

Predictors of Drinking and Functional Outcomes for Men and Women Following Inpatient Alcohol Treatment

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Background and Objectives: This prospective study uses path analytic models to examine baseline characteristics associated with both functioning and drinking outcomes 12 months after inpatient alcohol treatment.

Methods: Alcohol-dependent participants ($N = 101$) were recruited during inpatient alcohol treatment and assessed monthly 1 year after discharge.

Results: Alcohol severity was negatively associated with education and self-efficacy; marital status was positively associated with self-efficacy; and education and self-efficacy were negatively associated with drinking outcomes. Low alcohol severity, not having a depression diagnosis, and being married were associated with less social support impairment, which was in turn associated with better drinking outcomes. Having a history of sexual abuse did not influence drinking outcomes. However, having a history of sexual abuse was negatively associated with global functioning.

Conclusions and Scientific Significance: Drinking outcomes were associated with education, self-efficacy, social support, and diagnosis of depression at baseline; however, global functioning 1 year following treatment was primarily and negatively associated with sexual abuse history. Future treatment research should include measures of both functioning and drinking behavior outcomes. (*Am J Addict* 2014;23:226–233)

A comprehensive understanding of factors that contribute to prognosis may allow for gains in individualized treatment planning, thus reducing relapse rates.^{1,2}

Individual factors are among the most widely studied predictors of alcohol treatment outcomes (ie, gender, education, marital status),³ but findings examining background characteristics are not always consistent. Research is mixed regarding gender differences,¹ with some studies suggesting minimal gender differences in alcohol treatment outcomes,⁴ and others suggesting women are more vulnerable to relapse.^{5,6} Studies diverge regarding the predictive power of marital status and education. Some findings suggest that marital status and education are protective factors associated with significant long-term improvements,⁷ whereas others conclude that these factors are poor predictors of outcomes.¹

Research has also examined individual clinical factors and their relationship to alcohol treatment outcomes. Co-occurring depression has been associated with poorer treatment outcomes, such as decreased abstinence rates and increased frequency of drinking following treatment.⁸ Another clinical factor, sexual abuse history, has received less attention despite evidence of high rates of trauma among alcohol-dependent men and women.^{1,9} Recently, there has been evidence that individuals with a history of physical and sexual abuse demonstrate increased alcohol use following treatment compared to those not reporting an abuse history.¹⁰

In the past decade, alcohol-related measures have been examined more extensively and there is greater consistency across studies in their relationships to treatment outcomes. Alcohol-related self-efficacy, drinking patterns, and severity of alcohol use are considered the most consistent predictors of treatment outcomes.¹ Higher rates of alcohol severity at baseline significantly discriminate between individuals with positive and negative short- and long-term outcomes.^{3,11,12} Similarly, abstinence self-efficacy predicts better short- and long-term alcohol use outcomes.^{13,14}

BACKGROUND AND OBJECTIVES

Understanding predictors of alcohol treatment outcomes can help clinicians identify specific patient groups at greatest risk for poor outcomes, determine important targets for treatment success, and improve the accuracy of prognosis.¹

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Furthermore, a convergence of evidence from alcohol treatment trials demonstrates that treatment outcome is likely “multicausal” and is the effect of complex interactions among psychological, biological, and environmental factors.¹⁵ The lack of consistent findings across demographic and clinical characteristics may be partially attributed to a failure to account for other important variables in the same model.¹ Therefore, it is important to view treatment in context, examining specific treatment variables as well as demographic and clinical characteristics.^{3,15} Multivariate models may help provide information about the myriad factors affecting relapse and treatment outcomes.¹⁶

Alcohol treatment outcomes are typically assessed as changes in the quantity, frequency, and adverse consequences of use. Yet, alcohol use is also associated with adverse effects on functioning in multiple domains including, health, psychological function, and interpersonal relationships.¹⁷ Thus, quantity–frequency measures of alcohol use may not adequately capture the complexity of treatment outcomes. Recently, the National Institute on Drug Abuse (NIDA) convened a panel of substance abuse treatment experts who recommended extending treatment outcomes beyond quantity–frequency measures of use to include psychosocial functioning.¹⁷ Few studies have evaluated predictors of alcohol treatment response with respect to both drinking and functional outcomes.¹⁸

In order to address this gap in the literature, a secondary analysis of a larger study^{10,19–21} was undertaken to examine prospectively the relationship of clinical and demographic characteristics on drinking and functional outcomes during the first year following inpatient treatment for alcohol dependence. We used path analysis with a mixed-gender sample to determine the relationship of several baseline characteristics to outcomes 12 months post-treatment.

