Neurocognitive Dysfunction in Dually-Diagnosed Patients:
A Potential Roadblock to Motivating Behavior Change

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Abstract—Substance abuse has been associated with cognitive dysfunction, such as problems with attention, reasoning, and memory. Certain psychiatric disorders also have been associated with cognitive difficulties, thus placing dually-diagnosed patients at high risk for cognitive impairment that could interfere with successful entry into or completion of therapy. Twenty-two dually-disordered inpatients were administered the Brief Readiness to Change Questionnaire to measure levels of motivation to change substance use, and a neuropsychological test battery that included the Wechsler Adult Intelligence Scale-Revised (WAIS-R), the Halstead Category Test (HCT), and the Wechsler Memory Scale-Revised (WMS-R). Higher general intellectual, executive, and memory functioning were significantly related to greater scores in readiness to change substance abuse in this sample. Cognitive ability may be an important variable to consider in the motivation and treatment of dually-diagnosed patients.

Keywords—dual diagnosis, neuropsychology, transtheoretical model

Substance abuse therapists face significant challenges when they work with patients who are unaware of the need for change or incapable of following through on a plan of action. Innovative therapeutic strategies have been developed to meet the needs of these challenging patients (e.g., Motivation Enhancement Therapy: Miller et al. 1994; and Relapse Prevention: Marlatt & Gordon 1985). When a patient does not express concern at a level consistent with the acuity of his/her problems, it is easy to identify such a person as a “difficult patient.” Patients who present for substance abuse treatment with a comorbid psychiatric disorder often fall into this “difficult patient” category. Estimates of the comorbidity of substance abuse with other psychiatric disorders range from 37% (Regier et al. 1990) to 65% (Khantzian & Treece 1985), suggesting that a large number of patients entering treatment may have dual disorders (diagnosed or undiagnosed).

Individuals with multiple psychiatric problems involving substance abuse and primary DSM-IV (American Psychiatric Association 1994) Axis 1 mental disorders (commonly described as “dually-diagnosed” patients)
present a formidable challenge to mental health professionals attempting to provide effective psychotherapy and case management. In addition to situational and emotional factors contributing to both substance abuse and other Axis I mental disorders, dually-diagnosed patients are at substantial risk for cognitive dysfunction that could detrimentally affect treatment outcome. Indeed, it has been suggested that many dually-diagnosed patients may do poorly in treatment because of impaired neurological function (Levy, Saemmann & Oopen 1996). Cognitive dysfunction has been associated with poor treatment outcome and relapse (Weinstein & Shaffer 1993; Gordon, Kennedy & McPeake 1988; O'Leary et al. 1979), and cognitive deficits may arise from the neurocognitive effects of chronic substance or polysubstance abuse, major affective or psychotic disorders, psychotropic medication, or a combination of these factors.

Several substances of abuse are associated with cognitive deficits. For example, chronic alcohol abuse has been linked with short-term memory and learning deficits that become more pronounced with increased task complexity (Ryan & Butters 1986, 1982), visuospatial deficits, and impairment of executive functions such as problem-solving, abstract reasoning, planning, and organizational abilities (Butters 1985) that are important for adaptive behavior. Longer duration of alcohol abuse has been associated with greater cognitive deficits (DeFranco, Tadbox & McLaughlin 1985); abstraction, long-term memory, and visuospatial deficits have been found several years after cessation (Shaw & Spence 1985). To further complicate treatment efforts, chronic abusers of alcohol may underestimate or deny memory difficulties (Ryan & Lewis 1988).

Long-term cocaine abuse has been associated with deficits in complex attention (Melamed & Bleiberg 1986) and mildly impaired memory encoding and inefficient memory retrieval (Mitterenberg & Motta 1993). Cocaine use also can lead to cognitive deficits secondary to hemorrhagic strokes, cardiac failure, and seizures due to acute hypertension and central nervous system overstimulation. Chronic opiate abuse may result in visuospatial and visuomotor impairments (Carlin 1986; Grant et al. 1978). Long-term marijuana use has been associated with personality changes (including affective blunting, apathy, and sluggishness) that could negatively impact therapy, and marijuana users may demonstrate difficulties with recent memory (Ryan & Lewis 1988).

