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Cognitive Training and Work Therapy for the Treatment of Verbal Learning and Memory Deficits in Veterans with Alcohol Use Disorders

Morris D. Bell, Ph.D.[1,2], **Nicholas A. Vissicchio, B.A.**[2], and **Andrea J. Weinstein, MA, C.R.C.**[1,2]

Nicholas A. Vissicchio: VISSICCH@yahoo.com; Andrea J. Weinstein: andrea.weinstein@yale.edu

[1]Yale University School of Medicine, Dept. of Psychiatry, 300 George Street, New Haven, CT 06511

[2]Department of Veterans Affairs, Rehabilitation Research and Development Service, 950 Campbell Ave, West Haven, CT 06516

Abstract

Objective—This study focused on the efficacy of cognitive training for verbal learning and memory deficits in a population of older Veterans with alcohol use disorders.

Methods—Veterans with alcohol use disorders, who were in outpatient treatment at VA facilities and in early phase recovery ($N = 31$), were randomized to receive a 3-month trial of daily cognitive training plus work therapy ($n = 15$) or work therapy alone ($n = 16$), along with treatment as usual. Participants completed assessments at baseline and at 3- and 6-month follow-ups; the Hopkins Verbal Learning Task (HVLT) was the primary outcome measure.

Results—Participants were primarily male (97%), in their mid-50's ($M = 55.16$, $SD = 5.16$), and had been sober for 1.64 (SD = 2.81) months. Study retention was excellent (91% at 3-month follow-up) and adherence to treatment in both conditions was very good. On average, participants in the cognitive training condition had more than 41 hours of cognitive training, and both conditions had more than 230 hours of productive activity. HVLT results at 3-month follow-up revealed significant condition effects favoring cognitive training for verbal learning (HVLT Trial-3 T-score, $p < .005$; Cohen's d = 1.3) and verbal memory (HVLT Total T-score, $p < .01$, Cohen's d = 1.1). Condition effects were sustained at 6-month follow-up. At Baseline, 55.9% of participants showed a significant deficit in verbal memory and 58.8% showed a deficit in verbal learning compared with a premorbid estimate of Verbal IQ. At 3-month follow-up there was a significant reduction in the number of participants in the cognitive training condition with clinically significant verbal memory deficits ($p < .01$, NNT= 3.0) compared with the work therapy alone condition, and a trend toward significance for verbal learning deficits, which was not sustained at 6-month follow-up.

Corresponding Author: Morris D. Bell, Ph.D., Psychology Service 116B, VA Connecticut Healthcare System, 950 Campbell Avenue, West Haven, CT 06516, Tel:(203)932-5711 Ext 2281, Fax:(203)937-4735, morris.bell@yale.edu.

Disclosures

Morris Bell, Ph.D. has a commercial interest in Becaid, LLC, which is unrelated to this study. The other authors report no financial relationships with commercial interests.

Conclusions—This NIDA-funded pilot study demonstrates that cognitive training within the context of another activating intervention (work therapy) may have efficacy in remediating verbal learning and memory deficits in patients with alcohol use disorder. Findings indicate a large effect for cognitive training in this pilot study, which suggests that further research is warranted. This study is is registered on Clinicaltrials.gov (NCT 01410110).

Keywords

Cognitive Training; Verbal Learning; Verbal Memory; Alcohol Use Disorders; Neurocognition

1. Introduction

The findings presented here are based on a subsample of participants from a NIDA-funded randomized clinical trial of cognitive remediation for outpatients with substance use disorders Here we focus on the effects of cognitive remediation on verbal learning and memory among participants with alcohol use disorders. This focus is warranted because verbal learning and memory deficits are consistently associated with alcohol use disorders, and may be the most prominent of the neurocognitive effects of these disorders. Controlled trials have shown that both prolonged alcohol abuse (Sneider, Cohen-Gilbert, Crowley, Paul, & Silveri, 2013) and short-term abuse (Loeber et al., 2009; Kramer, Blusewicz, & Preston, 1989) are associated with problems in verbal learning. DSM-5 includes the diagnosis of substance-induced major or mild neurocognitive disorder, and in the case of alcohol use disorders, it specifically identifies problems in learning and memory (page 650, American Psychiatric Association, 2013).