Based on the literature, we chose to include demographic and clinical characteristics that have been associated with treatment outcome including gender,^{6,22} marital status,^{23,24} educational attainment,^{20,25} social support,⁷ abstinence self-efficacy,^{26,27} co-occurring major depressive disorder,^{25,28} alcohol severity,^{3,29} and history of sexual abuse.^{30,31} While many studies have examined these individual predictors, few have evaluated how they relate to one another in the context of treatment and their association with post-treatment functioning. This study adds to the literature by examining these predictors in a multivariate framework with multiple outcomes.

METHODS

Participants

A full description of the methods and demographic characteristics for this sample was previously published.^{19,21} Participants ($N = 101$) were recruited consecutively from the inpatient unit of McLean Hospital’s Alcohol and Drug Abuse Treatment Program. Participants 18 years or older were eligible if they met criteria for alcohol dependence as determined by the Structured Clinical Interview for DSM-III-R (SCID).³² SCIDs were administered by a clinically trained, master’s level social

worker, trained by the Principal Investigator (PI; SFG). All SCID diagnoses were reviewed by the PI. Exclusion criteria included an inability to complete follow-up visits and/or cognitive impairment that interfered with participants’ adherence to the study protocol.

The majority of participants were White (94.0%) and male (59.4%) with some college education (79.2%). On average, participants were 43 years old ($SD = 11.1$). Forty-one percent of participants were married and a majority were either employed full-time (41.4%) or disabled or retired (25.3%). Women had significantly more years of education than men, and men were more likely to be employed full-time.²¹ There were no other significant gender differences in sociodemographic characteristics. Over half (57.4%) of the participants met criteria for a psychiatric disorder.²¹ The most prevalent comorbid disorders were major depression (37.6%) and anxiety disorders (24.8%).²¹ Forty percent of participants reported a history of sexual abuse and 56% reported a history of physical abuse, with 28% reporting a history of both.¹⁰

Procedures

The study was approved by McLean Hospital’s Institutional Review Board. All participants provided written informed consent. Participants were screened and recruited in the hospital after undergoing detoxification. During their hospital stay, participants received standard care, consisting of approximately 6–8 treatment groups per day and brief daily meetings with a psychiatrist, case manager, and counseling staff. Participants’ average length of stay in the hospital ranged from 4 to 28 days ($M = 13$, $SD = 5.5$). Interview sessions were conducted when detoxification was completed. Participants completed structured interviews and self-report questionnaires at baseline and monthly for 12 months following discharge.

Measures

Alcohol use

The Timeline follow-back assessment method (TLFB)³³ assessed mean number of drinks per drinking day in the 12-month follow-up period. Breath alcohol tests and collateral informant reports were collected monthly to validate participants’ self-report. The high validity of participants’ self-reports of drinking during the follow-up period has been demonstrated and previously published.²¹

Educational Attainment

The Drug and Alcohol Use Questionnaire assessed educational attainment at baseline.³⁴ Participants’ responses were categorized to indicate their highest level of education: “Didn’t graduate from high school,” “Graduated from high school,” “Some college,” “Graduated from college,” and “Postgraduate.”

Self-Efficacy

Abstinence self-efficacy was measured at baseline using the Situational Confidence Questionnaire (SCQ).³⁵ The SCQ is a 39-

item self-report questionnaire in which participants indicate on a six-point scale how confident they feel about not drinking heavily in specified high-risk situations. Higher scores reflect a higher degree of confidence in one's ability to resist the urge to drink.

Social Support Impairment

The "social and leisure" subscale of the Social Adjustment Scale Self-Report³⁶ measured social support at baseline and month 12. The full 54-item self-report scale measures role performance over the past 2 weeks within six areas: work, social and leisure, extended family, marital relationship, parental relationship(s), and family unit. The "social and leisure" scale contains 11 items rated on a five-point scale with higher scores indicating greater impairment in social support. For the purpose of these analyses, we used the mean score of the "social and leisure" subscale.

