Further Validation of the Alcohol Dependence Scale as an Index of Severity*

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ABSTRACT. Objective: The Alcohol Dependence Scale (ADS) yields continuous scores purported to reflect the severity of the dependence syndrome. We evaluated the concurrent validity of the ADS as a general measure of severity and the screening accuracy of the total score and subscales to detect Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV), physiological dependence. Method: Treatment-seeking, alcohol-dependent individuals entering the Combining Pharmacotherapies and Behavioral Interventions for Alcohol Dependence (COMBINE) Study (N = 1,372; 69% men) completed the ADS, diagnostic interviews, and other measures before randomization. Analyses of variance tested differences between ADS quartiles on alcohol-related measures. Areas under the receiver operating characteristic (AUROC) curve assessed screening accuracy for DSM-IV physiological dependence (tolerance or withdrawal) or withdrawal alone. Results: ADS quartiles differed on age, other demographics, and prior treatment episodes. Linear correlation showed moderate to large magnitude associations with alcohol-related self-report measures and most indices of consumption. ADS quartiles differed significantly on proportion with DSM-IV physiological dependence, but AUROC curves indicated that the ADS had limited accuracy as a continuous measure to detect DSM-IV physiological dependence, but AUROC curves indicated that the ADS had limited accuracy as a continuous measure to detect DSM-IV physiological dependence (AUROC = .75 [95% confidence interval {CI}: .70-.79] and .67 [95% CI: .60-.74] for men and women, respectively; p = .08) or withdrawal alone (AUROC = .77 [95% CI: .74-.80] and .74 [95% CI: .69-.79] for men and women, respectively; p = .30). Screening accuracy was comparably limited based on ADS subscales reflecting psychoperceptual or psychophysical withdrawal. Conclusions: The ADS reflected variation in symptom severity but did not adequately identify physiological dependence or withdrawal in treatment-seeking individuals with DSM-IV alcohol dependence. (J Stud Alcohol Drugs 68: 149-156, 2007)

Following the recognition of alcoholism as a medical illness (Jellinek, 1952) and before the advent of Diagnostic and Statistical Manual (DSM-IV; American Psychiatric Association, 1994) criteria for alcohol dependence, researchers attempted to define the alcohol-dependence syndrome (Edwards and Gross, 1976; Feighner et al., 1972). Although there was not universal agreement about the components of this syndrome, most experts believed that key symptoms included impaired control over alcohol, alcohol-seeking behavior, tolerance, withdrawal, and awareness of a compulsion to consume alcohol. The Alcohol Dependence Scale (ADS; Skinner and Allen, 1982) was designed as a self-report measure assessing this complex of symptoms to yield a continuous score reflecting the degree to which the syndrome was present and its relative severity (i.e., a continuous vs. categorical measure of dependence). Obviously, DSM-IV alcohol-dependence criteria also include most of these criteria and are now widely accepted as the gold standard for diagnosis of alcohol dependence, despite the fact that they are based on expert consensus rather than empirical derivation.

A number of studies in the past 20 years have examined the properties of the ADS in regard to its factor structure, its ability to predict outcomes, and the cutpoints on the scale that should be used to indicate the presence of alcohol dependence (Allen et al., 1994; Kivlahan et al., 1989; Maisto et al., 2003; Ross et al., 1990; Skinner and Allen, 1982; Willenbring and Bielinski, 1994). The ADS did not accurately predict relapse after discharge and entry into outpatient aftercare treatment in a sample of alcohol-dependent inpatients (Kivlahan et al., 1989). In a sample of 501 individuals presenting for alcohol or drug treatment and given a structured diagnostic interview for DSM, Third Edition (DSM-III; American Psychiatric Association, 1980), alcohol dependence, a cutoff of 9 on the ADS showed a sensitivity of 91% and a specificity of 82% in detecting alcohol dependence as determined by diagnostic interview (Ross et al., 1990). However, the ADS had poor sensitivity and specificity in a sample of medically ill, alcohol-dependent veterans (Willenbring and Bielinski, 1994).
Overview of COMBINE Study

The COMBINE Study is an 11-site, randomized, placebo-controlled, clinical trial to test 16 weeks of active treatment using naltrexone (ReVia) and acamprosate (Campral) alone and in combination. Most participants received nine brief sessions delivered by medically trained providers to promote sobriety and enhance medication adherence. Half the participants were also randomized to individualized psychotherapy (up to 20 sessions) integrating elements of the successful behavioral interventions from Project MATCH (Matching Alcoholism Treatments to Client Heterogeneity). COMBINE evaluated the efficacy of the two most promising medications (naltrexone and acamprosate), both singly and together, when combined with different intensities of behavioral therapies.

