12-2006

Cognitive Impairment and Substance Abuse: Implications for Treatment Planning

Hunter Downing Alessi
Southeastern Louisiana University

Mary Ballard
Southeastern Louisiana University

Alan Kirk
Kennesaw State University, akirk@kennesaw.edu

Nicholas Montalbano

Recommended Citation
Alessi, H., Ballard, M., Kirk, A., & Montalbano, N. (2006). Cognitive impairment and substance abuse: Implications for treatment planning. Journal of Alcohol and Drug Education, 50(4), 55-66.

Cognitive Impairment and Substance Abuse: Implications for Treatment Planning

Hunter Alessi, Ph. D. and Mary Ballard, Ph.D.
Southeastern Louisiana University
Alan Kirk, Ph. D.
Kennesaw State University
Nicholas Montalbano, M. Ed., NBCC
Private Practice

Abstract

The cognitive abilities of 24 males at an in-patient substance abuse facility were assessed using the Neurobehavioral Cognitive Status Examination (Cognistat). Findings suggested that there were significant changes in cognitive functioning during the 21-day in-patient treatment as measured by the Cognistat. Implications for mental health professionals working with this population are discussed.

Keywords: substance abuse, Cognistat, addictions treatment, cognitive impairment

INTRODUCTION

An extensive body of evidence suggests that cognitive impairment may be a consequence of psychoactive substance abuse (e.g., Atkinson, & Misra, 2002; Fals-Stewart, 1997; Gordis, 1989 ; Morgenstern & Bates, 1999). Numerous studies have examined cognitive deficits in alcoholics (e.g., Atkinson, 2000; Parsons, 1987, Tarter & Edwards, 1987), cocaine abusers (O'Malley, Adamse, Heaton, & Gawin, 1992), and polysubstance abusers (Szalay, Bovasso, Vilov, & Williams, 1992). Although severe cognitive impairment is obvious and easily measurable in the cases of Wernike and Korsakoff Syndromes, deficiencies are more subtle and difficult to pinpoint in the majority of substance abusers (May, 2003; Reed, Grant, & Rourke, 1992).

Williams and Skinner (1990) studied the effects of social alcohol consumption on cognitive functioning in order to determine whether psychological tests could discriminate between high and low alcohol consuming social drinkers. Their limited study did find significant differences. However, they recommend that a battery of tests be used as part of an assessment procedure to identify cognitive deficits in heavy drinkers, including the Wechsler Intelligence Scale for Adults (WAIS), and the Visual Memory Scale (WMS).

Using biological and psychological assessments, May (2003), compared a control group of 14 mental health patients (5 males, 9 females, mean age of 47.5 years) with no substance abuse history to a treatment group of 18 newly abstinent substance abusers (16 males, 2 females, mean age 51 years) on the day of hospital discharge. The hypothesis specified that those who had just regained sobriety would still exhibit elevated enzymes and cognitive impairments that could impair their driving ability, though they were being discharged. Blood tests were utilized to measure the presence aspartate aminotransferase, gamma-glutamyl transferase, and mean corpuscular volume in each participant. Elevated levels of these enzymes often suggest the presence of liver disease, as well as damage to other major organs. The Brief Neuropsychological Cognitive Examination (BNCE), designed to measure cognitive functioning, was also administered. May found that the the BNCE did not detect significant differences in the two groups. However, as might be expected, significant differences were found between the two groups regarding levels of aspartate

aminotransferase and mean corpuscular volume, with substance abusers in recovery showing higher levels of each enzyme.

Mann, Gunther, Stettler, and Ackermann (1999) investigated the pattern of cognitive deficits in a group of 49 alcohol-dependent men in an in-patient treatment unit. These individuals had an average of 11.4 years being alcohol dependent. Using a test-retest design with a control group of 49 healthy males, the researchers administered a battery of neuropsychological tests, including an individually-administered measure of verbal intelligence, a test of logical memory, an auditory verbal learning test, and a test for concentration and attention. They found evidence that chronic alcoholism has detrimental effects on cognitive functioning, particularly for memory of verbal material. It was also noted that the alcohol-dependent men scored significantly lower than the controls on five of twelve of the neuropsychological measures.

O'Malley, et al (1992) looked at the effects of cocaine abuse on cognitive abilities. This study was designed to determine whether the intensity and frequency of cocaine use was related to the nature and degree of neuropsychological impairment. The instruments used to assess the participants took 3 hours to administer, and included the WAIS-R and parts of the Neuropsychological Screening Battery (NSB). The researchers found that there was mild, yet definite impairment in concentration and memory in heavy cocaine abusers.

