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Tobacco Smoking among Male and Female Alcohol Treatment-seekers: Clinical Complexities, Treatment Length of Stay, and Goal Achievement

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Abstract

Background—Literature suggests that tobacco smoking among clients in alcohol treatment has important clinical implications, including poorer treatment outcome. Much of this literature, however, has been derived from research-based treatment samples that utilized stringent inclusion and exclusion criteria, limiting generalizability of findings.

Objective—In order to further our understanding of the correlates of smoking among clients with alcohol problems, the present research examines tobacco smoking status at admission for 21,128 adult treatment seekers from 253 community outpatient substance abuse clinics across New York State.

Methods—This sample includes tobacco smokers at admission (62%) and women (25%). Clinical complexities at admission (unemployment, lack of high school diploma/GED, criminal justice involvement, mental illness, polysubstance abuse) and length of treatment stay and alcohol-related goal achievement at discharge were assessed by clinic staff.

Results—Mixed models revealed that tobacco smoking was significantly associated with all five clinical complexities; interactions with gender indicated that this association was stronger for women with regard to criminal justice involvement and polysubstance abuse. Also, these smokers evidenced shorter substance disorder treatment duration and were less likely to achieve alcohol-related treatment goals relative to their non-smoking counterparts.

Conclusions—Admission tobacco smoking status of alcohol treatment seekers is an important client characteristic with regard to clinical presentation and treatment outcome. Our findings underscore the need to further our understanding of the complexities associated with smoking and especially as it pertains to female smokers.

Keywords

Alcoholism; Gender; Substance Abuse; Tobacco Smoking; Treatment Outcome

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None.

Conflict of Interest.

None.

Introduction

Current literature indicates that smoking status is associated with experiencing life challenges and complexities. For example, the Centers for Disease Control and Prevention (CDCP; 2013) data indicate that more people who are below the poverty level smoke (29.0%) as compared to those above the poverty level (17.9%). Smoking is also associated with lower educational status; smoking is more prevalent among adults with a GED diploma (45.3%) or a high school diploma (23.8%) as compared to adults with an undergraduate college degree (9.3%) (CDCP, 2013). Furthermore, smoking is associated with mood and anxiety disorders (e.g., Goodwin, Zvolensky, & Keys., 2008; Johnson et al., 2008; Le Strat, Ramoz, & Gorwood., 2010), personality disorders (e.g., Pulay et al., 2010), and alcohol use disorders (e.g., Falk, Yi, & Hiller-Sturmhofel, 2006).

Not surprisingly, characteristics associated with smoking in the general population are also associated with smoking status among those with alcohol disorders. For example, alcohol-dependent smokers have less education and lower income relative to their non-smoking counterparts (Le Strat et al., 2010). Psychiatrically, smokers with alcohol problems have significantly higher rates of past psychiatric illness (Mason & Leher, 2009) and current psychiatric comorbidity (Le Strat et al., 2010) relative to those who do not smoke. Across this literature, a picture emerges of smokers who drink problematically as those who have fewer resources and greater challenges relative to their non-smoking counterparts.

The life challenges and complexities associated with smoking status are also predictive of less positive treatment outcome among clients in alcohol treatment. For example, a meta-analysis by Adamson, Sellman, and Frampton (2009) identified multiple predictors of poorer alcohol treatment outcomes including unemployment, lower socioeconomic status/income, and presence of psychopathology. Svikis and colleagues (2012) describe a relationship between employment and more positive alcohol treatment outcomes. Furthermore, the presence of illicit substance use at admission predicts poorer alcohol treatment outcomes (e.g., Mason & Leher, 2009). Although there is less information describing the outcomes of clients who enter substance abuse treatment via the criminal justice system (e.g., with referrals from criminal justice services such as the police, family or drug court, probation/parole), involvement with the legal system creates, at a minimum, complications and complexities during treatment. In sum, pre-existing client characteristics such as unemployment, lack of education, criminal justice involvement, psychiatric comorbidity, and polysubstance abuse can be cast as “clinical complexities” – client characteristics that pose clinical challenges during treatment and/or characteristics that are associated with poorer alcohol treatment outcome.

