Published in final edited form as:

J Nerv Ment Dis. 2003 May ; 191(5): 300–308.

Correlates of Substance Use Disorder among Psychiatric Outpatients: Focus on Cognition, Social Role Functioning and Psychiatric Status

Kate B. Carey, Ph.D., Michael P. Carey, Ph.D., and Jeffrey S. Simons, Ph.D.

Center for Health and Behavior Syracuse University

Abstract

This study compared psychiatric outpatients who were never, former, and current substance abusers on psychiatric, social, and cognitive functioning. Fifty-six outpatients with schizophrenia-spectrum and bipolar disorders volunteered to complete diagnostic and social role function interviews, self-report inventories, and neuropsychological tests. Multinomial logit regression analyses indicated that current and former abusers reported greater subjective feelings of distress than those who never abused. Contrary to expectations, however, both groups of substance abusers performed better on non-verbal cognitive tests compared to those who never abused. Differences in social functioning were also observed: former abusers demonstrated better instrumental role functioning than those who never abused. This pattern of findings challenges assumptions about additive effects of comorbid disorders on cognitive and social functioning.

Keywords

schizophrenia; substance abuse; psychiatric distress; cognitive function; social function

Persons living with a severe and persistent mental illness (SPMI; e.g., schizophrenia, bipolar disorder) often abuse alcohol or other drugs. At least 20% of all persons diagnosed with a SPMI have a current substance use disorder (SUD), and approximately 50% meet criteria for a SUD during their life (Regier et al., 1990). This comorbidity warrants greater attention because both classes of disorders are associated with pervasive impairment.

Persons living with a SPMI routinely experience impairment in cognitive and social domains. For example, schizophrenia is often associated with a generalized pattern of cognitive deficits, including impairments in attention, memory, abstract thinking, problem solving, and tasks involving effortful processing (e.g., Braff, 1993; Saykin et al., 1991). Such impairment predates experience with neuroleptic or other treatments; however, considerable variability exists among patients with schizophrenia on neuropsychological tests (Mohamed, Paulsen, O'Leary, Arndt, & Andreasen, 1999; Saykin et al., 1994). Similarly, bipolar patients also demonstrate deficits in attention, learning and memory, especially during manic phases of the illness (Martinez-Aran et al., 2000; Murphy & Sahakian, 2001). Social/occupational dysfunction is a necessary criterion for diagnosis of both schizophrenia and bipolar disorder (Diagnostic and Statistical Manual of Mental Disorders [DSM-IV], American Psychiatric Association [APA], 1994), and often includes impaired ability to perform expected role functions in the community. In particular, persons with schizophrenia experience stable and pervasive social skill deficits (e.g., Mueser, Bellack, Douglas, & Morrison, 1991). Social impairment, in turn, has been

consistently associated with information processing deficits (especially verbal memory, vigilance, and executive function) (Green, 1996; Liddle, 2000).

Substance use disorders also engender cognitive, social, and psychiatric problems. Prolonged abuse of alcohol is associated with impairment in abstraction, problem solving, memory, and perceptual-motor tasks (Chelune & Parker, 1981; Evert & Oscar-Berman, 1995). Polydrug abuse, especially the use of opiates and depressant drugs, also compromises cognitive function (Grant & Reed, 1985). Related social impairment includes family, occupational, health, and legal problems (APA, 1994). Abuse of alcohol and drugs also increases negative affect and psychiatric symptoms even in the absence of a co-occurring SPMI (Schuckit, 2000). It follows, then, that persons dually diagnosed with both a SPMI and a SUD should experience increased cognitive, social, and psychiatric impairment relative to patients diagnosed only with a SPMI.

A growing number of studies document the impairment characteristic of dually diagnosed patients. With regard to psychiatric symptoms, persons with both a psychiatric disorder and an active SUD report more depression and suicidal ideation (Kay, Kalathara, & Meinzer, 1989; Ries, Mullen, & Cox, 1994), exhibit more problems with anger and emotion control (Barry et al., 1996), and may experience more delusions and hallucinations (Negrete, Knapp, Douglass, & Smith, 1986). The presence of a concurrent SUD is associated with social dysfunction such as homelessness (Drake, Osher, & Wallach, 1989), legal and financial problems (Barry et al., 1996; Rosen & Rosenheck, 1999), violent behavior (Steadman et al., 1998), and lower quality of life (Addington & Addington, 1997). However, conflicting results have been reported with regard to social competence; some investigators have found that, among psychiatric inpatients, substance abusers demonstrated fewer negative symptoms, and less behavioral disorganization (e.g., Buckley, Thompson, Way, & Meltzer, 1994; Dixon, Haas, Weiden, Sweeney, & Frances, 1991).

