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DEVELOPMENT OF THE DRUG ABUSE SCREENING TEST FOR ADOLESCENTS (DAST-A)

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Abstract — The development and initial validation of the Drug Abuse Screening Test for Adolescents (DAST-A) is summarized. The DAST-A, derived from a modification of the original adult version called the Drug Abuse Screening Test (DAST; Skinner, 1982), was psychometrically tested in a study group of adolescent inpatients. The DAST-A demonstrated good internal consistency, high test-retest reliability, unidimensional factor structure, and good concurrent validity. Using the classification system of the fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association 1994), DAST-A scores of greater than 6 yielded sensitivity, specificity, and positive predictive powers of 78.6%, 84.5%, and 82.3%, respectively, in differentiating adolescent psychiatric inpatients with and without drug-related disorders. These findings suggest that the DAST-A holds promise as a drug abuse screening measure in psychiatrically impaired adolescent populations. © 2000 Elsevier Science Ltd

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Illicit drug use among American adolescents represents a major public health problem. Despite overall declines in annual and 30-day prevalence rates for substance use since 1979, use of marijuana, cocaine, LSD, and other hallucinogens among 8th, 10th, and 12th grade students has risen significantly in the 1990s (Johnston, O'Malley, & Buchman, 1995, 1996). During this same period, adolescents have reported less perceived dangers in using illicit drugs and have become less disapproving of individuals engaged in this activity (Johnston et al., 1995, 1996). These trends are alarming, given the numerous acute and long-term adverse consequences illicit drug use often has on the lives of adolescents (Newcomb, 1995).

Research about the comorbidity of adolescent substance abuse and psychiatric disorders within population-based and clinical samples suggests that substance abuse is likely to occur at higher rates among adolescents who have behavioral and psychological problems. Adolescents who have disturbed behavioral activity regulation (Tarter, Laird, Kabene, Buckstein, & Kaminer, 1990), significant adjustment problems (Grilo, Fehon, Walker, & Martino, 1996; Shedler & Block, 1990; Sussman, Dent, & Galaif, 1997; Wills, McNamara, Vaccaro, & Hirky, 1996), overall disruptive behavior disorders (Cohen et al., 1993; Wilens, Biederman, Abrantes, & Spencer, 1997), and conduct disorder, depression, or co-occurring conduct disorder and depression (Biederman et al., 1997; Buckstein, Glancy, & Kaminer, 1992; Greenbaum, Prange, Friedman, & Silver, 1991; Grilo et al., 1995; Hovens, Cantwell, & Kiriakos, 1994; Kaminer, 1991) are more likely to abuse substances than adolescents without these symptoms or syndromes. For example, Grilo and colleagues (1995) found that 50% of adolescents consecutively admitted into a psychiatric inpatient unit had at least one substance-related

disorder based on reliably administered semi-structured diagnostic interviews. This figure is higher than the 32% estimate for *DSM-III-R* (American Psychiatric Association, 1987) alcohol and drug use disorders observed in community-based adolescent samples (Reinherz, Giaconia, Lefkowitz, Pakiz, & Frost, 1993).

Detection of substance abuse among psychiatrically impaired adolescents is crucial. Substance abuse may exacerbate the adolescents' psychiatric problems or primarily account for the symptoms presented. By accurately identifying these comorbid conditions, attention can be given to deciphering the temporal sequence in which the problems emerged and how they interrelate with one another (Lehman, Myers, Corty, & Thompson, 1994). Comprehensive dual diagnosis treatment planning would ideally be based on this type of integrated understanding (Drake, Bartels, Teague, Noordsy, & Clark, 1993).