Smoking and Alcohol Treatment Outcome

Research has shown smoking to have a negative association with alcohol treatment participation (Satre, Kohn, & Weisner, 2007; Walitzer & Dearing, 2012) and alcohol treatment outcome (Hintz & Mann, 2007; Kohn, Tsoh, & Weisner, 2003; Mason & Leher, 2009; Satre et al., 2007). In terms of alcohol treatment participation, Walitzer and Dearing (2012) compared alcohol outpatient smokers, non-smokers, and former smokers in a

controlled trial that included 12 sessions of outpatient alcohol treatment. Smoking status was assessed at time of admission. Clients who were mandated to treatment were excluded from the study. Smokers ($n = 76$) attended significantly fewer treatment sessions relative to non-smokers ($n = 34$) and former smokers ($n = 33$). Hintz and Mann (2007) conducted a seven-year follow-up with 139 inpatient clients in alcohol treatment (from an original sample of 190). Those who were non-smokers at admission had a greater tendency to be alcohol abstainers at follow-up compared to smokers ($p = .06$). Satre et al. (2007) report on a five-year follow-up of 598 private outpatient clients who met criteria for drug or alcohol abuse or dependence (from an original sample of 749). These data reveal that smokers had worse outcomes relative to nonsmokers across a variety of domains including abstinence rates, substance-related negative consequences, and depression. In sum, this literature suggests that smoking and nicotine dependence may be associated with less participation in outpatient alcohol treatment and with poorer treatment outcome relative to non-smokers.

Gender

Women, relative to men, appear to have different alcohol problem trajectories (e.g., Randall, et al., 1999, although see Keyes, Martins, Blanco, & Hasin, 2010), treatment outcomes and relapse precipitants (e.g., Adamson et al., 2009; Greenfield, 2002; Walitzer & Dearing, 2006) as well as smoking cessation outcomes and processes (e.g., Reynoso, Susabda, & Cepeda-Benito, 2005; Torchalla, Okoli, Hemsing, & Greaves, 2011). Greenfield (2002), in her review of the gender literature, concludes that women, relative to men, have a heightened physiological vulnerability and sensitivity to ethanol and that the progression of drinking onset to problems and adverse health consequences is shorter. Similar gender differences have been noted for nicotine (e.g., Lynch & Sofuoglu, 2010); women, relative to men, may have greater sensitivity to nicotine and develop tobacco dependence symptoms more rapidly. Thus, it is reasonable to anticipate that the relationships of clinical complexities with tobacco smoking, and smoking status with alcohol treatment outcome, may differ as a function of gender. The present study furthers our understanding of gender differences with regard to these relationships among outpatients in alcohol treatment.

The Current Study

The present study describes relationships of (a) clinical complexities (as assessed at alcohol treatment admission) with admission tobacco smoking status and gender, and (b) admission smoking status and gender with alcohol treatment participation and alcohol outcome at discharge. The data set comprised 21,128 alcohol treatment seekers from 253 community outpatient substance abuse clinics across the State of New York. Admission characteristics and discharge status for all clients entering these substance abuse treatment clinics were made available to the research team by the New York State Office of Alcoholism and Substance Abuse Services (OASAS). The sample is unique in that it is an adult community treatment sample (i.e., neither sampled nor recruited), minimal eligibility criteria were applied, and the sample is large and nearly complete (i.e., only 0.5% of clients did not contribute discharge data).

First, we hypothesized that clinical complexities at admission would be associated with tobacco smoking status at admission. Specifically, we predicted that, among alcohol

treatment-seekers, the following clinical complexity variables would be associated with tobacco smoking: unemployment, lack of high school diploma/GED, criminal justice involvement, and mental illness and substance comorbidity. In addition, the present research extends earlier work by systematically examining gender differences in the sample. As discussed above, gender is an important variable with regard to both alcohol and nicotine and we included the gender main effect and the Gender X Smoking Status interaction in each model.

Second, consistent with previous research, we hypothesized that tobacco smokers in alcohol treatment would have shorter treatment involvement and poorer outcomes relative to their non-smoking counterparts. Specifically, we hypothesized that, among alcohol treatment-seeking clients, tobacco smoking status at admission would predict (1) fewer treatment visits, (2) shorter treatment duration, and (3) increased likelihood of being rated by treating clinicians as having “not achieved” alcohol treatment goals at discharge. We included the gender main effect and the Gender X Smoking Status interaction and controlled for age and the five clinical complexities.

