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Psychometric Characteristics of the Teen Addiction Severity Index-Two (T-ASI-2)

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ABSTRACT. The Teen Addiction Severity Index-Two (T-ASI-2) was developed as an extension of the T-ASI to assess the severity of substance abuse and related problems among adolescents (N = 371) 12-19 years of age. The T-ASI-2 consists of 18 domains that assess current use of alcohol, tobacco, marijuana, and other drugs, as well as mental health service utilization, treatment satisfaction, school difficulties, social functioning with family members and peers, substance use by family members and peers, depression, anxiety, attention deficit, hyperactivity, defiant and risky behaviors, and readiness for change. Results show that all domains have adequate to excellent internal consistency (.54 to .88, median .80). New domains assessing psychological factors strongly correlated with gold standard assessments in the respective areas. The T-ASI-2 was designed to be a user friendly, cost-effective, viable assessment of substance use behavior and related factors. doi:10.1080/08897070802092942 [Article copies available for a fee from The Haworth Document Delivery Service: 1-800-HAWORTH. E-mail address: <docdelivery@haworthpress.com> Website: <<http://www.HaworthPress.com>> © 2008 by The Haworth Press. All rights reserved.]

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Lifetime prevalence of adolescent substance use has gradually declined since 1999; however, a considerable number of adolescents still report having tried both licit and illicit drugs (1). Results from the 2006 Monitoring the Future study reveal that 41% of 8th graders report having ever tried alcohol and 21% report having ever tried an illicit drug. Older adolescents

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report significantly higher rates of lifetime use; 73% of 12th graders have tried alcohol and 48% have tried an illicit drug. Out of all the illicit drugs, marijuana is the one most prevalently used by adolescents, and it is also perceived as the most readily available (1).

Once drug use begins to have noticeably negative effects on adolescents, they may end up referred into treatment by parents, school workers, or the medical, mental health or juvenile justice systems. Admission rates to adolescent treatment programs have been on the rise: from 1994 to 2004, there was a 43% increase in admissions to state-regulated programs, mostly because of an increase in the number of adolescents seeking treatment for marijuana abuse and an increase in the number of adolescents being referred to treatment through the criminal justice system (2). However, even after completing treatment, many of these adolescents still struggle with substance use. A review of the literature shows that on average only 38% of adolescents remain abstinent 6 months post-treatment, and 32% are abstinent at 12 months (3). Therefore, it is necessary to incorporate into a treatment plan the ability to track clients' progress after treatment so that another intervention can occur if the client returns to a detrimental pattern of substance use. In order to accomplish this, a reliable and valid measure that tracks changes in adolescents' substance use over time is needed.

SUBSTANCE USE ASSESSMENTS

A recent review of issues relating to the assessment of adolescent substance abuse stresses the importance of meaningful assessment of a wide range of variables (4). To aid in the assessment of these variables, self-reports can be a beneficial tool. Self-report of substance use among adolescents is generally valid and detects more use than laboratory tests, (5) and parental/collateral reports (6,7), the latter of which are low to moderately accurate compared to self-report or drug urinalysis. The Institute of Medicine recommends the use of brief screening instruments as an essential first step for assessing drug use; measures for the assessment of severity should follow once a positive screen is elicited.

One such comprehensive instrument is the Addiction-Severity Index (ASI; 8), which is considered the gold standard instrument for assessing multiple domains of functioning among substance-using adults (9). The ASI is a semi-structured interview that takes an average of 50 minutes to complete when administered by a trained clinician (10). In addition to assessing drug and alcohol use, the ASI includes domains that assess medical status, employment status, legal status, family history, family and social relationships, and psychiatric status.

The ASI was developed and validated among adults; however, due to the developmental processes during adolescence and the psychosocial role of substance use in their lives, adolescent drug users have different drug-use patterns (e.g., binge drinking, polysubstance use), trajectories (i.e., they still have not reached the peak of drug abuse) and related problems (e.g., school, family, peer-social) as compared to adults (11). As a result of these differences, in the late 1980s, Kaminer and colleagues modified the ASI into the Teen-Addiction Severity Index (T-ASI) to assess substance use among teens (12). Like its adult counterpart, the T-ASI is a semi-structured interview. The language of the T-ASI was simplified so that adolescents with a 5th grade reading level could understand and respond to the questions. Based on the clinical consensus of Kaminer and colleagues, certain domains of the ASI were not included in the T-ASI while other domains deemed more relevant to adolescents were added to the T-ASI. For example, the medical domain from the ASI was dropped because adolescents tend to have fewer health problems than adults, and two additional domains, school status and social-peer relationships, were added to the T-ASI, resulting in a total of seven domains (12,13).

