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Predicting Relapse among Young Adults: Psychometric Validation of the Advanced Warning of Relapse (AWARE) Scale

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Abstract

Objective—Failure to maintain abstinence despite incurring severe harm is perhaps the key defining feature of addiction. Relapse prevention strategies have been developed to attenuate this propensity to relapse, but predicting who will, and who will not, relapse has stymied attempts to more efficiently tailor treatments according to relapse risk profile. Here we examine the psychometric properties of a promising relapse risk measure - the Advance Warning of Relapse scale (AWARE) scale (Miller and Harris, 2000) in an understudied but clinically important sample of young adults.

Method—Inpatient youth (N=303; Age 18-24; 26% female) completed the AWARE scale and the Brief Symptom Inventory-18 (BSI) at the end of residential treatment, and at 1-, 3-, and 6-months following discharge. Internal and convergent validity was tested for each of these four timepoints using confirmatory factor analysis and correlations (with BSI scores). Predictive validity was tested for relapse 1, 3, and 6 months following discharge, as was incremental utility, where AWARE scores were used as predictors of any substance use while controlling for treatment entry substance use severity and having spent time in a controlled environment following treatment.

Results—Confirmatory factor analysis revealed a single, internally consistent, 25-item factor that demonstrated convergent validity and predicted subsequent relapse alone and when controlling for other important relapse risk predictors.

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Conclusions—The AWARE scale may be a useful and efficient clinical tool for assessing short-term relapse risk among young people and, thus, could serve to enhance the effectiveness of relapse prevention efforts.

Keywords

substance use relapse; young adults; psychometrics

1. Introduction

One of the defining features of addiction is impaired control over substance use despite harmful consequences (Edwards, 1986; Edwards and Gross, 1976). By the time many individuals reach specialty treatment services for a substance use disorder (SUD), multiple attempts to cut down or cease use have been undertaken without sustained success. Consistent with other chronic diseases (e.g., diabetes, hypertension), relapse following the withdrawal of treatment is also common (McKay, 2001; McLellan et al., 2000; Peterson et al., 1994). Adult studies suggest that it may take as long as nine years and 3-4 treatment episodes, on average, from exposure to the first SUD treatment to achieve one year of full sustained remission (Dennis et al., 2005). Furthermore, it may take as long as a further five years before the risk of relapse in the next year falls below 15% (De Soto et al., 1989; Dennis et al., 2007; Vaillant, 1996). Relapse prevention strategies (Marlatt and Gordon, 1985; Gorski and Miller, 1982) have been developed to attenuate this propensity to relapse, but difficulty in predicting who will, and who will not, relapse has stymied attempts to more efficiently tailor treatments according to relapse risk profile.

In 1986 a volume was published based on the results from the relapse process histories of 118 chronically relapsing substance dependent individuals (Gorski and Miller, 1986). From these detailed clinical interview assessments was derived a list of 37 relapse warning signs delineating a temporal process along which many of these individuals reported progressing before eventually resuming substance use and relapsing. These warning signs were characterized by themes pertaining to cognition (e.g., maladaptive beliefs and attitudes), behavior (e.g., avoiding responsibilities), and residual neurophysiological symptoms (e.g., sleeplessness, poor concentration), called “post-acute withdrawal” symptoms, caused by chronic, intense, substance use. These warning signs have formed the basis for a manualized relapse prevention (RP) therapy (Gorski, 1995) with demonstrated clinical benefit (Bennet et al., 2005). The list of 37 warning signs has also been formally evaluated as a measure of relapse risk that resulted in a shorter, empirically validated, 28-item measure of relapse risk known as the AWARE (“Advance WArning of RElapse,”) scale (Miller and Harris, 2000). Although that study did not support a temporal aspect to the relapse warning signs, the 28-item measure was shown to be associated with relapse in a subsequent two-month follow-up period in a study with alcohol dependent adults (average age of 33.5 years) (Miller et al., 1996).