Method

Eligibility

Clinics contributing client data: (1) were licensed by OASAS to provide outpatient services; (2) had a minimum of 3 full-time counselors; and (3) had a minimum of 50% of admissions with clients having alcohol as either a primary or secondary problem. Admission and discharge information for clients age 18 years and older was obtained from OASAS for a randomly-selected 253 clinics (from a total of 321 clinics). These clinic eligibility criteria and the number of clinics selected were a function of the parent study from which these data were drawn. In total, data were obtained for consecutive 33,989 client admissions from these clinics from June, 2005 (at which time tobacco use information was added to the admission form) through October, 2007. Clinics contributed between one week and six months of client data (74.7% of clinics contributed six months of data; 19.8% of clinics provided 2 to 6 months of data; 5.5% of clinics provided between 1 week and 2 months of data; this variability was a function of the parent study from which these data were drawn).

In order to address our hypotheses, only clients reporting alcohol as a problem substance were selected for analysis. In addition, clients included in analyses were of ages 18 to 65 (to minimize variability associated with younger/older age) and had treatment durations of less than 364 days and 116 treatment sessions (to minimize variability associated with extended treatment periods). Fifteen clients were missing tobacco smoking status information; these clients were not included in analyses, yielding a final $N = 21,128$.

Clinical Complexities at Admission

Clinic staff completed the New York State standardized “Client Admission Report” which assessed basic demographics, tobacco smoking in the last week (yes/no), substances of use/abuse (including secondary and tertiary substances if applicable), and clinical complexities. In order to describe “clinical complexities” (i.e., client characteristics associated with

potential treatment challenges and/or relatively poor outcome, as previously described), clinic staff rated employment status (which was collapsed into employed [full time or part time] or not); education (which was collapsed into having at least a high school diploma/GED equivalent or not); criminal justice involvement (which was collapsed into present or absent); and coexisting “mental illness” (rated as present or absent). The clinic staff ratings of secondary and tertiary comorbid problem substances were combined into a polysubstance abuse variable (present or absent).

Treatment Variables

At discharge, the treating clinician completed the New York State standardized “Client Discharge Report” for all admitted clients. Three variables were derived from this report: the total number of treatment visits (including individual counseling, group counseling, and family counseling sessions), the duration of treatment (calculated as the difference between admission and date-last-treated dates), and alcohol use goal achievement at discharge. Alcohol use goal achievement was rated by clinic staff as “*achieved*,” (i.e., “all goals fully met”), “*partially achieved*,” (“some goals were fully met; or all were partially met; or some were fully met and others partially met”) or “*not achieved*” (“none of the goals were fully or even partially met”). Due to the partial overlap and questions regarding reliably and validly distinguishing between “*achieved*,” and “*partially achieved*,” these two categories were collapsed to contrast with the “*not achieved*” category.

Analytic Strategy

Clinical complexities—A logistic-type model (Proc GLIMMIX; SAS 9.2) was used to assess how each of the clinical complexities (i.e., unemployment, no high school diploma/GED, criminal justice involvement, mental illness, polysubstance abuse) and their interaction with gender was associated with current tobacco smoking. This logistic-type model was a random effects model (also referred to as a mixed effect or hierarchical model) that accommodated that treatment outcomes could depend on clinic as well as client factors. In the model, clinics were treated as random and data from individual clients were nested within clinics.

Treatment outcome at discharge—Two additional models (Proc MIXED; SAS 9.2) evaluated the effects of smoking status, gender, and Smoking Status X Gender, controlling for age and the five clinical complexities, for the two interval discharge variables (total number of treatment visits and duration of treatment; both normalized via a logarithmic transformation). A third parallel model was evaluated with the binary goal achievement dependent variable using the generalized model (via Proc GLIMMIX; SAS 9.2).

Results

Clinic Characteristics

The 253 New York State outpatient substance abuse clinics had an average of 7.3 FTE counseling staff ($SD = 3.9$). The clinics had an average of 159.31 clients ($SD = 111.40$) and an average of 52.5 new admissions/month ($SD = 37.64$). The majority of clinics were free

standing (77.5%); the remaining clinics were associated with hospitals and healthcare clinics. Most clinics (71.9%) were located in urban areas.

Client Characteristics

Overall, 29.3% of the sample were male non-smokers, 8.2% were female non-smokers, 45.5% were male current tobacco smokers, and 17.0% were female current tobacco smokers based on reports of past week tobacco smoking. The majority of clients (67.9%) identified alcohol as a primary problem substance; another 24.7% cited alcohol as a secondary problem substance and 7.4% as a tertiary problem substance. Table 1 displays demographics as a function of gender and current tobacco smoking status. There were no missing data on the client admission variables.