As they previously done with the ASI (14), Brodey and colleagues revised the wording of the T-ASI to make it suitable for a self-report version (T-ASI-SR) via the Internet or automated telephone (15), allowing for comparable assessments, but with less use of the clinician's time than the previous semi-structured interview format. While developing and validating the T-ASI-SR, psychometric concerns arose about the instrument. For example, internal consistency of all the domains was less than .70

for the clinician-administered version, and less than .70 on four of the six domains in for the self-report versions (internet and telephone administered). Three domains, peer, school, and legal status, had reliabilities at or less than .50 across all three types of administration. Moreover, the psychological composite did not adequately assess some mental health concerns relevant to teens, such as delinquent behavior and attention deficit disorder.

As both the ASI and T-ASI are widely used in substance abuse settings for assessment purposes, these instruments are very useful in developing treatment plans and protocols. The ASI and ASI-SR have exhibited adequate psychometric properties, but the T-ASI-SR has not been as sound. Consequently, the current study revised the T-ASI-SR to achieve better psychometric characteristics and broader coverage of psychological functioning.

METHOD

Participants

Three hundred seventy-one adolescents between the ages of 12 and 19 were recruited from four substance abuse clinics (three outpatient and one inpatient) in the northwest U.S. Fifty-seven percent of participants were male, 88.4% were non-Hispanic, 76.5% were White, and 81.7% were inpatients. The average age of participants was 15.96 ($SD = 1.21$) years.

Materials

Participants completed a battery of assessments, including the revised self-report version of the T-ASI (T-ASI-2). The T-ASI-2 reflects many changes to the T-ASI-SR. The revision consists of 18 domains as compared to the 7 domains of the T-ASI-SR. Several existing domains were divided into multiple ones in order to improve construct validity and internal consistency. For example, on the TASI-SR there was one family domain and one peer domain. The revised version now contains two domains for both family and peers, one assessing relationships and the other assessing substance use of the referenced group. The psychiatric status domain was also divided into multiple domains

reflecting psychological problems commonly experienced by teens. Additionally, new domains exist for depression, anxiety, attention deficit, hyperactivity, defiant behavior, and risky behavior. The TASI-SR-R consists of questions that assess both lifetime substance use and current use; however, the current study focuses only on questions concerning current use because they are most sensitive to change, and therefore most applicable to tracking progress over time.

Participants also completed three gold standard assessments, the Beck Anxiety Inventory (BAI; 16), the Conners-Wells' Adolescent Self-Report Scales (CASS; 17), and the Reynolds Adolescent Depression Scale 2nd edition (RADS; 18). These were included to assess the validity of some of the new domains (anxiety; defiant behavior, attention deficit, hyperactivity; and depression, respectively) that had not been included in the original T-ASI. The BAI is a reliable instrument that discriminates anxiety from depression (the correlation between the BAI and Beck Depression Inventory is .48). The CASS has four subscales; conduct problems, inattention, hyperactivity, and an ADHD index. Internal consistency reliabilities range from .75 to .85 and 6 to 8 week test-retest reliabilities range from .72-.87. Divergent validity of the CASS subscales has been shown by the fact that adolescents diagnosed with ADHD score higher than adolescents with emotional problems on all of the subscales. The RADS assesses dysphoric mood, anhedonia, negative self-evaluation, and somatic complaints, and exhibits excellent reliability ($r = .94$ among a clinical sample).

Procedure

All incoming clients completed the T-ASI-2 as part of standard intake practice. Clients were asked if they wanted to participate in a study that would assess their progress at four additional time points in the year following treatment. Those who consented (approximately 90%) were paid \$15 after completing the T-ASI-2 at intake (the follow-up component of the study will be reported elsewhere). Participants completed the survey on a touchscreen computer, and data were sent via secured

Internet connections to TeleSage where they were stored and analyzed.