Subjects

Individuals randomized into the COMBINE Study formed the subject pool for the present investigation. Telephone screens were conducted with 4,965 treatment-seeking volunteers who were evaluated for alcohol consumption criteria. Among the individuals screened, 2,928 did not meet entry criteria (see later discussion) on the telephone screen. The remaining 2,037 individuals were invited to study centers for in-person baseline evaluations. An additional 654 individuals failed to meet study entry criteria (see later discussion) during these evaluations. The predominant reasons (in order of occurrence) for failure to reach randomization were (1) “dropped-out of the evaluation after beginning the process,” (2) “already established abstinence for a duration that exceeded the maximum threshold for study entry,” and (3) “no-show for any post-telephone screening assessment session.” The final randomized sample comprised 1,383 subjects, with complete ADS data available for 1,372 of the subjects. These 1,372 individuals remained in the final sample for the present investigation.

All subjects gave informed consent before participation in the research. Key inclusion criteria for entry into the study were age 18 years or older, current DSM-IV diagnosis of alcohol dependence, drinking a minimum of 14 standard drinks (for women) or 21 standard drinks (for men) on average per week during a 30-day period in the 90 days prior to initiation of abstinence before randomization, 2 or more days of heavy drinking (4 or more drinks for women; 5 or more drinks for men) during a consecutive 30-day period within the 90 days before baseline evaluation, 4 consecutive days of abstinence and absence of measurable alcohol withdrawal symptoms immediately before randomization (i.e., scores < 8 on the revised Clinical Institute Withdrawal Assessment for Alcohol Scale, a score indicative of the absence of clinically meaningful alcohol withdrawal [Sullivan et al., 1989]), being abstinent for a maximum of 21 consecutive days before randomization, and the ability to speak and understand English. Key exclusion criteria were current DSM-IV criteria for bipolar disorder, schizophrenia, bulimia/anorexia, dementia; a psychological disorder requiring medication or concomitant therapy with any medications that pose safety issues; a current diagnosis of dependence on any drug except for nicotine, cannabis, and alcohol, or habitual caffeine use; DSM-IV criteria for opiate dependence or abuse within the past 6 months; chronic treatment with any opiate-containing medications during the previous month, or urine positive for opioids; significant medical disorders that would increase the potential risk of study treatment or interfere with study participation, or sensitivity to study medications or related drugs; aspartate amino transferase (AST) or alanine aminotransferase (ALT) more than 3 times the upper limit of normal; bilirubin more than 10% above the upper limit of normal; women pregnant, nursing, or not using contraception; or more than 7 days of inpatient substance use-disorders treatment in the 30 days before randomization.

Assessments

The data for the present investigation consisted entirely of baseline assessments of subjects performed before
randomization and before initiation of any study treatments. The primary measure of interest was the ADS (Skinner and Allen, 1982; Skinner and Horn, 1984). The ADS consists of 25 items that inquire about symptoms during the past 12 months and provide a quantitative measure of the severity of alcohol dependence syndrome consistent with the concept of the alcohol-dependence syndrome. The items assess alcohol withdrawal symptoms, impaired control over drinking, awareness of a compulsion to drink, increased tolerance to alcohol, and salience of drink-seeking behavior. The withdrawal items include questions about hallucinations, delirium tremens, and hangovers. The ADS has been found to have high levels of internal consistency, with indices ranging from .85 to .92 (Allen and Dixon, 1994; Skinner and Allen, 1982; Willenbring and Bielinski, 1994). The ADS has been found to be predominantly unidimensional when used as a total score, with either three or four principal components described as withdrawal symptoms, obsessive-compulsive drinking, and behavioral loss of control (Allen et al., 1994; Kivlahan et al., 1989; Skinner and Allen, 1982) with one analysis separating withdrawal into psychoperceptual withdrawal and psychophysiological effects of withdrawal (Allen et al., 1994).