Gender Differences

In this sample of alcohol treatment seekers, women were more likely to be current tobacco smokers relative to men (67.3% versus 60.8%, $X^2(1) = 72.0$, $p = .001$). Additional analyses were performed to determine if the presence of the clinical complexities differed as a function of gender; this was the case for four of the five complexities. As displayed in Table 1, women, relative to men, were more likely to be unemployed ($X^2[1] = 291.4$, $p < .001$) and have a co-existing mental illness ($X^2[1] = 1003.1$, $p < .001$). Women were less likely to be without a high school-level education ($X^2[1] = 25.0$, $p < .001$) and less likely to have criminal justice involvement ($X^2[1] = 622.5$, $p < .001$).

Clinical Complexities and Tobacco Smoking at Admission

Analysis revealed significant smoking status main effects for all five clinical complexities: unemployment, $F(1,239) = 47.2$, $p < .001$; lack of high school diploma/GED, $F(1,246) = 43.21$, $p < .001$; criminal justice involvement, $F(1,239) = 10.00$, $p < .01$; mental illness, $F(1,234) = 52.3$, $p < .001$; and polysubstance abuse, $F(1,245) = 417.6$, $p < .001$. In addition, two interactions with gender were found.

First, the effect of criminal justice involvement on smoking status was modified by gender ($F(1,209) = 9.6$, $p < .01$). As suggested by Table 1, rates of smoking were similar for men who had legal involvement and those men who did not. In contrast, women with legal involvement were more likely to smoke relative to women without legal involvement.

Second, gender also modified the polysubstance effect ($F[1, 204] = 8.47$, $p < .01$). Among both men and women, those who used drugs were more likely to smoke, however the effect of polysubstance abuse on smoking status was stronger among women than among men.

Tobacco Smoking Status at Admission Predicts Treatment Outcome at Discharge

Table 1 also presents data derived from the discharge report: number of treatment visits, duration of treatment, and achievement of alcohol goals, as a function of tobacco smoking status and gender. With regard to missing data, 3.2% of clients were missing number of treatment visits, 0.5% were missing treatment duration, 3.7% were missing alcohol goal achievement, and 0.5% were missing all three discharge variables.

Main effects of tobacco smoking status, gender and their interaction, controlling for age and the five clinical complexities, were evaluated for prediction of treatment visits (log), treatment duration (log), and goal achievement. For the number of treatment visits, neither the main effect of gender or tobacco smoking, nor their interaction, was significant. With regard to treatment duration, a significant tobacco smoking status main effect ($F[1,244] = 10.64, p < .01$) was revealed; Table 1 demonstrates that smokers' treatment duration was over one week shorter relative to that of non-smokers'. The main effect of gender and the Smoking Status X Gender interaction were not significant.

With regard to having achieved alcohol-related treatment goals at discharge, a significant main effect was found for tobacco smoking ($F[1,245] = 42.67, p < .001$). Table 1 reveals that alcohol goals were more likely to be achieved by non-smokers relative to smokers. The main effect of gender and the Smoking Status X Gender interaction were not significant.

Discussion

In this sample of 21,128 alcohol treatment seekers entering outpatient substance abuse clinics across the State of New York, 67.3% of the females and 60.8% of the males were current tobacco smokers; this gender difference was statistically significant. As hypothesized, the presence of complex clinical characteristics was associated with tobacco smoking. At admission, unemployment, lack of high school diploma/GED, criminal justice involvement, mental illness, and polysubstance abuse were each associated with tobacco smoking.