Numerous efforts have been made to develop and validate self-report instruments that detect substance abuse among adolescents. These efforts have included the psychometric evaluation of the Adolescent Alcohol Involvement Scale (Mayer & Filstead, 1979), Adolescent Substance Abuse Screening Measure (Petchers, Singer, Angelotta, & Chow, 1988), Rutgers Alcohol Problem Index (White & Labouvie, 1989), Adolescent Drinking Index (Harrell & Wirtz, 1990), Drug and Alcohol Problem Quick Screen (Schwartz & Wirtz, 1990), Substance Abuse Subtle Screening Inventory (Miller, 1990), Problem Oriented Screening Instrument for Teenagers (Rahdert, 1991), Personal Experience Screening Questionnaire (Winters, 1992), Presley Adolescent Alcohol Scale (Presley & Karmos, 1994), and Drug Use Screening Inventory (Kirisci, Mezzich, & Tarter, 1995). Most of the instruments are self- or clinician-administered, brief in length and completion time, and rapidly scored and interpreted. They have generally shown evidence for good reliability (e.g., internal consistencies between .74 and .97 and 1- to 3-week test-retest reliabilities between .88 and .95) and varying degrees of acceptable validity across studies. However, this psychometric literature originates primarily from adolescent study groups derived from substance abuse clinic, juvenile detention center, school, and pediatric settings rather than from psychiatric ones. Given that the impact of substance abuse on psychiatrically impaired individuals is complex and often different from those encountered by primary substance abusers (Martino, McCance-Katz, Workman, & Boozang, 1995), the generalizability of existing measures that screen substance use for an adolescent psychiatric population has not been established. Furthermore, many of the instruments focus solely on adolescent alcohol use and exclude illicit drug use (Winters, 1992). A brief reliable and valid instrument appropriate for screening psychiatrically impaired youth for illicit drug abuse is needed within acute care psychiatric inpatient settings where accurate identification of adolescent drug abuse and initiation of dual diagnosis treatment must occur quickly.

This report describes the development and initial psychometric properties of a screening instrument for adolescent drug use called the Drug Abuse Screening Test for Adolescents (DAST-A). It was derived from a modification of the original adult version, the Drug Abuse Screening Test (DAST) developed by Skinner (1982) and tested with a study group of adolescent psychiatric inpatients.

METHOD

Subjects

The study group consisted of 194 adolescents who were admitted nearly consecutively from 1994 through 1996 into an adolescent inpatient evaluation and crisis inter-

vention unit within an urban, university-affiliated, private, nonprofit psychiatric facility. Reasons for admissions to the unit typically involved acute suicidality, behavioral dyscontrol, or dangerousness to others. Referrals came from emergency rooms, clinicians, residential treatment facilities, and juvenile detention centers throughout Connecticut. Subjects were excluded from the sample pool only if they had difficulty with reading or comprehension, were actively psychotic, or too agitated to complete the assessment instruments (see below). Otherwise, participation in the study was completely voluntary. At the time of admission subjects and their parents (or legal guardians) provided written consent for evaluation. All subjects eligible for the study agreed to participate in it.

The study group's demographic characteristics are presented in Table 1. On average, subjects were 15.8 years old (range = 13–19 years). Somewhat more females (57.2%) than males (42.8%) participated in the study. The majority of subjects was Caucasian (83.5%), with 8.8% African American, 7.2% Hispanic American, and 0.5% Asian American. Most subjects (94%) were enrolled in school, with a mean level of educational obtainment of 9.7 years (range = 7–13 years). Subjects were predominantly privately insured (76.8%), although a sizeable minority of subjects (23.2%) received state-assisted medical benefits (i.e., Medicaid). On average, subjects experienced a moderate degree of psychiatric symptomotology; Global Assessment of Functioning ratings (GAF; American Psychiatric Association, 1987, 1994), which reflects severity of symptomatic and functional impairment averaged 54.2 (SD = 11.2).

Table 1. Demographic characteristics, subgroup Drug Abuse Screening Tests For Adolescents (DAST-A) scores, and severity of illness of inpatient adolescent sample

			DAST-A scores		
			M	(SD)	Statistical test[a]
Age (M, SD)	15.8	(1.6)	–	–	$r = .13, p = .06$
Gender (n, %)					$t(192) = 1.84, p = .07$
Males	83	(42.8)	6.76	(6.04)	
Female	111	(57.2)	5.20	(5.72)	
Ethnicity (n, %)					$t(192) = 1.57, p = .12$
Caucasian	162	(83.5)	6.16	(5.98)	
African American	17	(8.8)			
Hispanic American	14	(7.2)	4.38	(5.30)	
Asian American	1	(0.5)			
Attending school (n, %)					$t(192) = -.24, p = .81$
Yes	183	(94.3)	5.84	(5.96)	
No	11	(5.7)	6.27	(4.71)	
Grade in school (M, SD)	9.7	(1.5)	–	–	$r = .10, p = .16$
Insurance status (n, %)					$t(192) = 1.36, p = .18$
Private insurance	149	(76.8)	5.55	(5.54)	
Medicaid	45	(23.2)	6.91	(6.88)	
Global Assessment of Functioning (M, SD)[b]					
Current	54.2	(11.2)	–	–	$r = -.05, p = .48$
Past year	63.2	(9.8)	–	–	$r = -.21, p = .005$

n = 194.
[a]Pearson product–moment correlation coefficients and two-tailed independent t-tests were calculated. For ethnicity, a t-test of the difference between the DAST-A score means of Caucasians and all ethnic minorities (African American, Hispanic American, Asian American) in the sample was conducted.
[b]Global Assessment of Functioning (American Psychiatric Association, 1987, 1994) level reflects overall psychological functioning on a scale of 0–100, with lower scores indicating more severe symptomatic and functional impairment and higher scores representing improved mental health and functioning.