Despite the theoretical and clinical importance of explicating and measuring relapse risk (McKay et al., 2006; Miller et al., 1996), there is little available information regarding validated measures of this construct. The focus in the current study is to evaluate the psychometric properties of a promising relapse risk measure among a sample of young adults treated in a residential setting for SUD and followed through six months post-discharge.

Young adults (i.e., 18-24 years) have become a critical population to investigate. Recent nationally-representative epidemiological studies have made it increasingly clear that this period of human development confers unique mental health risks. In the U.S. population,

this period of emerging adulthood is characterized by the highest rates of substance use and SUD, as well as intense psychological distress and psychiatric disorder (Chan et al., 2008; SAMHSA, 2009). Importantly, as with other chronic illnesses, early intervention is related to a better prognosis and less time to remission (Dennis et al., 2005). Yet, little is known about young adult clinical populations and whether relapse risk factors evaluated with adults older than 24 years of age have the same relevance for individuals at this earlier developmental stage.

In this study we examine the factor structure, reliability, and convergent and predictive validity of a measure of relapse risk in a sample of young adults treated for SUD in a residential facility.

2. Method

2.1. Participants

Young adults (18–24 years old) entering a residential substance use treatment program in the upper Midwest ($n=303$) were enrolled in a naturalistic study of treatment process and outcome. During the recruitment period (October 2006 to March 2008), a total of 607 patients were admitted to treatment. A small number of potential participants left treatment before recruitment could take place ($n=6$) or were not approached by staff for recruitment ($n=14$). For the remaining patients, a stratified recruitment process was used, where recruitment efforts targeted only every other admitted patient aged 18–20, while every patient aged 21–24 was approached. The stratified approach was used, because in general, patients admitted to the treatment facility were predominantly aged 18–20, and our goal was to recruit a representative sample of young adults between the ages 18–24. Of those approached ($n=384$), 64 declined or withdrew participation. Reasons for non-participation included not wanting to participate in the follow-up interviews (44%), not being interested in the study (31%), wanting to focus on treatment (14%), and legal issues (2%). Following enrollment, an additional 17 participants withdrew prior to the baseline assessment. The final recruited sample of 303 represents 78.9% of those approached for participation.

Participants were predominantly male (73.9%), with an average age of 20.3 ($SD = 1.6$) years at treatment entry. The sample was predominantly Caucasian (94.7%), with 1.3% African American, 1.7% Native American, 1.0% Asian, and 0.7% self-identified as “other”. Hispanic ethnicity was reported by 0.6% of the sample. Most participants completed high school or equivalent, though 17% did not. Less than half (40%) of the participants attended some college, but only in rare exceptions (1.7%) had completed a higher degree by treatment entry. The most commonly reported “drug of choice” at treatment entry was alcohol (27%) and marijuana (27%), followed by heroin (13%) and cocaine (10%). On average, participants remained in the residential treatment program for 25.6 ($SD=5.7$) days. The majority of patients were discharged with staff approval (84%).

2.2. Procedure

After enrollment into the study, participants were contacted by research staff to set up an interview during which a series of questionnaires were administered. Subsequent assessments took place at mid-treatment (91% retention), end of treatment (87%), and 1 (84%), 3 (82%) and 6 (74%) month(s) after discharge. Each assessment included an interview portion, completed either in person or by telephone, and self-administered surveys, which were completed online through a secure login or using “paper and pencil” measures and returned by mail.

All procedures were reviewed and approved by the Institutional Review Board at Schulmann Associates IRB, an independent review board, and all participants signed informed consent documents.