Determining the effects of isolated substances is nearly impossible because many street drug users abuse multiple substances. Cognitive deficits may arise from use of individual drugs, a combination of substances, or associated variables such as head injury, infection from injection of the drug, or poor nutrition. Carlin (1986) documented cognitive impairments in approximately 40% to 50% of polysubstance abusers, and cognitive deficits have been detected very early in the pattern of abuse (Fals & Schafer 1992). Long-term substance abuse seems to adversely affect dopaminergic processes that may be important for human learning and motivation (DiChiara 1995).

Dually-diagnosed patients are at further risk for cognitive dysfunction associated with certain psychiatric disorders. Schizophrenia has been linked to cognitive changes similar to those caused by chronic alcohol abuse (Tracy, Josiassen & Bellack 1995), often involving significant cognitive disorganization and executive dysfunction. Bipolar affective disorder has been associated with prefrontal and frontal dysfunction (Mega & Cummings 1994; Monroe 1993) that can contribute to deficits in attention and executive dysfunction, and unipolar depression may lead to reversible cognitive deficits (McAllister 1981) involving memory, speed of information processing, and attention. Furthermore, psychotropic medication has been associated with side effects which may include cognitive impairment (see PDR Editors 1997; Calabrese & Woyslvhile 1995; Lader 1994; Lindstrom 1994; Mejo 1992). Therefore, dually-diagnosed clients may experience cognitive dysfunction associated with both their psychiatric and substance-related disorders that could negatively impact therapy.

Behavior change involves recognition of the need for change, a weighing of the pros and cons of change versus no change, and the ability to formulate and carry out a plan of action. A contemporary theory relevant to addictive behaviors, the transtheoretical model, relies heavily upon the patient’s cognitive abilities (Prochaska, DiClemente & Norcross 1992). It postulates that a person considering change may progress through several decision making stages: precontemplation (characterized by unawareness of a problem), contemplation (awareness of the problem and ambivalence about change), preparation for change (in resolution of the ambivalence), and ultimately taking action (Prochaska, DiClemente & Norcross 1992). The transtheoretical model is heuristically useful because it conceptualizes change as a process rather than a state, it posits that cognitive processes are critical for the activation of behavioral processes needed for sustained change, and it specifies how levels of motivation for change can be assessed. Using this model, concerns about health (Prochaska 1994) or self-reported cognitive problems (Blume & Schmaling 1996) have been used to predict readiness to change. DiClemente (1993) has proposed specific intervention strategies utilizing the transtheoretical model. Motivational therapy was developed to enhance the change process in addictive behaviors (Miller et al. 1994; Miller & Rollnick 1991). One important issue for therapy—the relationship between cognitive deficits and the motivation to change substance use behavior—has not been investigated.

Motivation to change behavior involves using complex cognitive abilities including observational processes, reasoning, flexibility, planning, and memory. Such cognitive skills are crucial for successful behavior change. The
authors hypothesized that difficulties with cognitive function in the areas of general intellect, memory, and executive functions (such as planning and organizing) would be predictive of less motivation to reduce substance abuse in dually-diagnosed patients.

**METHOD**

**Subjects**

A retrospective analysis of records from 162 psychiatric inpatients who had been assessed for substance use over a one-year period from February of 1995 through January of 1996 at an urban, public hospital was performed. A sample was developed consisting of 22 subjects who had been administered a neuropsychological test battery and who had no known history of traumatic brain injury, HIV infection, or other neuropsychological risk factors. All subjects met DSM-IV substance abuse or dependence criteria, reported substance use within six months of admission, and had a comorbid DSM-IV psychiatric disorder: 14 were diagnosed with depressive disorders, three with schizoaffective disorder, one with paranoid schizophrenia, and four with bipolar affective disorder. The patients typically had a lengthy history of substance use (M = 19.10 years, SD = 11.03). Three subjects abused alcohol exclusively; the remaining 19 subjects were characterized by polysubstance dependence. The patients averaged 33.27 years of age (SD = 9.50, range = 18-53), 18 were male (82%), 19 were Caucasian (86%), and they averaged 12.36 years of education (range = 8-16 years).

