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Effects of cognitive impairment on substance abuse treatment attendance: predictive validation of a brief cognitive screening measure

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Abstract

Background and Objectives—Neuropsychological impairment among patients with substance use disorders (SUDs) contributes to poorer treatment processes and outcomes. However, neuropsychological assessment is typically not an aspect of patient evaluation in SUD treatment programs because it is prohibitively time and resource consuming. In a previous study, we examined the concurrent validity, classification accuracy, and clinical utility of a brief screening measure, the Montreal Cognitive Assessment (MoCA), in identifying cognitive impairment among SUD patients. To provide further evidence of criterion-related validity, MoCA classification should optimally predict a clinically relevant behavior or outcome among SUD patients. The purpose of this study was to examine the validity of the MoCA in predicting treatment attendance.

Methods—We compared previously-collected clinical assessment data on 60 SUD patients receiving treatment in a program of short duration and high intensity to attendance data obtained via medical chart review.

Results—Though the proportion of therapy sessions attended did not differ between groups, cognitively impaired subjects were significantly less likely than unimpaired subjects to attend all of their group therapy sessions.

Conclusion—These results complement our previous findings by providing further evidence of criterion-related validity of the MoCA in predicting a clinically relevant behavior (i.e., perfect attendance) among SUD patients.

Scientific Significance—The capacity of the MoCA to predict a clinically relevant behavior provides support for its validity as a brief cognitive screening measure.

Keywords

substance use disorder; addiction; cognitive screening measure; Montreal Cognitive Assessment

1. BACKGROUND

The effectiveness of cognitive behavioral therapies commonly used to treat patients with substance use disorders (SUDs) is undermined by diminished cognitive resources. Cognitive impairment among SUD patients contributes to poorer treatment outcomes, including decreased treatment retention (1-3) and less abstinence from substances of abuse (1). Cognitive dysfunction also has a negative impact on treatment processes and therapeutic

change mechanisms including treatment motivation (4), readiness to change (5), self-efficacy (6), insight (7), coping skill acquisition (8), use of commitment language (9), treatment attendance (6), and aftercare attendance (8).

In a previous study, we examined the concurrent validity, classification accuracy, and clinical utility of a brief screening instrument, the Montreal Cognitive Assessment (MoCA) (10), in identifying cognitive impairment among SUD patients. Based on its agreement with a reference criterion, the MoCA showed evidence of criterion-related validity and good accuracy in correctly classifying cognitive impairment cases and non-cases (11). To provide further evidence of criterion-related validity, MoCA classification should optimally predict a clinically relevant behavior or outcome among SUD patients.

Attendance is often used as a clinical benchmark in SUD treatment studies because of its positive associations with clinical outcomes and therapeutic change mechanisms. Greater SUD treatment attendance is associated with increased abstinence (12), reduced impulsivity (13), and greater perceived self-efficacy to remain abstinent (14). To determine whether MoCA classification predicts this clinically relevant behavior, we examined its ability to identify SUD patients at treatment entry who will have better treatment attendance.

2. METHODS

2.1. Subjects

Study subjects were a convenience sample of 60 adult SUD patients enrolled in a study to assess the concurrent validity, classification accuracy, and clinical utility of a brief screening instrument in identifying cognitive impairment (11). Inclusion criteria for the main study were (a) recent admission to either the partial hospital or residential program in the McLean Hospital Alcohol and Drug Abuse Treatment Program, (b) any non-nicotine DSM-IV substance dependence disorder, (c) abstinence from all drugs of abuse other than nicotine for 7-30 days, and (d) age 18-65. Exclusion criteria were (a) acute intoxication or withdrawal, and (b) any medical or psychiatric illness (including dementia) that, in the view of the investigators, would interfere with provision of consent or valid self-report or compromise participation in research. Subject socio-demographic and drug use characteristics are presented in Table 1.

2.2. Treatment Setting

Subjects were recruited between January and July of 2008 through two complementary components of the Alcohol and Drug Abuse Treatment Program at McLean Hospital: the partial hospital and residential programs. The partial hospital program provides intensive outpatient treatment for persons who are willing to commute to the program daily. As part of standard treatment, all patients are expected to attend 4 treatment groups daily from 9:00 am to 2:00 pm (approximately 4 hours of group therapy per day) from 5-7 days per week, based on an individually identified treatment plan. Based on the most recent program data, average length of stay among all partial hospital and residential program patients is 8 days. Thus, on average, patients attend 35 groups while enrolled in the partial hospital program. Therapy groups are cognitive-behavioral and psycho-educational in orientation (e.g., topics related to relapse prevention, coping strategies, and understanding and building healthy relationships). The residential treatment program provides the same services, and also includes acute residential care, including two evening treatment groups per day.

2.3. Assessments

2.3.1. The Montreal Cognitive Assessment—The Montreal Cognitive Assessment (MoCA) samples behavior across 14 performance tasks that engage multiple cognitive

domains, including attention, language, visuospatial performance, executive function, and memory (10). The time to administer the MoCA is approximately 10 minutes. The total possible score is 30 points (31 if the patient has 12 or fewer years of education); a score of 26 or greater is classified as “normal,” i.e., without evidence of cognitive impairment. The MoCA was used to identify cognitive impairment among patients.