The sample's diagnostic description is presented under *DSM-III-R* (American Psychiatric Association, 1987) and *DSM-IV* (American Psychiatric Association, 1994) Axis I criteria (see Table 2); approximately midway through the study the hospital staff implemented the *DSM-IV* system. As a result, 81 subjects received *DSM-III-R* diagnoses, and 113 subjects received *DSM-IV* diagnoses. Using either *DSM* system, all subjects received psychiatric diagnoses. The most frequently assigned psychiatric diagnoses in descending order were: dysthymia (39%), major depression (38%), conduct disorder (21%), oppositional defiant disorder (18%), and attention deficit-hyperactivity disorder (18%). Eighty-three subjects (43%) received *DSM* substance-related diagnoses. The most frequently assigned substance-related diagnoses in descending order were: cannabis abuse or dependence (32%), alcohol abuse or dependence (21%), cocaine abuse or dependence (5%), and hallucinogen abuse or dependence (5%). Twenty-five subjects (12.9%) met diagnostic criteria for more than one substance-related disorder; the two largest diagnostic subgroups of this cohort were alcohol and cannabis (*n* = 9) and cannabis and hallucinogens (*n* = 5). All diagnoses were assigned

Table 2. Distribution of *DSM-III-R* and *DSM-IV* Axis I diagnoses for inpatient adolescent sample[a]

	All (*n* = 194)		*DSM-III-R* (*n* = 81)		*DSM-IV* (*n* = 113)	
	n	(%)	*n*	(%)	*n*	(%)
Mood disorders	152	(78)	64	(79)	88	(78)
Major depression	74	(38)	34	(42)	40	(35)
Dysthymia	75	(39)	38	(48)	36	(32)
Depressive disorder NOS	19	(10)	4	(5)	15	(13)
Bipolar disorder	9	(5)	2	(3)	7	(6)
Psychotic disorders	7	(4)	3	(4)	4	(4)
Anxiety disorders	11	(6)	4	(5)	7	(6)
Disruptive behavior disorder	88	(45)	35	(43)	53	(47)
Conduct disorder	41	(21)	21	(26)	20	(18)
Oppositional defiant disorder	34	(18)	11	(14)	23	(20)
ADHD	34	(18)	14	(17)	20	(18)
Eating disorders	7	(4)	5	(6)	2	(2)
Substance-related disorder[b]	83	(43)	38	(47)	45	(40)
Alcohol use	41	(21)	16	(20)	25	(22)
Drug use	72	(37)	30	(37)	42	(37)
Amphetamines	1	(1)	0	(0)	1	(1)
Cannabis	62	(32)	23	(28)	39	(35)
Cocaine	9	(5)	2	(3)	7	(6)
Hallucinogens	9	(5)	3	(4)	6	(5)
Inhalants	1	(1)	0	(0)	1	(1)
Opioid	2	(1)	1	(1)	1	(1)
Sedative	0	(0)	0	(0)	0	(0)
Polysubstance[c]	6	(3)	6	(7)	0	(0)

[a]Two-tailed independent *t*-tests were calculated to examine differences in Drug Abuse Screening Test for Adolescents scores among subjects with and without major psychiatric disorders (mood, psychotic, anxiety, disruptive behavior, eating). No significant statistical differences existed for either *DSM-III-R* and *IV* cohorts.
[b]Twenty-five of the 83 subjects met diagnostic criteria for more than one substance-related disorder. The two largest subgroups in this cohort included subjects who had alcohol and cannabis disorders (*n* = 9), and subjects who had cannabis and hallucinogen disorders (*n* = 5). The remaining subjects in this cohort had other combinations, which most often included at least alcohol or cannabis in addition to other illicit drugs.
[c]These subjects met *DSM* criteria for polysubstance dependence. Collectively, the subjects abused at least three groups of substances, which included different combinations of alcohol, cannabis, cocaine, and cannabis soaked in formaldahyde (i.e., "illy").

at the time of discharge and were not mutually exclusive of one another. A clinical consensus method was used to obtain them based on a review of each subject's history and presenting data by a multidisciplinary treatment team consisting of experienced attending psychiatrists, nurses, and clinicians. Medical record data, corroboration with family and referral sources, and staff observations were routinely integrated into the process of making diagnostic determinations. The DAST-A and psychological assessment data gathered upon admission were not used to establish diagnoses.

