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RESEARCH REPORT

An evaluation of Type A and B alcoholics

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Abstract

Evaluations of 1539 alcohol-dependent subjects (including 512 women) were carried out in an attempt to replicate the Type A/B dichotomy suggested by Babor et al. (1992). The subjects are participants in the Collaborative Study on the Genetics of Alcoholism (COGA), and each was evaluated using a face-to-face structured interview. Following the procedure of Babor et al. (1992), data were used to create 17 domains, and a k-means clustering method was invoked to generate a two-cluster solution. Thirty-one per cent of the males and 25% of the females fell into the Type B group, with overall R^2 of 0.22 and 0.24 for males and females, respectively. The scores in each of the 17 domains and the analyses of the clinical characteristics for Type A and B subjects were, in general, consistent with the earlier onset and more severe course for Type B men and women. The ability of the domains to identify subgroups of alcoholics remained robust even after the exclusion of alcohol dependent subjects with antisocial personality disorder (ASPD) and those with an onset of alcohol dependence before age 25 years. The present analyses suggest that five of the 17 domains might be especially useful in identifying Type A and B groups.

Introduction

There appear to be multiple paths leading to alcoholism. For example, men and women with the antisocial personality disorder (ASPD) have a 70% or greater probability of developing an alcohol use disorder (Hesselbrock, Hesselbrock & Workman-Daniels, 1986; Gerstley *et al.*, 1990; Hesselbrock, Meyer & Hesselbrock, 1992). This personality syndrome involves an onset very early in life of a behavior pattern that involves high levels of impulsivity and difficulty learning from punishment, characteristics that probably contribute to excessive use of substances. Other men and women develop severe and repetitive alcohol problems in the context of pre-existing Axis I psychiatric disorders, as described by the *Third Revised Version of the Diagnostic and Statistical Manual of the American Psychiatric Association* (American Psychiatric Association,

Collaborative Study on the Genetics of Alcoholism (H. Begleiter, SUNY HSCB Principal Investigator, T. Reich, Washington University, Co- Principal Investigator) includes six different centers where data collection takes place. The six sites and Principal Investigator and Co-Investigators are: Indiana University (J. Nurnberger, P. M. Conneally); University of Iowa (R. Crowe, S. Kuperman); University of California at San Diego and Scripps Institute (M. Schuckit, F. Bloom); University of Connecticut (V. Hesselbrock); State University of New York, Health Sciences Center at Brooklyn (H. Begleiter, B. Porjesz); Washington University in St. Louis (T. Reich, C. R. Cloninger). This national collaborative study is supported by the National Institute on Alcohol Abuse and Alcoholism (NIAAA) by USPHS grants NIAAA U10AA08401, U10AA08402, U10AA08403.

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1987). Studies of schizophrenics demonstrate an increased rate of substance use disorders, including alcoholism, perhaps as a consequence of poor judgement and a great deal of time spent "on the streets" without structured activities (McHugo, Paskus & Drake, 1993; Soyka *et al.*, 1993; Smith & Hucker, 1994). Similarly, problems related to excessive alcohol use appear more prevalent among individuals with bipolar manic depressive illness, especially within the context of manic episodes with their high levels of impulsivity and poor judgement (Helzer & Przybeck, 1988; Winokur *et al.*, 1993).

These observations have led to one approach to subtyping alcoholics based on the presence or absence of independent psychiatric disorders. Each of the major psychiatric syndromes is itself genetically influenced (Irwin, Schuckit & Smith, 1990; Kendler *et al.*, 1992; Cannon & Mednick, 1993), and each is likely to have unique treatment requirements (Goodwin & Guze, 1989). The fact that such diverse disorders appear associated with an elevated risk for alcoholism (alcohol abuse or dependence), possibly through separate mechanisms, highlights the heterogeneity observed among individuals with alcoholism.