We found only two studies in publication that have used cognitive training techniques to improve verbal learning in people with chronic alcohol abuse. An older study (Hannon et al., 1989) used one hour of memory training per week for eight weeks, which included attention training, visual imagery, verbal strategies, and external cue strategies, among 29 males with alcohol use disorder who had been sober for at least three weeks. The comparison group in this study was a treatment-as-usual control condition. Results revealed no significant differences in verbal learning between baseline and post-treatment for either the memory retraining group or the control group. This finding, however, may be explained by inadequate training intensity and dose in the experimental condition. A second, more recent study (Rupp et al., 2012) provided slightly more intensive training in an efficacy trial among patients with chronic alcohol dependence who were entering inpatient treatment. Compared with conventional treatment (n=21), those receiving 12 sessions of computer-assisted cognitive training over six weeks (n = 20) showed significantly greater improvement from baseline to six weeks on the long delay recall of the Munich Verbal Memory Test than the control group.

The current study employed a much more intensive training program of computer-based cognitive training than had been previously used in the studies reviewed above. Our participants also differed from those of previous studies because we recruited older individuals with alcohol use disorder who were in the first 30 days of sobriety and were receiving outpatient treatment. Due to our participants' older age and recent drug use, we

predicted that they would show significant impairment in verbal learning and memory at baseline. Our primary hypothesis was that participants who were randomized to 13 weeks of daily cognitive training as an augmentation to work therapy and outpatient alcohol use disorder treatment would show greater improvements in verbal learning and memory at 3-month follow-up than those receiving work therapy and outpatient alcohol use disorder treatment without cognitive training augmentation. We also hypothesized that these gains would be sustained three months later at a 6-month follow-up. Our secondary hypothesis was that, at 3-month follow-up (the conclusion of treatment), the frequency of clinically significant verbal learning and memory deficits would be lower for those in the cognitive training condition than those in the work therapy alone condition, and that these improvements would be sustained at 6-month follow-up.

2. Methods

2.1 Participants

US Veterans 18 years of age and older (age range 39–63) receiving health services through the Department of Veterans Affairs (VA) were recruited for a randomized clinical trial of cognitive training and work therapy (NCT 01410110) by referral from clinicians at an integraed VA substance abuse program that included a 21-day substance abuse day program and a 30-day residential program. Recruitment began in January 2011 and was completed in March 2014. Eighty-seven participants were consented and assessed for eligibility based on the presence of an alcohol use disorder and detoxification within 30 days. Exclusion criteria included untreated psychotic disorder, current use of opioids or benzodiazepines, a legal case that might lead to incarceration, a living arrangement that would interfere with participation, and the presence of a developmental disability or medical illness that might significantly compromise cognition or prevent work activity. Of the 87 Veterans assessed, 10 did not meet inclusion criteria, 6 declined to complete the intake, and 23 were excluded for other reasons (e.g., moving away or participating in other vocational programs that were not part of the study). The final sample of 48 participants included 29 who primarily abused alcohol, 14 who primarily abused either opiates or cocaine, and 5 who had more than one primary drug of abuse (one of which was alcohol).

For the purpose of this substudy, we included the 29 participants who abused alcohol and the 5 who abused alcohol and another substance, for a total of 34 participants. Of those, three were excluded from analysis (one from the cognitive training condition and two from the active control condition): one withdrew after randomization but before exposure to the intervention; one was withdrawn by researchers because he was hospitalized for 44 days during the active intervention; and one declined the 3-month follow-up because he became employed and was unavailable. Thus 31 of 34 (91%) participated in neurocognitive assessment at 3-month-follow up, an unusually high retention rate for an alcohol use disorder sample, and 29 out of 34 (85.3%) returned three months later for the 6-month follow-up.

2.2 Measures

2.2.1 Mini International Neuropsychiatric Interview (MINI)—The MINI is a short diagnostic structured interview used to diagnose different types of Axis I psychiatric disorders using the DSM-IV criteria, as well as suicidality and antisocial personality disorder. The interviewer asks the participants a series of yes or no questions to determine the presence of a disorder (Sheehan et al., 1998).

2.2.2 Addiction Severity Index (ASI)—This is used to determine the extent to which alcohol and drug abuse has affected the participant's life. The ASI covers seven different areas of everyday life: medical, employment, alcohol, drug, legal, family/social, and psychiatric. Frequency of use of alcohol and drugs of abuse are recorded for the prior 30 days and throughout the lifetime of the participants (McLellan, Luborsky, O'Brien, & Woody, 1980).