Functioning

Functioning at baseline and month 12 was measured using the Global Assessment of Functioning (GAF) Scale.³⁷ The GAF is an interval level measure ranging from 1 to 100, with higher numbers indicating better functioning. Test-retest reliability coefficients of the GAF range from .61 to .91.³⁷⁻³⁹ GAF scores were rated by the master's level social worker who administered the SCID. As there was only one rater, we were not able to assess inter-rater reliability. However, the social worker was trained on scoring the GAF, had a background in administering SCIDs for research purposes, and all scores were reviewed with the PI. Furthermore, there is evidence that GAF scores used in research are more reliable than in clinical settings.⁴⁰ Thus, we feel confident in these ratings given the rigorous training and supervision.

Alcohol Severity

Alcohol severity was measured using the Alcohol Dependence Scale (ADS) at baseline.⁴¹ The ADS is a 25-item self-report instrument designed to measure the degree of severity of alcohol dependence. A higher score on the ADS indicates greater severity of alcohol dependence.

Other Demographic and Clinical Variables

Marital status and gender were assessed with a demographic questionnaire. History of sexual abuse was derived from the Life Experiences Questionnaire (LEQ) completed at baseline.⁴² The LEQ is a 29-item self-report measure of lifetime traumatic events. Current major depression diagnosis at baseline was assessed with the SCID.³²

Attrition

Participants who missed a monthly assessment were contacted and encouraged to return for the next assessment. Seventy-five participants completed some or all of the assessments and 26 participants dropped out of the study during the 12-month follow-up period. Forty-six participants completed all 12 assessments. Seventy-two participants completed month 12 assessments in person, and three

participants completed month 12 assessments over the phone. Comparison analyses of completers versus dropouts were performed on all variables. The only statistically significant difference was marital status ($\chi^2 = 6.07$, $df = 1$, $p < .05$), with non-married participants more likely to drop out of the study.

Missing cases were excluded listwise. Mean number of drinks per drinking day was calculated for all 101 participants based on the number of days each participant completed data. At baseline, one participant was missing data for sexual abuse history and another for self-efficacy. In regard to GAF scores, 72 participants completed the month 12 assessment in person and were given GAF scores. Therefore, the model for drinking includes 99 participants and the model for functioning includes 70 participants.

Initial Model

We posited that demographic and clinical factors (marital status, gender, alcohol severity, education level, depression diagnosis, and sexual abuse history) would affect social support and efficacy. In turn, social support and efficacy were expected to be associated with drinking outcomes (see Fig. 1). Given that alcohol use is associated with adverse effects on functioning¹⁷ and previous research shows associations between drinking reductions and functioning,¹⁸ we hypothesized a second parallel model with the same demographic, clinical factors, and exogenous variables, but with global functioning as the outcome.

