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Demographic and Clinical Characteristics of Middle-Aged versus Younger Adults Enrolled in a Clinical Trial of a Web-Delivered Psychosocial Treatment for Substance Use Disorders

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Abstract

Objective—Evidence suggests that substance abuse is becoming more prevalent in middle-aged adults. The objective of this secondary analysis was to add to the growing empirical literature on the unique features of middle-aged substance abuse populations.

Methods—We descriptively compared baseline demographic and clinical characteristics of middle-aged (age 45–62, $n = 111$) and younger (age 18–44, $n = 395$) substance abusers entering a web-based psychosocial treatment study as part of the National Institute on Drug Abuse (NIDA) Clinical Trials Network (CTN).

Results—A significantly greater percentage of middle-aged adults were non-Caucasian and had a marital status other than single/never married. There was a significant association between frequency of Internet use and the age group. Forty-six percent of middle-aged adults versus 21% of younger adults reported no Internet use in the prior 90 days. A significantly greater percentage of middle-aged adults used cocaine, and a significantly greater percentage of younger adults used marijuana and opioids. Clinically significant cognitive impairment (z less than -1.0) was found for the average participant in both groups on logical association of familiar concepts.

Conclusions—This secondary analysis of a NIDA CTN study provides additional information on the unique features of middle-aged substance abusers. Increasing knowledge of similarities and differences between younger and middle-aged substance abusers can help with potential age-specific substance abuse treatment planning.

Keywords

aging; web-based treatment; addiction; neurocognitive

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Conflicts of Interest:

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the manuscript.

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Introduction

Evidence suggests that substance abuse is becoming more prevalent in the middle-aged adult population (Arndt et al., 2011; Blazer and Wu, 2011; Dinitto and Choi, 2010; Lofwall et al., 2008; SAMHSA, 2011; Satre et al., 2011), typically defined as age 45 and older in the substance abuse literature (Cicero et al., 2012; Hasin et al., 2005; Rabinowitz et al., 1996). As adults grow older, they begin to have unique neurocognitive (Hulette et al., 1998; Kalapatapu et al., 2011), biological (Ersche et al., 2012; Lin et al., 2011), psychological (Han et al., 2011; Miller, 1991) and social (Fiori et al., 2006; Gordon et al., 2012; Kuerbis and Sacco, 2012; Nielsen et al., 2010) characteristics that impact substance abuse treatment outcomes. The literature on such characteristics has emerged in recent years (Dowling et al., 2008; Frances, 2011), which may potentially help develop substance abuse treatments specific to middle-aged adults (Crome et al., 2011; Rothrauff et al., 2011). For example, in recent years, middle-aged adults are increasingly endorsing cocaine as their primary drug of choice (Arndt et al., 2011). Compared to younger patients, middle-aged patients on opioid maintenance have been found to have increased medical morbidity (e.g., cardiovascular, gastrointestinal and bone/joint problems) (Lofwall et al., 2005).

The objective of this secondary analysis was to add to such growing empirical literature on the unique features of middle-aged substance abuse populations. Specifically, we descriptively compared baseline demographic and clinical characteristics of middle-aged and younger substance abusers entering a web-based psychosocial treatment study (Bickel et al., 2008) as part of the National Institute on Drug Abuse (NIDA) Clinical Trials Network (CTN) (Campbell et al., 2012). The study has broad inclusion and few exclusion criteria and is intended to draw a quasi-representative sample of patients seeking treatment for drug or alcohol problems in community-based treatment programs in the United States. This study also includes a novel web-based platform for treatment delivery that allows for comparing technology use between middle-aged and younger substance abusers. Based on the chronicity and morbidity of substance abuse in middle-aged populations (Cicero et al., 2012; Lofwall et al., 2005; Patterson and Jeste, 1999), we hypothesized that middle-aged adults would have overall poorer psychiatric, medical and age and education-adjusted neurocognitive characteristics at baseline compared to younger adults.

Methods

Study Design, Setting and Measures

Full details about the study's design, recruitment settings and measures can be found in a prior publication (Campbell et al., 2012). Briefly, this study is evaluating a web-based version (Bickel et al., 2008) of the Community Reinforcement Approach (Hunt and Azrin, 1973), in addition to prize-based contingency management (Budney et al., 1991), among participants enrolled in 10 outpatient substance abuse treatment programs located across the United States. Eligible participants were in the first 30 days of the current treatment episode, reported using an illicit substance within the 30 days prior to screening, and not receiving opioid replacement medications. 1,781 participants were screened, 848 were ineligible (47.6%), 426 (23.9%) were eligible but did not enroll in the study, and 507 (28.5%) were eventually randomized. The primary reasons for ineligibility were: no recent illicit substance use (83.5%); not planning a treatment episode of at least 90 days (11.8%); in the current treatment episode greater than 30 days (8.5%); and currently prescribed an opioid replacement therapy (7.9%). One participant aged 67 was excluded for this analysis due to being over age 65. Final data collection was concluded in June 2012; this analysis used data as of September 2012, which included all baseline information.