The remaining measures included in the present analyses were chosen from a larger pool of baseline assessments (COMBINE Study Research Group, 2003; Gastfriend et al., 2005) because of their relevance to the elements of the alcohol-dependence syndrome assessed by the ADS. Self-report instruments relevant to the present investigation and focused on alcohol use included the Drinker Inventory of Consequences (DrInC; Miller et al., 1995), the Alcohol Abstinence Self-Efficacy Scale (AASE; DiClemente et al., 1994), and the Obsessive-Compulsive Drinking Scale (OCDS; Anton, 2000; Anton et al., 1995, 1996). The DrInC, developed as part of Project MATCH, consists of 50 items that assess adverse consequences of alcohol abuse and dependence during the past 90 days in five areas: interpersonal, physical, social, impulsive, and intrapersonal. Consequences related to impulse control include items such as drinking and driving and taking foolish risks; for physical consequences, there are items such as hangovers and sleeping problems; intrapersonal consequences include items such as feeling guilty or ashamed and personality changes; interpersonal consequences include items such as concerns by friends and family and marital problems; and social responsibility consequences include items such as absenteeism and work problems. An overall summary score provides an index of the severity of negative alcohol-related consequences.

Previous research has shown the DrInC to have good psychometric properties (Blume et al., 2006; Miller et al., 1995). The AASE assesses an individual’s perceived temptation to drink and his or her efficacy or confidence to abstain in 20 common drinking-related situations having a high risk for relapse. The AASE covers experiences that occurred during the prior week. The 20 items represent cues related to negative affect, social/positive, physical and other concerns, and withdrawal and urges. Two summary scores are provided, one assessing the degree of temptation and one assessing the degree of confidence in one’s ability to remain abstinent in the face of these situations. Prior research has demonstrated a high degree of reliability and validity for the AASE (DiClemente et al., 1994). The OCDS is a 14-item instrument that characterizes and quantifies the obsessive and compulsive cognitive aspects of “craving” and heavy drinking, such as drinking-related thoughts, urges to drink, and the ability to resist those thoughts and urges. The OCDS relates to experiences that occurred during the last week of consuming alcohol. It provides a total score as well as three factor subscale scores that measure the dimensions of “obsession,” “resistance/control impairment,” and “interference” (Roberts et al., 1999). The OCDS has been found to be reliable and to have good construct validity, including a positive correlation with the ADS (Anton et al., 1995; Bohn et al., 1996; Moak et al., 1998).

Interviewer-administered measures included the alcohol dependence section of the Structured Clinical Interview for DSM-IV (SCID; Spitzer et al., 1992), a structured interview that provides a DSM-IV diagnosis of alcohol abuse or dependence. A diagnosis of alcohol dependence on the SCID requires that the necessary criteria have been present during a 12-month period and that at least three criteria have been actively present during the prior 30 days. The Form 90 is a calendar-based assessment of alcohol use during the prior 90 days (Miller, 1996). It provides continuous measures of the percentage of days abstinent and drinks per drinking day during a 90-day time frame. It has been found to have good-to-excellent reliability for all key summary measures of alcohol consumption and psychosocial functioning (Tonigan et al., 1997). A history of alcohol-use disorders in the parents of subjects was determined based on the family history section of the Addiction Severity Index (McLellan et al., 1992). For this assessment, an interviewer specifically asks whether maternal relatives, paternal relatives, and siblings have had a drinking problem that led or should have led to treatment.

Data analysis

As per the analysis of Skinner and Allen (1982), the sample was divided into quartiles based on the observed distribution of the ADS scores. The quartiles were compared on categorical variables using chi-square analysis and on continuous variables using analysis of variance. Analyses of variance compared mean differences between quartiles on concurrent validity measures. Pearson correlations between total ADS scores and variables of interest were calculated. Area under the receiver operating characteristic
(AUROC) analyses (Hanley and McNeil, 1983) were used to compare gender differences in the sensitivity and specificity of the ADS to detect physiological alcohol dependence (i.e., tolerance and/or withdrawal) based on DSM-IV criteria from the SCID. Because accruing evidence supports the notion that tolerance alone has little prognostic significance (de Bruijn et al., 2005; Hasin et al., 2000; Schuckit et al., 2003) and does not fit well in a unidimensional construct of alcohol dependence (Langenbucher et al., 2004), the AUROC analyses were repeated to examine the sensitivity and specificity of the ADS in detecting DSM-IV-defined withdrawal. Similar AUROC analyses were also performed using only the subscales on the ADS previously described that are believed to reflect psychoperceptual and psychophysiological withdrawal specifically.