While this primary–secondary approach has the benefit of simplicity and has prognostic significance, most alcohol-dependent men and women have no independent major psychiatric condition (Schuckit, 1985; Powell *et al.*, 1987; Brown & Schuckit, 1988; Brown, Irwin & Schuckit, 1991) although rates of co-morbidity of alcohol-related problems and other psychiatric syndromes vary across studies depending on the methodologies employed (Hesselbrock *et al.*, 1983b; Nakamura *et al.*, 1983; Lambert *et al.*, 1986; Willenbring, 1986; Powell *et al.*, 1987; Read *et al.*, 1990; Regier *et al.*, 1990; Schuckit, 1994). Recognizing the high level of heterogeneity that remains among alcoholic men and women who have no major pre-existing psychiatric syndrome, multiple efforts have been made to define further subgroups which might have unique clinical needs. For example, Cloninger (1987) initially proposed two major subtypes of alcoholics, called Type I and Type II, with the latter characterized by an earlier onset of problems, a more severe course and higher levels of criminality (Cloninger, 1987; Gilligan, Reich & Cloninger, 1988). While of at least heuristic value, this dichotomy appears to overlap with the occurrence of ASPD in Type II alcoholics, and with the "unitary concept" of early versus late onset alcoholism (Irwin *et al.*, 1990; Penick *et al.*, 1990b; Vaillant, 1994). Additional potentially useful concepts for subgroups among alcoholics include the presence of a family history of alcoholism (those with a positive family history having an earlier onset and worse overall prognosis) (Goodwin, 1983; Penick *et al.*, 1990a; Penick *et al.*, 1990b), states of temperament and levels of pre-existing brain dysfunction (Tarter *et al.*, 1977; Tarter, Alterman & Edwards, 1985).

In recognition of the imperfections of these and other relatively straightforward approaches of identifying subgroups of alcoholics, Babor *et al.* (1992) proposed that a more appropriate typology could be generated by incorporating aspects of multiple unitary theories into a single broad and more complex concept. Thus, they developed a single typology based on 17 domains that tapped into ASPD and additional personality attributes, family history of alcoholism, severity of alcohol consumption, co-morbid psychiatric or substance use disorders and additional attributes of alcohol-related experiences. Using a clustering technique applied to information on 321 alcohol-dependent men and women in treatment, Babor *et al.* (1992) found a two-cluster solution to be both efficient and discriminative. Type A alcoholism was characterized by a later onset of alcohol-related problems, less severe symptoms of substance use disorders, the absence of childhood risk factors such as hyperactivity, minimal brain dysfunction, or conduct problems, and a lower probability of having received prior treatment for alcoholism. The Type B group is the antithesis of Type A and includes individuals with other higher rates of other substance use disorders and higher levels of life stress. A 1-year follow-up of 266 of the 321 subjects revealed that, as predicted, the Type A group had a better short-term prognosis.

While the research to date indicates the potential clinical usefulness of the Type A/B scheme, any theoretical formulation developed on one sample will benefit from evaluations using additional groups. More testing of the approach might illuminate ways to simplify the 17 domains and evaluate further whether this more complex typology offers advantages over simpler dichotomous approaches such as early versus late onset of alcoholism, or the presence or absence of pre-existing major psychiatric disorders. This paper tests the Type A and Type B typologies on

1539 alcohol-dependent individuals, including 1027 men and 512 women.

Methods

Complete data were available on 1539 alcohol-dependent men and women, all meeting DSM-III-R (American Psychiatric Association, 1987) and Feighner *et al.* (1972) criteria for alcohol dependence. These subjects were selected from 4786 individuals participating in the ongoing Collaborative Studies on the Genetics of Alcoholism (COGA) (Bucholz *et al.*, 1994; Schuckit *et al.*, 1994) after excluding 2835 individuals who were not alcohol-dependent and an additional 412 (21.1% of the remaining 1951) alcoholic subjects for whom one data component, the Tridimensional Personality Questionnaire (TPQ), was not available. The study sample included: 403 (26.2%) male and 130 (8.4%) female alcohol-dependent probands originally selected from treatment programs in the catchment areas of six centers; 550 (35.7%) alcohol-dependent male and 360 (23.4%) alcohol-dependent female blood relatives of probands participating in COGA; and 74 (4.8%) alcohol-dependent males and 22 (1.4%) alcohol-dependent females from control families selected from a variety of medical/dental clinics, as well as a random population survey. Among the probands, 349 of the males (86.6%) and 102 of the females (78.5%) were selected from inpatient alcohol and drug treatment. The remainder came from outpatient and day-time programs, with no subjects from specific dual diagnosis or psychiatry programs. The full sample of probands, relatives and controls was drawn from each of the six study centers as follows: 110 (7.2%) males and 41 (2.7%) females from Indianapolis, Indiana; 147 (9.6%) males and 107 (6.9%) females from Iowa City, Iowa; 259 males (16.8%) and 131 (8.5%) females from Brooklyn, New York; 219 (14.2%) males and 113 (7.3%) females from Farmington, Connecticut; 112 (7.3%) males and 46 (2.9%) females from St Louis, Missouri; and, 180 (11.7%) males and 74 (4.8%) females from San Diego, California.