2.3. Measures

AWARE Scale—The 28-item version of the “Advance WArning of Relapse” (AWARE) scale (Miller and Harris, 2000) was administered as part of the online/mail-in survey at four assessments (i.e., end of treatment, 1-, 3-, and 6-month). Participants were asked to use a 7-point Likert scale (“never” to “always”) to indicate “how much this has been true for you recently”, where “this” refers to a series of thoughts, feelings and experiences reflecting early warning signs of relapse (Gorski and Miller, 1982; see Table 2 for items). Among adults entering treatment for alcohol problems ($n=122$; Miller & Harris, 2000), coefficient alpha was estimated to be 0.92 with a test-retest reliability of $r=0.80$. In this study, we excluded three alcohol specific items¹ because treatment was not alcohol specific.

Brief Symptom Inventory-18—The Brief Symptom Inventory-18 (BSI-18; Derogatis, 2001) captures depression, anxiety, and somatization symptoms, and provides sub-scale and global measures of symptom severity. It has acceptable internal consistency and test-retest reliability, with coefficients ranging from .74 to .89 (Derogatis, 2001). The BSI was administered as part of the interview at all time points, including all post-discharge assessments, and was chosen for assessment of the convergent validity of the AWARE scale.

Relapse—Form 90-D (Westerberg, Tonigan, and Miller, 1998) was administered by trained interviewers to assess substance use at all assessments. We defined relapse as any substance use, which is consistent with the treatment program's emphasis on abstinence and with existing literature. Substance use included alcohol, marijuana, LSD, cocaine, amphetamines, barbiturates, tranquilizers, heroin, narcotics, steroids, inhalants, and participant-defined “other” drugs. We excluded nicotine and medications, such as antidepressants, anti-anxiety medication, antipsychotics, mood stabilizers, stimulants, pain medication, and anti-addiction medication.

Controlled Environment—Form 90-D includes questions about further treatment and involvement with the judicial system. From these questions, we coded a binary indicator of having spent time in a controlled environment between assessments after discharge, including time spent in jail, participation in detox and in-patient treatments (for substance use or other mental health concerns), and living in a sober living environment.

Baseline descriptors—At baseline, demographic information (i.e., age, sex, race, education) and “drug of choice” were recorded. For statistical reasons, we recoded race into a binary indicator (“Non-Hispanic white” vs. “other”), education into a 3-level categorical variable (“did not complete high school”, “high school diploma or GED”, “some college or more”) and drug of choice into a 3-level categorical variable (“alcohol”, “marijuana”, and “other”), where the first named substance was interpreted as the primary drug of choice, if more than one was named (occurred in 1% of cases).

Baseline Substance Use Severity—We used two items of the baseline assessment of Form 90-D as indices of substance use severity prior to study enrollment and treatment: Question 27 (“On how many days during this time period [previous 90 days] have you been completely abstinent from all substances?”) ($M=23.9$, $SD=28.1$; square-root transformed)

¹We kept two items that used the word “sober”.

and Question 34 (“During the year before treatment, how many days did you spend in hospital for alcohol or other substance-use related reasons?”), from which we coded a binary “never” (coded 0: 74%) and “ever” (coded 1: 26%) indicator.

2.4. Analytic Strategy

Starting with the AWARE data collected at the end of treatment, we used exploratory principal component analysis to verify the emergence of a single underlying factor, with Parallel Analysis (Horn, 1965) and the minimum average partial (MAP) test (Velicer, 1976) to determine the number of components, as recommended (Zwick and Velicer, 1986). We then used confirmatory factor analysis (CFA) to evaluate the fit of the 25 items to the hypothesized 1-factor model across time points. As was done in the original scale validation study (Miller and Harris, 2000), we used both the 7-point Likert format of the items and, alternatively, binary codings of each item (“never” and “almost never” vs. “sometimes” through “always”)². We based the exploratory principal component analysis and CFAs on the polychoric correlations of the items. For the CFAs, we used robust weighted least squares (WLSMV) estimation, which has been shown to perform well for ordinal and binary data (Flora and Curran, 2004). Model fit was assessed in terms of absolute, parsimonious and incremental fit, using the cutoff criteria recommended by Hu and Bentler (1999). In addition to the chi-square test, absolute fit was measured by the standardized root mean square residual (SRMR), where values close to or below 0.08 indicate good fit. Parsimonious fit was measured by the Root Mean Square Error of Approximation (RMSEA) (Browne and Cudeck, 1993), where values less or equal to 0.06 indicate good fit. Finally, the incremental value of the model over the null model was assessed with the Comparative Fit Index (CFI; Bentler, 1990), where values close to 0.95 or higher indicate a good fit. We replicated analyses for each time point the AWARE scale was administered.