Results

The mean (SD) ADS score for the sample was 17.4 (7.5). As a point of comparison across studies, the quartiles reported by Skinner and Allen (1982) had cutoffs at 14, 22, and 31, whereas the quartiles based on the distribution of ADS scores in the present sample had lower cutoffs (12, 17, and 22). Table 1 displays subjects' demographic characteristics across quartiles and correlations between ADS scores and demographic measures. Significant differences are noted across the quartiles in age, education, marital status, and employment. Significant correlations were evident between ADS scores and marital status, employment, age, and education, although none of these correlations exceeded $r = .26$.

In the entire sample, 670 subjects (48.8%) reported having a father with alcohol problems, and 302 (22.0%) reported having a mother with alcohol problems. There was no significant difference across quartiles on these variables.

Table 2 presents differences across quartiles in alcohol-related measures including prior alcohol treatment and proportion with DSM-IV-defined physiological dependence, consumption, consequences, self-efficacy, and craving. Table 2 also shows correlations between these measures and ADS scores. There are significant differences across quartiles in the proportion of subjects with prior alcohol treatment and proportion with DSM-IV-defined physiological dependence. There is also a significant linear trend across quartiles for drinks per drinking day and total standard drinks in the 30 days before baseline assessment but no difference in percentage of heavy drinking days (defined as four or more drinks per day for women and five or more drinks per day for men). Significant linear trends across quartiles are noted for the DrInC total score, the AASE temptation score, and the OCDS total score. On the AASE confidence score, Quartile 1 differed significantly from the other three quartiles. Significant correlations between ADS scores and measures reported in Table 2 occurred for all of these measures except percentage of heavy drinking days, with the most robust correlations evident for the DrInC and the OCDS. Effect sizes for all these analyses range from small to large, with drinks per drinking day, the DrInC, and OCDS showing larger effects, reflecting a fair amount of shared variance with concurrent validity measures.

Most of the sample ($n = 1,195$, 87.1%) met criteria for physiological dependence on alcohol. Among those with physiological dependence, 370 (31.0%) reported tolerance only, 187 (15.6%) reported withdrawal only, and 638 (53.4%) reported both tolerance and withdrawal. Figure 1 displays the AUROCs for the ADS to detect DSM-IV physiological dependence. There is no significant difference in AUROC by gender (AUROC = .75 [95% CI: .70-.79] and .67 [95% CI: .60-.74] for men and women, respectively; $p = .08$). Despite the fact that progressively higher proportions of subjects meet DSM-IV criteria for physiological dependence across ADS Quartiles 1-4, the ADS has, at best, modest sensitivity and specificity for determination of DSM-IV physiological dependence.

### Table 1. Subject characteristics for the total sample ($N = 1,372$)

<table>
<thead>
<tr>
<th>Variable</th>
<th>1 (n = 309-313)</th>
<th>2 (n = 349-354)</th>
<th>3 (n = 336-343)</th>
<th>4 (n = 350-362)</th>
<th>Total (N = 1,372)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>222 (70.93%)</td>
<td>242 (68.36%)</td>
<td>223 (65.01%)</td>
<td>258 (71.27%)</td>
<td>945 (68.88%)</td>
</tr>
<tr>
<td>Non-Hispanic white</td>
<td>244 (77.96%)</td>
<td>283 (79.94%)</td>
<td>260 (76.25%)</td>
<td>263 (72.65%)</td>
<td>1,050 (76.64%)</td>
</tr>
<tr>
<td>Married/cohabiting</td>
<td>162 (51.76%)</td>
<td>185 (52.26%)</td>
<td>149 (43.44%)</td>
<td>117 (32.32%)</td>
<td>613 (44.68%)</td>
</tr>
<tr>
<td>Employment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full time</td>
<td>206 (65.81%)</td>
<td>235 (66.57%)</td>
<td>213 (62.46%)</td>
<td>177 (49.17%)</td>
<td>831 (60.79%)</td>
</tr>
<tr>
<td>Age, in years</td>
<td>49.0 (10.2)</td>
<td>45.6 (10.2)</td>
<td>42.5 (9.4)</td>
<td>41.7 (9.4)</td>
<td>44.6 (10.2)</td>
</tr>
<tr>
<td>Education, in years</td>
<td>15.3 (2.5)</td>
<td>14.9 (2.9)</td>
<td>14.3 (2.6)</td>
<td>13.8 (2.6)</td>
<td>14.6 (2.7)</td>
</tr>
</tbody>
</table>

