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Visual and verbal learning deficits in Veterans with alcohol and substance use disorders

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ABSTRACT

Background: This study examined visual and verbal learning in the early phase of recovery for 48 Veterans with alcohol use (AUD) and substance use disorders (SUD, primarily cocaine and opiate abusers). Previous studies have demonstrated visual and verbal learning deficits in AUD, however little is known about the differences between AUD and SUD on these domains. Since the DSM-5 specifically identifies problems with learning in AUD and not in SUD, and problems with visual and verbal learning have been more prevalent in the literature for AUD than SUD, we predicted that people with AUD would be more impaired on measures of visual and verbal learning than people with SUD.
Methods: Participants were enrolled in a comprehensive rehabilitation program and were assessed within the first 5 weeks of abstinence. Verbal learning was measured using the Hopkins Verbal Learning Test (HVLT) and visual learning was assessed using the Brief Visuospatial Memory Test (BVMT).
Results: Results indicated significantly greater decline in verbal learning on the HVLT across the three learning trials for AUD participants but not for SUD participants ($F = 4.653$, df = 48, $p = 0.036$). Visual learning was less impaired than verbal learning across learning trials for both diagnostic groups ($F = 0.197$, df = 48, $p = 0.674$); there was no significant difference between groups on visual learning ($F = 0.401$, df = 14, $p = 0.538$).
Discussion: Older Veterans in the early phase of recovery from AUD may have difficulty learning new verbal information. Deficits in verbal learning may reduce the effectiveness of verbally-based interventions such as psycho-education.

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1. Introduction

The first few weeks of abstinence are particularly difficult for people in recovery from substance use disorders. In this early phase of a rehabilitation program, people are attempting to learn concepts and skills for sustaining sobriety by participating in psychoeducational classes and group experiences. These methods heavily rely on the capacity for new learning. Unfortunately, this new learning occurs at a time when verbal and visual learning deficits may interfere with these rehabilitation methods. In the current study, we examined these deficits in verbal and visual learning in a cohort of U.S. military Veterans first entering substance abuse rehabilitation programs. We determined the severity of these impairments as well as differences in the pattern of deficits between Veterans with alcohol use disorders and those with primarily cocaine or opioid use disorders.

1.1. Visual learning and memory deficits in AUD and SUD

Impairments in visual learning are consistently found in abusers of alcohol. One study from 1996 found that alcohol abusers had impaired spatial scanning and memory as compared to controls (Beatty et al., 1996). Another study from the same year found that deficits in visual learning were similar among short-term and long-term abstinent alcohol abusers, showing that deficits in visual learning persist throughout recovery (Schandler et al., 1996). Another more recent study found that women who abuse alcohol performed worse than age-matched controls on measures of visual learning and visuospatial construction (Fama et al., 2006). Two

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other studies performed by Sullivan and colleagues found similar results as well (Sullivan, 2000; Sullivan et al., 2002).

Studies have shown that abusers of a variety of illicit substances are usually more impaired than controls on measures of visual learning and memory. However, visual learning deficits in AUD are more prevalent in the literature than deficits in SUD. Since most of the people in this study abused cocaine and opiates, only these two substances were taken into consideration when searching the literature. One study found that abusers of cocaine performed worse than controls on the Rey Complex Figure Test (RCFT), a measure of visuospatial construction (Meade et al., 2011). As for opiates, one study showed that people that abused opiates performed more poorly than controls on a measure assessing visual learning because they required more trials than controls to master the visual memory task (Ersche et al., 2006). Another study demonstrated that opiate dependent individuals performed worse than controls on a measure of visual learning (Messinis et al., 2009). A third study found that abstinent opioid abusers and current methadone users performed worse than controls on the BVRT, a measure of visual memory (Prosser et al., 2006).

1.2. Verbal learning and memory deficits in AUD and SUD

Deficits in verbal learning are consistently observed in abusers of alcohol. One early study found that abusers of alcohol performed worse than age-matched controls on the California Verbal Learning Test (CVLT), a measure of verbal learning and memory (Kramer et al., 1989). In 2009, Loeber et al. (2009) found a significant correlation between duration of lifetime dependence on alcohol and performance on a verbal learning task. A recent study conducted by Sneider et al. (2013) found that binge drinkers performed significantly worse than light drinkers on the CVLT.