RESULTS

Over half of the sample reported using tobacco (76.5%), marijuana (65.2%), and alcohol (63.4%) at least once in the past 30 days. Other drugs that were assessed received moderate endorsement of use in the past 30 days; opiates (28%), cocaine (25.3%), over the counter medications (21.6%), methamphetamines (19.4%), amphetamines (15.1%), MDMA (14.6%), and hallucinogens (11.9%). Less than 10% of the sample reported using the remaining drugs at least once in the past 30 days; sedatives (9.7%), inhalants (9.2%), Ritalin (5.9%), GHB (1.3%), ketamine (0.8%), and rohypnol (0%).

Responses to all questions used in the calculation of composite scores were transformed into *z* scores. This was done for two reasons: (1) some questions that assess the same domain have different response options and transforming them to a common metric allows for composites to be made, and (2) many questions have highly skewed distributions (e.g., number of days in the past 30 that you used opiates). Next, exploratory principal-axis factor analyses with varimax rotation were conducted on all Likert-type domains to construct validity. Single factor solutions were appropriate for all domains. Items that loaded above .40 were combined and divided by the total number of questions for that domain to calculate the composite score. Internal consistency reliability was then calculated for each domain using Cronbach's alpha. For domains that lost items due to the factor analysis results, Cronbach's alphas are reported for both pre- and post-reduction composites.

Table 1 shows the number of items on the T-ASI-2 that assess current endorsement of the domains. Also included in the table are the items that were used to calculate the composite for each domain. A difference in these two numbers resulted for several reasons. First, some of the items included on the survey are screening items (e.g., "Have you used alcohol in the past 30 days?"), and thus are not included in composite; other items were excluded from the composite based on the results of the factor

analyses. For instance, one of the seven items assessing family functioning loaded at .02, and thus was excluded from the final analyses. Inter-item correlations were examined for collinearity among items remaining within a domain. Correlations greater than .90 can distort results models due to the redundancy of item content; therefore, this value was used as a cut-off. Results show that within a domain, no two items correlated higher than .75; therefore, no items were deleted based on this analysis. All items included in the analyses are presented in the Appendix.

Internal consistency reliability for each of the domains as well as for the gold standard instruments included in the study are also reported in Table 1. Reliabilities are high ($\alpha > .70$), for all of the T-ASI-2 domains, except the tobacco use and risk behavior domains. Reliabilities for the created domains of defiant behavior, attention deficit, and hyperactivity were comparable to those of the CASS subdomains. Additionally, reliabilities of the BAI and our anxiety domain are similar (.95 and .88, respectively), but ours achieves this reliability more efficiently with 57% (12) fewer items. Similarly, although the RADS has a higher reliability than our depression domain (.94 versus .85), both are high, and our domain has 75% (23) fewer items than the RADS.

Table 2 shows the correlations among all of the T-ASI-2 domains, several of which are particularly noteworthy. First, all of the substance use domains—tobacco, alcohol, marijuana, and other drugs—were significantly correlated with one another and with peer substance use. Second, all of the psychological variables—depression, anxiety, attention deficit, hyperactivity, risky behavior, and defiant behavior—were all significantly correlated with each other (with the exception of the correlation between risky behavior and depression). Moreover, all substance use domains were significantly correlated with school difficulties, defiant behavior, and peer substance use. Alcohol, marijuana, and other drug use were significantly correlated with attention deficit. Other drug use significantly correlated with all psychological domains (e.g., depression, anxiety) unlike tobacco, alcohol, and marijuana use.

TABLE 1. Reliabilities of the Domains of the T-ASI-2

Domain	Number of items	Number of items	Reliability (α)
	on T-ASI-2	used in calculations	
Tobacco Use	3	2	.66
Alcohol Use	5	3	.83
Marijuana Use	1	1	N/A
Other Drug Use	13	13	.79 ^a
Service Utilization	6	6	.73
Treatment Satisfaction	4	4	.78
School Difficulties	10	5	.71
Social Functioning (Family)	7	7	.88
Substance Use (Family)	4	2	(.68) ^b .82
Social Functioning (peer)	7	5	(.73) ^b .80
Substance Use (Peer)	4	4	.80
Depression	7	7	.85
Anxiety	9	9	.88
Attention Deficit	5	4	(.82) ^b .85
Hyperactivity	5	5	.84
Defiant Behavior	7	7	.82
Risky Behavior	9	9	.54
Readiness for Change	4	3	.72

^aReliability for Other Drug Use was calculated with all drugs reported by at least 10% of participants.