As part of the COGA protocol all probands, their relatives and controls were evaluated with face-to-face interviews by trained personnel using the Semi-Structured Assessment for the Genetics of Alcoholism (SSAGA) interview (Bucholz *et al.*, 1994). This instrument allows for diagnoses of major psychiatric and substance use disorder syndromes using multiple diagnostic classification systems, including DSM-III-R. Additional information was obtained from the Tridimensional Personality Questionnaire (TPQ) (Cloninger, 1987) and the structured Family History Assessment Module (FHAM) (Rice *et al.*, 1993). The latter was used to supplement direct interview data with family history-based information on disorders in family members to provide a family history measure of alcohol dependence.

From these data, analogues for each of the 17 domains described by Babor *et al.* (1992) were developed (Table 1):

(1) *familial* alcoholism was defined as the proportion of first-degree relatives who met criteria for DSM-III-R alcohol dependence (by SSAGA or FHAM report);
(2) *childhood disorder* was considered the number of DSM-III-R childhood conduct disorder symptoms endorsed by the subject in the SSAGA interview;
(3) *bipolar character dimension*, or temperament, was operationalized in two parts as scores on the Harm Avoidance and Reward Dependence scales of the TPQ to measure the concepts described by Babor *et al.* (1992) as "reward seeking and punishment avoidance;"
(4) *onset of problem drinking* was recorded as the age at which DSM-III-R alcohol dependence symptoms clustered together;
(5) *ounces of alcohol consumed per day* was scored as the average number of drinks per drinking day in the 6 months prior to interview;
(6) *relief drinking* was the specific number of relief drinking symptoms endorsed in the SSAGA interview using items described by Babor *et al.* (1992);
(7) *severity of dependence* was measured as the number of DSM-III-R alcohol dependence Criterion A symptoms endorsed in the SSAGA. Although this is only an approximation of severity, there is a general relationship between the number of items and other aspects of the intensity of substance use or problems (Andreatini *et al.*, 1994; Woody & Cacciola, 1994);
(8) frequency of *benzodiazepine use* reflects the lifetime total number of times the alcohol-

Table 1. *Comparison of operational definitions of 17 domains for cluster analysis*

Babor dimension	Original measure of Babor *et al.* (1992)	Measures used in the present study
1. Familial alcoholism	% 1st degree relatives with a "serious alcohol problem" by family history	% 1st degree relatives with DSM-III-R alcohol dependence by SSAGA or family history
2. Childhood disorder	Hyperactivity, minimal brain dysfunction, and conduct disorder measured by Behavior Child Checklist (Tarter *et al.*, 1977)	Number of DSM-III-R childhood conduct disorder symptoms
3. Bipolar character dimension	Reward seeking and punishment avoidance measured by MacAndrew Alcolism Scale (MacAndrew, 1981)	Scores on Harm Avoidance and Reward Dependence scales of the Tridimensional Personality Questionnaire (Cloninger, 1987)
4. Onset of problem drinking	Average age at onset of: first regular drinking; getting drunk regularly; heaviest drinking; and, reported diagnosis of alcoholism	Age at which two or more DSM-III-R alcohol dependence symptoms clustered
5. Oz. of alcohol consumed per day	Average daily alcohol consumption in 6 months before treatment	Average number of drinks per drinking day in last 6 months
6. Relief drinking	6-item scale to rate salience of "relief drinking"	4-item index of relief drinking symptoms
7. Dependence syndrome	5-item scale of behavioral, cognitive and physiological symptoms of dependence syndrome experienced in last 6 months	No. of DSM-III-R alcohol dependence Criterion A symptoms
8 Benzodiazepine use	5-point Likert scale of frequency of benzodiaze use in last 6 months	Lifetime number of uses of sedative/hypnotics, converted to a 5-point Likert scale
9. Polydrug use	Frequency of amphetamine, barbiturate, marijuana, opiate and cocaine use in 6 months before treatment	Lifetime number of uses of all other substances converted to a 5-point Likert scale
10. Medical conditions	84-item index of alcohol-related conditions from Cornell Medical Index (Brodman *et al.*) and other sources	5-item index of alcohol-related conditions requiring medical attention
11. Physical consequences	5-item scale of frequency of alcohol-related physical consequences during last 6 months (Hesselbrock *et al.*, 1983a)	6-item index of alcohol-related physical problems
12. Social consequences	5-item scale of frequency of alcohol-related social problems during last 6 months (Hesselbrock *et al.*, 1983a)	7-item index of alcohol-related social problems
13. Lifetime severity	Total weighted MAST score (Selzer, 1971)	20-item index of SSAGA symptoms that directly correspond with MAST (Selzer, 1971) items
14. Year heavy drinking	Present age minus age of onset	Age recency minus age onset of clustering of two or more DSM-III-R symptoms
15. Depressive symptoms	Number of depressive symptoms from DIS (Robin *et al.*, 1981)	Number of DSM-III-R symptoms endorsed regarding worst depressive episode
16. ASP symptoms	Number of ASP symptoms measured by the DIS (Robins *et al.*, 1981), excluding alcohol abuse items	Number of adult ASP symptoms regardless of alcohol/drug use
17. Anxiety severity	Total score on Taylor Manifest Anxiety Scale from the MMPI	4-item index of anxiety syndromes endorsed