To assess internal reliability, we calculated the ordinal version of the coefficient alpha (Zumbo et al., 2007). To assess convergent validity, we calculated bivariate correlations between AWARE and BSI-18 scores for each follow-up assessment.

To assess predictive validity, we first assessed retention biases, where we used logistic regression analyses to predict retention at follow-up assessments (i.e., 1, 3, and 6 months after discharge) using baseline descriptors (i.e., age, sex, race, education and drug of choice) and substance-use severity (i.e., percent of days abstinent, prior substance-use related hospitalization) as predictors. If significant, we included baseline descriptors as covariates in prediction analyses; we included baseline substance-use severity regardless of significance. Then we used logistic regression analyses to predict relapse using the previous assessment's AWARE score as a predictor, and controlled environment, significant baseline predictors of retention and baseline substance-use severity as covariates. We replicated prediction analyses for 1-, 3- and 6- month assessments.

Finally, we examined the incremental utility of AWARE scores in predicting relapse by comparing R^2 values of alternative predictive models: adding AWARE scores as a predictor to a basic model adjusting for retention biases; adding AWARE scores to a model including other predictors of relapse in addition to adjusting for attrition biases; and instead of using AWARE scores, using BSI scores to predict relapse while adjusting for attrition biases and other predictors of relapse.

Missing data were handled in the following ways: EFA, CFAs and Pearson's correlation were calculated based on retained participants at each assessment. For logistic regressions,

²CFA analyses based on alternative cut-off points for binary scoring resulted in comparable and substantially equivocal results. We chose to combine “never” and “almost never” in one category, as “never” vs. “ever” produced ceiling effects in our sample.

multiple imputation ($k=50$) was used, as recommended (Schafer and Graham, 2002). CFA models were estimated using MPlus 3.18, and all other analyses were conducted using SAS 9.2. An alpha level of .05 was used for all statistical tests.

3. Results

3.1. Unidimensionality

Parallel analysis and the MAP test on the 7-point Likert scale items both indicated that two factors should be retained in exploratory principal component analysis. This second factor was defined by the reverse-coded items, a well-known methodological artifact, which can be caused by only a few careless respondents (Schmitt and Stuits, 1985; Schriesheim and Eisenbach, 1995). Not surprisingly, CFAs imposing the hypothesized 1-factor structure resulted in poor model fit across time points (Table 1). When the binary codings of the 25 items were used, Parallel Analysis still indicated two factors, but the MAP test indicated that one factor should be extracted. The second factor was no longer defined by reverse coded items but rather consisted of several complex items, indicating over-extraction. Moreover, the internal reliability for the 25 binary items was 0.95. Similarly, CFA model fit was much improved (Table 1). Overall, fit of the 1-factor model of the binary items fell somewhat short of good fit on all three types of measures, but was acceptable. All items loaded statistically significantly on the underlying factor (Table 2).

3.2. Convergent Validity

Pearson's correlations between concurrent assessments of the AWARE scale and BSI were statistically significant across assessments (Table 3). Correlations tended to be lowest for the somatization subscale and highest for the global and depression scores.