Concern has been expressed regarding the role that cognitive deficits play in the clinical presentation of dually diagnosed persons (Tracy, Josiassen, & Bellack, 1995). However, only a few empirical investigations of cognitive function among dually diagnosed patients are available, and methodological flaws limit the confidence in their findings. Two investigations (Cleghorn et al., 1991; Nixon, Hallford, & Tivis, 1996) conflated lifetime and current SUDs in their dually diagnosed samples, and neither found differences on a battery of neuropsychological tests between schizophrenia patients with and without SUDs. Other investigations (Addington & Addington, 1997; Cooper et al., 1999; Serper, Copersino, Richarme, Vadhan, & Cancro, 2000) compared schizophrenic patients with and without current SUDs; however, persons with a history of SUD were allowed in the samples of nonabusers. Serper et al. (2000) found differences between groups only on memory but not in other cognitive domains; in other studies, no differences were observed on cognitive functioning (Addington & Addington, 1997; Cooper et al., 1999). Sevy, Kay, Opler, and van Praag (1990) compared inpatients with schizophrenia with and without a history of cocaine abuse on cognitive tests. However, their findings are difficult to interpret, because most of the cocaine abusers also abused alcohol and other drugs, and a majority of the non-cocaine group had a history of alcohol abuse. Thus, the investigations that have compared schizophrenia patients with and without SUD on measures of cognitive status have not found the expected additive differences. Interpretation of this literature is challenging because investigators have conflated current and former SUDs, or combined those with former SUDs and those who never met SUD criteria. The practice of combining former abusers with active abusers or those who never abused may obscure important differences among them.

Only one of the studies published to date has included measures of cognitive, social, and psychiatric functioning on the same sample (Addington & Addington, 1997), and this study did not use multivariate analyses. Given the covariation among these domains (e.g., Liddle,

2000; Miklowitz, Goldstein, Nuechterlein, Snyder, & Mintz, 1988; Nuechterlein & Dawson, 1984; Penn, Corrigan, Bentall, Racenstein, & Newman, 1997), it is difficult to discern the unique associations of cognitive, social, and symptom measures with substance abuse status. Studies that address all three domains simultaneously -- while controlling for one another -- are needed.

The purpose of this study was to determine the extent to which variables representing cognitive function, social role function, and psychiatric status are related to SUDs among outpatients diagnosed with a SPMI. Based on previous research, we predict that current abusers will exhibit more symptoms than either of the other two groups. We made no specific predictions with regard to differences in social role function and cognitive function in light of mixed findings in the literature. To improve upon previous research, we (a) distinguish among never, former, and current abusers, using DSM-III-R diagnoses and a six-month remission criterion; (b) establish group membership carefully based on structured clinical interviews; (c) report data on an extensive battery of validated cognitive tests; and (d) use an analytic strategy that controls for common variance and identifies the unique predictive ability of each variable.

Methods

Participants

Participants were 56 outpatients (77% male) at a public psychiatric hospital. Mean age of participants was 38.2 ($SD = 8.6$). Eighty-six percent were Caucasian, 11% African-American, 2% Asian-American, and 2% Hispanic. Most were unmarried (93%) and unemployed during the last three years (63%); 92% received a pension for psychiatric disability.

Primary diagnosis was established using the Structured Clinical Interview for DSM-III-R, Patient Version (SCID-P; Spitzer, Williams, Gibbon & First, 1990), conducted by a doctoral-level clinical psychologist. In order to evaluate inter-rater reliability, an interviewer-observer procedure was used; that is, a second doctoral-level psychologist independently scored 25% of the interviews. The kappa coefficient for primary diagnosis was 1.0. The majority of participants had a primary diagnosis of schizophrenia (64%), and the remainder received diagnoses of bipolar disorder (29%) or schizoaffective disorder (7%). Nearly all participants were taking psychiatric medications (95%), and all had a history of psychiatric hospitalization ($M=10.1$ admissions, $SD=10.4$). Mean Global Assessment of Functioning (GAF) score was 48.5 ($SD=10.4$), indicating serious symptoms and/or serious impairment in social/occupational function.

Substance use disorders were also determined by SCID-P. Fifteen (27%) met criteria for abuse or dependence within the last six months ("current abusers"); twenty-six (46%) had a lifetime abuse or dependence diagnosis, but full criteria were not met in the last six months ("former abusers"); and fifteen (27%) did not meet criteria for a lifetime abuse or dependence ("never abusers"). The kappa of 1.0 for SUD classifications again reflected perfect agreement. Specific lifetime SUDs (combining abuse and dependence) were: alcohol, 57%; cannabis, 48%; cocaine, 14%; stimulants, 27%; sedatives, 13%; opiates, 9%, hallucinogens, 20%; polydrug, 16%, and other, 7%. Percentages sum to > 100% due to multiple diagnoses assigned to patients.

Measures

Four domains of functioning were assessed. Substance abuse measures served to validate the diagnostic distinctions between current, former, and never substance abusers. Psychiatric indices served to describe the sample, and to differentiate the groups. Social and cognitive variables were used exclusively to differentiate the groups.

Substance abuse—Four self-report variables corroborated substance abuse group membership. First, the 25-item Michigan Alcoholism Screening Test (MAST; Selzer, 1971) assessed the severity of alcohol-related problems over the lifetime. The MAST is internally consistent ($\alpha = .92$ in this sample) and temporally stable ($r = .95$ over one week); the MAST discriminates between known groups of psychiatric outpatients with and without alcohol use disorders (Teitelbaum & Carey, 2000). Second, the 20-item Drug Abuse Screening Test (DAST; Skinner, 1982) indicates severity of drug use consequences in the last year. With psychiatric outpatients, the DAST is internally consistent ($\alpha = .91$ in this sample) and temporally stable ($r = .78$ over two weeks); both convergent and criterion evidence for validity of the DAST have been reported (Cocco & Carey, 1998). Third, participants reported how much money they spent in the last month on alcohol and other drugs. Because of severe skew, this variable was dichotomized into \$10 or less and more than \$10, reflecting a natural break in the distribution. Finally, participants indicated how many days since they had used alcohol or other drugs; an indicator variable was created to represent use in the last month.

