–Research Edition (Delis et al. 1987).*
(odd speech, ideas of reference, suspiciousness, magical thinking, illusions) and an interpersonal/deficit dimension (social isolation, poor rapport, hypersensitivity). Previous research has also uncovered a three-factor structure of SPD symptoms (Bergman et al. 1996), including a paranoid dimension (ideas of reference, suspiciousness, and hypersensitivity) as well as cognitive-perceptual distortion (magical thinking, illusions) and interpersonal/deficit (social isolation, odd speech, poor rapport) dimensions. Pearson product-moment correlation coefficients were calculated between the scores on the above dimensions, based on SIDP ratings of DSM–III criteria, and the CVLT trials 1–5 total learning score (total words learned over the five trials). Using only two dimensions, the correlation between the CVLT total learning score and cognitive/perceptual distortion was significant ($r = -0.46, p = 0.001$). This indicates that the greater the ratings for the cognitive/perceptual distortion dimension, the poorer the performance (fewer words learned) on the CVLT. In contrast, the correlation between the interpersonal/deficit dimension and CVLT total score was not significant ($r = -0.14, p = 0.351$). When three dimensions were correlated with the CVLT total learning score, the correlations were as follows: $r = -0.30, p = 0.039$ for cognitive/perceptual distortion; $r = -0.35, p = 0.013$ for paranoid; and $r = -0.26, p = 0.069$ for interpersonal/deficit.

Finally, to examine the possible effects of current affective state on performance of the CVLT, Pearson product-moment correlation coefficients were used to examine the associations among the affective state variables (BDI, STAI) and CVLT performance. Results of these analyses indicated no significant associations between any of these variables; all correlations between the state measures and the CVLT scores ranged from $-0.16$ to $0.14$.

**Discussion**

The purpose of the present study was to examine verbal learning and memory in SPD patients as compared with a group of OPD patients. The results indicated that SPD patients learned fewer words than OPD patients on the CVLT. The group × trial interaction for standardized scores indicates that, when compared to normative data, SPD patients learned information at a slower rate over trials than OPD patients did. In addition, with respect to total words learned over the five trials, the patients with SPD learned fewer total words than the patients with OPD. The results also indicated that SPD patients had comparable rates of retention compared with OPD patients, as illustrated by the nonsignificant group × trial interaction for this analysis. Thus, the reduced performance of the SPD group on the CVLT appears to be the result of deficits in initial encoding and serial verbal learning, with no deficits in retention of information successfully learned.

These results are consistent with previous CVLT results comparing SPD patients with normal controls in that SPD subjects remembered fewer words. In the previous study, however, their rate of learning was the same as the normal controls’ (Vogtmaier et al. 1994). The deficits displayed by SPD subjects in that study appeared to be a result of reduced encoding (e.g., entering of information prior to memory consolidation), rather than rapid memory loss. In the present study, the use of standardized scores indicated that rates of learning in SPD patients differed from available norms while OPD patients displayed rates of learning similar to the norms, as illustrated by their mean standard scores close to zero (see figure 1).

The findings of the present study are also consistent with previous research in schizophrenia, although patients with schizophrenia have demonstrated more extensive deficits in both verbal learning and memory. Schizophrenia patients have consistently demonstrated extensive deficits in memory (Saykin et al. 1991; Gold et al. 1992; Tamlyn et al. 1992) that are more severe than those reported for SPD patients in the present study. For example, some schizophrenia patients have also shown problems of rapid forgetting (Calev et al. 1983; Sengel and Lovallo 1983) as well as slow rates of learning (Gruzelier et al. 1988). However, most of the research has suggested that schizophrenia patients may not have problems of rapid forgetting, especially on the CVLT (Paulsen et al. 1995) and that chronic, poor-outcome patients are more likely to have postencoding deficits (Calev et al. 1983).

The present findings should be considered in light of the limitations of the study. First of all, there was no normal control group, although standardized scores were computed based on normative data. In addition, only one clinical neuropsychological memory test, the CVLT, was used. Thus, it was not possible to determine directly whether verbal learning deficits were related to attentional limitations. This issue has been dealt with more directly in schizophrenia research, with some researchers concluding that memory failures are a result of dysfunction of the memory system rather than a limitation of attentional capacity (Gold et al. 1992). The CVLT assesses multiple aspects of memory. Some of the memory functions assessed with the CVLT, such as retention and clustering, were not disturbed in the SPD patients. This suggests that SPD patients have relatively focal deficits in verbal learning. In another study, SPD patients (many of whom participated in the current study), when compared to normal volunteers and OPD patients, also performed more poorly.
on tasks involving executive functions such as the Wisconsin Card Sorting Task (Heaton et al. 1993), which are sensitive to frontal dysfunction (Trestman et al. 1995). The SPD patients did not, however, show deficits on tests of general intellectual functioning or on neuropsychological tests sensitive to posterior cortical dysfunction. These results collectively suggest that SPD patients show relatively specific impairments in some aspects of verbal learning and memory as well as executive functions.

In conclusion, the results of the present study provide further support for the notion that SPD is at the milder end of the schizophrenia spectrum. Previous research indicates that schizophrenia patients display extensive deficits in memory. The findings of this study demonstrate that SPD patients have deficits in the initial stages of encoding and that they do not overcome this deficit with multiple exposures, resulting in lowered rates of learning. The commonalities between schizophrenia and SPD suggest a core impairment in verbal learning associated with cognitive/perceptual distortion, which is evident in patients without the more severe form of the schizophrenia syndrome. Future studies with this population may uncover the neurological underpinnings of these core deficits, shedding light on the pathophysiology of schizophrenia.

References


Randolph, C.; Gold, J.M.; Kozora, E.; Cullum, C.M.; Hermann, B.P.; and Wyler, A.R. Estimating memory func-


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