While most studies suggest that neuropsychological evaluation is necessary in order to provide appropriate treatment (e.g., Fals-Stewart, 1997; Goldman, 1990), and that such assessment should be a routine component of substance abuse treatment programs, there is a prohibitive feature to such testing. Comprehensive test batteries are often time-consuming and costly, both in terms of personnel and supplies. In fact, many facilities find it impossible to fund such extensive assessment procedures (Fals-Stewart, 1997).

An alternative to extensive psychological testing was examined by Fals-Stewart (1997). The Neurobehavioral Cognitive Status Examination (Cognistat, The Northern California Behavioral Group, 1995) provides information about examinee's level of consciousness, orientation, and attention and functioning in five major areas, including language, memory, and higher level reasoning. This assessment was administered to 51 patients

after they had been in a residential substance abuse program for 3 weeks. Results were compared to a neuropsychological screening battery (Neuropsychological Screening Battery) that has been shown to reliably identify cognitive impairment in substance-abusing patients. Though much more practical in terms of time and expense (testing time for Cognistat is 10 to 30 minutes), the Cognistat was found to have low sensitivity, because it correctly identified only 8 of the 22 impaired substance-abusing patients, yielding a high false-negative error rate. However, the specificity of the Cognistat was excellent.

Meek, Clark, and Solana (1989) used the Cognistat in a study with clients in a 14-day inpatient treatment program. Their findings contrasted with those of Fals-Stewart (1997) in that they found the instrument to have high sensitivity. The discrepancy between these two studies may be in the design, since Fals-Stewart administered the Cognistat after 3 weeks of treatment, and Meek's group tested during the first few days of hospitalization. Discussion by Meek and colleagues recommended further research on the use of brief neuropsychological tests, and cited cases illustrating the positive effect of such testing on staff attitudes and treatment issues.

The present study examined the cognitive functioning of a group of male clients in an in-patient substance abuse treatment facility and assessed specific impairment as measured by the Cognistat. The design partially replicated the studies by Meek, Clark, and Solana (1989), and Fals-Stewart (1997). The purpose of this study is to clarify the efficacy of the Cognistat in planning effective interventions for individuals undergoing treatment for substance abuse, and to determine the suitability of the instrument for diagnosing cognitive functioning of these clients.

METHOD

Participants

The study was conducted at an all male, publicly funded, inpatient, 28-day substance abuse treatment facility located in a suburban community. The majority of patients at this facility are court-ordered; others volunteer for treatment. Participants for the study were solicited from the total population of approximately 35 male patients. Twenty-four elected to take part in the study. Fifteen were Caucasian, 8 were African-American, and one was Hispanic. The participants ranged in age from 18 to 55 years. The

average age was 31.3 (sd=9.6). Most of the men (n= 18, 75%) were self-referred to treatment. The other participants (n=6, 25%) were receiving care under a court order. All participants described themselves as in excellent (n=4, 17%), good (n=18, 75%), or average (n=2, 8%) health on the Alcohol Abuse History assessment. Additionally, all participants reported a lengthy history of problems with substance abuse. Most (n=17, 71%) reported a history of problems in excess of 5 years. It is interesting to note that more than half of the participants (n=13, 54%) had not received treatment for substance abuse in the past. Most (n=22, 92%) of the participants self-assessed the severity of their alcohol abuse problem as either extremely severe or severe. Eleven (46%) of the respondents had been terminated from employment because of alcohol abuse. Six (25%) reported a divorce directly related to the alcohol abuse. More than one half (n=15, 62%) had been arrested at least once in an alcohol related incident. As may be expected given their current life circumstances, nineteen (79%) of the men reported having felt moderately or extremely depressed during the past 6 months. None, however, reported that they were taking antidepressant medication.