Psychiatric status—Two variables from the SCID-P interview provided descriptive information regarding psychiatric treatment history: age of first psychiatric hospitalization and number of previous hospitalizations. Two additional measures of psychiatric status served to differentiate groups. First, the Global Severity Index (GSI) from the Symptom Checklist Revised (Derogatis, 1983) was used to determine self-reported psychological distress. The GSI is reliable and has demonstrated convergent, discriminant, and construct validity in general (Derogatis & Cleary, 1977), and known groups validity in this population (Carey, Carey, & Meisler, 1991). Second, an indicator variable was created signifying presence of a schizophrenic spectrum diagnosis (i.e., schizophrenia or schizoaffective disorder) versus bipolar diagnosis.

Social functioning—Two social functioning variables were obtained from the Social Assessment Scale II (SAS-II; Schooler, Hogarty, & Weissman, 1979). Two global rating scales were selected to represent social role functioning: (1) social/leisure functioning, reflecting the level of social activities and meaningfulness of interpersonal relationships; and (2) instrumental role performance, reflecting the consistency and effectiveness of relevant role performance (e.g., worker, homemaker, student). Interviewers assigned these ratings based on both observational and interview data; higher scores represent poorer functioning (1 = excellent; 7 = severe maladjustment). Interrater reliabilities were calculated using a subset of 10 cases that were rated independently by a second trained interviewer. The intraclass correlation coefficients (a conservative index of interrater reliability) for social/leisure functioning and instrumental role performance were .92 and .50, respectively. Further inspection of the instrumental role performance ratings indicated that the two sets of ratings differed by a maximum of 2 points and the mean difference was less than one point ($M = .89$, $SD = .78$). Thus, both sets of ratings demonstrated acceptable consistency for use in subsequent analyses.

Cognitive functioning—Twelve neuropsychological tests were selected to assess cognitive function. Separately, each is brief and has acceptable psychometric properties; together, they assessed key areas of cognitive and perceptual ability likely to be affected by substance abuse. The cognitive battery consisted of the following tests (yielding 14 variables): the Controlled Word Association Test (total score; Benton, Hamsher, Varney, & Spreen, 1983); the Stroop Test (word score; Golden, 1978); Vocabulary, Block Design, and Digit Span subtests of the Wechsler Adult Intelligence Scale-Revised (total scores; WAIS-R; Wechsler, 1981); the Wechsler Memory Scale-Revised (immediate and 30-minute delayed recall totals; Wechsler, 1987); the Symbol Digit Modalities Test (total correct; Smith, 1982); the Grooved Pegboard Test (total time for both hands; Matthews & Klove, 1964); the Benton Visual Retention Test (total score; Benton, 1974); Trails B of the Trail Making Test (completion time; Reitan,

1958); the Rey-Osterrieth Complex Figure (recall and copy scores; Osterrieth, 1944); and the Wisconsin Card Sorting Test (perseverative errors; WCST; Heaton, 1981).

Procedure

Treatment staff working in four outpatient clinics referred patients who were likely to meet study inclusion criteria (18–50 years of age, suspected diagnosis of schizophrenia or bipolar disorder, and able to participate in testing for periods of at least 30 minutes). Patients were excluded if their self-reports or chart review revealed any of the following: electroconvulsive therapy within the last 6 months; organic brain disorder, mental retardation, learning disability; uncorrected sensory handicap; prescribed use of benzodiazepines, barbiturates, or other sedative-hypnotic medications; or current need for alcohol or drug detoxification.

Research staff described the study and the procedures involved. Interested participants provided written informed consent and received an appointment for the baseline assessment. All assessments occurred in private offices in the clinics across several individualized sessions. A breathalyzer test (Alcosensor III, Intoximeters, Inc.) was administered prior to each assessment session, in order to verify that participants were not under the acute influence of alcohol.

At the initial session, a doctoral-level clinical psychologist administered the SCID-P to determine primary psychiatric disorder and the presence of any SUD. Subsequent sessions were conducted by a trained research assistant, who administered the MAST, DAST, the SASII, and neuropsychological tests. Upon completion of all study assessments, participants received reimbursement in the form of coupons to local restaurants and/or movie tickets.

Data Analysis Strategy

First, participants were classified into one of three groups: (1) participants who have never had SUD, (2) those with a former SUD (i.e., full criteria met at one time but not in the last six months), and (3) participants with a current SUD (i.e., meeting full criteria within the last six months). The six-month remission criterion maximizes the likelihood that participants designated as former abusers will be free from the acute or residual effects of intoxication, although abstinence was not required for membership in the former abuser group. Second, these groups were compared on demographic and descriptive psychiatric variables, in order to establish their equivalence on potentially confounding variables. Third, we compared groups on substance-related variables to further validate the grouping strategy.

Fourth, we used principal factors analysis to reduce the 14 cognitive test scores to a smaller number of underlying factors. This data reduction step allowed us to retain a comprehensive assessment of cognitive functioning while limiting the number of variables entered into the analyses. Then we compared groups on the psychiatric, social, and cognitive variables in order to test the primary hypotheses. These comparisons included both univariate analyses, in order to allow comparisons with prior research, and multivariate analyses, in order to control for common variance across the three constructs.