^bNumbers in parentheses are Cronbach's alpha for the domain prior to item deletion.

Convergent validity of particular domains was also examined by correlating them with gold standard instruments. Table 3 shows the correlations between the depression, anxiety, defiant behavior, attention deficit, and hyperactivity domains of the T-ASI-2 and the RADS, BAI, and subscales of the CASS. All domains strongly correlated with the gold standard measures of the respective domains (e.g., our depression domain and the RADS correlated at $r =$

.85, our anxiety domain and the BAI correlated at $r = .75$, and our attention deficit measure correlated with the inattention subscale of the CASS at $r = .67$) indicating convergent validity of the domains. Furthermore, although all domains significantly correlated with all gold standard instruments, the strongest correlation was between the domain and the respective instrument or subscale (e.g., hyperactivity correlated strongest with the hyperactivity subscales

TABLE 2. Inter-Correlations of the T-ASI-2 Domains

	T ^a	A ^b	M ^c	OD ^d	SU ^e	TS ^f	S ^g	FF ^h	FSU ⁱ	PF ^j	PSU ^k	D ^l	A ^m	AD ⁿ	H ^o	DB ^p	RB ^q	RC ^r	
T	1.0																		
A	.30^r	1.0																	
M	.36	.28	1.0																
OD	.28	.32	.30	1.0															
SU	-.01	.04	-.08	.11	1.0														
TS	.12	.12	.13	.14	.13	1.0													
S	.29	.28	.28	.39	.02	.06	1.0												
FF	.13	.19	.13	.20	-.10	.31	.23^s	1.0											
FSU	.07	.02	.18	.02	-.13	.16	.04	.45	1.0										
PF	<i>-.14</i>	-.11	-.13	-.11	.04	.11	-.05	.14	.15	1.0									
PSU	.20	.36	.51	<i>.17</i>	-.08	.22	.28	.25	.26	.04	1.0								
D	-.01	.01	.02	<i>.14</i>	.13	.17	.04	.30	.15	.29	-.03	1.0							
A	.06	.12	.08	.29	.13	.07	.15	.26	.10	.08	.10	.73	1.0						
AD	.11	<i>.16</i>	<i>.14</i>	.33	.18	.12	<i>.21</i>	.21	-.01	.01	.20	.42	.62	1.0					
H	.09	.21	.06	<i>.15</i>	.14	.06	.20	.20	.08	.02	.12	.26	.45	.57	1.0				
DB	.25	.39	.27	.29	.10	.25	.35	.52	.27	-.02	.39	.24	.33	.43	.44	1.0			
RB	.16	.30	.17	<i>.24</i>	.27	.04	.24	.18	.09	.03	.35	.06	.27	.34	.27	.56	1.0		
RC	.08	.09	.10	.18	.22	-.12	-.10	-.05	-.05	.07	.07	.08	<i>.14</i>	.13	.08	.11	.20	1.0	

^aT – Tobacco^bA – Alcohol^cM – Marijuana^dOD – Other Drugs^eSU – Service Utilization^fTS – Treatment Satisfaction^gS – School^hFF – Family FunctioningⁱFSU – Family Substance Use^jPF – Peer Functioning^kPSU – Peer Substance Use^lD – Depression^mA – AnxietyⁿAD – Attention Deficit^oH – Hyperactivity^pDB – Defiant Behavior^qRB – Risky Behavior^rRC – Readiness for Change^sBold indicates $p < .001$ ^tItalics indicates $p < .01$

of the CASS). The exception is the anxiety domain, which correlated strongly with both the BAI and the RADS. However, it must be noted that depression and anxiety are often highly correlated with one another; in fact, in this study the BAI and RADS correlated at .70.