3.4. Predictive Validity

Logistic regression analyses predicting study retention at the 1-, 3- and 6-month assessments showed that education and race were statistically significant predictors. Education was a consistent predictor of retention ($\chi^2(2)=7.3, p<0.05$, $\chi^2(2)=11.3, p<0.01$ and $\chi^2(2)=7.8, p<0.05$ for 1-, 3- and 6-month assessment completion, respectively), where participants who did not complete high school or equivalent were less likely to complete follow-up assessments (74%, 74% and 68% for 1-, 3- and 6-month assessment completion, respectively) than participants who attended some college or received a higher degree (reference group; 92%, 92% and 83% for 1-, 3- and 6-month assessment completion, respectively). Race inconsistently predicted retention, where only retention at the 1-month assessment was statistically significant ($\chi^2(1)=8.8, p<0.01$, OR=0.19 (CI:0.07-0.56)). At this assessment, non-Caucasian participants were less likely to be reached than Caucasian participants (only 9 out of 16). We included both education and race as covariates for all prediction analyses to be consistent across time points.

Predictive analyses showed that AWARE scores predicted relapse (i.e., any substance use) at the 1-month and 6-month assessment. At the 3-month assessment it approached significance ($p=.08$; Table 4). Having spent time in a controlled environment (55% at 1-month, 50% at 3-month, and 33% at 6-month) was consistently associated with a lower likelihood of subsequent relapse. Percent of days abstinent prior to treatment did not predict relapse at 1-month or 3-month, but did at 6-month, where greater abstinence was related to reduced chance of relapse. Prior substance-related hospitalization was associated with 3- and 6-month relapse, although this was at the level of a trend ($p<.10$).

3.5. Incremental Utility

Comparison of the likelihood-based pseudo R^2 values of the basic models showed that the inclusion of AWARE scores in a predictive model adjusting only for retention biases increased the variance accounted for by 2.3%, 0.7% and 4.1% in predicting relapse at 1-month, 3-month and 6-month assessments post discharge, respectively. After including other predictors of relapse (i.e., controlled environment, percent days abstinent prior to treatment, substance-use related hospitalization prior to treatment), the addition of AWARE scores also increased the variance accounted for (i.e., 2.4% at 1-month, 1.5% at 3-month, 2.5% at 6-month; table 5). By comparison, the addition of BSI scores also increased variance accounted for, but less so than the inclusion of AWARE scores. This effect was consistent across time points.

4. Discussion

This study evaluated the psychometric properties of a relapse risk measure developed and validated initially with alcohol dependent adults. Overall, this clinically useful and face valid measure was shown to possess a single factor using confirmatory factor analysis and very high internal consistency. It also possessed good convergent validity with a well-known measure of psychiatric distress (i.e., the BSI), itself shown to be a significant predictor of relapse in the current study. The AWARE scale was shown also to possess unique predictive validity over and above other factors associated with future relapse risk and was more specific than a common and well-validated measure of psychiatric distress (BSI) in predicting subsequent relapse risk.

The confirmatory factor analysis produced a single factor that possessed very high internal consistency. The 25 retained items (Table 2) reveal cognitive, affective, and behavioral themes that pertain to passivity, isolation, negative affect, and common neuro-vegetative symptoms associated with early recovery, such as sleep, concentration, and appetite/nutritional problems. Although such symptoms are common to many psychiatric problems, and in this study correlated quite well with a common measure of psychiatric distress (the BSI), the AWARE scale appears to possess greater specificity regarding relapse risk. Importantly, the items of the AWARE scale were originally derived from the actual relapse process experiences of addiction patients. As such, the items are readily accessible and meaningful to clinical populations. The fact that the AWARE scale has both high face validity and predictive validity in our young adult sample suggests that it could potentially be a useful clinical tool that might inform, guide, and enhance patient-therapist interactions about relapse risk in this age group.