*Point biserial or Pearson’s correlations between Alcohol Dependence Scale score and row variable.

* $p < .001$
yielded both sensitivity and specificity greater than 75%. AUROCs for the ADS to detect DSM-IV withdrawal alone also did not differ by gender (AUROC = .77 [95% CI: .74-.80] and .74 [95% CI: .69-.79] for men and women, respectively, \( p = .30 \)) and 95% CI overlapped substantially with the AUROCs for DSM-IV physiological dependence. The total ADS score showed substantial point biserial correlations with DSM-IV-defined withdrawal for both men (\( r = .44, 944 \) df, \( p < .0001 \)) and women (\( r = .41, 426 \) df, \( p < .0001 \)), but the total ADS score had only modest correlation with DSM-IV-defined tolerance for men (\( r = .17, 426 \) df, \( p < .0001 \)) and did not correlate significantly with tolerance for women (\( r = .04 \)).

The subscales on the ADS that specifically purported to reflect psychoperceptual and psychophysiological withdrawal functioned very similarly to the ADS total score in their capacity to detect either DSM-IV physiologic dependence or DSM-IV withdrawal. To detect DSM-IV physiological

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**TABLE 2. Alcohol Dependence Scale quartiles compared on alcohol-related variables**

<table>
<thead>
<tr>
<th>Alcohol Dependence Scale quartiles</th>
<th>Quartile 1 (0-11)</th>
<th>Quartile 2 (12-16)</th>
<th>Quartile 3 (17-21)</th>
<th>Quartile 4 (22-46)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol Dependence Scale quartiles</td>
<td>n (%) or mean (SD)</td>
<td>n (%) or mean (SD)</td>
<td>n (%) or mean (SD)</td>
<td>n (%) or mean (SD)</td>
</tr>
<tr>
<td>Prior alcohol treatment</td>
<td>88 (28.3)</td>
<td>139 (39.8)</td>
<td>194 (57.7)</td>
<td>242 (68.0)</td>
</tr>
<tr>
<td>Physiological dependence</td>
<td>229 (73.2)</td>
<td>303 (85.6)</td>
<td>313 (86.0)</td>
<td>350 (96.7)</td>
</tr>
<tr>
<td>Drinks per drinking day</td>
<td>8.9 (5.7)</td>
<td>10.4 (5.2)</td>
<td>13.1 (7.2)</td>
<td>17.1 (10.0)</td>
</tr>
<tr>
<td>Total standard drinks</td>
<td>221 (170)</td>
<td>237 (147)</td>
<td>283 (189)</td>
<td>350 (229)</td>
</tr>
<tr>
<td>% heavy drinking days</td>
<td>64.6 (31.6)</td>
<td>66.7 (26.4)</td>
<td>65.4 (28.7)</td>
<td>65.7 (27.8)</td>
</tr>
<tr>
<td>% days abstinent</td>
<td>17.3 (23.0)</td>
<td>24.1 (23.2)</td>
<td>27.5 (25.7)</td>
<td>30.2 (26.5)</td>
</tr>
<tr>
<td>DrInC total score</td>
<td>31.1 (15.4)</td>
<td>41.4 (13.8)</td>
<td>51.4 (16.5)</td>
<td>64.1 (19.4)</td>
</tr>
<tr>
<td>AASE confidence score</td>
<td>2.8 (0.7)</td>
<td>2.6 (0.6)</td>
<td>2.6 (0.8)</td>
<td>2.5 (0.8)</td>
</tr>
<tr>
<td>AASE temptation score</td>
<td>2.8 (0.7)</td>
<td>3.0 (0.7)</td>
<td>3.2 (0.8)</td>
<td>3.4 (0.8)</td>
</tr>
<tr>
<td>OCDS total score</td>
<td>21.7 (6.8)</td>
<td>24.5 (6.6)</td>
<td>27.8 (7.3)</td>
<td>32.0 (8.1)</td>
</tr>
</tbody>
</table>

Notes: DrInC = Drinker Inventory of Consequences; AASE = Alcohol Abstinence Self-Efficacy Scales; OCDS = Obsessive-Compulsive Drinking Scale. *Point biserial or Pearson’s correlations between Alcohol Dependence Scale score and row variable.