2.2.3 Global Assessment of Functioning (GAF)—The GAF is a single scale (1 through 100) first included in the DSM-III (Axis V) and continued through the DSM-IV TR for rating the overall social, occupational, and psychological functioning of adults. Outpatient substance abuse samples commonly have scores between 40 and 70 since scores below 40 usually indicate reality testing difficulties and scores above 70 indicate a relatively unimpaired level of community functioning.

2.2.4 Wechsler Test of Adult Reading (WTAR)—This is a neuropsychological assessment used as a baseline test of intelligence. In the test, the examiner asks the participant to pronounce 50 irregularly spelled words. Each of these words does not follow grammatical rules, and thus cannot be sounded out. The test is discontinued following twelve consecutive incorrect pronunciations of words or until all 50 words are sounded out. This is a standard test of verbal ability and commonly used as a pre-morbid estimate of intelligence quotient (IQ) because this ability is usually preserved despite cognitive decline and correlates highly with lengthier measures of IQ (Holdnack, 2001).

2.2.5 Hopkins Verbal Learning Test Revised (HVLT)—The HVLT is a test used to assess verbal learning and memory. The test consists of a list of twelve nouns that come from three different semantic categories. The tester reads the list of twelve words aloud to the participant. The participant then attempts to recall as many words as possible from this list. The list is then read aloud two more times, and each time the participant tries to recall as many words as possible, including words that have already been mentioned previously. There are a total of three learning blocks (Brandt & Benedict, 2001). The total number of words recalled (Total Score) across the three learning trials is commonly used as an outcome measure and in this report will be labelled as verbal memory. The score on Trial 3 will be used to capture the more specific construct of verbal learning since Trial 3 is the final trial and thus benefits from the exposure of two previous learning trials. Both Total Score and Trial 3 have age corrected norms from the publisher that allows conversion into T scores.

2.3 Procedures

2.3.1 Recruitment, Informed Consent and Randomization—Potential participants were referred by clinicians. After an initial phone screening, they were invited for informed consent procedures. Following a complete discussion of the study, written informed consent was obtained in accordance with the Declaration of Helsinki and with the procedures of the VA Connecticut Healthcare System Institutional Review Board, which approved and monitored this study. After informed consent, baseline assessments were conducted and participants who met all inclusion and exclusion criteria were randomized according to a block randomization of six that was performed by a statistician not otherwise associated with the study. Block randomization assured approximately equal distribution to the two arms of the study. No attempt was made to stratify by type of primary diagnosis, but both arms ended up having a very similar number of participants with alcohol use disorders.

2.3.2 Assessments—Substance use was determined based upon chart review, MINI structured interview and the ASI. Participants were also administered urine toxicology screens and Breathalyzer tests. Baseline assessments were not administered if the participant reported using substances in the 7 days leading up to the assessment. Follow-up assessments were conducted three months after baseline, which was at the end of the active phase (3-month follow-up), and three months later (6-month follow-up). Assessments were performed by a psychometrician who was not involved in providing interventions. However, this person was not blind to participant condition.

2.3.3 Interventions—Cognitive training was completed using auditory and visual Posit Science software. At that time Posit Science offered two separate but complete suites of training software on CD’s, one called BrainFitness (auditory) and the other named Insight (visual). Training games began with the most elementary sensory processing tasks (i.e., auditory or visual sweeps) and progressed through a pre-set curriculum of progressively more complex and demanding games. For example, the most difficult auditory memory task involved recalling details from audio-presented stories that increased memory load by becoming progressively longer and more complicated as the person’s performance improved. Participants in the cognitive training plus work therapy condition were offered five hours of cognitive training per week for 13 weeks. In addition to the cognitive training, they also participated in Incentive Work Therapy for up to 15 hours per week, doing entry level duties at medical center job sites supervised by regular medical center staff. They also participated in group sessions for 30 minutes per week to discuss issues in the workplace, and to provide support and motivation.

Participants in the work therapy only condition could work up to 20 hours per week of work therapy as well as participate in weekly group sessions. Participants in the work therapy condition did not complete any cognitive training.