The current study supports the predictive validity of the AWARE scale among young adults in predicting short-term relapse risk during the first 6 months post-treatment. It independently predicted relapse at both 1-month and 6-month; at 3-months, the prediction of the AWARE scale followed the same pattern ($p=.08$), but did not quite reach statistical significance at the conventional level of $p<.05$. It is unclear why predictive validity was not as strong in the 60 day period between 1- and 3-month follow-ups as it was during the other periods. Future research should examine whether this reflects idiosyncrasies common to that particular phase of the recovery process, is an artifact specific to the current clinical sample, is due to chance, or something else. The original study (Miller and Harris, 2000) did find that this measure predicted subsequent relapse consistently over a two-month period over a 1-year follow-up, but that study did not control for other important confounds that could also account for relapse risk, was conducted on an adult alcohol dependent sample, and included three additional alcohol-only items that were removed in this study. These differences notwithstanding, it should be noted that the incremental utility of the AWARE scale in our young adult sample was on par with its incremental utility in adults. Miller and Harris

(2000) reported R^2 increases due to AWARE scores of 0.01 to 0.05 for the prediction of relapse 4 and 6 months following treatment, over and above the effect of prior drinking. Our results showed R^2 increases of 0.02 to 0.03, while controlling for multiple additional predictors of relapse. Thus, demonstrated here is that the AWARE scale also successfully predicts relapse during the first 6 months following treatment among polydrug-using young adults with high levels of psychiatric distress.

Additional research with the AWARE scale in other samples and patient subgroups is recommended in order to help determine the generalizability of these results. To increase precision and allow for binary comparisons tailored to the severity of the sample, we recommend administering the measure with Likert-scaled items. Although the binary coding performed better in analyses, by collecting the data with Likert-scale items, researchers can subsequently score the measure in a binary fashion using a dichotomization scheme most suited for the sample under study. Second, given the problems noted with psychometric oddities that can arise with reverse-scored items, we recommend either skipping reverse-coded items or revising them into items that are scored in a consistent direction with the rest. We also recommend avoiding substance-specific language as polydrug use is common among most clinical samples. Finally, the AWARE was derived on adults who were older (i.e., average age of 33.5 years) than the young adults in this sample and focuses on mostly intra-individual cognitive and behavior risks. As such, it may not be as specific to the experiences of young adults who appear to be more strongly influenced by motivational, social, and environmental factors (Brown et al., 1993; Kelly et al., 2000). Qualitative research on the relapse experiences of youth would inform efforts to increase the content and predictive validity of this scale or identify the need for a more developmentally specific measure.

4.1. Limitations

A number of limitations inherent in the current study should be noted in making generalizations from these results. The definition of “relapse” as a return to *any* substance use was used in this study, but may not be the ideal way to examine the construct. The original definition implies a re-occurrence or reinstatement of the full disorder. Other categorizations may yield different results. Also, it should be remembered that these results derive from a mostly male, White, inpatient, sample of young adults and results may not generalize to less severe outpatient populations or in samples where the majority is female or from ethnic minorities. Also, while the AWARE measure predicted relapse over and above several other important variables related to early recovery, it did not account for a large proportion of the variability, even across relatively short periods (e.g., 30 days). This suggests the need to improve our knowledge and theories about relapse.

5. Conclusions

Addiction is recognized as a chronic condition that requires ongoing monitoring and management over the long-term (McLellan et al., 2001; Kelly and White, 2011). However, despite its importance, the relapse construct is one that has remained a challenge to define and measure, and relapse itself has been difficult to predict. The AWARE scale is compelling for several reasons. It is phenomenological in its derivation, stemming from the reported experiences of individuals who have struggled to maintain sobriety despite prior treatment, mutual-help involvement, and severe consequences in multiple domains (Gorski and Miller, 1986). Hence, it has strong face validity that may resonate with clinicians and their patients. Further, it is easy to administer and quick to score making it useful in busy programs and practices. Most importantly, when used alone, it possesses short-term predictive validity, and even when other important relapse risk factors are considered it still adds significantly to the prediction of relapse. Although additional validation is necessary to

document the measure's broader utility, the AWARE scale shows promise as a useful clinical tool for providers wishing to assess and minimize short-term relapse risk.