For the multivariate analysis, we used multinomial logistic regression (MLR), a generalization of ordinary logistic regression (Hosmer & Lemeshow, 2000). Whereas the latter is used to predict membership in two groups, MLR can be used to predict membership in three or more unordered groups. MLR is appropriate for testing our hypotheses because the diagnostic categories have no natural order, hence diagnostic category cannot be used as the criterion in a regression model that requires a continuous variable (i.e., ordinary least squares), or ordered logistic models that require ordered categorical data. In addition, we wished to examine relationships among groups on each variable of interest while simultaneously controlling for

the effects of every other variable. Multiple univariate analyses of means cannot provide this information. Furthermore, we wished to minimize family-wise error rate that would result from comparisons of mean differences in multiple domains. According to standard procedures, one group (never abusers) was designated as the reference category and this designation structures comparisons among groups (Hosmer & Lemeshow, 2000).

Results

Sample Description

Table 1 presents demographic, psychiatric history, and substance abuse information by group. ANOVAs and chi-square tests indicate no differences among groups on the demographic or psychiatric variables. However, as expected, both MAST and DAST scores differentiate the groups defined by SUD. Consistent with its lifetime time frame, MAST scores for the current and former abusers exceed those of the never abusers. The DAST, which orients responses to the last year, differentiates the current abusers from the former and never abusers. The money spent on alcohol and other drugs also differed by group: none of the never abusers spent more than \$10 in the last month, but a third of the current abusers spent that much.

With regard to the distributions of specific SUDs across the former abuser and current abuser groups, the frequencies of substance dependence (vs. abuse) were statistically comparable (77% vs. 93%, respectively), as were the frequencies of multiple SUD diagnoses (61% and 80%, respectively). Former abuser and current abuser groups differed in frequencies of certain types of SUDs, specifically, cocaine (33% vs. 12%, $p = .03$) and polydrug diagnoses (40% vs. 12%, $p = .057$), by Fishers exact tests.

Data Reduction

Next, we conducted a principal factors analysis to reduce the cognitive variables to a few dimensions. We obtained initial estimates of the communalities from the squared multiple correlation coefficients, and extracted factors using the principal factor method in STATA 5.0 (StataCorp, 1997). The decision to retain 2 factors was determined on the basis of the eigenvalue > 1 guideline and examination of the scree plot (Floyd & Widaman, 1995). We used a promax oblique rotation to allow the factors to correlate as may be expected among cognitive dimensions, and variables were assigned to a factor if loadings were greater than .40. This resulted in a verbal factor (Controlled Word Association Test, Vocabulary, Wechsler Memory scores, and Stroop word score) and a non-verbal factor (Trails B, Benton, WCST perseverative errors, Rey-Osterrieth scores, Block Design, Digit Span, Symbol-Digit, and Grooved Pegboard). Factor scores were computed by summing unit weighted standardized variable scores.

Univariate Analyses

Univariate tests compared the groups on the six variables reflecting the three constructs. Table 2 summarizes group means on the predictor variables to be used in subsequent analyses. The current and former abuser groups scored better on the non-verbal factor in univariate analyses; in contrast, verbal factor scores were equivalent across groups. The former abusers scored better on instrumental role performance than the never abusers. No group differences were observed on GSI, percentage with bipolar disorder, or on social/leisure functioning.

Regression Analyses

Group was regressed on the markers of psychiatric (GSI and an indicator variable for schizophrenia spectrum diagnosis), social (instrumental role functioning and social leisure functioning), and cognitive functioning (verbal and non-verbal factors). The group that never

had a SUD served as the comparison group for the MLR. The overall model was significant: $\chi^2(12) = 29.10, p = .004$ (see Table 3). Wald tests of the individual coefficients indicate that both the former and current substance abuse/dependence groups can be distinguished from the never group on the basis of more psychological symptoms ($p's < .04$) and better non-verbal functioning ($ps < .02$). The relative risk ratios (RRRs) indicate that for each unit increase in reported symptoms, a participant is between 9.7 and 11.7 times more likely to be in one of the SUD groups. Each unit of increase in non-verbal functioning increases the chance of being in the former group ($RRR = 9.9$), and in the current group ($RRR = 19.1$). In addition, better instrumental role performance (reverse scored; $RRR = .31$) and poorer verbal functioning ($RRR = .13$) predicted status as a former abuser versus never abuser ($ps < .05$). The findings of the multivariate analysis differ somewhat from those of the univariate analyses because the effects reflect the independent contributions of each predictor, controlling for shared variance. A parallel model in which the current abusers served as the reference group revealed no individual predictors that significantly predicted current versus former status.

Discussion

This study examined the covariation of lifetime and current SUDs with cognitive, social, and psychiatric functioning among outpatients diagnosed with a SPMI. We attempted to improve upon prior research by the careful delineation of groups and simultaneous evaluation of three classes of variables. This study produced four main findings.