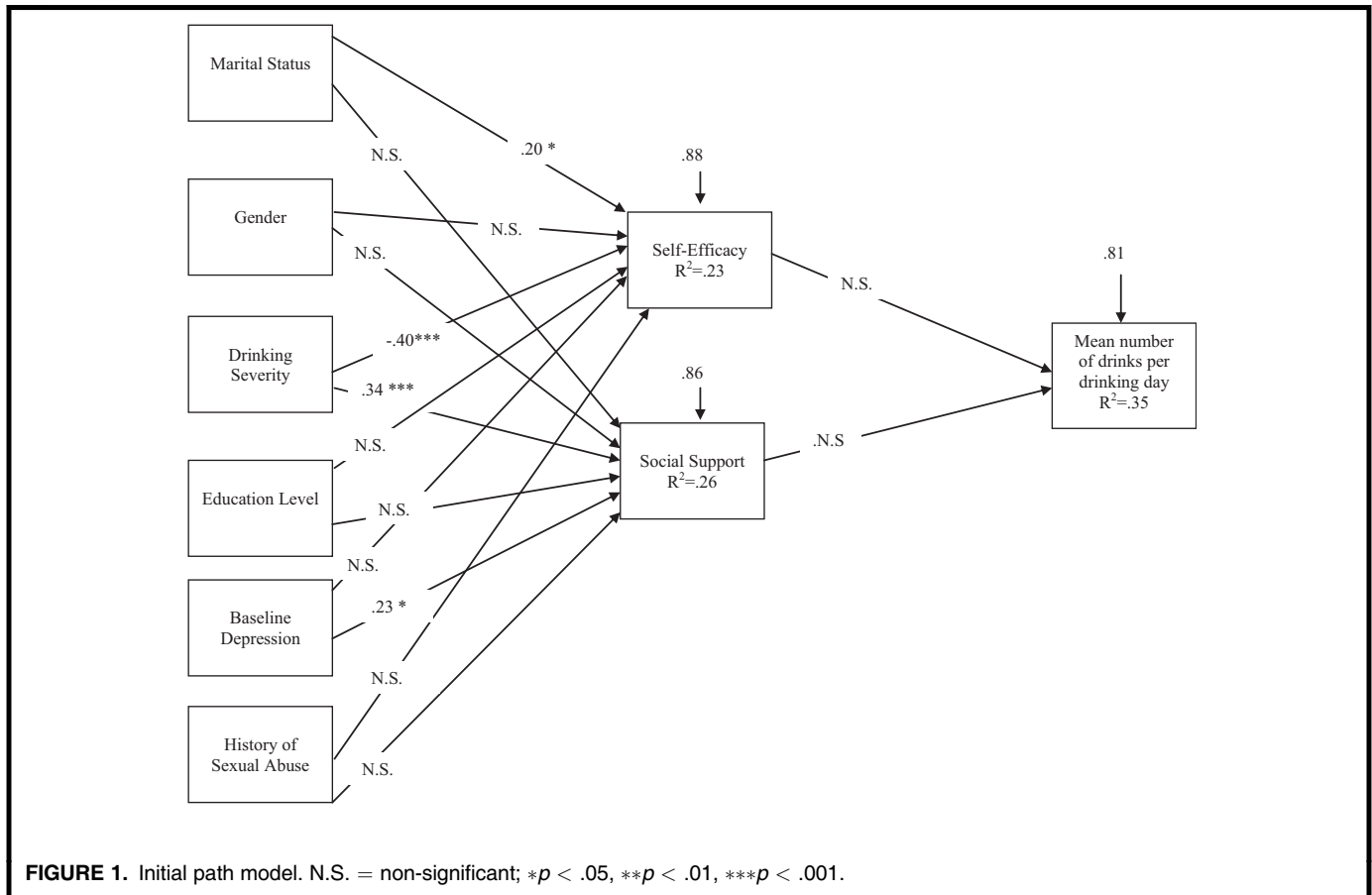
Data Analyses

Path analysis was performed to test the theoretical models presented in Figs. 1-3. Due to the small sample size, the results of the path analysis should be considered exploratory. All analyses were conducted using the SAS System's CALIS procedure.⁴³ These analyses used maximum likelihood estimation, and were performed on the variance-covariance matrix.

Marital status, gender, depression, and history of sexual abuse were included in the models as exogenous variables. Marital status, history of sexual abuse, depression diagnosis, and gender are dichotomous variables and were coded as "1" for: married, a history of sexual abuse, a baseline depression diagnosis, and female. The functioning model also includes the baseline GAF score as an exogenous variable.

RESULTS

Preliminary assumption testing was conducted to check for normality, linearity, multivariate outliers, and multicollinearity, with no serious violations noted. Means, standard deviations, and intercorrelations for study variables are presented in Table 1. To account for positive skewness in the drinks per drinking day variable, a log transformation was performed ($M = .66$, $SD = .54$). However, log transforming the variable and re-running the analyses did not meaningfully change



results; therefore, the original, untransformed variable was used in all analyses.