Instrument

The Neurobehavioral Cognitive Status Examination (Cognistat, The Northern California Neurobehavioral Group, 1995) is designed to provide swift assessment of intellectual functioning in five major ability areas: constructional ability, memory, calculation skills, and reasoning/judgment. It is widely used by mental health professionals including psychologists, neurophysiologists, and other mental health practitioners to assess mental functioning in 10 to 30 minutes. It can be administered by a "wide range of health care professionals whose sophistication in assessment procedures will necessarily vary" (The Northern California Neurobehavioral Group, 1995, pp. 18). Persons who have no cognitive deficits usually complete the test in 10 minutes or less, and make near-perfect scores, and it does not differentiate between average and superior intellectual capacity. Because of this, the Cognistat is not well suited to typical reliability criteria; test-retest means of individuals with normal intellectual functioning would generate irrelevant scores (The Northern California Neurobehavioral Group, 1995).

Performance on the Cognistat provides information about the examinees' language skills, constructional praxis, memory, calculations, and reasoning. Attention, level of consciousness and

orientation are also evaluated. Domains and the constructs measured are these:

DOMAIN	CONSTRUCT
Attention	Attention, Concentration
Orientation	Attention, Perception, Memory
Comprehension	Sensation, Perception, Memory
Repetition	Integration of receptive and expressive speech
Naming	Speech fluency
Memory	Short-term memory
Calculation	Arithmetic functions
Similarities	Perception, Memory, Expressive Behavior
Judgment	Logical thinking, Practical judgments

Scores are plotted on a profile that depicts an overall pattern of abilities and disabilities, as well as a differentiated profile that concisely represents the cognitive status of the persons tested (Northern California Neurobehavioral Group, Inc., 1995).

Kiernan, Muller, Langston, and Van Dyke (1987) found concurrent validity when compared to the Mini-Mental Status Exam (MMSE; Folstein, Folstein, & McHugh, 1975), a widely utilized screening test for cognitive impairment. Predictive validity of the Cognistat is reported to exceed that of the MMSE, according to Starrat, Fields, and Fishman, 1992).

Procedure

Because two major studies (Meek, Clark, & Solana, 1989; Fals-Stewart, 1997) yielded different findings about the detection of neurocognitive impairment as measured by the Neurobehavioral Cognitive Status Exam (Cognistat), this study was designed to partially replicate the previous research, and to draw conclusions about the feasibility of using the Cognistat as an assessment tool in substance abuse facilities. Therefore, the Cognistat was administered as a pre-test to all participants during their first 3 days of in-patient substance abuse treatment. Prior to being admitted to this program, clients undergo detoxification at a separate facility, so that none are experiencing serious withdrawal symptoms at the time treatment begins.

Participants took the Cognistat as a post-test after 3 to 3 ½ weeks of treatment. During the course of this treatment, all participants followed the same structured schedule that included the following activities: morning meditation, groups counseling,

educational modules, and recreational activities. Daily morning meditation provided 30 minutes for participants to engage in solitary prayer or meditation. The men, divided into groups of 10, met for one-hour group counseling sessions each weekday. Theses groups were facilitated by licensed mental health professionals. Two-hour educational modules were also conducted on weekdays. Topics for these modules included anger management, understanding the disease model, addiction and the brain, recovery issues, and relationship issues. Daily 1 to 2 hour schedules for recreational activities included jogging, ping-pong, walking, and basketball.

There were 4 pre-tests which were not considered as part of the study, because the participants did not complete the program. Differences in pre and post scores were analyzed with a series of t-tests for related scores.

RESULTS

Table 1 presents a complete listing of pre and post-test scores of the 10 key outcome measures for this study. Table 1 also indicates the pairs that demonstrated a significant change in average pre and post-test score.

Of the 10 pre and post mean pairs, all comparisons show a change in the positive direction and four (Memory, Judgment, Similarities, and Calculation) were found to be significantly different. Of these four significant outcomes, Memory appears to be the most improved indicator. The pre-test for memory was found to be 8.92 (sd = 2.17) compared to 11.00 (sd = 1.77) for the post-test. The difference in the means was significant when inspected by a t-test ($t=-4.20$, $df = 23$, $p<.001$).

The next greatest improvement was in Judgment scores. The average pre-test score of the 24 subjects was found to be 3.88 (sd = 1.78) compared to a post-test average of 5.50 (sd =1.02). The difference in these means was significant ($t = -6.22$, $df = 23$, $p = <.001$).

The third pair of means with a significant difference between pre and post-test was Similarities. The 24 subjects scored an average of 5.91 (sd = 2.43) compared to a post test average of 7.04 (sd =1.23), $t =-3.29$, $df = 23$, $p =.004$).