Deficits in verbal learning are common in abusers of cocaine. An older study from 1993 (Mittenberg and Motta, 1993) determined that cocaine abusers had impaired verbal learning when compared to controls, as demonstrated by poor performance on trial 5 of the CVLT. Gillen et al. (1998) found that cocaine abusers performed more poorly than controls on measures of verbal memory. Another more recent study demonstrated again that cocaine abusers performed worse than controls on trial 5 of the CVLT (Reske et al., 2010). Less research has been done on opiates and verbal learning, but opiate users tend to do worse than controls on neuropsychological measures (Rogers and Robbins, 2001). The study cited previously about opiates and visual learning found verbal learning deficits when comparing opiate users to controls (Messinis et al., 2009).

1.3. Comparisons of AUD and SUD on visual and verbal learning and memory

Studies comparing visual learning performance in long-term alcohol abusers to abusers of other substances have yielded inconsistent findings. A study done by Hanson et al. (2011) revealed that heavy stimulant use predicted poorer visual learning and memory during a 10-year longitudinal study. Alcohol use did not have this predictive effect. A study that compared alcohol abusers to heroin addicts after three weeks of detoxification in an inpatient unit found that alcohol-abusing subjects were more impaired on measures of visual learning (Fishbein et al., 2007). Beatty and colleagues compared alcohol abusers that also abused other substances to abusers of alcohol alone on measures of visual learning. There were no significant differences in visual learning between people that abused only alcohol and people that abused alcohol and other drugs (Beatty et al., 1996).

Only a few studies have compared verbal learning deficits in chronic alcohol abusers to abusers of other substances, and these studies have yielded mixed results as well. One study (Selby and Azrin, 1998) comparing abstinent alcohol abusers to abstinent cocaine abusers and abstinent polysubstance abusers found that people in the alcohol dependence group performed significantly worse on the Rey Auditory Verbal Learning Test (RAVLT) trial 5 and delay trial than people who were dependent on cocaine. Length of abstinence from alcohol was also correlated with performance on the RAVLT, whereas length of abstinence from cocaine was not. Polysubstance abusers performed significantly worse on the RAVLT than both the cocaine and alcohol abusers. One study that contradicted these findings (Bolla et al., 2000) reported a significant negative correlation between lifetime cocaine abuse and performance on the RAVLT. Lifetime alcohol abuse was not correlated with performance on the RAVLT. A third study (Bondi et al., 1998) compared polysubstance abusers with concurrent alcohol abuse to abusers of alcohol alone in the early phase of a drug treatment program. The polysubstance abusers performed significantly worse than the alcohol abusers on the CVLT total recall and trial 5 recall. However, there was no significant difference in the learning slopes between the two groups.

The present study attempts to shed light on these inconsistent findings by examining visual and verbal learning deficits in a cohort of Veterans with substance use disorders within the first two months of abstinence. A recent review (Ridley et al., 2013) of alcohol- related dementia points out that verbal and visual learning are both commonly impaired, and that visual learning may take longer to recover from after sustained abstinence than verbal learning. The DSM-5 includes the diagnosis of substance-induced major or mild neurocognitive disorder with criteria that includes persistence of the deficit beyond acute withdrawal, and in the case of alcohol use disorders, it specifically identifies problems in memory and learning (American Psychiatric Association, 2013). The DSM-5 specifically cites problems with learning in alcohol use disorders and not in abusers of cocaine or opiates, which are the primary substances of abuse in the SUD group. There is also an extensive literature for visual and verbal learning deficits in alcohol use disorders, and the literature is much sparser for abusers of other substances, especially for opiates and verbal learning deficits. Given the extent of previous research on neurocognitive impairment in AUD as well as the DSM-5 statements about learning deficits in AUD specifically, we hypothesized that Veterans who abused alcohol would be impaired on measures of verbal and visual learning relative to published norms and that their impairments would be significantly greater than abusers of cocaine and opiates.

2. Materials and methods

2.1. Participants

US Veterans 18 years of age and older (Table 1) were recruited for a randomized clinical trial of cognitive training and work therapy (NCT01410110) by referral from clinicians at a VA substance abuse program, including 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 assessed for eligibility and consented. 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. Ten did not meet inclusion criteria, 6 declined to complete the intake, and 23 were excluded for other reasons such as moving away or participating in other vocational programs that were not part of the study. Forty-eight participants were included in the study. Twenty-nine participants primarily abused alcohol, 14 primarily abused either opiates or cocaine, and the remaining 5 participants were polysubstance abusers that had more than one primary drug of abuse in addition to alcohol.

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