2.3.2. Substance Use—The DSM-IV Checklist (15) was used to determine current substance abuse and dependence diagnoses. The timeline follow-back method (16) was used to assess the number of consecutive days of abstinence prior to testing, and days of substance use in the past 30 days, including alcohol, amphetamine, cannabis, cocaine, opioid, and benzodiazepine use. Primary problem substance and overall years of problematic substance use were self-defined and collected via self-administered questionnaire. Weekly urine toxicology results were obtained via medical chart review.

2.3.3. Attendance—Attendance data were collected from the medical chart in the form of number of group therapy sessions patients were expected to attend, number of sessions attended, and number of sessions excused (if documented in the chart progress notes). Absences were considered excused if the time was spent meeting with another member of the s’patient treatment team (e.g., case manager or psychiatrist) or if the treatment team was notified in advance and provided with a reasonable excuse (e.g., childcare issue or illness). Absences were considered unexcused if the patient was a “no-call/no-show,” or if a reason could not be determined from the patient medical record.

2.4. Statistical Analyses

Treatment attendance was calculated for each patient as a percentage by dividing the number of treatment groups attended (including excused absences) by the number of treatment groups the patient was expected to attend. Perfect attendance was examined as a secondary outcome, because there is evidence from one study that it is predictive of good clinical outcome (17). “Perfect attendance” was defined as attending all expected group therapy sessions. Mean rate of attendance and proportions attaining perfect attendance were examined via between-group comparison (i.e., impaired versus unimpaired patients). Between-group differences across each of the study weeks were also examined to more precisely identify where group differences lie.

Other statistical comparisons include sociodemographic, drug use, and other clinical characteristics (e.g., length of stay and number of excused absences). Despite a very low base rate of positive urine toxicology screens in the partial hospital and residential programs, alcohol and drug toxicology results were also examined between groups. Mean differences were tested based on either the t-test or the Mann–Whitney U test, and proportional differences were tested using the chi-squared statistic. The significance level for all analyses was set at $p < 0.05$.

3. RESULTS

Study results are presented in Table 2. Cognitively impaired (mean [SD] MoCA score = 22 [3], range 12–25) and intact (MoCA score = 27 [1], range 26–30) subjects did not differ with respect to age, sex, race, level of education, employment status, primary substance of abuse, or days of substance use out of the past 30. The between-group difference in age approached, but did not reach, significance. Impaired patients reported a significantly longer lifetime history of drug use. Cognitively impaired and unimpaired subjects did not differ with respect to their referral source (about half of the patients in either group stepped down from inpatient detoxification and about half came directly from the community), proportions

assigned to either the partial hospital or residential programs, length of stay, number of group therapy sessions they were expected to attend, or their number of excused absences.

Although the actual percentage of therapy sessions attended did not differ between groups, cognitively impaired subjects were significantly less likely than unimpaired subjects to attend all of their group therapy sessions. Specifically, this between-group difference occurred during Weeks 2 and 3 of treatment. There was no difference between groups regarding perfect attendance at Week 1. Data for Weeks 2 and 3 were aggregated because not all 60 subjects remained in treatment by Week 3. Rates of alcohol, opioid, and stimulant use were close to zero and did not differ between groups.

4. DISCUSSION

In our previous study, the MoCA showed evidence of criterion-related validity and good accuracy in correctly classifying cognitive impairment cases and non-cases (11). Given the association between cognitive impairment and poorer SUD treatment processes and outcomes, the MoCA should be able to predict a clinically relevant behavior or outcome among SUD patients. The purpose of this study was to examine the predictive validity of the MoCA in identifying patients at treatment entry who will have better treatment attendance. Results showed no between-group difference in rates of group therapy attendance. However, patients who screened positive for cognitive impairment on the MoCA were less likely than patients who screened negative to attend all of their treatment sessions. Specifically, cognitively impaired patients were less likely to attend all of their treatment sessions during Weeks 2 and 3 (i.e., after their first week of treatment). These results complement our previous findings by providing further evidence of criterion-related validity of the MoCA in predicting a clinically relevant behavior (i.e., perfect attendance) among SUD patients.

Results also showed that impaired patients reported a significantly longer lifetime history of drug use than cognitively intact patients. Thus much of the cognitive impairment in our sample is most likely due to the consequence of chronic substance use. This was an expected finding given the body of evidence supporting the negative consequences of chronic substance use on cognitive functioning (18).

Perfect attendance has been used as a target behavior in contingency management studies (19-20), and as a benchmark for treatment adherence (21) and compliance (22). Research supporting the association between perfect treatment attendance and good outcome, however, is limited to one study (17). Results of that study showed that perfect attendance of a seven-session behavioral group counseling intervention adjunctive to nicotine replacement therapy predicted abstinence from cigarettes at the end of treatment and at 6-month follow-up.