TABLE 1

Means and Standard Deviations of Pre and Post Treatment Scores (N=24)

Variable	Pre Test Mean	Post Test Mean	t	sig
Orientation	11.38 (sd= 1.99)	12.00 (sd= .00)	-1.53	.139
Attention	7.42 (sd=1.41)	7.83 (sd= .48)	-1.55	.135
Comprehension	5.87 (sd= .34)	6.00 (sd= .00)	-1.81	.083
Repetition	11.50 (sd= 1.47)	12.00 (sd= .00)	-1.66	.110
Naming	7.62 (sd= .65)	7.87 (sd= .34)	-2.02	.056
Constructions	3.95 (sd= 1.46)	4.54 (sd=1.56)	-2.43	.023
Judgment	3.87 (sd=1.78)	5.50 (sd= 1.022)	-4.20	.000 ***
Similarities	5.91 (sd= 2.43)	7.04 (sd=1.23)	-1.51	.144 ***
Calculations	3.21 (sd= 1.22)	3.63 (sd= .56)	-3.24	.004 ***
Memory	8.92 (sd=2.17)	11.00 (sd= 1.77)	-6.22	.000 ***

*** The difference in the pre and post-test mean was significant at the .05 alpha level.

Calculations also demonstrated a statistically significant improvement; however, the change was less than the other three significant variables and should be viewed with caution in interpreting the results of this study. The pre-test mean of Calculations was found to be 3.21 (sd = 1.22) compared to the post-test average of 3.62 (sd = .58).

It is interesting to note that all of the significant indicators of positive outcome had post-test means with a much-reduced standard deviation among the individual scores. This reduction in score variance seems to be consistent with the issues of reliability on the Cognistat found in individuals with normal intellectual functioning. Because healthy persons score almost perfectly on all subtests, the post-test results are expectedly more homogenous since the test does not differentiate average from superior cognitive performance.

CONCLUSION

Those who work with clients who abuse substances are aware of the mild-to-moderate neurocognitive impairment manifested by individuals who are chronic users of alcohol and other psychoactive drugs. This study confirms that those who enter a treatment facility, even days after detoxification, may still have residual impairment, particularly in memory and reasoning abilities.

During the course of treatment, however, the neurocognitive impairment decreased, and participants scored mainly within normal ranges. This is a promising finding, suggesting that, at least in this relatively small sample, most cognitive impairment was reversible. Because the age of the participants ranged from 18 to 55, the finding by Atkinson (2000) that cognitive impairment among heavy drinkers increases with age was not considered, and this possibility was not addressed in the analysis of the data.

This study had two limitations. First, the sample was small (24), and it was comprised of males only. Future research should examine both a larger group of individuals, and should include both men and women.

Second, the present study did not have a control group, so that there was no comparison with other measures of cognitive impairment. Because two previous studies had compared the Cognistat to a battery of instruments, it was determined that such extensive

comparison was not necessary in this case. Furthermore, it should be noted that indications of impairment were about the same as those found in the Meek (1989) study.

Future research should expand the focus of the study to include both a control group and specific activities that address cognitive impairment, particularly memory and judgment. This would enable those who work with newly sober clients to design interventions that will be more relevant to clients' needs, ensuring enhanced treatment at a crucial time in their recovery. Most in-patient programs rely heavily on the clients' abilities to process information that requires adequate auditory and visual skills. Therefore, identifying the clients' levels of cognitive functioning would be a tremendous benefit in treatment planning. For example, educational modules presented during the first days of abstinence may be ineffectual because of drug-induced cognitive impairment. If this is the case, interventions that focus on improved nutrition, physical exercise, interpersonal skills, and feelings checks might be emphasized at first. As cognitive functioning improves, interventions such as individual and group therapy, didactic activities, and 12-Step assignments can begin.

It would also be important for future research to differentiate between those who only abuse alcohol, and those who abuse other drugs. More specifically, the drugs of choice should be a variable in future studies.

REFERENCES

Atkinson, R., & Misra, S. (2002). Mental disorders and symptoms in older alcoholics. In A. Gurnack, R. Atkinson, & N. Osgood (Editors). *Treating alcohol and drug abuse in the elderly*, pp. 50-71. New York: Springer Press.

Atkinson, R. M. (2000). Substance Abuse. In C. E. Coffee and J. L. Cummings (Editors). *Textbook of Geriatric Neuropsychiatry*, (2nd ed.), pp. 367-400. Washington, DC: American Psychiatric Press.