Goodness of fit was assessed using multiple indices: the chi-square statistic, normed fit index (NFI),⁴⁴ non-normed fit index (NNI),⁴⁴ and comparative fit index (CFI).⁴⁵ The chi-square statistic provides a test of the null hypothesis that the reproduced covariance matrix has the specified model structure (ie, that the models “fit” the data). Values on the NFI, NNFI, and CFI over .9 indicate an acceptable fit between model and data.⁴⁶

Drinking Model

We had posited that marital status, gender, alcohol severity, education level, depression diagnosis, and history of sexual abuse would be associated with social support and efficacy, which in turn would be associated with drinking outcomes. However, this initial model was a poor fit with the data, $\chi^2(7, N = 99) = 25.60, p < .001, NFI = .86, NNI = .35, CFI = .87$. Previous independent results suggested a direct relationship between education level and drinking outcomes,²⁰

TABLE 1. Means, standard deviations, and intercorrelations for the variables in the models

Variable	N	M	SD	1	2	3	4	5	6	7	8	9	10
1. Mean number of drinks per drinking day	101	7.45	8.11										
2. 12-Month functioning	71	67.31	14.71	-.44									
3. Education level	101	3.37	1.15	-.32	.24								
4. Self-efficacy	100	65.80	25.65	-.34	.36	.13							
5. Social support	101	2.65	.63	.37	-.39	-.14	-.30						
6. Marital status	101	.39	.49	-.31	.33	.27	.29	-.27					
7. Gender	101	1.41	.49	-.16	-.07	.29	-.05	.02	.07				
8. Drinking severity	101	22.46	8.94	.35	-.42	-.21	-.44	.42	-.21	.17			
9. Baseline depression	101	.38	.48	.26	-.28	.09	-.15	.31	-.08	.14	.25		
10. History of sexual abuse	100	.40	.49	.20	-.43	.04	-.16	.15	-.10	.43	.40	.24	
11. Baseline functioning	101	50.81	10.25	-.35	.25	.22	.28	-.22	.22	.00	-.43	-.16	-.23

and LaGrange Multipliers suggested adding a path between education level and drinking outcomes to improve model fit. Positing a direct relationship between gender, alcohol severity, and education, the education level variable was shifted in the model to an endogenous position directly associated with drinking outcomes.

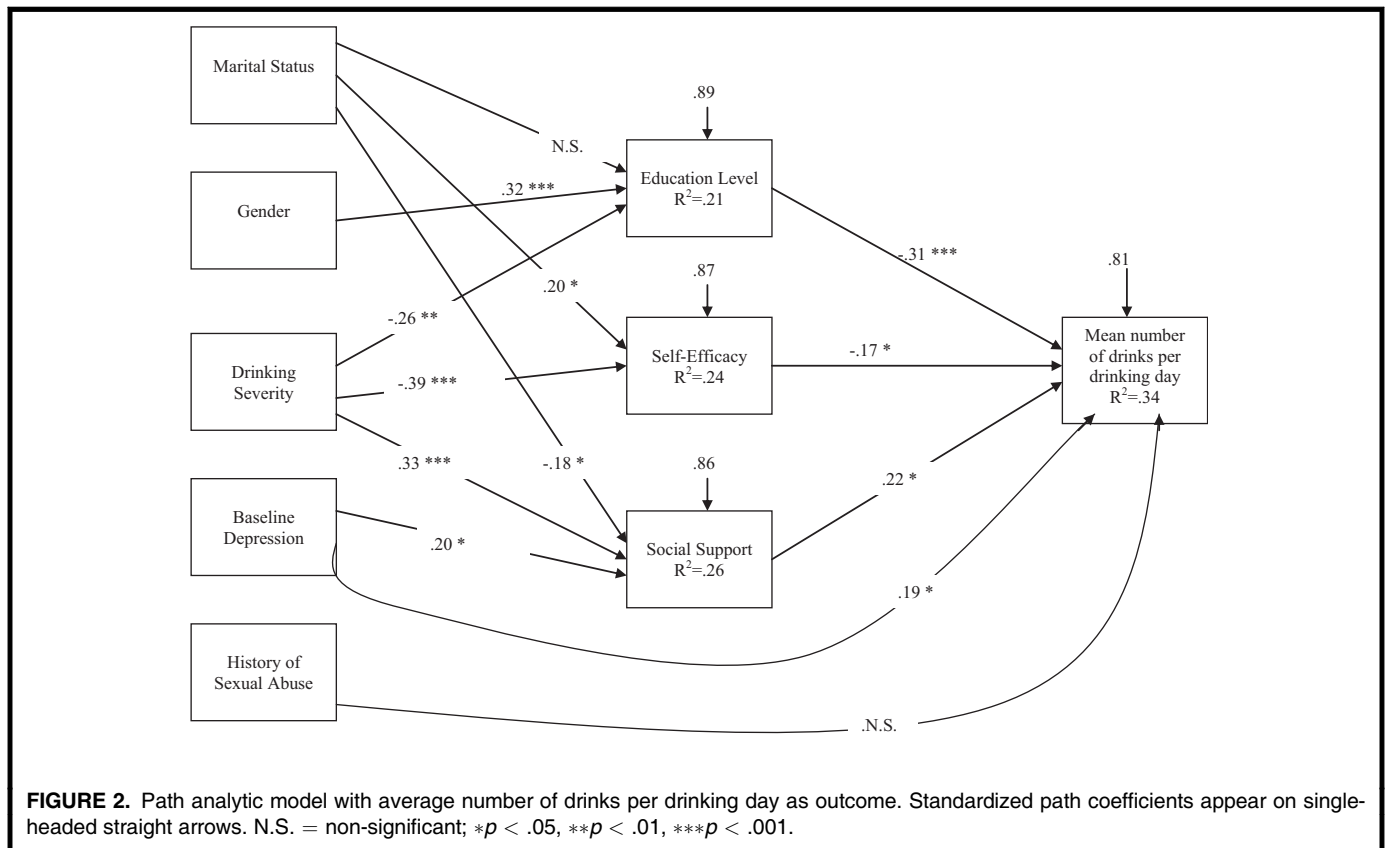
As seen in Fig. 2, the model improves dramatically when education level is moved from an exogenous to endogenous position in the model. Additional minor adjustments to the initial model based on theory and fit indices included adding a path from baseline depression diagnosis and sexual abuse history to drinking outcome, as well as removing non-significant paths between gender and social support, and gender and self-efficacy. Using a conservative approach in modifying the model, all changes were made one at a time and the model re-estimated after each change.⁴⁶