Procedure

All subjects completed a computerized version of the DAST-A between 1 and 4 days of admission as part of a standardized computer-administered battery of self-report psychological assessments. In addition, a random sampling of 42 of the original cohort who remained hospitalized for at least 1 week completed the DAST-A again after 1 week to establish test-retest reliability. The battery included well-established measures of depression, suicide risk, past feelings and acts of violence, alcohol use, and substance abuse proneness, all areas of immediate concern to an acute adolescent inpatient unit and previously found to be significantly related to adolescent drug abuse (Hawkins, Catalano, & Miller, 1992; Newcomb, 1995). A measure of social desirability was also included in the battery to assess the impact of response style bias on the DAST-A. A computerized administration of all of the instruments was selected to remove some of the interpersonal concerns (e.g., embarrassment, fear) or barriers to accurate disclosure of sensitive material (Erdman, Greist, Gustafson, Taves, & Kline, 1987) and to improve the reliability and validity of them (Wilson, Genco, & Yager, 1995). A brief description of the instruments follows.

The DAST-A is a 27-item self-report screening instrument (see Table 3) that directly queries adolescents about any adverse consequences they may have experienced secondary to drug use. Because the sequelae of drug abuse may overlap with those associated with psychiatric conditions, all DAST-A items incorporated language that explicitly linked the noted adverse consequences with drug use. This test development strategy was necessary to accurately distinguish adolescents with drug-related problems from adolescents whose problems emanated primarily from psychiatric concerns (Kirisci et al., 1995). In general, the DAST-A parallels the 28 items of the DAST developed by Skinner (1982). The DAST has been shown to have relatively sound reliability (coefficient alpha = .92) and validity (e.g., unidimensional factor structure, significant correlations between DAST scores and self-reported frequency of specific drug use over past 12 months ranging from .19–.55) and to be minimally influenced by response style biases (Skinner, 1982). Some modifications were made on the DAST items, however, to make them more relevant to an adolescent population (e.g., rewording items about spousal concerns to concerns expressed by parents, boyfriends, or girlfriends and about work-related concerns to those occurring at school). In addition, to reduce item redundancy two items similarly querying previous involvement in drug abuse treatment were combined into one. The DAST-A score is computed by summing all items that are endorsed in the direction of increased drug use problems, resulting in a total score range from 0 to 27. Administration of the DAST-A takes about 5 minutes.

The *Beck Depression Inventory* (BDI) is a 21-item inventory of cognitive, affective, motivational, and somatic symptoms of depression (Beck, Rush, Shaw, & Emory, 1979; Beck & Steer, 1987). It requires a fifth-grade reading level (Berndt, Schwartz, & Kaiser, 1983). The BDI has been researched extensively with adolescents and has

Table 3. Item analysis of the Drug Abuse Screening Test for Adolescents (DAST-A)

DAST-A item	M	SD	Item–total correlation
1. Have you used drugs other than needed for medical reasons?	.65	.47	.52
2. Have you abused prescription drugs?	.27	.45	.38
3. Do you abuse more than one drug at a time?	.30	.46	.66
4. Can you get through the week without using drugs (other than those required for medical reasons)?	.17	.37	.37
5. Can you get through the month without using drugs (other than those required for medical reasons)?	.23	.42	.51
6. Are you always able to stop using drugs when you want to?	.16	.37	.36
7. Do you abuse drugs more than once a week?	.23	.42	.61
8. Have you had "blackouts" or "flashbacks" as a result of drug use?	.26	.44	.62
9. Do you ever feel bad about your drug abuse?	.32	.47	.52
10. Does your boyfriend/girlfriend (or parents) ever complain about you using drugs?	.38	.49	.65
11. Do your friends or family know or suspect you abuse drugs?	.43	.50	.62
12. Has drug abuse ever created problems between you and your boyfriend/girlfriend?	.24	.43	.48
13. Has any family member ever gone for help for problems related to your drug use?	.16	.37	.28
14. Have you ever lost friends because of your use of drugs?	.15	.36	.57
15. Have your ever avoided your family or missed school or work because of drug abuse?	.26	.44	.61
16. Have you ever been in trouble at school or work because of drug abuse?	.16	.37	.57
17. Have you ever been kicked out of school or lost a job because of drug abuse?	.05	.21	.43
18. Have you gotten into fights when under the influence of drugs?	.20	.40	.48
19. Have you ever been arrested while under the influence of drugs?	.06	.23	.34
20. Have you ever been arrested for driving while under the influence of drugs?	.02	.12	.22
21. Have you engaged in illegal activities in order to obtain drugs?	.20	.40	.62
22. Have you ever been arrested for possession of illegal drugs?	.05	.21	.25
23. Have you ever experienced withdrawal symptoms as a result of heavy drug intake?	.11	.31	.56
24. Have you had medical problems as a result of your drug use (e.g., memory loss, hepatitis, convulsions, bleeding, etc.)?	.22	.41	.53
25. Have you ever gone to anyone for help for a drug problem?	.20	.40	.66
26. Have you ever been in the hospital for medical problems related to your drug use?	.12	.32	.52
27. Have you ever been involved in a treatment program specifically related to your drug use?	.23	.42	.62