dependent person reported non-prescription use of sedative/hypnotics, with that number converted to a Likert scale as described by Babor *et al.* (1992);

(9) frequency of *polydrug use* was the number of times of use of all illicit substances other than alcohol and sedative/hypnotics converted to a Likert scale;

(10) evidence of *medical conditions* was measured by the number of alcohol-related medical problems (severe or enduring conditions requiring medical attention) recorded in the SSAGA (i.e. ulcers, pancreatitis);

(11) *physical consequences* was measured by the number of alcohol-related physical problems (those likely to abate with abstinence such as blackouts, confusion and accidental injury) endorsed in the SSAGA;

(12) *social consequences* was measured as the number of social problems related to alcohol use taken from the SSAGA;

(13) *lifetime severity* involves the total score from 20 items in the SSAGA that directly corresponded with the 25-item Michigan Alcohol Screening Test (MAST) (McHugo *et al.*, 1993) thus a "pseudo-MAST" score;

(14) *years of heavy drinking* was scored as the total number of years elapsed between the onset and recency of clustering of DSM-III-R symptoms as described above;

(15) *depressive symptoms* was simply the number of DSM-III-R major depressive disorder symptoms endorsed regarding their most severe depressive episode by any subject who reported a depression in the SSAGA. The number of depressive symptoms was calculated for alcohol-related or independent depression, whichever was more severe;

(16) *antisocial personality symptoms* was the number of DSM-III-R adult ASPD symptoms recorded either within or outside the context of alcohol and drug problems in the SSAGA, and

(17) *anxiety severity* was scored as the number of different anxiety syndromes initially endorsed in screening for these syndromes in the SSAGA, regardless of whether full diagnostic criteria were met and regardless of independence from alcohol. A direct comparison of these measures and those employed by Babor *et al.* (1992) is given in Table 1.

A *k*-means clustering approach similar to that described by Babor *et al.* (1992) was used to replicate the prior analysis of the 17 dimensions. Data were first transformed using Proc Standard in SAS (1990), which allows the user to define a linear transformation to achieve a given mean and variance (SAS Institute Inc., 1990). These data were transformed into z-scores (mean = 0, standard deviation = 1) to render items with different units of measure more comparable. The SAS procedure Proc Fastclus (SAS Institute Inc., 1989), which uses a clustering approach similar to that reported by Babor *et al.* (1992), and also provides a post-calculation within-cluster mean substitution for missing values (SAS Institute Inc., 1989) was run separately on male and female subjects. As a confirmatory analysis, the basic objective of this study was to replicate Babor's (1992) results. Thus, a two-cluster solution was used (Borgen *et al.*, 1987).

The univariate r^2 values reported for individual variables in Table 2 reflect how well cluster assignment is predicted from each measure entered in the clustering procedure. Because of the large samples, r^2 are of limited value as an indicator of p values, but do supply useful data regarding effect size. The overall R^2 for men and women at the bottom of the tables is the average of the univariate r^2 values, and relates to the proportion of variance explained in cluster assignment by the variables included in the analysis.