The revised model (Fig. 2) was a good fit with the data, $\chi^2(13, N = 99) = 11.56, p = .56, NFI = .93, NNI = 1.02, CFI = 1.00$. The path model accounted for 34% of the variance in mean number of drinks per drinking day. A history of sexual abuse, while independently related to drinking outcomes, was not statistically significant in the path model. The significant path coefficients reveal that individuals with lower education and self-efficacy, and higher social support scores (ie, more social support impairment), had a higher mean number of drinks per drinking day in the 12-month follow-up period. Participants with depression at baseline had more social

support impairment and a higher mean number of drinks per drinking day in the 12-month follow-up period. Married participants had higher self-efficacy and less social support impairment. Moreover, as seen in previous analyses using these data, women were more educated than men.²⁰ Lastly, participants with lower alcohol severity had a higher education level, higher self-efficacy, and less social support impairment.

Functioning Model

Performing a path analysis on the revised model using GAF scores as the functioning outcome at 12 months (and controlling for initial levels of functioning) revealed a good model fit and some interesting changes in the significant paths, $\chi^2(15, N = 70) = 11.32, p = .72, NFI = .91, NNI = 1.11, CFI = 1.00$ (see Fig. 3). Unlike the drinking model, marital status was not significantly related to any of the endogenous variables. Path coefficients for alcohol severity were of the same magnitude and direction in the functioning model as in the drinking outcomes model, as were the path coefficients between baseline depression diagnosis and social support. Baseline functioning was not related to education, self-efficacy, or social support, and there was no association between baseline functioning and 12-month functioning. Unlike the results for drinking outcome, education level, self-efficacy, and social support were not related to 12-month functioning. However, a history of sexual abuse was significantly and negatively associated with functioning.