Participants received payment of half minimum wage for their hours of productivity whether in cognitive training or work therapy. Offering 20 hours per week of work therapy in the work therapy only active control condition created equipoise between conditions in terms of the number of hours of compensated productive activity offered to participants.

Participation in both conditions was excellent. Those in cognitive training averaged 41.2 (SD=20.8) hours of cognitive training and 190.9 (SD=173.7) hours of work therapy for a total of 232.2 (SD =179.7) hours of productive activity. They also attended an average of 10.5 (SD = 3.0) group sessions. Participants receiving work therapy only averaged 252.9 (SD = 112.4) hours of work therapy and 10.7 (SD = 3.0) group sessions. There were no statistically significant differences between conditions on total hours of productive activity or number of groups attended.

2.3.4 Analyses—Analyses of covariance (ANCOVAs) were performed to test the primary hypotheses that verbal memory (HVLT Total T-Score) and verbal learning (HVLT Trial 3 T-Score) at 3-month follow-up would reveal a significant difference between conditions co-varying for baseline performance. To determine whether differences were sustained at 6-month follow-up, repeated measures ANCOVAs (RM-ANCOVAs) were performed using 3- and 6-month data co-varying for baseline.

Following the procedure from a previously reported study (Richardson et al, 2009), baseline level of verbal memory and verbal learning impairments were determined by using the WTAR as premorbid estimate of verbal IQ. The HVLT Total T-Score and Trial 3 T-score were converted to z scores along with the WTAR. The WTAR z scores were subtracted from the HVLT z scores to determine the extent of baseline verbal learning deficits. Participants were classified as having a clinically significant impairment in verbal memory or verbal learning if they had a z score 1 SD or more below what would be expected based on their WTAR scores. Scores at 3-month and 6-month follow-up were similarly converted. Comparisons of condition by impairment classification at baseline, 3-month and 6-month follow-up were performed using Chi Square analyses. For the 3 participants without 6-month follow-up, the convention of last observation carried forward was used to allow their inclusion in the RM-ANCOVAs and Chi-Square analyses. Effect size was determined using Cohen's d and Number Needed to Treat (NNT). Alpha was set at .05 for all analyses.

3. Results

Demographic characteristics of the 31 participants retained in the current analysis are presented in Table 1. They were mostly male (n = 30, 97%), in their mid-50's (M = 55.16 years, SD = 5.16), with a high school education (M = 12.72 years, SD = 1.72). Most had been married (n = 24, 75%), many had been convicted of a felony (n = 14, 44%), and 22% (n = 9) were currently receiving Social Security Disability Insurance (SSDI). Participants were recruited within 30 days of detoxification and had about 6 weeks of sobriety at the time of baseline evaluation (M = 1.64 months, SD = 2.81). None were employed or had immediate plans for returning to employment because the study included participation in work therapy for the duration of the active phase. This meant that most were living in VA supported housing of some kind, a condition of which was continued engagement in outpatient substance abuse therapy. There were no differences in baseline characteristics between conditions.

In terms of cognitive impairment, about half of our participants (n = 16, 51.6%) had a deficit in verbal memory and 58.1% (n = 18) had a deficit in verbal learning, defined as one

standard deviation below their baseline IQ. There was no significant difference between conditions regarding the frequency of deficits at baseline

As hypothesized, participants receiving cognitive training, compared to those receiving work therapy only, showed greater improvements on verbal memory and learning at 3-month follow-up (see Table 2). ANCOVAs revealed significant condition effects favoring cognitive training for verbal memory (HVLT total T-Score) at 3-month follow-up; $F(1,28) = 7.98$, $p < .01$; and for verbal learning (HVLT trial 3 T-score) at 3-month follow-up; $F(1,28) = 9.22$, $p < .005$; covarying for baseline values. These differences suggest large effects with Cohen's d = 1.01 for verbal memory and Cohen's d = 1.09 for verbal learning.

These improvements were sustained at 6-month follow-up. RM-ANCOVAs for 3-month and 6-month follow-ups yielded a significant condition effect for verbal memory favoring cognitive training; $F(1,28) = 10.73$ $p < .005$; and for verbal learning; $F(1,28) = 13.23$, $p < .001$. These differences suggest large condition effects with Cohen's d = 1.18 for verbal memory and Cohen's d = 1.31 for verbal learning over 3 and 6-month follow-up. There were no significant time by condition effects for verbal memory; $F(1,28) = .057$, $p = .81$; or for verbal learning; $F(1,28) = .24$, $p = .63$. (See Figures 1 and 2 for graphic depictions for HVLT scores at all three assessment points.)