Results

The 1539 subjects (1027 men) included in this sample had a mean age of 37.4 ± 12.39 years, had completed 12.6 ± 2.29 years of school, and were predominantly Caucasian (75.1% white, 15.5% African American, 6.4% Hispanic and 2.9% made up of Asian, Pacific Islander and other groups). In addition to alcohol dependence, using life-time histories and DSM-III-R criteria, 16.8% of the sample met criteria for antisocial personality disorder (ASPD), 34.1% qualified for cannabis abuse or dependence, and abuse or dependence criteria were met for amphetamines in 15.9%, cocaine in 30.7%, opiates in 9.6% and sedative/hypnotics in 10.3% of the sample. In addition, 13.6% of the sample met DSM-III-R criteria for a life-time diagnosis of major depressive disorder independent of temporary symptoms during drinking periods, illness or

Table 2. *Cluster means used to determine Type A and B for the 17 defining characteristics*

Babor *et al.* (1992) Item No.	Measure used in analysis	Male ($n = 1027$) r^2 for clustering	Female ($n = 512$) r^2 for clustering
1	Familial alcoholism	0.00	0.00
2	Childhood disorder (conduct)	0.09	0.09
3	Bipolar character dimension, HA*	0.10	0.07
	Bipolar character dimension, RD	0.01	0.00
4	Onset of problem drinking	0.03	0.04
5	Oz. of alcohol consumed per day	0.39	0.61
6	Relief drinking	0.39	0.39
7	Dependence syndrome	0.44	0.47
8	Benzodiazepine use	0.13	0.17
9	Polydrug use	0.11	0.15
10	Medical conditions	0.36	0.34
11	Physical consequences	0.51	0.48
12	Social consequences	0.33	0.38
13	Lifetime severity (pseudo-MAST)	0.44	0.49
14	Years heavy drinking	0.02	0.03
15	Depressive symptom count	0.19	0.08
16	ASP symptom count	0.28	0.32
17	Anxiety severity	0.06	0.09
	Overall R^2 (% variance explained)	0.22	0.24

*HA = harm avoidance; RD = reward dependence from the Tridimensional Personality Questionnaire (TPQ).

bereavement, and 13.3% of the sample met DSM-III-R criteria for at least one other major psychiatric disorder during their lives, independent of heavy drinking, including 1.6% for dysthymia, 2.7% for mania, 1.8% for agoraphobia, 2.1% for obsessive compulsive disorder, 2.7% for social phobia and 5.5% for panic disorder. None of the subjects in this sample met criteria for somatization disorder. In all, 52.5% of the sample (52.3% of males, 53.1% of females) were alcohol-dependent exclusive of an independent major depressive disorder, antisocial personality disorder or pre-existing substance use disorder, 16.4% had a pre-existing substance use disorder and 45.4%, including 93.8% of probands 47.6% of relatives and 3.1% of controls, had participated in inpatient treatment for alcohol problems.

Regarding these demographic characteristics, males and females differed only slightly. Males had a mean age of 38.4 ± 13.08 while females were slightly younger with a mean age of 35.3 ± 10.59 ($t = 4.89$, $p < 0.0001$). Males and females attained similar levels of education with males having completed on average 12.58 ± 2.35 and females 12.58 ± 2.19 years of school. The male group was predominantly Caucasian (74.9% white, 15.8% African American, 6.3% Hispanic and 2.9% Asian/other) as was the female group (75.4% white, 15.0% African American, 6.6% Hispanic and 2.9% Asian/other). Males more often met criteria for antisocial personality disorder, with 20.7% of males versus 8.9% of females reporting sufficient symptoms ($\chi^2 = 40.07$, $p < 0.0001$). Males met criteria for substance abuse or dependence more often than females for cannabis (36.7% vs. 28.7%, $\chi^2 = 9.73$, $p < 0.002$) and opiates (10.9% vs. 7.0%, $\chi^2 = 5.90$, $p < 0.02$), but the two sexes did not differ significantly for other substances including cocaine (31.6% vs. 29.1%), sedative/hypnotics (10.7% vs. 9.4%) and amphetamines (15.7% vs. 16.6%). Females more often met criteria for at least one other major psychiatric disorder (20.2% vs. 9.9%, $\chi^2 = 30.69$, $p < 0.0001$), including major depressive disorder (17.4% vs. 6.9%, $\chi^2 = 40.20$, $p < 0.0001$) when compared with males.