Demographic variables included sex, age, race/ethnicity, education, marital status, and employment status. Frequency of Internet use was a self-report categorical measure, asking participants how often they accessed the Internet in the past 90 days.

Probable current diagnoses across six psychiatric disorders were assessed using the Patient Health Questionnaire (PHQ) (Spitzer et al., 1999) and included major depression, attention-deficit/hyperactivity disorder (ADHD), posttraumatic stress disorder (PTSD), and panic, social anxiety, and generalized anxiety disorders (combined the last three into one category). The Brief Symptom Inventory-18 (Derogatis, 2000) (total global score) measured overall psychological distress level. Days of substance use were collected using the Timeline Follow Back method (Sobell et al., 1979). Age of onset for first substance use dependence and primary substance of abuse were both collected using the DSM-IV symptom questionnaire (Hudziak et al., 1993). The Coping Strategies Scale (Litt et al., 2003) (total number of endorsed strategies of 23 where endorsed equals occasionally or frequently; range 0–23) assessed change processes used in altering substance use behavior.

The Euro Quality of Life (QoL) questionnaire assessed participants' perception of their physical health using a visual analogue scale (range 0–100; where 100 is the best health) (1990). Medical service utilization was measured for the 90 days prior to baseline and included number of doctor visits, emergency department visits, and hospital admissions.

The MicroCog computerized Assessment of Cognitive Functioning has been normalized and standardized for adults (Powell et al., 1993). Based on our previous work (Aharonovich et al., 2008; Aharonovich et al., 2006), a custom version of the MicroCog (20–25 minutes in length) was used to measure working memory (Numbers Forward and Reversed), immediate/delayed memory (Wordlist 1 and 2), logical association of familiar concepts (Analogies), and spatial recognition/logic (Object Match A and B; Clocks). Subtest raw scores were transformed to scaled scores ($\mu = 10.0$, $\sigma = 3.0$) and descriptively defined (Powell et al., 1993) as: $\mu - 4$ (below average), $8 > \mu > 4$ (low average), $13 > \mu - 8$ (average), and $\mu - 13$ (above average). Scaled scores were also transformed to standard scores (z); we used a cut-off of z less than -1.0 (Jak et al., 2009) to define clinically significant cognitive impairment, which is frequently used in neuropsychological studies across diverse clinical populations (Bischkopf et al., 2002; Busse et al., 2006; Karzmark et al., 2012; Lonie et al., 2008; Patti et al., 2009; Reichenberg et al., 2009).

Statistical Analysis

A cut-off of age 45 was used to divide the sample into younger and middle-aged groups. Either the χ^2 test or the Kruskal-Wallis test (non-parametric equivalent of the one-way independent ANOVA) was used to compare both groups across variables. A p -value of less than 0.05 was considered significant. All analyses were conducted using SAS version 9.3 (Cary, NC).

Results

Demographic Data

Table 1 presents baseline demographic features of the randomized sample. The median age of the entire sample was 33. The mean age of the younger group was 30.38 (S.D. = 7.36) and 50.66 (S.D. = 4.30) for the middle-aged group. Of the 111 participants in the middle-aged group, twenty two were 55 or older. A significantly greater percentage of middle-aged adults were non-Caucasian and had a marital status other than single/never married. There was a significant association between frequency of Internet use and the age group. Forty-six percent of middle-aged adults versus 21% of younger adults reported no Internet use in the prior 90 days.

Clinical Data

Table 2 presents baseline clinical features of the randomized sample. The number of days used of any substance in the past 90 days and the percentage of participants using alcohol, amphetamines and other drugs were similar between both groups. Middle-aged adults had a significantly later age of onset and greater duration of any substance dependence. A significantly greater percentage of middle-aged adults used cocaine, and a significantly greater percentage of younger adults used marijuana and opioids. On all other psychiatric and medical/physical health measures (e.g., coping strategies, quality of life, medical visits), both groups were similar.