been shown to have sound psychometric properties (Ambrosini, Metz, Bianchi, Rabinovich, & Undie, 1991; Steer & Beck, 1988; Strober, Green, & Carlson, 1981). For example, in a sample of adolescent inpatients, Strober et al. (1981) reported an internal consistency of .79, a 5-day test-retest reliability of .69, and a .67 correlation with clinical ratings of depression.

The *Suicide Risk Scale* (SRS) is a 15-item true/false self-report measure of feelings of hopelessness, present suicidal feelings, past suicidal behavior, and other items that have been shown to be associated with suicide risk (Plutchik, van Praag, & Conte, 1989a). In adolescent sample populations, the SRS has good internal reliability (coefficient alpha = .75), sensitivity, and specificity (Plutchik et al., 1989a; Plutchik & van Praag, 1989; Plutchik, van Praag, & Conte, 1989b).

The *Past Feelings and Acts of Violence Scale* (PFAV) is a 12-item self-report scale where responses are coded on a 3-point continuum of frequency (Plutchik & van Praag, 1990). The scale inquires about the frequency of feelings of anger, past acts of violence toward others, use of weapons, and history of arrests. The scale has been shown to have good internal consistency (coefficient alpha = .78) and item sensitivity and specificity (Brent & Kolko, 1990; Plutchik & van Praag, 1990).

The *Alcohol Abuse Involvement Scale* (AAIS) is a 14-item, self-report screening measure for alcohol abuse in adolescent populations (Mayer & Filstead, 1979). The measure identifies adolescents whose alcohol use interferes with psychological, social, and family functioning. The AAIS has demonstrated good psychometric properties (e.g., coefficient alpha = .96, 2-week test-retest reliability = .91) in adolescent clinical and population-based samples (Mayer & Filstead, 1979, 1980; Moberg, 1983).

The *Millon Adolescent Clinical Inventory* (MACI) is a 160-item, true/false self-report inventory that assesses 12 personality patterns, 8 expressed concerns, and 7 clinical syndromes in adolescent clinical populations (Millon & Davis, 1993; Millon, Millon, & Davis, 1993). It has been shown to have excellent theoretical-structural, internal-structural, and external-criterion validity. It has been cross-validated with several measures of symptomatic/psychological functioning and has good test-retest (range of .57–.92 for individual scales) and internal consistency (coefficient alpha range of .73–.91 for individual scales) reliabilities. MACI raw scores are transformed into base rate scores taking into account age, gender, and actuarial base rate data to establish scale cut-offs and then adjusted based on the respondent's test-taking response style. Base rate scores greater than 75 indicate that the characteristic in question is either present or prominent.

For the purposes of this study, only the *Substance Abuse Proneness Scale* (MACI-SAPS) and the *Desirability Scale* (MACI-DS) were used. The MACI-SAPS contains 35 items that tap maladaptive patterns of either alcohol or drug abuse that has led to significant impairment of the adolescent's performance and behavior. The MACI-SAPS showed good internal consistency in two validation samples (.89 and .88) and a test-retest (3–7-day interval) reliability coefficient of .90. The MACI-DS contains 17 items that assess the extent to which the respondent attempts to appear socially attractive and emotionally composed. It demonstrated adequate internal consistency in two validation samples (.73 and .75) and a 3- to 7-day test-retest reliability coefficient of .71.

Statistical analyses

Data analysis was conducted to examine item characteristics and scale reliability and validity. Specifically, item-total correlations and internal consistency and test-retest reliability coefficients were calculated. Response style bias was examined by correlating DAST-A scores with the MACI-DS. Concurrent validity was established by examining expected differences in DAST-A scores between substance-related disorder cohorts. Correlations between DAST-A scores and various indicators of substance abuse proneness or psychological functioning hypothesized to be related to drug

use also were established. Construct validity was explored by examining the DAST-A's underlying factor structure. Finally, a discriminant function analysis was used to determine the DAST-A's sensitivity (true positives), specificity (true negatives), and positive predictive power (overall correct classification rate). All statistical analyses were performed in a listwise fashion. Because the study group had no missing data, all cases were included in the analyses.