**Measures**

Patients were administered the 12-item Brief Readiness to Change Questionnaire (RTC) which was found to be an internally consistent instrument (Rollnick et al. 1992). Greater RTC scores have been associated with reduction in alcohol use at two and six months following hospital discharge (Heather, Rollnick & Bell 1993). The RTC was scored for total readiness to change (contemplation + action – precontemplation). Later in their hospitalization, each subject was administered a battery of neuropsychological tests. Since each patient's test battery was chosen based on clinical indications, not all subjects received the same tests. Patients may have been administered either the Wechsler Adult Intelligence Scale-Revised (WAIS-R: Wechsler 1981, N = 21), the Halstead Category Test (HCT: Halstead 1947, N = 16), and/or the Wechsler Memory Scale-Revised (WMS-R: Wechsler 1987, N = 12). From the WAIS-R, a Full Scale IQ was retained for analysis. The total errors score of 62.7 for the HCT is in the mildly impaired range (Spreen & Strauss 1991). The General Memory Index scores were used from the WMS-R as a measure of short-term memory function.

**RESULTS**

The subjects in this sample had full scale IQ scores at the lower end of the normal range (See Table 1) and averaged approximately one standard deviation below the mean on the General Memory Index of the WMS-R. These WMS-R results are consistent with the low average full scale IQ scores of this sample. The mean error score of 62.7 for the HCT is in the mildly impaired range (Spreen & Strauss 1991).

Full scale IQ scores were correlated significantly and positively with total RTC scores (N = 21, r(19) = .488, p < .05), as was the WMS-R General Memory (N = 12, r(10) = .626, p < .05). On the other hand, HCT error scores were correlated significantly and negatively with total RTC scores (N = 16, r(14) = -.580, p < .05). These correlations remained statistically significant when the Modified

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**TABLE 1**

<table>
<thead>
<tr>
<th>Test</th>
<th>Index</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAIS-R</td>
<td>Full Scale IQ</td>
<td>89.7</td>
<td>11.9</td>
</tr>
<tr>
<td></td>
<td>Verbal IQ</td>
<td>90.0</td>
<td>15.4</td>
</tr>
<tr>
<td></td>
<td>Performance IQ</td>
<td>92.0</td>
<td>11.6</td>
</tr>
<tr>
<td>WMS-R</td>
<td>Verbal Memory</td>
<td>85.8</td>
<td>18.0</td>
</tr>
<tr>
<td></td>
<td>Visual Memory</td>
<td>84.9</td>
<td>11.4</td>
</tr>
<tr>
<td></td>
<td>General Memory</td>
<td>84.0</td>
<td>18.9</td>
</tr>
<tr>
<td></td>
<td>Attention</td>
<td>83.4</td>
<td>21.2</td>
</tr>
<tr>
<td></td>
<td>Delayed Recall</td>
<td>77.2</td>
<td>20.6</td>
</tr>
<tr>
<td>HCT</td>
<td>Errors</td>
<td>62.7</td>
<td>28.4</td>
</tr>
</tbody>
</table>

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*Note:* Table 1 is a summary of neuropsychological test results for the sample of subjects. The table includes measures such as Full Scale IQ, Verbal IQ, Performance IQ, and various memory indices from the WAIS-R and WMS-R tests. The table also includes the mean and standard deviation for each measure.
Bonferroni Test was applied (Keppel 1982). There was concern that group differences may have confounded the results. However, independent sample t-tests found no significant differences between men and women, between patients who were psychotic upon admission and those who were not, and between people who were white and people of color for mean total RTC, WAIS-R full scale IQ, WMS-R General Memory, and HCT error scores.

DISCUSSION

The results of this study supported the primary hypothesis: Lower Full Scale IQ and General Memory Index and higher total HCT error scores were associated with lower total RTC scores. These findings suggest that lower levels of general intellectual functioning and memory, cognitive flexibility, and problem solving and abstraction abilities may interfere with the contemplation of behavior change. Post-hoc analyses indicate that difficulties with verbal skills and verbal and visual memory may pose particular problems for changing substance abuse behavior.