DISCUSSION

The current study's aim was to develop a reliable extension of the T-ASI-SR to assess substance use among adolescents, and several significant results were obtained. First, all of the

TABLE 3. Correlations Between T-ASI-2 Domains and Gold Standard Instruments^a

	D ^b	A ^c	AD ^d	H ^e	DB ^f
RADS ^g	.85	.80	.54	.39	.40
BAI ^h	.55	.75	.51	.41	.31
CON ⁱ	.22	.26	.39	.28	.61
ATT ^j	.39	.45	.67	.40	.38
H_C ^k	.34	.49	.62	.62	.34
ADHD ^l	.52	.58	.64	.45	.49

^aAll correlations significant at $p < .001$

^bD – Depression

^cA – Anxiety

^dAD – Attention Deficit

^eH – Hyperactivity

^fDB – Defiant Behavior

^gRADS – Reynolds Adolescent Depression Scale

^hBAI – Beck Anxiety Inventory

ⁱCON – Conduct Subscale of CASS

^jATT – Inattention Subscale of CASS

^kH_C – Hyperactivity Subscale of CASS

^lADHD – ADHA Index Subscale of CASS

domains of the T-ASI-2 showed adequate to good internal consistency, except risky behavior. However, this domain is understandably low because it assesses a comprehensive, very diverse range of risky behaviors that are not expected to appear in the same individual. For example, some of these behaviors (e.g., weapons-carrying and participating in street racing) show a gender-bias, whereas others (e.g., having sexual intercourse without a condom) do not. Second, the new domains created for the T-ASI-2 correlated highly with included gold standard measures of anxiety, depression, defiant behavior, attention deficit, and hyperactivity. The inclusion of these domains in an instrument of substance use assessment is desirable considering the high proportion of adolescents with substance use disorders and comorbid psychiatric disorders (19). By administering the T-ASI-2 to adolescents as they enter a substance abuse treatment center, domains can be identified that may need immediate treatment or re-assessment after a period of abstinence. Finally, school difficulties, peer sub-

stance use, and defiant behavior were correlated with all substance use behaviors.

The T-ASI-2 adds an additional 11 domains to the previous version, allowing for more specific assessment of substance use behaviors and related domains. Although the added length to the instrument may seem disadvantageous, in the current study, the T-ASI-2 was administered via computer which allowed screening questions to branch participants out of more specific follow-up questions if they did not apply, thereby tailoring the length of the instrument to the particular participant.

The results of this study provide preliminary support for the T-ASI-2 as a reliable and valid assessment tool for substance use and related behaviors. Future analyses need to be conducted to examine test-retest reliability of the domains, as well as more rigorous validation comparisons with published instruments. The T-ASI-2 offers many advantages over previous versions of the T-ASI in that self-administration via the Internet or telephone is low-cost, fairly quick, and allows the adolescent to complete the survey from virtually anywhere, as

compared to paper administration. Thus, the T-ASI-2 can be used to assess adolescents' substance use and psychological progress after they have left treatment. Future research should examine the ability of T-ASI-2 domains to predict substance use. If predictive ability is found, these domains may be helpful in predicting and preventing relapse over the long-term.

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APPENDIX

Domain	Item
Tobacco Use	<p>In the past 30 days:</p> <p>On how many days, if any, did you smoke cigarettes?</p> <p>How many cigarettes per day did you usually smoke?</p>
Alcohol Use	<p>In the past 30 days:</p> <p>On how many days, if any, did you drink alcohol?</p> <p>How many drinks per day, if any, did you usually consume on weekdays?</p> <p>How many drinks per day, if any, did you usually consume on weekends?</p>
Marijuana Use	<p>In the past 30 days, on how many days, if any, did you use marijuana or hashish?</p>
Other Drug Use	<p>In the past 30 days, on how many days, if any, did you:</p> <p>Sniff glue or inhale gases or sprays to get high (huffing)?</p> <p>Use over-the-counter drugs to get high?</p> <p>Use Ritalin to get high, that is without a doctor telling you to take it at a higher dose than the doctor told you?</p> <p>Use cocaine or crack cocaine?</p> <p>Use methamphetamine?</p> <p>Use amphetamines to get high?</p> <p>Use opiates to get high?</p> <p>Take barbiturates, tranquilizers, or sedatives to get high?</p> <p>Use MDMA (ecstasy, X)?</p> <p>Use ketamine?</p> <p>Use hallucinogens?</p>

APPENDIX (continued)