RESULTS

To rule out demographic and diagnostic differences in DAST-A scores, a series of independent *t*-tests were conducted with the DAST-A total score as the dependent variable and sex, ethnicity (Caucasian vs. ethnic minority), school attendance (attending school vs. not attending school), insurance type (Medicaid vs. private insurance), *DSM* system (III-R vs. IV), and major psychiatric conditions (presence vs. absence of mood disorder, psychotic disorder, anxiety disorder, disruptive behavior disorder) as the respective independent variables. Continuous demographic (age, school grade) and severity of illness (current GAF, highest past year GAF) variables were correlated with the DAST-A score and examined for statistical significance. The only significant finding at the .05 alpha level or below was a negative correlation ($r = -.21$) between the DAST-A score and past year GAF, indicating that a higher level of self-reported adverse consequences of drug abuse is associated with a lower level of general adaptive functioning for adolescents in the past year. These analyses revealed no significant demographic or diagnostic DAST-A score differences or correlations, including the comparison of the *DSM-III-R* and *IV* cohorts. Likewise, social desirability, as measured by the MACI-DS was not significantly correlated with DAST-A scores ($M = 51.45$, $SD = 22.57$; $r = -.11$, $p = .12$), indicating that subjects inclination to present themselves in an overly favorable light did not appear to be associated with performance on the DAST-A instrument.

Item-total scale correlations were calculated and were found to be moderate to high ($M = .49$, range $= .26-.70$), suggesting that the DAST-A items are each discriminating problems related to adolescent drug use (see Table 3). The DAST-A showed substantial internal consistency among items (coefficient alpha $= .91$). One-week test-retest reliability ($n = 42$) also was strong ($r = .89, p < .00$).

Concurrent validity was examined by comparing the DAST-A scores of subjects diagnosed with: (a) drug dependence, (b) drug abuse without drug dependence, (c) alcohol abuse or dependence only, and (d) no substance-related disorders, without regard to their psychiatric conditions. It was hypothesized that the DAST-A mean scores for these four cohorts would descend in magnitude, with subjects receiving drug-related diagnoses having significantly higher scores than subjects who did not receive them. Because adolescent drug abuse is often preceded by abuse of substances legal for adults (e.g., alcohol, cigarettes) and by drug experimentation that might not meet *DSM-IV* criteria for drug-related disorders (Kandel, Yamaguchi, & Chen, 1992), an alcohol-only cohort was included in the analysis as a more conservative test of the DAST-A's ability to discriminate drug abuse among adolescents with different types and degrees of substance use. A one-way analysis of variance indicated that significant differences, $F(3, 190) = 50.35, p < .0001$, existed among the four cohorts (see Table 4). Scheffe post-hoc tests with a significance level of .05 revealed that subjects diagnosed with drug dependencies had significantly higher mean DAST-A scores than all other groups. Subjects with drug abuse disorders and subjects with only alcohol-related dis-

Table 4. Comparison of Drug Abuse Screening Test for Adolescents (DAST-A)
scores among four diagnostic groups

| | | DAST-A scores | |
Diagnostic study group	*n*	*M*	*SD*
Drug dependence (DD)	17	13.59	5.30
Drug abuse without dependence (DA)	55	9.67	5.67
Alcohol abuse or dependence only (ALC)	11	7.18	5.67
No substance-related disorder (no-SRD)	111	2.76	3.34

Note. A univariate *F*-test indicated that significant mean DAST-A score differences ($p < .0001$) existed among the four diagnostic comparison groups. Scheffe post-hoc analyses revealed the following significant differences ($p < .05$): DD > DA, ALC, no-SRD; DA > no-SRD; and ALC > no-SRD.

orders had significantly higher mean DAST-A scores than those who had no substance-related disorders. No significant differences existed between subjects with drug abuse disorders and those with only alcohol-related ones, although the magnitudes of the mean DAST-A scores were in the predicted direction.

Concurrent validity was examined further with Pearson *r* correlations between DAST-A scores and the total scores of measures thought to be related to drug use (see Table 5). These results showed that higher DAST-A scores were significantly related to higher levels of BDI depression ($r = .15, p < .04$), SRS suicide risk ($r = .22, p < .01$), PFAV violence risk ($r = .20, p < .01$), AAIS alcohol-related problems ($r = .49, p < .001$), and MACI-SAPS substance abuse proneness ($r = .61, p < .001$).