Before proceeding with the analyses, steps were taken to compare the 412 people (21.1% of the original 1951 alcohol-dependent individuals) who were excluded because of missing TPQ data. In general these excluded subjects were quite similar to the 1539 alcohol-dependent sub-

jects who were included in the analyses. For example, there were no consistent differences for excluded versus included subjects regarding current age, the age of onset of the first alcohol problems, the age of onset of regular drinking, the number of times married, the number of divorces, the number of antisocial symptoms as reported in Table 2 nor on any other measures.

Table 2 shows the univariate cluster r^2 for the 17 dimensions for the 1539 subjects. These values can be taken as a measure of how strongly each item relates to the cluster assignment. For men, the items most strongly related to the clusters (with a univariate $r^2 \geq 0.30$) include ounces of alcohol consumed per day, relief drinking, severity of alcohol dependence, medical conditions, physical consequences, social consequences and involvement with alcohol as assessed by the "pseudo-MAST". The average proportion of variance explained in cluster assignment, or overall R^2, for this analysis was a modest 0.22. For women, the individual domains most strongly related to the clustering solution were the same as those for men. Here, the overall R^2 (0.24) was slightly higher than for men.

In contrast to the data in Table 2, Table 3 shows the actual scores on each of the 17 dimensions for Types A and B men and women. These analyses, applied to the full sample, resulted in figures of 319 (31.1%) men and 126 (24.6%) women classified as Type B. In this table, Type A individuals had lower levels of most areas of alcohol-related symptomatology, fewer years of heavy drinking, fewer symptoms of other psychiatric disorders including childhood conduct disorder and a later onset of problem drinking. In contrast, Type B individuals had higher levels of conduct problems, an earlier onset and a more severe course of alcohol-related difficulties, demonstrated a higher risk for substance use and associated problems and showed higher scores for other areas of psychiatric symptomatology. However, regarding temperament (bipolar character dimension), Type B individuals had higher scores on harm avoidance.

Because the clustering procedures carried out for the entire sample of 1539 subjects in the tables included data regarding both probands and their relatives combined, there is a danger that the individual observations reported in the tables might not be independent and could provide biased results. To estimate the effect of this potential bias, the analyses described in Tables 2 and 3 were repeated on the subsample of 533 alcohol-dependent probands themselves, thus excluding data regarding their relatives. These analyses restricted to probands included 403 males, resulted in 189 (46.9%) Type B and 214 Type A men. The clustering procedure applied to the 130 women alcohol-dependent probands resulted in 45 Type B individuals (34.6%) and 85 Type A individuals. While the proportion of Type B men and women was higher among probands compared to the non-proband sample ($\chi^2 = 160.81$, $p < 0.001$ for males; $\chi^2 = 72.05$, $p < 0.001$ for females), the result of the cluster analyses confirmed the relative importance of some of the specific items generated for the full group of probands in Table 2. Here, the items more strongly related to the clusters for men included relief drinking, severity of the alcohol dependence syndrome, physical consequences and the "pseudo-MAST". Similarly, the items most identified with the clusters for women included physical consequences and "pseudo-MAST".

Having described the clustering results for the entire group of alcoholics, and then having presented the data on probands, it is also of interest to look separately at the alcohol dependent relatives of probands. One hundred and twenty-seven of 550 (23.1%) male relatives of probands fit the composite of Type B, a rate lower than that among males from the full sample ($\chi^2 = 96.99$, $p < 0.001$). For these relatives the overall cluster r^2 was 0.07, without any univariate r^2 in excess of 0.20, although the general outline of more alcohol, drug and psychiatric problems fit the group of Type B male relatives. For the sample of female relatives of probands, 51 of 360 (14.2%) fulfilled the clustering criteria for Type B, a proportion significantly lower than that seen among alcohol-dependent probands ($\chi^2 = 50.34$, $p < 0.001$). These Type B female relatives demonstrated an overall $R^2 = 0.24$ and the more important measures included ounces of alcohol consumed (0.77), relief drinking ($r^2 = 0.38$), severity of dependence ($r^2 = 0.44$), medical conditions ($r^2 = 0.39$), physical consequences ($r^2 = 0.46$), social consequences ($r^2 = 0.33$) and the pseudo-MAST ($r^2 = 0.44$).