First, as predicted, the current SUD group reported more acute symptoms than the group who never abused. Consistent with previous research (Carey et al., 1991; Fowler et al., 1998; Ries et al., 1994), active substance abuse is associated with subjective distress. Contrary to expectations, however, participants with a SUD in remission for at least 6 months were also more symptomatic than the never group. Longitudinal studies with schizophrenic samples have documented reductions in acute symptoms (Cooper et al., 1999) and negative affect associated with remission of a SUD (Cuffel & Chase, 1994). Thus, prior research suggests that subjective distress may diminish with reduced substance abuse or, as distress is reduced, remission from substance abuse or dependence may be achieved. Although none of the former abuser group met criteria for abuse or dependence within the last 6 months, some were still using alcohol or drugs. The similarity between the current abuser and former abuser groups suggests that extended abstinence may be necessary before psychological symptoms stabilize in outpatients with a SPMI.

Second, both SUD groups had better non-verbal functioning relative to the group who never abused. This finding contrasts with results reported by many other investigators (e.g., Addington & Addington, 1997; Clegghorn et al., 1991; Cooper et al., 1999; Nixon et al., 1996), who found no differences in cognitive function between participants with schizophrenia with or without SUDs. However, the present analyses simultaneously controlled for other cognitive (i.e., verbal ability), social, and psychiatric variables, allowing conclusions based on the independent contributions of non-verbal functioning. A limitation of cross-sectional designs is that they cannot determine whether the observed differences predate the SUD or whether they are caused or exacerbated by SUD. However, presence of better non-verbal functioning in both of the SUD groups suggests a premorbid advantage for the SUD groups relative to the group who never abused.

Third, former abusers demonstrated better instrumental role functioning than patients who never abused. Current abuse may interfere with performance in important social roles by creating chaotic lifestyles and social conflict (cf. Barry et al., 1996; Dixon et al., 1998; Fowler et al., 1998) resulting in the lack of differences between the current abuser and never abuser groups on social role functioning. Cessation of substance abuse may create opportunities for

a person to demonstrate more effective social and vocational performance. Thus, it is possible that former abusers may be returning to a higher premorbid level of functioning. Precedent for this finding exists in the literature. A pattern characterized by more behavioral disorganization with better social competence has been labeled the “paradox of the dually diagnosed” (Penk et al., 2000). In psychiatric inpatient samples, substance abusers demonstrated less withdrawn or bizarre behavior (Kay et al., 1989), fewer negative symptoms overall (Buckley et al., 1994; Dixon et al., 1991), less flat affect (Dixon et al., 1991) and less poverty of speech (Alexander et al., 1994). Furthermore, findings that substance abusing schizophrenic patients have fewer abnormalities in brain morphology than schizophrenia patients with no history of substance abuse also support a hypothesis related to better premorbid adjustment (Scheller-Gilkey, Lewine, Caudle, & Brown, 1999). Taken together, these findings suggest that more attention is needed to separate the social competence of dually diagnosed persons from the acute behavioral and social disorganization associated with a substance abusing lifestyle.

Fourth, no differences were found between the current abuser and former abuser groups. The equivalence of these two SUD groups is surprising, and three hypotheses can be proposed. First, the occasional use of alcohol or drugs in the former abuser group suggests partial remission of the SUD in some cases. Second, we relied on patient volunteers, which may have included only the highest functioning patients (Ries et al., 1994). Thus, selection bias associated with research involvement may have excluded very dysfunctional current abusers. Third, the dimensions assessed may not be the most sensitive for determining the effects of current versus past substance abuse. However, the careful distinctions among never, former, and current SUD status made in this study are not consistently made in the literature. Additional research using this grouping scheme is needed to determine the replicability of these findings.

These findings should be interpreted mindful of the study's limitations. First, our sample size was modest. We were unable to evaluate patterns that might be related to demographic and diagnostic factors related to substance use, such as gender, race, and substance of abuse. Similarly, all of the potential differences between bipolar and schizophrenic patients with comorbid SUDs cannot be addressed in this sample. Second, this study focused on a limited number of indices of social and psychiatric function. Although these domains are important reflections of the impact of substance use on persons with psychiatric disorders, they do not provide a comprehensive evaluation of the effects of substance abuse. Third, although we selected reliable and well-validated instruments used extensively with psychiatric patients, many of the variables relied on self-report. Fourth, this study is limited by its cross sectional design. Only longitudinal research can elucidate the complex covariation between psychiatric, cognitive, and social functioning in the context of co-occurring psychiatric and substance use disorders.

Acknowledgements

This research was supported by National Institute on Drug Abuse Grants R29-DA07635 and K02-DA00426 to Kate B. Carey, and National Institute of Mental Health Grant K02-MH01582 to Michael P. Carey. The authors thank Lesley Teitelbaum, Cynthia Larson, David Pilkey, Daniel Purnine, and Karen Cocco for their assistance with data collection and management, and Dan Neal for his helpful statistical consultation.

References

- Addington J, Addington D. Substance abuse and cognitive functioning in schizophrenia. *Journal of Psychiatry and Neuroscience* 1997;22:99–104. [PubMed: 9074303]
- Alexander MJ, Craig TJ, MacDonald J, Haugland G. Dual diagnosis in a state psychiatric facility: Risk factors, correlates, and phenomenology of use. *American Journal on Addictions* 1994;3:314–324.
- American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. 4th Edition. Author; Washington, DC: 1994.