A principal component factor analysis was performed on the 27 DAST-A items. Although the sample size for this analysis is low by traditional standards in which sample size adequacy is linked to a scale's number of items, the variables comprising the DAST-A clearly define the intended component of *consequences of adolescent drug use* and should load highly on it. In these cases, Guadagnoli and Velicer (1988) demonstrated that a smaller sample size is sufficient to obtain a factor solution that best represents its population pattern. Analysis of the DAST-A items identified only one meaningful factor with an eigenvalue of 8.64, accounting for 32% of the total variance. Item factor loadings ranged from .25 to .70 (median = .62). The next factor contributed only an additional 7.6% of the total variance, a substantial difference from the first factor. Overall, this analysis suggests that the DAST-A taps a single general construct of adverse consequences of drug abuse in an adolescent population.

Table 5. Pearson Correlations between Drug Abuse Screening Test for
Adolescents (DAST-A) scores and related measures

	M	*SD*	Correlation	*p*
DAST-A	5.9	5.9	–	–
BDI	16.7	11.6	.15	.035
SRS	6.4	3.4	.22	.002
PFAV	8.9	5.3	.20	.004
AAIS	32.4	18.1	.49	.000
MACI-SAPS	58.9	29.7	.61	.000

BDI = Beck Depression Inventory; SRS = Suicide Risk Scale; PFAV = Past Feelings and Acts of Violence; AAIS = Adolescent Alcohol Involvement Scale; MACI-SAPS = Million Adolescent Clinical Inventory - Substance Abuse Proneness Scale.

Finally, a discriminant function analysis was conducted to determine the DAST-A's sensitivity, specificity, and positive predictive power. An optimal cut-off score of greater than 6 was empirically derived from a visual inspection of the data set and was used to indicate the presence of a *DSM* drug-related disorder. The results for the respective *DSM* classification systems are: positive predictive power (*DSM-III-R* = 79%, *DSM-IV* = 82.3%); sensitivity (*DSM-III-R* = 70%, *DSM-IV* = 78.6%); and specificity (*DSM-III-R* = 82.4%, *DSM-IV* 84.5%).

DISCUSSION

The results of this study indicate that the DAST-A is a reliable and valid screening instrument for detecting drug abuse problems among adolescents in psychiatric inpatient settings and is comparable psychometrically to existing measures designed to screen substance abuse in nonpsychiatric adolescent populations. The DAST-A demonstrated good internal consistency, high 1-week test-retest reliability, and unidimensional factor structure. In addition, the DAST-A was not significantly associated with demographic, psychiatric diagnostic, or social desirability factors. The only variable significantly associated with DAST-A scores was the past year GAF; higher DAST-A scores were related to more impairment in general adaptive functioning over the preceding year, although not at the time of inpatient admission. Because psychiatric inpatient admission criteria requires a relatively low and restricted range of current GAF (imminent suicidality, homicidality, or grave disability) regardless of the types of presenting problems, the adolescents' level of adaptive functioning upon admission may be unrelated to DAST-A scores.

Regarding concurrent validity, the DAST-A significantly converged with measures hypothesized to be related to adolescent drug abuse. Specifically, higher DAST-A scores were related to more depressive symptoms, greater risk for suicide and feelings and acts of violence, greater likelihood of having alcohol-related problems, and increased proneness for substance abuse. The DAST-A's concurrent validity was substantiated further by it's ability to predictably vary in total score magnitude among groups with different degrees and types of substance abuse. Significantly higher DAST-A scores were obtained by adolescents diagnosed with drug dependent disorders than by respective groups of adolescents who abuse drugs in a nondependent fashion, who only received alcohol abuse or dependence diagnoses, or who did not have substance-related disorders. Adolescents with drug abuse disorders (without dependence diagnoses) also had significantly higher DAST-A scores than those without substance-related disorders.

Using the DAST-A to distinguish between adolescents who experience adverse consequences associated with drug abuse rather than alcohol abuse or dependence proved to be more difficult. While the drug abuse cohort had higher mean DAST-A scores than the alcohol abuse/dependence cohort, this difference was not significant. Given that most adolescents experiment with drugs at some point in their lives, particularly those who have abused alcohol (Kandel et al., 1992), it may be that the alcohol-only cohort contained adolescents who also had some lifetime history of drug use that did not meet diagnostic criteria for abuse, but may have caused adverse consequences that the adolescents reported on the DAST-A. It is also possible that in some cases the clinical consensus method used to determine diagnoses was less sensitive in detecting adolescent drug abuse than the more obvious signs and symptoms of drug dependence, hence clouding the comparison groups used to determine the DAST-A's dis-

criminant validity. These possibilities highlight the difficulties inherent in screening for adolescent drug abuse and the lack of foolproof criterion measures for determining the detection accuracy of them (Albanese, Bartel, Bruno, Morgenbesser, & Schatzberg, 1994).