**Figure 1.** Receiver operating characteristics curves for capacity of the Alcohol Dependence Scale to detect physiologic alcohol dependence.
dependence among men, the psychoperceptual subscale resulted in an AUROC of .65 (95% CI: .61-.70), whereas the psychophysiological subscale resulted in an AUROC of .71 (95% CI: .66-.76). Similar analyses for women showed AUROCs of .62 (95% CI: .55-.68) and .67 (95% CI: .60-.74), respectively. Among men the psychophysiological subscale performed better than the psychoperceptual subscale ($\chi^2 = 7.24, 2 \text{ df}, p < .01$), but there were no significant differences in performance between subscales in women nor any significant differences within subscales across gender. To detect DSM-IV withdrawal alone among men, the psychoperceptual subscale resulted in an AUROC of .69 (95% CI: .66-.73), whereas the psychophysiological subscale resulted in an AUROC of .77 (95% CI: .74-.80). Similar analyses for withdrawal alone for women showed AUROCs of .69 (95% CI: .65-.74) and .75 (95% CI: .71-.80), respectively. For both men ($\chi^2 = 23.1, 2 \text{ df}, p = .000$) and women ($\chi^2 = 5.59, 2 \text{ df}, p = .018$) the psychophysiological items performed significantly better than the psychoperceptual items. There were no significant differences across gender.

Discussion

This study evaluated the concurrent validity of the ADS in a large sample of treatment-seeking, alcohol-dependent individuals, and the results partially support the findings of Skinner and Allen (1982) that ADS quartiles delineate groups of alcohol-dependent individuals who differ in some clinically meaningful ways. Although it does not appear from the findings in the current sample that the ADS can serve as an adequately sensitive and specific screening instrument for DSM-IV-defined physiological dependence, given the high base rate of DSM-IV physiological dependence in this sample (87.1%), it would pose a challenge for any self-report measure to perform such a function.

The mean ADS score in the current study (17.4) was somewhat lower than the mean (23.1) in the study of Skinner and Allen (1982) in which the subjects were receiving help in a treatment-specialist setting with few study entry restrictions. However, the mean was consistent with results from other clinical samples (Kivlahan et al., 1989; Ross et al., 1990) despite the fairly restrictive exclusion criteria for the COMBINE Study and considerable recruitment directly from the community rather than within clinical settings. In the study of Skinner and Allen (1982), a significant linear trend was noted across quartiles for the belief that “cutting down to a few drinks is possible,” with each quartile successively less likely to endorse this opinion as ADS scores increased. ADS quartiles were successively more likely to endorse the beliefs that “abstinence is the only way to improve” and “considers self to be alcoholic” and to be diagnosed with digestive diseases as ADS scores increased.

The concurrent validity criteria compared across ADS quartiles in the present study were different than those used by Skinner and Allen (1982). Also, the subjects in the present study were seeking treatment, whereas the subjects in the Skinner and Allen study were already enrolled in treatment. The present study shows that alcohol-dependent individuals with higher ADS scores are significantly younger, are more socially unstable in that they have less education, and are less likely to be employed or married, and more likely to have had prior alcohol treatment. In the study of Skinner and Allen, the ADS did not correlate with age but did have an inverse correlation with education and social stability. Thus, again our findings do partially confirm the findings of the Skinner and Allen study and lend further support to the concurrent validity of the ADS. These demographic findings are not unexpected and would be consistent with the speculation that a substantial proportion of individuals in the higher ADS quartiles have a more biologically driven, early-onset form of alcohol dependence, somewhat similar to the Cloninger Type II dependence (Cloninger, 1987).