Neurocognitive Data

Table 3 presents baseline neurocognitive data of the scaled scores on the MicroCog subtests. Scores were age and education-adjusted. Compared to the younger substance abusing adults, middle-aged substance abusing adults performed statistically significantly lower on working memory (Numbers Forward and Reversed – low average), delayed memory (Wordlist 2 – average), and on one measure of spatial recognition (Object Match B – low average). Younger adults performed statistically significantly lower on another measure of spatial recognition (Object Match A – average). Both age groups performed statistically similarly on immediate memory (Wordlist 1 – low average), logical association of familiar concepts (Analogies – low average) and spatial logic (Clocks – average). Clinically significant cognitive impairment (z less than -1.0) was found for the average participant in both groups on logical association of familiar concepts (Analogies).

Discussion

As expected, middle-aged substance abusing adults significantly differed from younger substance abusing adults on several measures. However, it is equally important to note similarities across several other measures.

A greater percentage of middle-aged adults identified as non-Caucasian (59% vs. 44%). Since substance abuse can be underdiagnosed in Hispanics (Andrews, 2008) and African-Americans (Cully et al., 2005) as they grow older, our findings reinforce the need for clinicians to screen for substance abuse in non-Caucasian middle-aged adults.

The similarity between middle-aged and younger adults in the days used of any substance highlights the role of clinicians to continue screening for substance abuse as younger adults grow older, rather than assuming that younger adults will “mature out” of substance use over time (Snow, 1973; Winick, 1962). This finding is similar to our previous dataset in cocaine users (Kalapatapu et al., 2011), where we found a similar level ($p > 0.05$) of cocaine use between middle-aged adults (20.4 days of use in the past 30 days) and younger adults (23.45 days of use in the past 30 days).

The later age of onset of substance dependence in middle-aged adults compared to younger adults in this analysis is also consistent with our previous dataset (Kalapatapu et al., 2011) and other studies (Al-Otaiba et al., 2012; Arndt et al., 2002). This difference may be due to biased recall, where younger adults were more likely to remember an earlier age of onset because it is more recent due to their younger age. As these younger adults grow older, they may have more substance dependence chronicity and functional impairment because of an earlier age of onset of substance dependence.

The percentage of middle-aged adults reporting cocaine as their primary drug of choice was even greater than alcohol, which is reported as the most commonly abused substance in adults as they grow older (Choi and Dinitto, 2011). Trend data from the Treatment Episode

Dataset (TEDS) show that middle-aged adults endorsing cocaine as their primary drug of choice is on the rise (Arndt et al., 2011). Studies in emergency room settings (Chait et al., 2010; Rivers et al., 2004; Schlaerth et al., 2004) show that cocaine is used more among adults as they grow older than normally assumed. So, the data in this analysis are consistent with a growing trend of cocaine abuse in middle-aged adults.

It is not unexpected that a greater percentage of middle-aged adults had a marital status other than single/never married, since living longer might lead to more opportunities to have a change in one's marital status. Also, it is not unexpected that much of the middle-aged group was between the ages of 45–55 compared to age 55+; this distribution is consistent with national samples, such as the Treatment Episode Data Set (TEDS, 2010).

Surprisingly, we found no differences in psychiatric comorbidity between age groups. Depression has been reported to be prevalent among substance abuse populations as they grow older (Blixen et al., 1997; Blow et al., 2004; Schonfeld et al., 2009), but the present analysis shows no difference in current depressive disorders between age groups. Similarly surprising was the lack of increased medical comorbidity in the middle-aged group, also a common finding in middle-aged substance abuse populations (Lofwall et al., 2005). Mood and anxiety disorders are often underdiagnosed in adults as they grow older (Gum et al., 2009; Sable and Jeste, 2001; VanItallie, 2005). The lack of increased psychiatric or medical comorbidity in this sample of middle-aged adults may be due to the self-report format of the psychiatric and medical measures used, as opposed to a standardized clinical psychiatric interview (e.g., Structured Clinical Interview for DSM-IV-TR Disorders). Furthermore, collateral medical history from a family member or primary care physician was not obtained. These findings, however, highlight the high rates of comorbidity overall among this treatment-seeking sample.

Regarding coping strategies, there is some evidence that more reliance on avoidance coping strategies can predict late-life problem drinking (Schutte et al., 1998) and that neurocognitive ability (e.g., processing speed) can moderate the relationship between coping strategies (e.g., self-blaming) and drinking outcomes, such as subsequent drinking (Tapert et al., 2004). We found no difference in coping strategies between the middle-aged and younger groups at baseline. The impact of coping strategies on substance abuse outcomes will be reported in a future manuscript.