Results regarding cognitive deficits were partially in line with our hypotheses. At baseline, about half of participants ($n = 16$, 51.6%) had a deficit in verbal memory and 58.1% ($n = 18$) in verbal learning, defined as one standard deviation below their estimated IQ (based on the WTAR). There was no significant difference between conditions regarding the frequency of deficits at baseline (Table 3), but Chi-square analyses at 3-month follow-up revealed a significant difference in deficit frequencies favoring cognitive training for verbal memory and a trend toward significance for verbal learning. The effect size for verbal memory at 3-month follow-up can be expressed as Number Needed to Treat (NNT) = 3.0 with a 95% confidence interval 1.3 – 5.5. At 6-month follow-up, verbal memory trended toward significance and verbal learning was not significant.

4. Discussion

To our knowledge, this is the first study focused on the efficacy of cognitive training for older Veterans with alcohol use disorder in an outpatient context of comprehensive care. The study had unusually good retention and participation in all procedures. Findings indicate that cognitive training plus work therapy in the context of VA treatment as usual led to improvements in verbal memory and learning that were not achieved by work therapy alone with treatment as usual. Effect sizes at the conclusion of treatment (3-month follow-up) were large. While there was some decline three months after the active intervention (6-month follow-up), the differences by condition remained significant with a non-significant time by condition effect, indicating that the gains made during the active intervention were retained.

Other evidence for the large effect at the conclusion of the active intervention comes from examining the number of participants who met the definition for a verbal memory or verbal learning deficit (Table 3). More than 50% of the participants were so identified at baseline,

but by 3 months only 20% in the cognitive training condition still met the criterion for impairment in verbal memory, a statistically significant difference from the work therapy only condition at 3 months, which actually had a slight increase in the number of participants with a verbal memory deficit. The NNT = 3 is a very promising finding supporting the potential clinical benefit of this intervention. Three months after the active intervention, the percentage of participants with verbal learning and memory deficits marginally increased, and the finding was no longer significant. However, the percentage of impairment in the cognitive training condition was still lower than the percentage of impairment in the work therapy condition.

The number of people with verbal learning deficits in the cognitive training condition was also substantially reduced at the conclusion of the active intervention, from 66.7% to 26.7%, but the difference between the two conditions did not reach significance. Three months later, the difference in percentages by condition was not significant. The somewhat weaker response on the verbal learning measure than on the verbal memory measure may indicate that verbal learning deficits are more difficult to remediate, a hypothesis worth exploring in future studies.

These findings add to the evidence that verbal learning and memory are profoundly affected by alcohol use disorders. On average, the sample was almost 1.5 SD's below age-corrected norms (Figures 1 and 2), and more than half met the definition of a clinically meaningful decline from their pre-morbid verbal IQ (Table 3). These deficits can have profound effects on functioning and can also interfere with alcohol use disorder treatment, which relies heavily on psychoeducation and verbal interventions that require verbal learning and memory.

This NIDA-funded pilot study demonstrates that cognitive training within the context of another activating intervention (Work Therapy) and with VA treatment as usual may have efficacy in remediating verbal learning and verbal memory deficits in patients with alcohol use disorders. The large effect size found in this study exceeds the moderate effect sizes reported in meta-analyses of cognitive training for psychotic disorders (Wykes et al., 2011), and the NNT is encouraging as well. However, it must be recognized that this cognitive training was part of a comprehensive program that promoted excellent study retention and led to participants receiving an adequate dose of the intervention. To our knowledge, this is the first cognitive training study of alcohol use disorders that was conducted as an outpatient service and successfully achieved an average dose of 40 hours of training.