Domain	Item
	Take Rohypnol?
	Take GHB?
Service Utilization	How many days in the past 14 days have you: Attended an alcohol education session? Attended an alcohol relapse prevention meeting? Received a urinalysis or other test for drug use? Attended a drug education session? Attended a drug relapse prevention meeting? Discussed your legal problems with a counselor, advocate, or lawyer?
Treatment Satisfaction	In the past 14 days: I felt like I had a good relationship with my counselor or therapist.* I felt satisfied with the treatment I received for alcohol or substance abuse.* My counselor or therapist treated me with respect.* My counselor or therapist was helpful.*
School Difficulties	In the past 14 days, how many days, if any: Did you skip an entire day of school? Did you skip one or more classes at school? Were you late to school? Did you get into trouble at school, like being sent to detention or the principal's office? Were you suspended from school?
Social Functioning (Family)	In the past 14 days: I had arguments with members of my family that involved screaming

Domain	Item
	<p>or yelling.*</p> <p>Members of my family helped each other.*</p> <p>I was able to trust my parents, guardian, or caretaker.*</p> <p>I felt good about my relationships with family members.*</p> <p>I was interested in what my family members said to me.*</p> <p>I got along well with family members.*</p> <p>I avoided spending time with family members.*</p>
Substance Use (Family)	<p>In the past 14 days:</p> <p>Family members helped me stay away from alcohol.*</p> <p>Family members helped me stay away from illegal drugs.*</p>
Social Functioning (Peer)	<p>In the past 14 days:</p> <p>I felt close to a good friend.*</p> <p>I trusted a friend.*</p> <p>I felt let down by friends.*</p> <p>I enjoyed spending time with friends.*</p> <p>I could count on friends for help.*</p>
Substance Use (Peer)	<p>In the past 14 days:</p> <p>My friends helped me stay away from alcohol.*</p> <p>I hung out with friends while they were drinking alcohol.*</p> <p>My friends helped me stay away from illegal drugs.*</p> <p>I hung out with friends while they were getting high or using illegal drugs.*</p>
Depression	<p>In the past 14 days:</p> <p>I felt lonely.*</p>

APPENDIX (continued)

Domain	Item
	I felt sad.*
	I felt like life was worth living.*
	I had fun.*
	I thought that people liked me.*
	I felt like nothing went right for me.*
	I hated myself.*
Anxiety	In the past 14 days:
	I felt tense.*
	I felt calm.*
	I felt unsure of myself around other people.*
	I worried.*
	I felt suddenly scared for no reason.*
	I had nightmares.*
	I had an upset stomach.*
	I felt shaky.*
	I worried about what was going to happen.*
Attention Deficit	In the past 14 days:
	I had a hard time concentrating.*
	People told me I should pay more attention.*
	I had a hard time following directions.*
	I had trouble paying attention to what I was doing.*
Hyperactivity	In the past 14 days:
	People said I talked too much.*
	People said I interrupted.*

Domain	Item
	<p>People told me to stop moving.*</p> <p>I had trouble sitting still.*</p> <p>People told me that I was noisy.*</p>
Defiant Behavior	<p>In the past 14 days:</p> <p>I did what my parent or guardian told me to do.*</p> <p>I refused to do what my parent or guardian told me to do.*</p> <p>I lied.*</p> <p>I yelled at someone when I was angry.*</p> <p>I threatened to hurt someone physically.*</p> <p>I damaged someone else's property.*</p> <p>I got into physical fights.*</p>
Risky Behavior	<p>In the past 14 days:</p> <p>I snuck out of the house at night.*</p> <p>I drove or rode in a car that was going 20 or more miles over the speed limit.*</p> <p>I carried a weapon, like a gun or knife.*</p> <p>I rode in a car or other vehicle driven by someone who had been drinking alcohol or taking illegal drugs.*</p> <p>I was involved in street-racing.**</p> <p>I ran away from home for overnight or longer.**</p> <p>The last time you had sexual intercourse, did you or your partner use a condom.**</p>
Readiness for Change	Do you believe that you have a problem with alcohol or drugs?***

APPENDIX (continued)

Domain	Item
	Do you believe that your life could get better with some help from a substance abuse counselor or treatment program?*
	Do you want to be in treatment for alcohol or substance abuse?*

*Response options were *Never, Rarely, Sometimes, Often, Almost Always*

**Response options were *Yes, No*