The COGA sample of alcohol-dependent subjects also offered the opportunity of evaluating the clustering approach for alcohol-dependent men and women who had never entered treat-

Table 3. *Comparisons of Type A and B groups on the scores[1] for the 17 dimensions*

Dimension no.		Males		Females	
		Type A	Type B	Type A	Type B
	Number of subjects (%)	708 (68.9%)	319 (31.1%)	386 (75.4%)	126 (24.6%)
1	Familial alcoholism	0.26 (0.19)	0.25 (0.19)	0.29 (0.20)	0.31 (0.21)
2	Childhood disorder (conduct)	10.53 (1.55)	2.73 (1.99)	0.85 (1.17)	1.89 (1.5)
3	Bipolar character dimension, HA*	11.18 (6.62)	16.16 (7.51)	15.37 (6.89)	19.86 (7.50)
	Bipolar character dimension, RD	17.38 (4.58)	16.58 (4.48)	19.64 (4.36)	19.25 (4.52)
4	Onset of problem drinking	25.52 (9.43)	22.29 (7.35)	26.33 (11.81)	21.50 (6.48)
5	Drinks of alcohol per drinking day	7.49 (6.00)	18.09 (10.50)	5.08 (3.95)	17.95 (13.90)
6	Relief drinking	0.79 (0.77)	2.15 (0.82)	0.51 (0.73)	1.90 (0.86)
7	Dependence syndrome	5.31 (1.77)	8.35 (0.98)	4.87 (1.73)	8.25 (0.89)
8	Benzodiazepine use	0.46 (0.82)	1.21 (1.05)	0.49 (0.80)	1.44 (1.21)
9	Polydrug use	11.36 (2.51)	13.49 (3.25)	11.09 (2.15)	13.45 (3.21)
10	Medical conditions	0.16 (0.43)	1.16 (0.89)	0.18 (0.47)	1.26 (1.01)
11	Physical consequences	1.42 (1.11)	3.97 (1.27)	1.43 (1.15)	4.05 (1.24)
12	Social consequences	2.31 (1.71)	4.68 (1.13)	1.89 (1.61)	4.71 (1.28)
13	Lifetime severity (pseudo-MAST)	7.86 (3.70)	14.29 (2.46)	5.98 (3.32)	13.03 (2.35)
14	Years heavy drinking	10.14 (9.74)	13.09 (8.82)	7.01 (9.60)	9.60 (6.42)
15	Depressive symptom count	2.52 (3.21)	5.95 (3.19)	4.29 (3.52)	6.61 (2.81)
16	ASP symptom count	3.12 (1.90)	5.59 (1.72)	2.05 (1.71)	4.86 (1.85)
17	Anxiety severity	0.09 (0.37)	0.38 (0.75)	0.22 (0.54)	0.71 (0.96)

[1]Mean score shown with standard deviation in parentheses.

Table 4. *Clinical characteristics of Type A and B men and women*[1] *focusing on continuous variables not used to generate the 17 domains*

	Males		Females	
Characteristic	Type A	Type B	Type A	Type B
n	708	319	386	126
Age	38.87 (14.12)	37.27 (10.35)	35.90 (11.08)★	33.57 (8.75)
Number of marriages (ever married)	1.30 (0.63)	1.39 (0.71)	1.34 (0.64)	1.45 (0.74)
Number of divorces (ever married)	0.48 (0.75)§	0.73 (0.88)	0.56 (0.72)★	0.73 (0.69)
Highest grade completed	12.83 (2.42)§	12.02 (2.06)	12.69 (2.25)★	12.21 (2.00)
Mean household gross income	40,423 (34,186)§	26,843 (26,908)	36,904 (33,326)§	24,795 (27,386)
Mean Hollingshead SES score	40.51 (13,79)§	47.98 (13.02)	42.36 (14.08)§	49.06 (12.11)
Onset of first alcohol Sx	18.05 (5.18)§	15.64 (3.29)	19.04 (6.01)	16.69 (4.57)
Onset of regular drinking (years)	17.56 (4.05)§	15.76 (4.11)	18.49 (5.87)†	16.89 (4.97)
Onset of problem clustering (years)	25.52 (9.43)§	22.29 (7.35)	26.33 (11.81)§	21.50 (6.48)
Longest abstinence (months)	23.10 (49.89)	26.58 (46.94)	23.36 (39.95)	29.49 (42.22)
Number of DSM-III-R ASPD symptoms (exclusive of substance use, if any)	3.00 (1.68)§	4.56 (1.48)	2.36 (1.42)§	4.06 (1.60)
Number of depressive symptoms (most severe episode, if any)	5.92 (2.00)§	7.28 (1.66)	6.68 (1.82)§	7.50 (1.49)
Global assessment of functioning	70.55 (12.89)§	62.55 (14.69)	70.07 (14.21)§	62.44 (13.55)
Number of illicit drugs used	1.59 (1.86)§	3.61 (2.67)	1.34 (1.50)§	3.38 (2.22)