The neurocognitive data show that assessing and recognizing the role of cognitive functioning in substance abuse treatment planning for middle-aged adults is important. This is consistent with earlier findings that adults are more likely to be cognitively sensitive to substances as they grow older (Dowling et al., 2008; Fingerhood, 2000). Due to brain abnormalities present in a middle-aged substance abuser that are not found in a healthy aging brain (Bartzokis et al., 2002; Bartzokis et al., 1999), cognitive impairment in an middle-aged substance abuser may be above and beyond the normal cognitive changes (e.g., working memory) expected for a middle-aged adult. If clinically significant cognitive impairment is found, psychotherapeutic interventions may need to be modified (Aharonovich et al., 2008; Aharonovich et al., 2006) or cognitive rehabilitation techniques (Ball et al., 2002) may need to be added to the treatment plan to rehabilitate a cognitive domain. Compared to the younger group, the middle-aged group reported a later age of onset but greater duration of substance dependence. Thus, the associations between age and cognitive impairment could reflect adverse effects on the brain of longer exposure to substances, or cognitive impairment could be a premorbid factor that conveys risk for a more chronic course of substance dependence (Latvala et al., 2009; Newton et al., 2011; Tarter et al., 2003).

Of note in the neurocognitive data is the finding that the younger group performed worse than the middle-aged group on one measure of spatial recognition (Object Match A Total Score). This may be an aberrancy, or this may represent some difference in the dorsal stream of the visual processing pathway [involved in the processing of visuospatial information (Kravitz et al., 2011)] between both groups. This is speculative given the absence of neuroimaging in this study to better understand underlying neural correlates.

Regarding Internet use, adults are more likely to use the Internet when they are younger (Berner et al., 2012; Cohall et al., 2011). However, a growing literature shows adults are willing to use web-based platforms for general healthcare (Lukazewski et al., 2012; Robertson-Lang et al., 2011; Xie, 2011) and substance abuse treatment (Finfgeld-Connett, 2009; Postel et al., 2011) as they grow older. Web-based and mobile phone platforms represent a potentially innovative way to reach and treat middle-aged substance abusers who might suffer from social isolation, a common concern as adults grow older (Dickens et al., 2011).

This analysis has several strengths, such as a large sample size, a wide variety of outpatient clinical recruitment sites across the United States, and the assessment of baseline Internet use. There are also clear limitations. First, since participants were selected from outpatient programs, these findings may not be generalizable to other populations, such as inpatient or correctional populations. Further, since eligibility criteria required recent (past 30 days) illicit substance use, participants with alcohol use disorders only were not included. Second, our assessment of medical and psychiatric morbidity was limited, only relying on self-report. A more comprehensive medical and psychiatric assessment with collateral history from participants' families or their primary care physicians might have yielded different findings. Third, we dichotomized the continuous variable of age, which may contribute to a loss of information about individual differences, as well as power (Altman and Royston, 2006; MacCallum et al., 2002; Naggara et al., 2011). Fourth, we don't know if the neurocognitive data reflect premorbid capacity or substance-induced cognitive changes, which could have been further teased out with collateral history. Finally, the results could be biased due to the limitations of the study sample.

Conclusions

In summary, this secondary analysis of a NIDA CTN study provides additional information on the unique features of middle-aged substance abusers. Increasing knowledge of similarities and differences between younger and middle-aged substance abusers can help with potential age-specific substance abuse treatment planning.

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Table 1

Middle-aged adults versus Younger adults – Baseline demographic data.

Demographic Data		Age 18–44 <i>n</i> = 395	Age 45–62 <i>n</i> = 111	Significance between Groups
		Mean (S.D.) or %		
Age		30.38 (7.36)	50.66 (4.30)	
Education	<12 years	23.54	22.52	$\chi^2(2) = 5.62, p = 0.060$
	=12 years	63.04	54.95	
	>12 years	13.42	22.52	
Sex	Male	60.00	69.09	$\chi^2(1) = 3.02, p = 0.082$
	Female	40.00	30.91	
Race	Caucasian	55.70	41.44	$\chi^2(1) = 7.06, p = 0.008$
	Non-Caucasian	44.30	58.56	
Work	Unemployed	56.71	65.77	$\chi^2(1) = 2.93, p = 0.087$
	Employed/Retired	43.29	34.23	
Marital Status	Single/Never Married	70.38	27.03	$\chi^2(1) = 68.37, p < 0.0001$
	All Other	29.62	72.97	
Frequency of Internet use in the past 90 days	None	20.76	45.95	$\chi^2(3) = 32.20, p < 0.0001$
	<1 per week	6.58	9.01	
	At least weekly	20.00	15.32	
	At least once per day	52.66	29.73	

Table 2

Middle-aged adults versus Younger adults – Baseline clinical data.