DISCUSSION

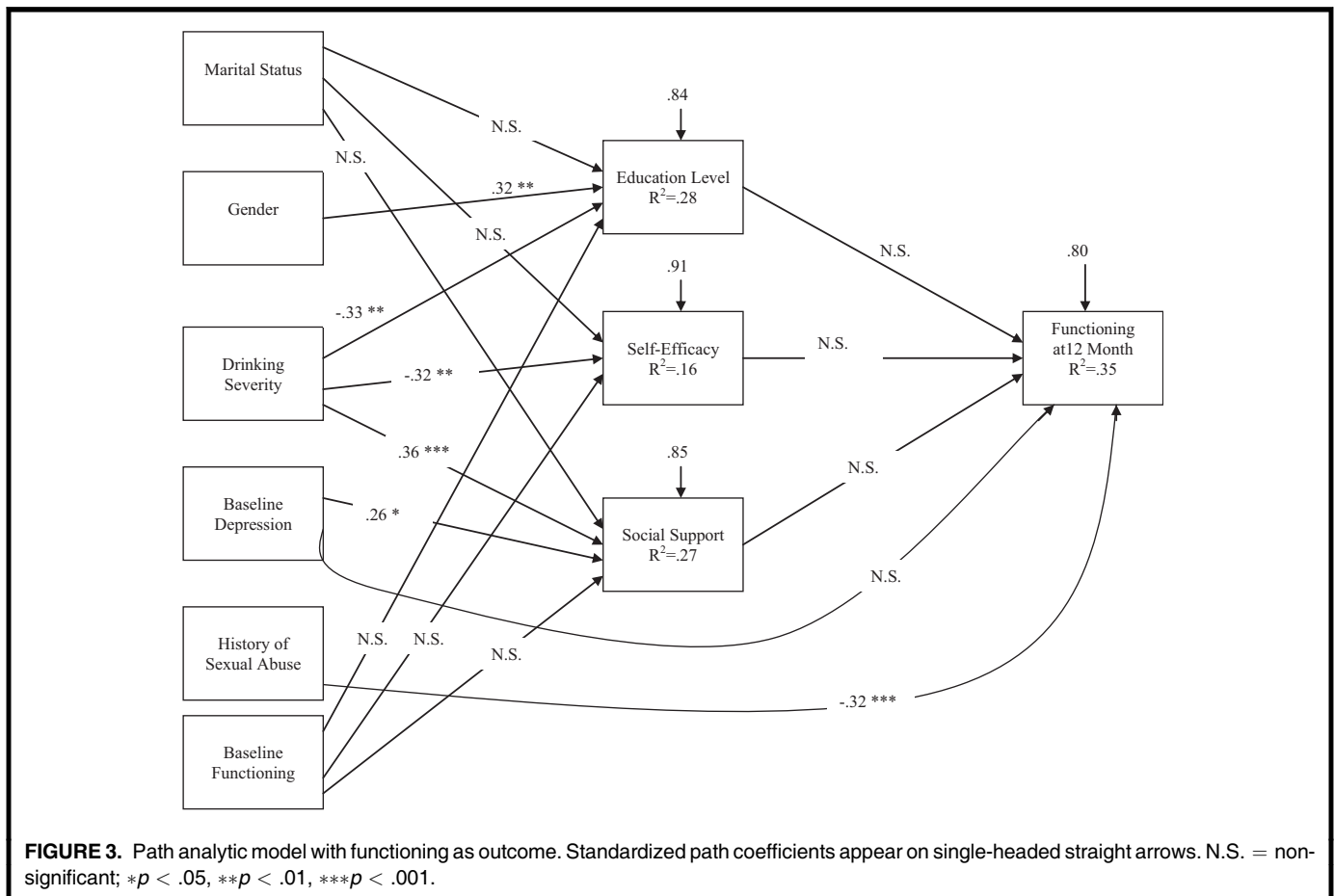
The present study demonstrates that the individual characteristics associated with functioning and drinking outcomes 12 months following discharge from inpatient treatment are distinct. It is notable that sexual abuse history is the only baseline characteristic associated with functioning at 12 months while education, self-efficacy, and social support are significantly related to drinking outcomes. In this study, lower alcohol severity was associated with education level and self-efficacy, and these in turn were related to better drinking outcomes. The path analysis revealed that participants with lower educational attainment and lower self-efficacy had a higher mean number of drinks per drinking day in the year following treatment. Married participants had less impairment in social support, whereas participants with higher alcohol severity and a depression diagnosis had greater impairment in social support, which in turn predicted worse drinking outcomes. These results extend previous findings demonstrating a correlation between lower education levels and poorer drinking outcomes,^{20,47} and findings that depression^{21,48} and lower self-efficacy^{19,49} predict poorer drinking outcomes.