- Barry KL, Fleming MF, Greenley JR, Kropp S, Widlak P. Characteristics of persons with severe mental illness and substance abuse in rural areas. *Psychiatric Services* 1996;47:88–90. [PubMed: 8925354]
- Benton, AL.; Hamsher, K. deS.; Varney, NR.; Spreen, O. Contributions to neuropsychological assessment. Oxford University Press; New York: 1983.
- Benton, AL. The Revised Visual Retention Test. 4th Edition. Psychological Corporation; New York: 1974.
- Braff DL. Information processing and attention dysfunctions in schizophrenia. *Schizophrenia Bulletin* 1993;19:233–259. [PubMed: 8322034]
- Buckley P, Thompson P, Way L, Meltzer HY. Substance abuse among patients with treatment-resistant schizophrenia: Characteristics and implications for clozapine therapy. *American Journal of Psychiatry* 1994;151:385–389. [PubMed: 8109646]
- Carey MP, Carey KB, Meisler AW. Psychiatric symptoms in mentally ill chemical abusers. *Journal of Nervous and Mental Disease* 1991;179:136–138. [PubMed: 1997660]
- Carey KB, Cocco KM, Simons JS. Concurrent validity of substance abuse ratings by outpatient clinicians. *Psychiatric Services* 1996;47:842–847. [PubMed: 8837156]
- Chelune GJ, Parker JB. Neuropsychological deficits associated with chronic alcohol abuse. *Clinical Psychology Review* 1981;1:181–195.
- Cleghorn JM, Kaplan RD, Szechtman B, Szechtman H, Brown GM, Franco S. Substance abuse and schizophrenia: Effect on symptoms but not on neurocognitive function. *Journal of Clinical Psychiatry* 1991;52:26–30. [PubMed: 1671032]
- Cocco KM, Carey KB. Psychometric properties of the Drug Abuse Screening Test in psychiatric outpatients. *Psychological Assessment* 1998;10:408–414.
- Cooper L, Liberman D, Tucker D, Nuechterlein KH, Tsuang J, Barnett HL. Neurocognitive deficits in the dually diagnosed with schizophrenia and cocaine abuse. *Psychiatric Rehabilitation Skills* 1999;3:231–245.
- Cuffel BJ, Chase P. Remission and relapse of substance use disorders in schizophrenia: Results from a one-year prospective study. *Journal of Nervous and Mental Disease* 1994;182:342–348. [PubMed: 8201306]
- Derogatis, LR. SCL-90-R: Administration, scoring, and procedures manual-II. Clinical Psychometric Research; Baltimore: 1983.
- Derogatis LR, Cleary P. Confirmation of the dimensional structure of the SCL-90: A study in construct validity. *Journal of Clinical Psychology* 1977;33:981–989.
- Dixon L, Haas G, Weiden PJ, Sweeney J, Frances AJ. Drug abuse in schizophrenic patients: Clinical correlates and reasons for use. *American Journal of Psychiatry* 1991;148:224–230. [PubMed: 1987823]
- Drake RE, Osher FC, Wallach MA. Alcohol use and abuse in schizophrenia: A prospective community study. *Journal of Nervous and Mental Disease* 1989;177:408. [PubMed: 2746194]
- Evert DL, Oscar-Berman M. Alcohol-related cognitive impairments: An overview of how alcoholism may affect the workings of the brain. *Alcohol Health and Research World* 1995;19:89–96.
- Floyd FJ, Widaman KF. Factor analysis in the development and refinement of clinical assessment instruments. *Psychological Assessment* 1995;7:286–299.
- Fowler IL, Carr VJ, Carter NT, Lewin TJ. Patterns of current and lifetime substance use in schizophrenia. *Schizophrenia Bulletin* 1998;24:443–455. [PubMed: 9718636]
- Golden, CJ. Stroop Color and Word Test. Stoelting; Chicago, IL: 1978.
- Grant, I.; Reed, R. Neuropsychology of alcohol and drug abuse.. In: Alterman, AI., editor. Substance abuse and psychopathology. Plenum; New York: 1985. p. 289–341.
- Green MF. What are the functional consequences of neurocognitive deficits in schizophrenia? *American Journal of Psychiatry* 1996;153:321–330. [PubMed: 8610818]
- Heaton, RK. Wisconsin Card Sorting Test Manual. Psychological Assessment Resources; Odessa, FL: 1981.
- Hosmer, DW.; Lemeshow, S. Applied logistic regression. 2nd Edition. Wiley; New York: 2000.
- Kay SR, Kalathara M, Meinzer AE. Diagnostic and behavioral characteristics of psychiatric patients who abuse substances. *Hospital and Community Psychiatry* 1989;40:1062–1064.