The association between clinical complexities and tobacco smoking behavior among alcohol treatment seekers, as well as in the general population, does not yield a compelling direct-effect causal interpretation (i.e., clinical complexities cause smoking, or vice versa). More persuasive are theories that connect mediating variables linking clinical complexities to smoking risk, such as coping skills and negative affect. Hintz and Mann (2007) suggest that the smoking status effect may reflect differences in coping abilities – nonsmokers may have more appropriate problem solving coping skills relative to smokers, contributing to a more positive prognosis. Satre et al. (2007) theorize that the smoking effect may be a result of preexisting differences in psychiatric problems between smokers and nonsmokers; smoking status may serve as a marker for psychiatric severity, and thus predict alcohol treatment outcome accordingly. Similarly, increased negative affect is associated with smoking status (e.g., Anda et al., 1990; Lyvers, Thorberg, Dobie, Huang, & Reginald, 2008). Previous literature indicates that smokers may use cigarettes as a self-regulation strategy and that use of smoking as a coping mechanism for negative mood may hinder establishment of more effective coping strategies (e.g., Johnson et al., 2008). Ineffective coping and problem solving skills, as well as the experience of significant negative affect, in turn may be causal in the development and occurrence of clinical complications and life challenges. Even in the absence of a secure understanding of the etiology of the clinical complexity of smokers in alcohol treatment, tobacco smoking status may be a simple but important marker among clients in terms of complications with the potential to interfere with successful treatment.

Tobacco Smoking and Treatment Duration and Discharge Outcome

Our data supported the hypothesis that tobacco smokers in alcohol treatment had shorter treatment durations (approximately 9 days shorter), even after controlling for age and the five clinical complexities. With regard to alcohol goal attainment at discharge, tobacco smokers were less likely to have achieved their alcohol-related goals at discharge relative to their non-smoking counterparts.

In an attempt to understand why alcohol treatment seekers who smoke tobacco have poorer outcomes at discharge relative to those who do not smoke, it is instructive to consider other characteristics that may differ as a function of smoking status in this population. For example, data exist suggesting that alcohol treatment seekers who smoke may exhibit a greater severity of alcohol problems and dependence relative to those who do not smoke (e.g., Walitzer & Dearing, 2012). This finding appears to be attributable to negative synergistic effects between nicotine and ethanol (Campbell, Taylor, & Tizabi, 2006; Lapin, Maker, & Bhardwaj, 1995). If smokers experience greater severity of negative consequences and alcohol dependence relative to their non-smoking counterparts, this severity difference may partially explain why these smokers have poorer treatment outcome relative to non-smokers.

Our findings are consistent with the research reviewed earlier which demonstrated substance abuse treatment outcome differences between clients who smoke and those who do not smoke. Further, data suggest that substance abusers who smoke, but who successfully self-initiate smoking cessation post-substance abuse treatment, may have relatively better outcomes. Kohn et al., (2003) followed 86.9% of an original 749 clients entering treatment for drug and/or alcohol problems. Twelve months after treatment entry, as predicted, non-smokers had the greatest number of days abstinent; smokers had the fewest days abstinent. Further, 53 clients had stopped smoking during the 12-month follow-up period; these self-initiated quitters also had greater numbers of days abstinent from alcohol and drugs relative to smokers at follow-up. The relatively positive outcomes of these newly-quit clients, as well as among non-smoking clients generally, are consistent with literature supporting smoking cessation treatment during alcohol/substance use treatment. Much of this literature indicates that although smoking cessation rates may be modest, recovery outcomes for other substances remain unchanged or may be enhanced (Baca & Yahne, 2009). Concurrent smoking cessation and alcohol/substance use abstinence may be especially challenging as a result of stronger and combined withdrawals from and cravings for multiple substances, and there is a possibility of a negative impact on alcohol outcomes (see Joseph, Willenbring, Nugent, & Nelson, 2004), nonetheless simultaneous treatment may have some benefits.

Gender Differences

In the general population, a variety of characteristics differentiate men and women who smoke including overall prevalence (e.g., King, Dube, & Tynan, 2012), demographics and smoking characteristics (e.g., Croghan et al., 2009), and response to treatment (e.g., Cepeda-Benito, Reynoso, & Forth, 2004; Torchalla et al., 2011). In contrast, among our sample of alcohol treatment-seekers, women were significantly more likely to be current tobacco smokers than men. Further, four of the five clinical complexities were not evenly distributed

across gender in this sample. In contrast to the general population (see U.S. Bureau of Labor Statistics, 2013), in our sample, women were significantly more likely to be unemployed than men. As expected, more women were high school completers relative to men, had more mental illness than men, and had less criminal justice involvement than men. Our analyses indicate that two clinical complexities/smoking status relationships were moderated by gender. With regard to criminal justice involvement and polysubstance abuse, women evidenced more negative impact of the clinical complexity on tobacco smoking status, relative to men. In sum, our data paint a picture of alcohol treatment seeking women, and especially women who smoke, in a more challenging inter- and intrapersonal environment relative to their male counterparts. Despite these gender differences in clinical complexities at admission, the treatment participation variables and alcohol-related goal achievement at discharge did not differ as a function of gender, suggesting that despite challenges, women responded similarly to men in treatment.