Neurocognitive function may be an important variable that mediates motivation to change substance abuse. In spite of the limited number of subjects, these correlation coefficients were robust. Although group differences did not seem to confound the results of this study, there may have been unidentified factors. Further investigation is warranted to study the relationship of cognitive function with the process of change in substance abuse under more tightly controlled conditions, and to study whether these findings generalize to patients without psychiatric disorders who abuse substances. Behavior that may be interpreted by clinicians as indicative of denial or defensiveness may be the result of cognitive impairment. Cognitive deficits are not always obvious to clinicians, further complicating the treatment process. If a patient seems to be having difficulty with treatment or therapy (showing signs of poor memory, planning skills, or impulsivity for example), an important next step would be to assess cognitive abilities. Unmotivated dually-diagnosed patients may inadequately assess the consequences of substance abuse, or the desirability to change substance use behavior, because of cognitive dysfunction.

Dually-diagnosed patients who seem unable or unwilling to change their behavior may benefit from a thorough neuropsychological assessment. If time or resources are problematic, the Neurobehavioral Cognitive Status Examination (Kleman et al. 1987) is brief, relatively easy to administer, and has been used to assess neurocognitive impairment in dually-diagnosed patients (Meek, Clark & Solana 1989). Referral for a full neuropsychological and/or neurological assessment is indicated if deficits are identified from the results of the screening tests. For those with identified deficits, comprehensive cognitive rehabilitation programs for chronic abusers of substances have been described (e.g., Gordon et al. 1988).

Finally, this study indicated that dually-diagnosed patients may have cognitive difficulties; for therapy to be successful with such patients, it would be important to offer treatment strategies that are responsive to these problems. The preliminary data in this study indicated that dually-diagnosed patients had particular difficulties with the recall of newly learned information after a short (30 minute) delay, and with problem-solving and complex organizational tasks. Some strategies that may facilitate the treatment of patients with these cognitive difficulties are suggested: information that is presented in a didactic format should be concrete, easy to remember, and paced more slowly than usual. If group treatment is utilized, smaller-than-usual groups will minimize overt distractions. Memory prompts, such as diaries and daily planners, may be particularly helpful. Significant others and/or case managers may be enlisted to help with the repetition and rehearsal of important information. Strategies to compensate for neurocognitive impairment may be a necessary, early part of motivating and treating the substance abusing patient.

NOTES

1. Each subject who met criteria for poly-substance dependence (N = 19) abused an average of 3.5 substances: alcohol (N = 18, 95%), marijuana (N = 17, 89%), cocaine (N = 15, 79%), methamphetamine (N = 9, 47%), opioids including heroin (N = 6, 32%), LSD (N = 8, 42%), sedative/hypnotics (N = 2, 11%), and inhalants (N = 2, 11%). None of these subjects had a history of benzodiazepine abuse.

2. Although neither the Verbal and Performance IQ scores from the WAIS-R nor the Verbal Memory, Visual Memory, Attention/Concentration, and Delayed Recall Indices from the WMS-R were the variables of primary interest, these data have been included in Table 1. In general the WMS-R indices were consistent with what would be expected given the WAIS-R scores with the exception of the WMS-R Delayed Recall Indices mean score, which was lower relative to the other scores and may indicate an area of particular difficulty in this sample.

3. The significant correlation between the RTC and Full Scale WAIS-R and the WMS-R General Memory Index scores led the authors to attempt to identify more specifically the source of this relationship, although we were reluctant to do so as an initial data analytic strategy because of potential Type I error. Within the WAIS-R, Verbal IQ seemed to be more strongly associated with total RTC than was Performance IQ; r(19) = .49, p < .05 and r(19) = .32, ns, respectively. Within the WMS-R, higher Visual Memory and Verbal Memory Indices scores were associated with greater total RTC scores; r(10) = .74, p > .01, and r(10) = .66, p > .05, respectively.