- Lehman AF, Myers CP, Thompson JW, Corty E. Implications of mental and substance use disorders: A comparison of single and dual diagnosis patients. *Journal of Nervous and Mental Disease* 1993;181:365–370. [PubMed: 8388914]
- Liddle PF. Cognitive impairment in schizophrenia: Its impact on social functioning. *Acta Psychiatr Scand Suppl* 2000;400:11–16. [PubMed: 10823306]
- Matthews, CG.; Klove, H. Instruction manual for the Adult Neuropsychology Test Battery. University of Wisconsin; Madison, WI: 1964.
- Miklowitz DJ, Goldstein MJ, Nuechterlein KH, Snyder KS, Mintz J. Family factors and the course of bipolar affective disorder. *Archives of General Psychiatry* 1988;45:225–231. [PubMed: 3341878]
- Mohamed S, Paulsen JS, O'Leary D, Arndt S, Andreasen N. Generalized cognitive deficits in schizophrenia: A study of first episode patients. *Archives of General Psychiatry* 1999;56:749–754. [PubMed: 10435610]
- Mueser KT, Bellack AS, Douglas MS, Morrison RL. Prevalence and stability of social skill deficits in schizophrenia. *Schizophrenia Research* 1991;5:167–176. [PubMed: 1931809]
- Murphy FC, Sahakian BJ. Neuropsychology of bipolar disorder. *British Journal of Psychiatry* 2001;178:s120–s127. [PubMed: 11388950]
- Martinez-Aran A, Vieta E, Colom F, Reinares M, Banabarré A, Gasto C, Salamero M. Cognitive dysfunctions in bipolar disorder: Evidence of neuropsychological disturbances. *Psychotherapy & Psychosomatics* 2000;69:2–18. [PubMed: 10601830]
- Negrete JC, Knapp WP, Douglas DE, Smith WB. Cannabis affects the severity of schizophrenic symptoms: Results of a clinical survey. *Psychological Medicine* 1986;16:515–520. [PubMed: 3489951]
- Nixon SJ, Hallford HG, Tivis RD. Neurocognitive function in alcoholic, schizophrenic, and dually diagnosed patients. *Psychiatry Research* 1996;64:35–45. [PubMed: 8888363]
- Nuechterlein KH, Dawson ME. Information processing and attentional functioning in the developmental course of schizophrenic disorders. *Schizophrenia Bulletin* 1984;10:160–203. [PubMed: 6729409]
- Osterrieth PA. Le test de copie d'une figure complexe. *Archives de Psychologie* 1944;30:206–356.
- Penk WE, Flannery RB, Irvin E, Geller J, Fisher W, Hanson MA. Characteristics of substance-abusing persons with schizophrenia: The paradox of the dually diagnosed. *Journal of Addictive Diseases* 2000;19:23–30. [PubMed: 10772600]
- Penn DL, Corrigan PW, Bentall RP, Racenstein JM, Newman L. Social cognition in schizophrenia. *Psychological Bulletin* 1997;121:114–132. [PubMed: 9000894]
- Regier DA, Farmer ME, Rae DS, Locke BZ, Keith SJ, Judd LL, Goodwin FK. Comorbidity of mental disorders with alcohol and other drug abuse: Results from the Epidemiological Catchment Area (ECA) Study. *Journal of the American Medical Association* 1990;263:2511–2518. [PubMed: 2232018]
- Ries R, Mullen M, Cox G. Symptom severity and utilization of treatment resources among dually diagnosed inpatients. *Hospital and Community Psychiatry* 1994;45:562–568.
- Reitan RM. Validity of the Trail Making Test as an indication of organic brain damage. *Perceptual and Motor Skills* 1958;8:271–276.
- Rosen MI, Rosenheck R. Substance use and assignment of representative payees. *Psychiatric Services* 1999;50:95–98. [PubMed: 9890587]
- Saykin AJ, Gur RC, Gur RE, Mozley D, Mozley LH, Resnick SM, Kester DB, Stafiniak P. Neuropsychological function in schizophrenia. *Archives of General Psychiatry* 1991;48:618–624. [PubMed: 2069492]
- Saykin AJ, Shtasel DL, Gur RE, Kester DB, Mozley LH, Stafiniak P, Gur RC. Neuropsychological deficits in neuroleptic naïve patients with first-episode schizophrenia. *Archives of General Psychiatry* 1994;51:124–131. [PubMed: 7905258]
- Scheller-Gilkey G, Lewine RRJ, Caudle J, Brown FW. Schizophrenia, substance use, and brain morphology. *Schizophrenia Research* 1999;35:113–120. [PubMed: 9988848]
- Schooler, N.; Hogarty, G.; Weissman, M. Social Adjustment Scale II (SASII).. In: Hargreaves, WA.; Attkisson, CC.; Sorenson, JE., editors. Resource materials for community mental health program evaluators. United States Department of Health, Education, and Welfare; Rockville, MD: 1979. p. 290-303. Publication No. (ADM) 79328.