The major limitation of this study is the absence of treatment outcome data to support the clinical relevance of perfect treatment attendance. Another limitation of this study is the influence of abstinence duration on length of stay. The eligibility criterion excluding patients with known substance use within seven days prior to study participation is consistent with recommendations made by some investigators who suggest a duration of one week or longer between treatment admission and cognitive testing (23-24). This exclusion, however, resulted in the recruitment of subjects with a longer average length of stay than is typical among individuals receiving treatment in these programs. There may have been differences between impaired and unimpaired patients during the first week of treatment (i.e., among patients who never achieved a full seven days of abstinence) that were not captured because of this exclusion criterion. Another weakness is the unknown influence of legal status on

treatment attendance. Though none of the study participants were legally mandated into the program, their treatment attendance may have been influenced by other legal problems.

This study has several strengths. Excluding patients with known alcohol or drug use in the seven days preceding study participation controlled for the cognitive effects of intoxication and acute abstinence. There was also uniformity between impaired and unimpaired patients on potentially confounding sociodemographic, drug use, and treatment characteristics, including level of education, primary substance of abuse, days since last substance use, number of group therapy sessions expected to attend, and number of excused absences.

In conclusion, these results complement our previous findings by providing further evidence of criterion-related validity of the MoCA. Specifically, these results show the MoCA has predictive validity in identifying patients at treatment entry who are either more likely or less likely to attend all of their treatment sessions. These findings also provide further evidence of the clinical utility of the MoCA. For example, this 10-minute cognitive screening measure may assist treatment providers in identifying patients who would benefit from therapeutic strategies known to enhance treatment attendance, such as contingency management. Finally, the finding that cognitively impaired SUD patients are less likely to attend all of their treatment sessions supports a growing body of literature showing an association between cognitive impairment and poorer treatment processes and outcomes. Future studies should continue to examine the associations between attendance, therapeutic change mechanisms, and treatment outcome.

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Table 1

Demographic and substance use characteristics data for 60 patients screened for cognitive impairment using the Montreal Cognitive Assessment (MoCA)

	MoCA+ (impaired) (n=23)	MoCA- (intact) (n=37)	
Demographics			
	<i>Mean (SD)</i>	<i>Mean (SD)</i>	<i>p</i>
Age (years)	42 (12)	36 (13)	.055
Education (years)	14 (2)	15 (2)	.074
	<i>% (n)</i>	<i>% (n)</i>	<i>p</i>
Sex (% female)	52 (12)	46 (17)	.419
Race (% white)	87 (20)	95 (35)	.282
Employed	26 (6)	32 (12)	.407
Substance Use			
Primary problem substance	<i>% (n)</i>	<i>% (n)</i>	<i>p</i>
Alcohol	52 (12)	62 (23)	.834
Opioid	35 (8)	24 (9)	.834
Stimulant	13 (3)	14 (5)	.834
	<i>Mean (SD)</i>	<i>Mean (SD)</i>	<i>p</i>
Days of any substance use in past 30 ^I	4 (5)	5 (6)	.431
Years of problem drug use	20 (13)	12 (10)	.008

Mean differences in demographic variables were calculated based on the t-test, and proportional differences were calculated based on the Chi-squared statistic. Significant p value is bolded. Italicized value approached significance $p > 0.05$ and < 0.06

^IBased on self-reported use of alcohol, amphetamine, cannabis, cocaine, opioid, and benzodiazepine.

Table 2

Attendance data for 60 patients screened for cognitive impairment using the Montreal Cognitive Assessment (MoCA)

	MoCA+ (impaired) (n=23)	MoCA- (intact) (n=37)	
	<i>% (n)</i>	<i>% (n)</i>	<i>p</i>
Detox before entering treatment	52 (12)	46 (17)	.791
Entered via partial hospital program ¹	56 (13)	62 (23)	.419
	<i>Median/Mode</i>	<i>Median/Mode</i>	
Length of Treatment (days) ²	15/14	15/14	--
Percentage (%) of groups attended	<i>Mean (SD)</i>	<i>Mean (SD)</i>	<i>p</i>
Week 1	95 (7)	95 (8)	.705
Week2-3	91 (13)	94 (8)	.097
Week1-3	61 (21)	58 (22)	.546
Groups expected to attend	64 (21)	62 (23)	.533
Excused absences	4 (4)	3 (3)	.403
Proportion attending all groups	<i>% (n)</i>	<i>% (n)</i>	<i>p</i>
Week 1	56 (15)	62 (23)	.434
Week 2-3	17 (4)	49 (18)	.026
Week 1-3	8 (2)	40 (15)	.009

Mean difference in % of groups attended was calculated based on the Mann–Whitney U test, and proportional differences were calculated based on the Chi-squared statistic. Significant p value is bolded.

¹ All other subjects entered treatment via the residential program.

² Length of stay: Mean value was 16 for both groups. Distribution was highly skewed due to 1 individual who remained in treatment for 90 days, thus median and mode are provided as measures of central tendency.