There are a number of limitations to this study. First, this was a sample of US Veterans who were interested in participating in a work therapy program. They had long histories of alcohol use disorders and many were dependent on the VA for housing services. It is unknown how good retention would have been in a general outpatient sample. Second, although the psychometrician who performed the HVLT assessments was not involved in implementing the interventions, he was not fully blinded to condition. HVLT assessments are unlikely to have been influenced by unconscious bias, since administration is straight-forward and scoring does not include interpretation, yet this cannot be considered a blinded trial. Although the study successfully achieved equipoise as can be judged by the excellent

participation in both conditions, the study participants were also unblinded. Finally, the NIDA study was a trial that included all SUDs, and the alcohol use disorder sample was therefore relatively small for a pilot. Even so, the sample is comparable in size to samples used in the other studies published on this subject, which were reviewed in the introduction. Nevertheless, large effect sizes in a small study can be misleading, and it is best to be conservative about their interpretation. These findings support the hypothesis that cognitive training may have meaningful clinical benefit in addressing verbal memory and verbal learning deficit, and that further investigations are warranted.

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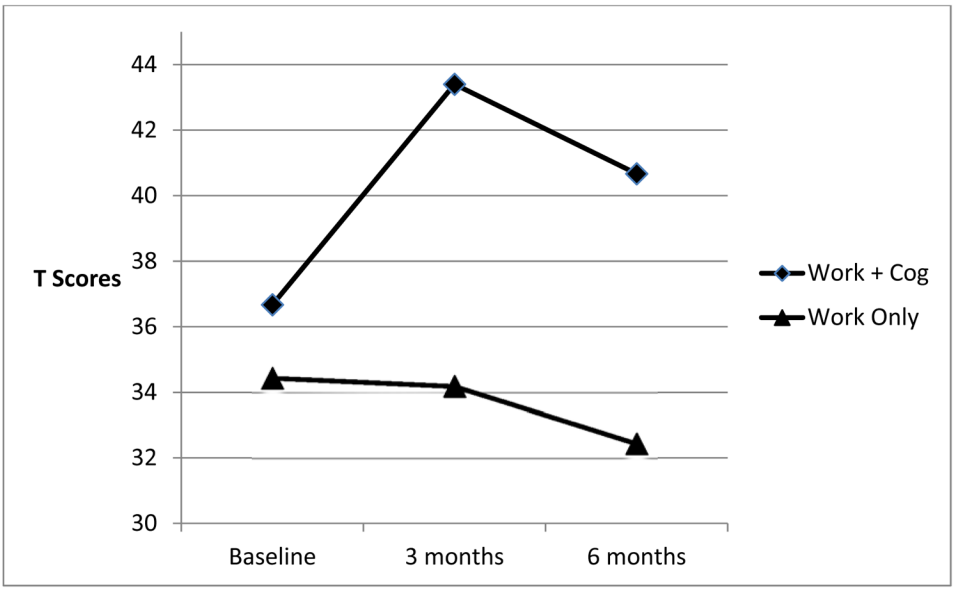