Strengths and Limitations of the Study

This study has strengths and limitations. In terms of strengths, the study used a representative and inclusive sample of adult treatment-seeking alcohol-involved clients across New York State. Minimal eligibility criteria were employed in contrast to treatment outcome research that often must employ criminal justice, psychiatric comorbidity, and/or other drug dependency exclusion criteria for logistical, ethical, and/or scientific purposes. Thus, our findings are highly generalizable to alcohol treatment seekers.

Second, the sample size was large, providing adequate power to detect even small, statistically reliable, effects. It is recognized that a single small effect (e.g., describing a difference between tobacco smokers and non-smokers) may have limited clinical significance. However, in the context of the multiple, consistent findings depicting the disadvantages associated with smoking among alcohol treatment seekers, an overall picture emerges of the smoker being generally more disadvantaged than their non-smoking counterparts.

A limitation of the study is the single-item assessment of current tobacco smoking at admission. Due to the volume of material assessed at admission in a community clinic setting, it is likely not feasible to assess multiple aspects of smoking behavior (such as type of tobacco, quantity, frequency, dependence symptoms, and history). Further, tobacco smoking was assessed only at admission. However, this single-item assessment of admission tobacco smoking yields a conservative evaluation of the differences between the smokers and non-smokers and should work against finding differences between smoking groups rather than detecting spurious findings.

A second limitation of these data is that the admission and discharge reports, from which the client characteristics and outcome measures were derived, are completed by clinic staff. Thus, the picture of client outcome is the impression of the clinician and is not necessarily equivalent to other objective outcome measures or clients' own assessments of their outcomes. It cannot be ruled out that our findings reflect negative outcome biases on the part of clinicians. In other words, it is possible that clinicians are more likely to rate smokers in alcohol treatment (or individuals with various clinical complications) negatively at

discharge. However, the consistency of our findings argues against this alternate interpretation.

Although the inclusion of outcome data at discharge is a strength of the study and yielded positive findings, the study is limited in lacking availability of longer-term and broader outcome data in order to describe outcomes in more depth and breadth.

Final Thoughts

It is tempting to attribute this cluster of complexities, smoking status, and poorer treatment outcome to a central etiological factor or factors. The presence of weaker coping skills, weaker problem solving skills, and stronger negative mood are characteristics that have been suggested that may tie this cluster of negative characteristics together. Although specific causal processes cannot be determined based on these findings, it is nonetheless clear that smoking status is worthy of consideration as an indicant that a client may have a potentially challenging treatment episode and may be at risk for poorer outcomes.

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Glossary

Clinical complexities	Client characteristics that pose clinical challenges during treatment and/or characteristics that are associated with poorer outcome
Substance disorder psychiatric comorbidity	The presence of one or more psychiatric disorders co-occurring with a substance use disorder within the same individual
Random effects models	A linear model that assumes at least one of the effects arises from probability distribution of such effects. Also known as mixed-effect, hierarchical, or multilevel models

References

- Adamson SJ, Sellman JD, Frampton CMA. Patient predictors of alcohol treatment outcome: A systematic review. *Journal of Substance Abuse Treatment*. 2009; 36:75–86. [PubMed: 18657940]
- Anda RF, Williamson DF, Escobedo LG, Mast EE, Giovino GA, Remington PL. Depression and the dynamics of smoking: A national perspective. *Journal of the American Medical Association*. 1990; 264:1541–1545.10.1001/jama.1990.03450120053028 [PubMed: 2395193]
- Baca CT, Yahne CE. Smoking cessation during substance abuse treatment: What you need to know. *Journal of Substance Abuse Treatment*. 2009; 36:205–219.10.1016/j.jsat.2008.06.003 [PubMed: 18715746]
- Campbell VC, Taylor RE, Tizabi Y. Antinociceptive effects of alcohol and nicotine: Involvement of the opioid system. *Brain Research*. 2006; 1097:71–77.10.1016/j.brainres.2006.04.054 [PubMed: 16730342]