Fals-Stewart, W. (1997). Detection of neuropsychological impairment among substance-abusing patients: Accuracy of the Neurobehavioral Cognitive Status Examination. *Experimental and Clinical Psychopharmacology, 5*(3), 269-276.

Folstein, M. F., Folstein, S. E., & McHugh, P. R. (1975). Mini-mental state: A practical method for grading the cognitive state of patients for clinicians. *Journal of Psychiatric Research, 12(3)*, 189-198.

Goldman, M. (1990). Experience-dependent neuropsychological recovery and the treatment of chronic alcoholism. *Neuropsychology Review, 1*, 75-101.

Gordis, E. (1989). Alcohol and cognition. *Alcohol Alert, 4*, 3-4.

Kiernan, R. J., Muller, J., & Langston, J. W. (1987). The Neurobehavioral Cognitive Status Examination: A brief but quantitative approach to cognitive assessment. *Annals of Psychiatric Medicine, 107(4)*, 481-485.

Mann, K., Guenther, A., Stetter, F., & Ackerman, K. (1999). Rapid recovery from cognitive deficits in abstinent alcoholics: A controlled test-retest study. *Alcohol and Alcoholism, 34*(4), 567-574.

May, T. D. (2003). Biochemical state markers and neurocognitive impairments in newly abstinent alcoholics. *Dissertation Abstracts International: Section B: The Sciences & Engineering, 63*(7-B), 3479.

Meek, P. S., Clark, W., & Solana, V. (1989). Neurocognitive impairment: The unrecognized component of dual diagnosis in substance abuse treatment. *Journal of Psychoactive Drugs, 21*(2), 153-160.

Morgenstern, J., & Bates, M. E. (1999). Effects of executive function impairment on change process and substance use outcomes in 12-step treatment. *Journal of Studies on Alcohol, 60*, (6), 846-855.

O'Malley, S., Adamse, M., Heaton, R. K., & Gawin, F. H. (1992). Neuropsychological impairment in chronic cocaine abusers. *American Journal of Drug and Alcohol Abuse, 18*(2), 131-144.

Northern California Neurobehavioral Group. (1995). *Manual for the Neurobehavioral Cognitive Status Examination.* Fairfax, CA: Author.

Parsons, O. (1987). Neurocognitive deficits in alcoholics and social drinkers. *Alcoholism: Clinical and Experimental Research, 22*(2), 954-961.

Reed, R. J., Grant, I., & Rouke, S. (1992). Long term abstinent alcoholics have normal memory. *Alcoholism: Clinical and Experimental Research, 16*(4), 677-683.

Starratt, C., Fields, R.B., Fishman, E. (1992). Differentiality of the NCSE and MMSE with neurophsychiatric patients. *The Clinical Neurophsychologist*, 6, 331.

Szalay, L., Bovasso, G., Vilov, S., & Williams, R. E. (1992). Assessing treatment effects through changes in perceptions and cognitive organization. *American Journal of Drug and Alcohol Abuse, 18*(4), 407-428.

Tarter, R. E., & Edwards, K. L. (1986). Multifactorial etiology of neuropsychological impairment in alcoholics. *Alcoholism: Clinical and Experimental Research, 10*(2), 128-135.

Williams, C. M. & Skinner, E. G. (1990). The cognitive effects of alcohol abuse: A controlled study. *British Journal of Addiction, 85*, 911-917.

Authors Note

Hunter Alessi, Ph.D., Professor, Department of Humon Development, Southeastern Louisiana University, SLU-10863, White Hall 110C, Hammond, LA 70402, email: halessi@selu.edu.; Mary Ballard, Ph.D., Associate Professor, Department of Human Development, Southeastern Louisiana University, SLU-10863, White Hall, 110A, Hammond, LA 70402, email: mballard2-sel.edu; Alan Kirk, Ph.D., Chair, Department of Human Services and Professor of Social Work, Kennesaw State University, 1000 Chastain Rd., Mailstop #1801, Kennesaw, GA 30144, email: akirk@kennesaw.edu; and Nicholas Montabano, M.Ed., NBCC, Counselor, Private Practice, 224 Tchefuncte Dr., Covington, LA 70233, email: nicholasmontalbano@yahoo.com.

Correspondence concerning this article should be addressed to Hunter Alessi, Ph.D., Professor, Department of Humon Development, Southeastern Louisiana University, SLU-10863, White Hall 110C, Hammond, LA 70402, email: halessi@selu.edu.