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Research Highlights

- Relapse following the withdrawal of substance use treatment is common
- There is little available information regarding validated measures of relapse risk
- This study examined the AWARE scale in young adults in a residential treatment program
- We found an internally consistent, 25-item factor that demonstrated convergent validity
- AWARE scores predicted relapse alone and when controlling for other predictors

Table 1

CFA model fit per AWARE administration

Time	χ^2	df	p	CFI	RMSEA	SRMR
7-point Likert items						
End of Tx (<i>n</i> =264)	453.8	75	<.0001	0.83	0.14	0.08
1-month (<i>n</i> =197)	389.4	67	<.0001	0.80	0.16	0.08
3-month (<i>n</i> =185)	332.4	52	<.0001	0.82	0.17	0.08
6-month (<i>n</i> =172)	475.3	44	<.0001	0.65	0.24	0.10
Binary items						
End of Tx (<i>n</i> =264)	177.9	93	<.0001	0.94	0.06	0.10
1-month (<i>n</i> =197)	145.8	83	<.0001	0.94	0.06	0.10
3-month (<i>n</i> =185)	153.4	77	<.0001	0.94	0.07	0.10
6-month (<i>n</i> =172)	150.4	73	<.0001	0.95	0.08	0.10

Note: *n*=303 were enrolled; the degrees of freedom are estimated when using WLSMV estimation

Table 2
Prevalence and standardized factor loadings of the 25 binary AWARE items across time points

Item No.	<i>(descending prevalence at End of Tx)</i>	End of Tx		1-month		3-month		6-month	
		%	loading	%	loading	%	loading	%	loading
2	I have many problems in my life.	90.2	0.47	72.6	0.69	65.9	0.75	62.2	0.67
7	I engage in wishful thinking.	89.0	0.36	81.7	0.59	78.9	0.40	79.7	0.52
8	The plans that I make succeed. †	86.0	0.46	87.3	0.55	82.2	0.70	79.7	0.62
3	I tend to overreact or act impulsively.	83.0	0.59	68.5	0.71	62.7	0.77	67.4	0.76
5	I get too focused on one area of my life.	78.4	0.69	70.6	0.75	69.7	0.68	64.5	0.65
1	I feel nervous or unsure of my ability to stay sober.	76.9	0.61	66.0	0.59	58.9	0.61	59.3	0.71
9	I have trouble concentrating and prefer to dream about how things could be.	74.6	0.60	65.0	0.75	65.4	0.69	59.3	0.61
10	Things don't work out well for me.	72.3	0.87	53.8	0.82	50.8	0.79	45.3	0.81
13	I feel angry or frustrated.	71.6	0.74	66.5	0.72	59.5	0.83	55.2	0.82
12	I get irritated or annoyed with my friends.	70.8	0.60	64.5	0.66	63.8	0.71	58.7	0.71
11	I feel confused.	68.9	0.81	64.5	0.72	57.8	0.71	57.0	0.87
16	I have trouble sleeping.	68.9	0.51	44.7	0.49	49.2	0.60	50.6	0.59
24	I feel hopeful and confident. †	64.4	0.70	69.0	0.78	65.4	0.82	65.1	0.80
6	I feel blue, down, listless, or depressed.	64.0	0.81	54.3	0.78	55.7	0.85	49.4	0.91
14	I have good eating habits. †	60.2	0.31	64.0	0.53	64.9	0.49	70.9	0.48
4	I keep to myself and feel lonely.	57.6	0.69	58.4	0.63	53.5	0.66	53.5	0.73
15	I feel trapped and stuck, like there is no way out.	57.6	0.79	51.3	0.82	47.0	0.81	44.8	0.88
20	I am able to think clearly. †	55.7	0.69	58.4	0.72	59.5	0.65	60.5	0.77
21	I feel sorry for myself.	52.7	0.62	46.7	0.69	38.9	0.82	36.0	0.85
23	I lie to other people.	48.5	0.50	33.0	0.60	33.5	0.59	38.4	0.69
17	I have long periods of serious depression.	46.2	0.67	32.5	0.81	24.3	0.80	30.8	0.85
25	I feel angry at the world in general.	38.3	0.68	36.0	0.75	35.1	0.82	36.6	0.80
26	I am doing things to stay sober. †	37.1	0.55	37.1	0.52	47.0	0.58	51.7	0.44
18	I don't really care what happens.	33.0	0.70	32.5	0.75	28.1	0.78	30.8	0.89
27	I am afraid that I am losing my mind.	31.1	0.55	31.5	0.63	25.9	0.74	27.9	0.81