Clinical Data		Age 18–44 <i>n</i> = 395	Age 45–62 <i>n</i> = 111	Significance between Groups
		Mean (S.D.) or %		
Days used of any substance in the past 90 days		44.96 (27.20)	43.70 (26.71)	$H(1)^a = 0.21, p = 0.64$
Age of onset of substance dependence		20.76 (6.21)	27.10 (12.16)	$H(1) = 17.38, p < 0.0001^b$
Years of substance dependence ^c		9.73 (7.39)	23.67 (11.92)	$H(1) = 98.08, p < 0.0001^b$
Primary drug of choice	Alcohol	18.99	26.13	$\chi^2(1) = 2.70, p = 0.10$
	Marijuana	25.82	10.81	$\chi^2(1) = 11.19, p = 0.0008$
	Cocaine	15.70	35.14	$\chi^2(1) = 20.49, p < 0.0001$
	Amphetamines	13.67	13.51	$\chi^2(1) = 0.002, p = 0.97$
	Opioids	23.54	13.51	$\chi^2(1) = 5.19, p = 0.02$
	Other	2.28	0.90	$\chi^2(1) = 0.85, p = 0.36$
Current Comorbid Depressive Disorder		19.24	27.03	$\chi^2(1) = 3.17, p = 0.07$
Current Comorbid Non-PTSD Anxiety Disorder		50.63	43.24	$\chi^2(1) = 1.89, p = 0.17$
Current Comorbid PTSD Disorder		20.36	24.07	$\chi^2(1) = 0.70, p = 0.40$
Current Comorbid ADHD Disorder		24.81	24.32	$\chi^2(1) = 0.01, p = 0.92$
Brief Symptom Inventory-18 Total Score		13.18 (11.91)	14.79 (14.66)	$H(1) = 0.16, p = 0.69$
Coping Strategies Scale – Brief Version Total Score		16.56 (5.61)	17.78 (4.75)	$H(1) = 3.21, p = 0.07$
Euro Qol questionnaire overall physical health score		73.32 (19.18)	71.41 (21.36)	$H(1) = 0.36, p = 0.55$
Total number of medical visits in the past 30 days		1.76 (3.55)	1.85 (2.57)	$H(1) = 1.70, p = 0.19$

^a*H* denotes the Kruskal-Wallis test.^b44 individuals excluded from this analysis: 35 individuals (age 18–44) and 9 individuals (age 45–62) did not meet criteria for substance dependence.^cPresent age minus age of onset of substance dependence.

Table 3

Middle-aged adults versus Younger adults – Baseline age/education-adjusted neurocognitive data.

MicroCog Subtest Scaled Scores	Age 18–44 <i>n</i> = 395	Age 45–62 <i>n</i> = 111	Significance between Groups
	Mean (S.D.), standard score		
Numbers Forward Average Total Score	8.81 (2.58), <i>z</i> = −0.40	7.85 (2.41), <i>z</i> = −0.72	<i>H</i> (1) = 15.56, <i>p</i> < 0.0001
Numbers Reversed Total Score	8.33 (2.69), <i>z</i> = −0.56	7.50 (2.58), <i>z</i> = −0.83	<i>H</i> (1) = 13.55, <i>p</i> = 0.0002
Wordlist 1 Total Score	7.64 (4.48), <i>z</i> = −0.79	7.03 (4.54), <i>z</i> = −0.99	<i>H</i> (1) = 2.43, <i>p</i> = 0.12
Wordlist 2 Total Score	9.85 (3.12), <i>z</i> = −0.05	8.91 (3.41), <i>z</i> = −0.36	<i>H</i> (1) = 12.04, <i>p</i> = 0.0005
Analogies Average Total Score	6.80 (2.84), <i>z</i> = −1.07	6.35 (2.90), <i>z</i> = −1.22	<i>H</i> (1) = 1.73, <i>p</i> = 0.19
Object Match A Total Score	8.10 (3.91), <i>z</i> = −0.63	8.89 (3.85), <i>z</i> = −0.37	<i>H</i> (1) = 4.09, <i>p</i> = 0.043
Object Match B Total Score	8.86 (3.08), <i>z</i> = −0.38	7.72 (3.19), <i>z</i> = −0.76	<i>H</i> (1) = 11.22, <i>p</i> = 0.0008
Clocks Total Score	11.00 (1.84), <i>z</i> = 0.33	11.00 (1.91), <i>z</i> = 0.33	<i>H</i> (1) = 0.001, <i>p</i> = 0.97