Importantly, sexual abuse history was not significantly associated with drinking at 12 months. These findings differ

from those of Sacks et al.,³⁰ in which women with a history of early trauma had worse substance use outcomes 12 months post-treatment; however, they defined early trauma as sexual, physical, or emotional abuse. In the present study, only a history of sexual abuse was examined. In previous analyses from this study,¹⁰ a history of sexual abuse (but not physical abuse) was associated with poorer drinking outcomes; however, this association was no longer significant when the analyses controlled for marital status, education, employment, and co-occurring psychiatric diagnoses. Our results highlight the importance of examining factors associated with treatment outcomes in multivariate models.

Global functioning at 12 months following discharge from inpatient alcohol treatment was not associated with the same predictors as drinking outcomes. Unlike results from the drinking model, education, self-efficacy, social support, and depression were not significantly associated with functioning outcomes. In direct contrast to the drinking model, sexual abuse was the *only* variable that had a significant effect on functioning outcomes. These results are consistent with findings from other studies that found lower functioning levels in abused than non-abused participants.^{30,31}

Our results suggest that a history of sexual abuse alone does not predict poorer drinking outcomes after treatment.



However, it is possible that there are risk factors related to an abuse history that are associated with poorer drinking outcomes. For example, Rice et al.³¹ found that physically, sexually, or emotionally abused participants were less likely to marry than those without an abuse history. We found that marriage was significantly correlated with lower levels of social support impairment and greater self-efficacy, which in turn were related to better drinking outcomes. When these variables are accounted for, sexual abuse history no longer affects drinking outcomes. Yet, our findings also suggest that sexual abuse may have persistent negative effects on global functioning. These results highlight the importance of considering functioning as well as alcohol use in post-treatment outcomes. Furthermore, diverse patient characteristics may pose different risks for drinking and functioning in the year following treatment.

Limitations

The present study has several limitations. Our results may not be generalizable due to demographic characteristics of our sample compared to other populations seeking treatment for alcohol dependence. Namely, our sample was primarily white, male, and well-educated. The sample size is also a limitation. A larger sample size may have yielded sufficient power to detect a significant effect between sexual abuse and drinking outcomes or stronger correlations with functioning. Given that results from path analyses with relatively small sample sizes are often unreliable, the sample size also limits interpretation of the results. Moreover, we cannot rule out the possibility that differences in sample size between the two models may also account for the different pattern of findings. Therefore, until validated in a larger sample, our results must be interpreted with caution.

As is common with other alcohol treatment outcome research,^{3,16,50–52} the time points for follow-up did not exceed 1-year post-treatment. Examining longer-term outcomes might provide a better understanding of predictive factors for relapse and recovery. We also did not assess types of sexual abuse or participants' age when the abuse occurred, which may account for differences in results. Also, sexual abuse history was measured with self-report instruments, which may have a recall and willingness-to-disclose bias. Furthermore, individuals were selected for this study from an inpatient treatment setting. As seen in previous research,^{53,54} comparing this sample to individuals treated in outpatient treatment settings may yield very different results. It is also important to note that the use of listwise deletion may yield biased results unless data are missing completely at random. A final consideration is our decision to move the education variable to an endogenous position in the model. This may seem counterintuitive given that a third, unmeasured variable may better explain the relationship between marital status, drinking severity, gender, and education level; however, we followed model fit suggestions and previous research²⁰ to examine the potential path correlations in this exploratory analysis.

Scientific Significance and Future Directions

The results of this study support previous research demonstrating the necessity of assessment and individualized treatment plans when trying to achieve optimal results for patients with alcohol dependence. We highlight the need for research examining complex associations of predictive and demographic factors in the substance-using population. Future analyses examining the interaction between multiple predictive factors during treatment and follow-up may provide valuable information concerning recovery and relapse, as well as treatment responses among alcohol-dependent patients. These results support the recent NIDA panel recommendations¹⁷ to extend treatment research beyond quantity and frequency outcome measures to include functional outcomes. We encourage research seeking to improve alcohol treatment outcomes and life-functioning outcomes across diverse populations by examining factors that directly and indirectly influence these outcomes.

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Declaration of Interest

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

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