- Centers for Disease Control and Prevention. Adult cigarette smoking in the United States: Current estimate. CDC Fact Sheet. Accessed July 31 2013 Retrieved from http://www.cdc.gov/tobacco/data_statistics/fact_sheets/adult_data/cig_smoking/index.htm
- Cepeda-Benito A, Reynoso JT, Erath S. Meta-analysis of the efficacy of nicotine replacement therapy for smoking cessation: Differences between men and women. *Journal of Consulting and Clinical Psychology*. 2004; 72:712–722. [PubMed: 15301656]
- Croghan IT, Ebbert JO, Hurt RD, Hays JT, Dale LC, Warner N, Schroeder DR. Gender differences among smokers receiving interventions for tobacco dependence in a medical setting. *Addictive Behaviors*. 2009; 34:61–67. [PubMed: 18814974]
- Falk DE, Yi HY, Hiller-Sturmhofel S. An epidemiologic analysis of co-occurring alcohol and tobacco use and disorders: Findings from the National Epidemiologic Survey on Alcohol and Related Conditions. *Alcohol Research and Health*. 2006; 29:162–171. [PubMed: 17373404]
- Goodwin RD, Zvolensky MJ, Keyes KM. Nicotine dependence and mental disorders among adults in the USA: Evaluating the role of the mode of administration. *Psychological Medicine*. 2008; 38:1277–1286.10.1017/S0033291708003012 [PubMed: 18366824]
- Greenfield SF. Women and alcohol use disorders. *Harvard Review of Psychiatry*. 2002; 10:76–85.10.1080/10673220216212 [PubMed: 11897748]
- Hintz T, Mann K. Long-term behavior in treated alcoholism: Evidence for beneficial carry-over effects of abstinence from smoking on alcohol use and vice versa. *Addictive Behaviors*. 2007; 32:3093–3100.10.1016/j.addbeh.2007.06.006 [PubMed: 17601675]
- Joseph AM, Willenbring ML, Nugent SM, Nelson DB. A randomized trial of concurrent versus delayed smoking intervention for patients in alcohol dependence treatment. *Journal of Studies on Alcohol*. 2004; 65:681–691. [PubMed: 15700504]
- Johnson KA, Zvolensky MJ, Marshall EC, Gonzalez A, Abrams K, Vujanovic AA. Linkages between cigarette smoking outcome expectancies and negative emotional vulnerability. *Addictive Behaviors*. 2008; 33:1416–1424.10.1016/j.addbeh.2008.05.001 [PubMed: 18550294]
- Keyes KM, Martins SS, Blanco C, Hasin DS. Telescoping and gender differences in alcohol dependence: New evidence from two national surveys. *The American Journal of Psychiatry*. 2010; 167:969–976. [PubMed: 20439391]
- King BA, Dube SR, Tynan MA. Current tobacco use among adults in the United States: Findings from the National Adult Tobacco Survey. *American Journal of Public Health*. 2012; 102:e93–e100. [PubMed: 22994278]
- Kohn CS, Tsoh JY, Weisner CM. Changes in smoking status among substance abusers: Baseline characteristics and abstinence from alcohol and drugs at 12-month follow-up. *Drug and Alcohol Dependence*. 2003; 69:61–71.10.1016/S0376-8716(02)00256-9 [PubMed: 12536067]
- Lapin EP, Maker HS, Bhardwaj A. Ethanol enhancement of the motor-stimulating effect of nicotine in the rat. *Alcohol*. 1995; 12:217–220.10.1016/0741-8329(94)00097-w [PubMed: 7639954]
- Lynch WJ, Sofuoglu M. Role of progesterone in nicotine addiction: Evidence from initiation to relapse. *Experimental and Clinical Psychopharmacology*. 2010; 18:451–461.10.1037/a0021265 [PubMed: 21186920]
- Lyvers M, Thorberg FD, Dobie A, Huang J, Reginald P. Mood and interpersonal functioning in heavy smokers. *Journal of Substance Use*. 2008; 13:308–318.10.1080/14659890802040807
- Mason BJ, Leher P. Effects of nicotine and illicit substance use on alcoholism treatment outcomes and acamprosate efficacy. *Journal of Addiction Medicine*. 2009; 3:164–171.10.1097/ADM.0b013e3181917d53 [PubMed: 21769013]
- Pulay AJ, Stinson FS, Ruan WJ, Smith SM, Pickering RP, Dawson DA, Grant BF. The relationship of DSM-IV personality disorders to nicotine dependence –Results from a national survey. *Drug and Alcohol Dependence*. 2010; 108:141–145.10.1016/j.drugalcdep.2009.12.004 [PubMed: 20079976]
- Randall CL, Roberts JS, Del Boca FK, Carroll KM, Connors GJ, Mattson ME. Telescoping of landmark events associated with drinking: A gender comparison. *Journal of Studies on Alcohol*. 1999; 60:252–260. [PubMed: 10091964]
- Reynoso J, Susabda A, Cepeda-Benito A. Gender differences in smoking cessation. *Journal of Psychopathology and Behavioral Assessment*. 2005; 27:227–234.10.1007/s10862-005-0638-2