Note: Items were dichotomized, where "never" and "rarely" were coded as 0 and "sometimes", "fairly often", "almost always", and "always" were coded as 1;

are reverse-scored items

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Table 3
Pearson's correlations between AWARE and BSI scores across assessments

	End of Tx <i>r</i>	1-month <i>r</i>	3-month <i>r</i>	6-month <i>r</i>
BSI Somatization	0.36**	0.33**	0.30**	0.35**
BSI Depression	0.56**	0.51**	0.50**	0.52**
BSI Anxiety	0.47**	0.49**	0.44**	0.46**
BSI Global	0.61**	0.55**	0.48**	0.52**

Note:

* = $p < 0.05$,

** = $p < 0.01$

Table 4
Logistic regression results predicting relapse at post-discharge follow-up assessments

Parameter	1-month (26% relapse)			3-month (36% relapse)			6-month (46% relapse)		
	EST	SE	t	EST	SE	t	EST	SE	t
Intercept	-2.04	10.37	-0.20	-0.95	9.95	-0.10	-0.57	9.60	-0.06
AWARE score (at previous assessment)	0.08	0.03	2.44 *	0.04	0.02	1.72 †	0.05	0.02	2.30 *
Race (White vs. other)	-0.50	0.43	-1.18	0.15	0.33	0.46	0.12	0.38	0.31
Education (reference group: Some college or more)									
High School completion	0.23	10.34	0.02	-0.05	9.94	0.00	0.02	9.59	0.00
No High School completion or GED	-0.36	10.35	-0.03	-0.12	9.94	-0.01	0.13	9.59	0.01
Controlled Environment (since last assessment)	-1.28	0.18	-7.24 **	-0.96	0.16	-6.16 **	-0.75	0.15	-5.02 **
Hospitalization due to substance use (prior to tx)	0.10	0.19	0.51	0.30	0.16	1.83 †	0.32	0.17	1.90 †
Percent days abstinent (prior to tx)	0.05	0.06	0.88	-0.02	0.05	-0.49	-0.10	0.05	-2.12 *

Note:

* = $p < 0.05$,

** = $p < 0.01$;

† = $p < 0.10$

Table 5
Pseudo R² values for alternative models predicting relapse

Model	Any Substance Use		
	1-month	3-month	6-month
Basic Models			
Retention predictors [†]	0.020	0.009	0.012
Retention predictors [†] and AWARE score	0.043	0.016	0.053
Incremental Models			
Retention predictors [†] and other relapse predictors [‡]	0.248	0.174	0.144
Retention predictors [†] , other relapse predictors [‡] , and AWARE score	0.272	0.189	0.169
Alternative Models - instead of AWARE score, using:			
BSI Somatization	0.260	0.176	0.157
BSI Depression	0.255	0.175	0.159
BSI Anxiety	0.265	0.175	0.148
BSI Global	0.267	0.177	0.159

Note:

[†] Retention predictors were: race (White vs. other), education (3 levels);

[‡] other predictors of relapse were: having spent time in a controlled environment, percent days abstinent prior to treatment, hospitalization due to substance use prior to tx ("ever" versus "never").