The present study also had data on recent drinking behavior that indicated that, in a group of alcohol-dependent individuals who were all drinking excessively, the amount of recent alcohol consumption increased as a function of ADS quartile. Despite the fact that subjects in different ADS quartiles were consuming different total amounts of alcohol overall, they did not differ in frequency of heavy drinking, using a fairly low threshold of five drinks per day. Somewhat paradoxically, percentage of days abstinent also increased as a function of ADS quartile. Subjects in higher quartiles reported consuming significantly more alcohol on the days they drank, but they took more days off from any drinking. One possible interpretation of these findings is that subjects in the highest ADS quartile were very serious heavy episodic drinkers who used the intervening days between drinking bouts to recover. The requirement of 4 consecutive days of abstinence before entering the trial may also have had some influence on this finding if those with the highest ADS scores who could not interrupt drinking for at least 4 days were excluded from the trial. Although the subjects in the highest ADS quartile averaged 17 drinks per drinking day, they were able to interrupt their alcohol consumption to enter the trial.

Even though individuals in higher ADS quartiles are younger than those in lower quartiles, the individuals in higher quartiles have suffered more consequences of their alcohol use, as indicated by higher scores on the DrInC. Scores on the AASE temptation scale, and particularly those on the OCDS, show a much higher degree of alcohol craving as ADS quartile scores increase. Similarly, a prior study demonstrated a significant positive correlation between ADS and OCDS scores (Moak et al., 1998). This finding holds some interest in that a recent study demonstrated that
presence of “craving” (one of the International Classification of Diseases, 10th Revision [World Health Organization, 2006], criteria but not one of the DSM-IV criteria for dependence) at baseline in a sample with alcohol dependence or alcohol abuse served as the strongest predictor among dependence criteria for the presence of dependence at 1- and 3-year follow-ups (de Bruijn et al., 2005). It is conceivable that the heavy episodic-type drinking manifested by the highest ADS quartile promoted a greater level of consequences, leading to higher DrInC scores than would steady consumption of lesser amounts. It also makes sense that interruption of higher levels of consumption would produce multiple opportunities for intense cravings during interruptions, which might incur higher OCDS and AASE temptation scores.

It seems possible, then, that distinguishing clinically different groups of alcohol-dependent individuals as defined by ADS quartiles may have some prognostic value. As suggested by Maisto et al. (2003), treatment response could differ among these subgroups despite the failure of ADS as a continuous measure to predict treatment response in a sample of inpatients (Kivlahan et al., 1989), and/or different types of treatment might be needed for different subgroups. Future analyses with the COMBINE Study outcome dataset would allow testing of such hypotheses.

Although the proportions of subjects with DSM-IV-defined physiological dependence increased successively across ADS quartiles in the present study, overall the ADS as a continuous measure performed very modestly with respect to determination of physiological dependence. The ADS subscales specific to withdrawal were tested separately for their ability to detect DSM-IV physiological dependence and performed similarly to the entire scale. Apparently the ADS and DSM-IV physiological criteria, although both purporting to describe aspects of the alcohol-dependence syndrome, are tapping somewhat different constructs. DSM-IV physiological criteria include both tolerance and withdrawal. Data from this and previous investigations suggest that tolerance alone may not offer a robust reflection of physiological dependence (de Bruijn et al., 2005; Hasin et al., 2000; Schuckit et al., 2003).

Limitations of the study include its cross-sectional nature and the fact that it involved only treatment-seeking, alcohol-dependent subjects who met inclusion and exclusion criteria for a clinical trial. An understanding of the representativeness of the sample is slightly compromised by the lack of detailed data on why many potential subjects were screened out of the study. Because the sample did not include non-alcohol-dependent control subjects, we could not test whether the ADS reliably distinguishes individuals with and without DSM-IV-defined alcohol dependence. In addition, some alcohol-dependent individuals (such as those with major psychiatric problems or physical health problems, or those unable to attain brief abstinence without significant withdrawal symptoms) were eliminated from participation. Although trained staff interviewed participants with the SCID for DSM-IV alcohol dependence, the study did not include reliability checks on these interviews.

Overall, the ADS does appear to measure severity of some important aspects of the alcohol-dependence syndrome. Its results accord closely with the results of other self-report measures of alcohol problems. Despite its inability to function as a good screen for physiological dependence, it undoubtedly will retain some utility as an effective method to rank-order dependence severity.

**References**


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