- Satre DD, Kohn CS, Weisner C. Cigarette smoking and long-term alcohol and drug treatment outcomes: A telephone follow-up at five years. *The American Journal on Addictions*. 2007; 16:32–37.10.1080/10550490601077825 [PubMed: 17364419]
- Svikis DS, Keyser-Marcus L, Stitzer M, Rieckmann T, Safford L, Loeb P, Allen T, et al. Randomized multi-site trial of the Job Seekers' Workshop in patients with substance use disorders. *Drug and Alcohol Dependence*. 2012; 120:55–64.10.1016/j.drugalcdep.2011.06024 [PubMed: 21802222]
- Torchalla I, Okoli CTC, Hemsing N, Greaves L. Gender differences in smoking behaviour and cessation. *Journal of Smoking Cessation*. 2011; 6:9–16.10.1375/jsc.6.1.9
- U.S. Bureau of Labor Statistics. Labor force statistics from the Current Population Survey. Accessed November 11 2013Retrieved from www.bls.gov/web/empsit/cpseea10.htm
- Walitzer KS, Dearing RL. Gender differences in alcohol and substance use relapse. *Clinical Psychology Review*. 2006; 26:128–148.10.1016/j.cpr.2005.11.003 [PubMed: 16412541]
- Walitzer KS, Dearing RL. Characteristics of alcoholic smokers, non-smokers, and former smokers: Personality, negative affect, alcohol involvement, and treatment participation. *Nicotine & Tobacco Research*. 2012; 15:282–284.10.1093/ntr/nts112 [PubMed: 22573729]

Table 1

Characteristics of Alcohol Treatment-Seeking Outpatients as a Function of Gender and Current Tobacco Smoking

	Male		Female	
	Non-Smokers	Smokers	Non-Smokers	Smokers
	n = 6183	n = 9605	n = 1744	n = 3596
% Smokers by Gender	39.2%	60.8%	32.7%	67.3%
Age	36.4 (11.5)	35.5 (11.0)	38.0 (11.5)	35.7 (10.5)
Marital Status				
Single, never married	53.7 %	57.8%	46.0%	53.8%
Married/Cohabiting	27.9 %	21.9%	26.8%	18.6%
Widowed/Divorced/Separated	18.4%	20.3%	27.2%	27.6%
Race				
Black	22.8%	22.7%	21.2%	23.3%
White	55.0%	64.0%	68.0%	68.2%
Other	22.2%	13.3%	10.8%	8.5%
Hispanic	20.6%	11.7%	9.1%	7.7%
Unemployed	43.5%	54.6%	55.6%	67.7%
No HS/GED	24.9%	28.7%	17.8%	26.6%
Criminal Justice Involvement	54.3%	53.4%	30.3%	35.8%
Mental Illness	16.7%	25.3%	37.2%	47.8%
Polysubstance Abuse	55.6%	72.4%	52.2%	73.8%
Total Treatment Visits	25.8 (22.6)	25.2 (23.8)	24.6 (23.9)	24.1 (23.9)
(Log transformed)	2.8 (1.1)	2.7 (1.2)	2.6 (1.2)	2.6 (1.2)
Total Treatment Duration	110.7 (89.1)	100.9 (87.9)	105.7 (92.6)	96.6 (88.8)
(Log transformed)	4.2 (1.4)	4.0 (1.4)	4.0 (1.5)	3.9 (1.5)
Achieved Treatment Goals	66.4%	55.9%	60.7%	52.0%

Note. With regard to missing data, 3.2% of clients were missing number of treatment visits, 0.5% were missing treatment duration and 3.7% were missing alcohol goal achievement.