Figure 1.
HVLT Total Score T Scores (Verbal Memory) across three time points

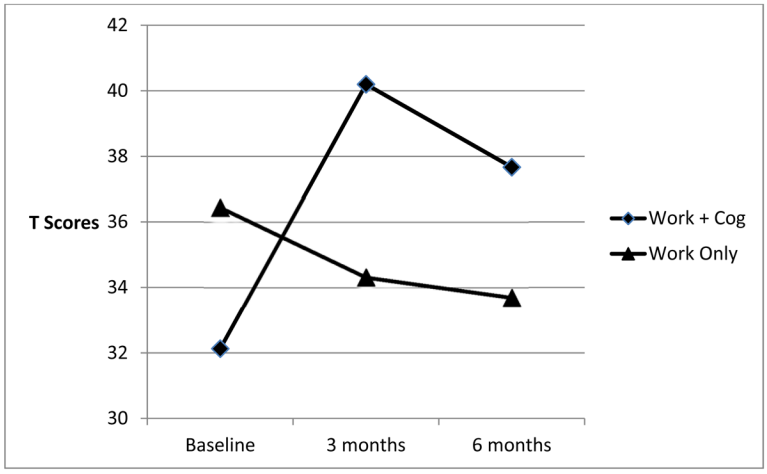

Figure 2.
HVLT Trial 3 T Scores (Verbal Learning) across three time points

Table 1

Baseline Characteristics

Baseline Characteristic	**Total (*N*=31)**	**Cognitive Training + Work Therapy (*n*=15)**	**Work Therapy Only (*n*=16)**
	***n* (%)**	***n* (%)**	***n* (%)**
Gender (male)	30 (96.77%)	14 (93.33%)	16 (100%)
Race			
White	14 (45.16%)	8 (53.33%)	6 (37.50%)
Black	14 (45.16%)	7(46.67%)	7 (43.75%)
Other	4 (12.90)	0	4 (25.00%)
Ever married	24 (77.42%)	13 (86.67%)	11 ((68.75%)
Primary Axis I Diagnosis			
AUD	27 (87.09%)	12 (80.00%)	15 (93.75%)
Poly SUD	5 16.13%)	3 (20.00%)	2 (12.5%)
Secondary Axis I Diagnosis			
Major Depressive Disorder	8 (25.81%)	3 (20.00%)	5 (31.25%)
Posttraumatic Stress Disorder	2 (6.45%)	2 (13.33%)	0
Psychotropic Medications			
Antidepressants	5 (16.12%)	2 (13.33%)	3 (18.75%)
Alpha blockers[a]	1 (3.23%)	1 (6.67%)	0
Felony conviction	14 (45.16%)	6 (40.00%)	8 (50.00%)
Receiving SSDI	9 (29.03%)	4 (26.67%)	5 (31.25%)
	M (*SD*)	*M* (*SD*)	*M* (*SD*)
Age (years)	55.16 (5.16)	55.27 (5.27)	55.06 (5.23)
Education (years)	12.72 (1.72)	13.27 (1.83)	12.24 (1.52)
Months of Sobriety	1.64 (2.81)	1.63 (2.90)	1.64 (2.81)
GAF	46.81 (5.72)	45.60 (3.96)	47.88 (6.86)

Note: There were no significant differences between groups on baseline characteristics. AUD= alcohol use disorder, Poly SUD= polysubstance dependence; SSDI = Social Security Disability Insurance; GAF = Global Assessment of Functioning.

[a]Used to treat nightmares associated with posttraumatic stress disorder.

Table 2

Verbal Memory and Verbal Learning T-Scores over Time by Condition

	Baseline		3-month Follow-up		6-month Follow-up	
	CT + WT T-score	**WT only T-score**	**CT + WT T-score**	**WT only T-score**	**CT + WT T-score**	**WT only T-score**
Verbal Memory (HVLT Total)	36.67	34.44	43.40	34.19	40.67	32.44
			$F(1,28) = 7.98$, $p < .01$		$F(1,28) = 10.73$, $p < .005$	
Verbal Learning (HVLT Trial 3)	32.13	36.44	40.20	34.31	37.67	33.69
			$F(1,28) = 9.22$, $p < .005$		$F(1,28) = 13.23$, $p < .001$	

Note. CT+WT = Cognitive Training plus Work Therapy; WT = Work Therapy; HVLT = Hopkins Verbal Learning Test Revised.

Table 3

Frequency of Verbal Memory and Verbal Learning Impairments* by Condition.

		Baseline		3-month Follow-up		6-month Follow-up	
	Condition	**Impaired**	**Unimpaired**	**Impaired**	**Unimpaired**	**Impaired**	**Unimpaired**
Verbal Memory (HVLT Total)	WT	9 (56.3%)	7 (43.8%)	11 (68.8%)	5 (31.3%)	10 (62.5%)	6 (37.5%)
	CT+WT	7 (46.7%)	8 (53.3%)	3 (20%)	12 (80%)	5 (33.3%)	10 (66.7%)
		$\chi^2 = 0.28$, $p = .59$		$\chi^2 = 7.4$, $p < .01$		$\chi^2 = 2.63$, $p = .10$	
Verbal Learning (HVLT Trial 3)	WT	8 (50%)	8 (50%)	8 (50%)	8 (50%)	9 (56.3%)	7 (43.8%)
	CT+WT	10 (66.7%)	5 (33.3%)	4 (26.7%)	11 (73.3%)	7 (46.7%)	8 (53.3%)
		$\chi^2 = 0.88$, $p = .35$		$\chi^2 = 1.78$, $p = .18$		$\chi^2 = 0.28$, $p = .59$	

Note. All chi-square degrees of freedom = 1. HVLT = Hopkins Verbal Learning Test Revised; WT = Work Therapy Alone; CT+WT = Cognitive Training plus Work Therapy.

*Impairments are classified based on T-Scores one standard deviation or greater decline from baseline estimates of Verbal IQ.