Despite these difficulties, the DAST-A showed evidence of good discriminant validity. It correctly classified 82.4% of adolescents on the criterion measure of clinically derived *DSM-IV* discharge diagnoses, an improvement over the 79% positive predictive power obtained using the *DSM-III-R* classification system. This finding suggests that the DAST-A is a useful measure for accurately detecting adolescents who may be abusing illicit drugs and in a manner most consistent with contemporary *DSM-IV* diagnostic practice. In terms of false classification, however, the DAST-A seems to yield more false negatives (*DSM-III-R* = 30%; *DSM-IV* = 21.4%) than false positives (*DSM-III-R* = 17.6%; *DSM-IV* = 15.5%), suggesting the DAST-A may be more likely to underestimate rather than overestimate an adolescent's drug abuse when compared to the conclusions of a treatment team within an adolescent inpatient psychiatric setting. In this regard, Winters (1992) correctly emphasizes that brief adolescent substance abuse screening measures are not intended for use as diagnostic tools or for singularly making complex clinical decisions. The ramifications of misclassification of adolescent substance abuse in either direction may have significant adverse effects on the course of subsequent assessment and treatment of the adolescent. Use of screening measures must occur in the context of several other evaluative mechanisms (e.g., urinalysis, collateral reports, self-reported extent and nature of substance use) to maximize the accuracy and reliability of the substance abuse assessment (Carroll, 1995).

Limitations of this study are several fold. Regarding the applicability of the DAST-A, it only screens for adverse consequences of lifetime illicit drug abuse. Given that alcohol abuse effects a higher proportion of adolescents than illicit drug abuse (Johnston et al., 1996) and that it is likely to co-occur with adolescent drug abuse problems (Stewart & Brown, 1995), thorough screening for adolescent substance abuse would require the addition of a screening measure for alcohol abuse when using the DAST-A. In addition, the DAST-A does not query adolescents about the amount, frequency, recency, type, and nature of their drug use. This information would need to be garnered using an alternative assessment strategy (e.g., Sobell et al. (1980) Timeline Follow-Back procedure or Maisto, McKay, and Connors' (1990) discussion of self-report approaches).

This study also has some methodological limitations. The generalizability of our findings are limited in that the DAST-A was developed and validated using an adolescent psychiatric inpatient study group. Thus, the utility of using the DAST-A with other adolescent populations (e.g., outpatient clinics, school settings) has to be established. In addition, this study did not examine the relative utility of the DAST-A in comparison to already existing drug abuse screening measures that were developed in nonpsychiatric settings. Future studies are needed to examine the incremental validity of the DAST-A to such measures and to other established procedures for detecting adolescent drug abuse. In this study, we relied on a clinical consensus method to determine psychiatric diagnoses, including the drug-related disorders used as the criterion validators in the discriminant function analysis. While reliable and valid diagnostic determinations often can be made using a comprehensive clinical consensus method, such as with the LEAD standard (Kanzler, Tennen, Babor, Kadden, & Rounsaville, 1997), use of a structured diagnostic interview, such as with the Structured Clinical In-

terview for *DSM-IV* Axis I Disorders (First, Spitzer, Gibbon, & Williams, 1995) would be preferable in that it is an established and psychometrically sound diagnostic measure and could serve as a standard criterion validator of substance abuse detection from which all adolescent substance abuse screening measures could be compared and their relative utility established.

Overall, the results of this study suggest that the DAST-A has good reliability and validity. While other psychometrically sound measures for screening adolescents for substance abuse problems exist, the DAST-A has been developed within a psychiatrically ill adolescent inpatient population rather than with less functionally impaired adolescents commonly used in the development of other measures. Given the importance of accurate assessment and subsequent treatment of substance abuse problems among adolescents with psychiatric disorders, the DAST-A represents a needed addition to the substance abuse assessment field. If the DAST-A continues to demonstrate psychometric robustness in studies of samples obtained from other adolescent populations and settings and in comparison to other substance abuse screening measures, it could serve as a useful clinical and research tool to help identify youth struggling with drug-related problems.

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