- Schuckit, MA. Drug and alcohol abuse: A clinical guide to diagnosis and treatment. 5th Edition. Plenum; New York: 2000.
- Selzer ML. The Michigan Alcoholism Screening Test: The quest for a new diagnostic instrument. *American Journal of Psychiatry* 1971;127:1653–1658. [PubMed: 5565851]
- Serper MR, Copersino ML, Richarme D, Vadhan N, Cancro R. Neurocognitive functioning in recently abstinent, cocaine-abusing schizophrenic patients. *Journal of Substance Abuse* 2000;11:205–213. [PubMed: 10989779]
- Sevy S, Kay SR, Opler LA, van Praag HM. Significance of cocaine history in schizophrenia. *Journal of Nervous and Mental Disease* 1990;178:642–648. [PubMed: 2230749]
- Skinner H. The Drug Abuse Screening Test. *Addictive Behaviors* 1982;7:363–371. [PubMed: 7183189]
- Smith, A. Symbol Digit Modalities Test Manual. Revised. Western Psychological Services; Los Angeles: 1982.
- Spitzer, RL.; Williams, JBW.; Gibbon, M.; First, M. Structured Clinical Interview for DSM-III-R - Patient Version (SCID-P). Biometrics Research Department, New York State Psychiatric Institute; New York: 1990.
- StataCorp. Stata statistical software: Release 5.0. Stata Corporation; College Station, TX: 1997.
- Steadman HJ, Mulvey EP, Monahan J, Robbins PC, Appelbaum PS, Grisso T, Roth LH, Silver E. Violence by people discharged from acute psychiatric inpatient facilities and by others in the same neighborhoods. *Archives of General Psychiatry* 1998;55:393–401. [PubMed: 9596041]
- Teitelbaum LM, Carey KB. Temporal stability of alcohol screening measures in a psychiatric setting. *Psychology of Addictive Behaviors* 2000;14:401–404. [PubMed: 11130159]
- Tracy JI, Josiassen RC, Bellack AS. Neuropsychology of dual diagnosis: Understanding the combined effects of schizophrenia and substance use disorders. *Clinical Psychology Review* 1995;15:67–97.
- Wechsler, D. Wechsler Memory Scale - Revised Manual. The Psychological Corporation; New York: 1987.
- Wechsler, D. Wechsler Adult Intelligence Scale - Revised Manual. The Psychological Corporation; New York: 1981.

Table 1
Demographic, Psychiatric History and Substance Abuse Variables by Group

	Never SUD n=15 Mean (SD)	Former SUD n=26 Mean (SD)	Current SUD n=15 Mean (SD)	F / χ^2	p
Age (years)	39.40 (7.54)	38.15 (10.12)	37.13 (7.11)	0.25	.778
Gender (% female)	27%	23%	20%	0.19	.911
Education (years)	12.80 (1.93)	13.19 (2.55)	12.20 (2.43)	0.84	.532
Race (% Caucasian)	80%	88%	86%	5.62	.466
Age at First Hospitalization	22.64 (8.01)	23.48 (7.98)	22.29 (4.73)	0.13	.877
Number of Previous Hospitalizations	4.21 (1.42)	4.36 (1.25)	4.20 (1.21)	0.10	.909
Diagnosis (% schizophrenia spectrum)	67%	69%	73%	.16	.922
MAST	3.33 (4.42) ^a	15.73 (13.73) ^b	25.27 (14.48) ^b	12.17	.000
DAST	1.47 (1.60) ^a	2.81 (3.57) ^a	7.27 (6.11) ^b	8.65	.001
Money Spent in Last Month on Alcohol and Drugs (% > \$10)	0%	4%	33%	11.10	.004
Used Alcohol or Drugs in Last Month	20%	27%	53%	4.43	.109

Notes. SUD=Substance Use Disorder; MAST=Michigan Alcoholism Screening Test; DAST=Drug Abuse Screening Test; GSI=Global Severity Index. Means with different superscripts differ on Scheffé tests ($p < .05$).

Table 2
Means and SDs for Psychiatric, Social, and Cognitive Variables by Group

	Never SUD n=15 Mean (SD)	Former SUD n=26 Mean (SD)	Current SUD n=15 Mean (SD)	F / X ²	p
GSI	0.57 (0.49)	0.83 (0.52)	0.96 (0.64)	2.00	.145
Schizophrenia Indicator	67%	69%	73%	16.16	.922
Social/leisure Functioning	4.93 (1.53)	4.19 (0.98)	4.60 (1.06)	1.98	.148
Instrumental Role Performance	4.80 (1.08) ^a	4.00 (0.80) ^b	4.47 (1.19)	3.26	.046
Verbal Factor	-0.18 (0.96)	0.07 (0.75)	0.16 (0.62)	0.78	.462
Non-Verbal Factor	-0.51 (0.77) ^a	0.11 (0.70) ^b	0.34 (0.49) ^b	6.56	.003

Notes. SUD=Substance Use Disorder; GSI=Global Severity Index. Lower values indicate better instrumental role performance and social/leisure functioning. Degrees of freedom for all F tests are 2, 53. Means with different superscripts differ on Scheffé tests ($p < .05$).

Table 3

Multinomial Logit Analysis of Relations between Psychological, Social, and Cognitive Variables and Substance Abuse Category (Base Category = Never)

Variable	RRR	<u>b</u>	<u>SE</u>	<u>p > z </u>
Former vs. Never				
GSI	9.71	2.27	1.09	0.04
Schizophrenia spectrum diagnosis	1.56	0.44	1.13	0.69
Social/leisure functioning	0.54	-0.61	0.47	0.19
Instrumental role performance	0.31	-1.17	0.59	0.05
Verbal factor	0.13	-2.00	1.01	0.05
Non-verbal factor	9.89	2.29	0.96	0.02
Current vs. Never				
GSI	11.71	2.46	1.16	0.04
Schizophrenia spectrum diagnosis	1.43	0.36	1.27	0.78
Social/leisure functioning	0.76	-0.27	0.52	0.60
Instrumental role performance	0.41	-0.88	0.63	0.16
Verbal factor	0.14	-1.99	1.08	0.07
Non-verbal factor	19.15	2.95	1.07	0.01

Notes. RRR=Relative Risk Ratio. GSI=Global Severity Index. The RRR represents the increase in risk of being in the former (or current) group compared to the never group.