[1]Mean score shown with standard deviation in parentheses.

★t for difference is significant at $p < 0.05$ or better.

†t for difference is significant at $p < 0.01$ or better.

§t for difference is significant at $p < 0.001$ or better.

ment. Within the overall sample of 1539 individuals, 510 men and 331 women (a total of 841 people) with alcohol dependence had never entered treatment. Among this group, 129 of the men (25.3%) fulfilled criteria for Type B, while the same was true of 54 (16.3%) of the women. These figures differ from the rates for the inpatient treated sample ($\chi^2 = 225.79$, $p < 0.0001$ and $\chi^2 = 112.67$, $p < 0.001$, respectively). However, while the proportion of Type B individuals differed for this subsample, the results of the clustering approach were similar to those reported in Tables 2 and 3. For example, among men who had never had inpatient alcohol treatment, the items most related to cluster assignment included relief drinking, severity of the dependence syndrome, physical consequences, social consequences and the "pseudo-MAST" score. Similarly, among such women in this subsample, these same dimensions with the inclusion of ounces of alcohol consumed appeared most closely related to cluster assignment.

Having demonstrated that the basic clustering results were similar to the full sample in various subsamples of individuals with alcohol dependence, in order to present results with the broadest possible applicability and for the sake of simplicity, information in the remaining tables is offered for the full sample only. Tables 4 and 5 evaluate the demographic, substance use and psychiatric characteristics of men and women of both subtypes on measures distinct from those used to generate the clusters. These tables focus on items indicative of alcohol-related experiences and the characteristics of the two subtypes. Consistent with the work of Babor *et al.* (1992), these findings also reveal an earlier onset of problems, more evidence of instability in general life functioning (e.g. the percentage divorced) and more intense symptomatology among Type B individuals.

The manner in which the Type A/B approach was developed and the data presented in Tables 3–5 raise a question about whether the Type A/B scheme might only represent a more complex, but not necessarily more accurate, restatement of several earlier or more straightforward approaches. Indeed, 121 of the 319 (37.9%) Type B males fulfilled criteria for ASPD versus 92 of the 708 (13.0%) of the Type As ($\chi^2 = 83.19$, $p < 0.0001$), while 225 Type B (70.5%) and 404 Type As (57.1%) ($\chi^2 = 16.81$, $p < 0.0001$) had an onset of alcohol dependence prior to age 25 years. Among women, 29 of the 126 (23.0%) Type Bs and 17 of the 386 Type As (4.4%) were ASPD ($\chi^2 = 40.24$, $p < 0.0001$), while 91 (72.2%) and 209 (54.2%) of Type B and A women, respectively, had an early onset of alcohol dependence ($\chi^2 = 12.79$, $p < 0.0001$).

Because these data raise the possibility that the A/B scheme might only be a restatement of two relatively easy to measure factors long established as predictors of a possible subgroup (ASPD and early onset), key data in the tables were reanalysed while limiting the sample to the 347 men and 203 women who had an onset of alcohol dependence at age 25 years or later (late onset) and who did not fulfill DSM-III-R criteria for ASPD. Among the late onset/non-ASPD male subsample, the two-cluster solution resulted in 253 Type A and 94 (27.1%) Type B individuals. Types A and B group characteristics conformed to those described previously, with an average proportion of variance explained in cluster assignment of $R^2 = 0.19$. In contrast to the results for the full male sample shown in Table 2, social consequences was not among the more influential measures determining cluster separation. The more powerful items included the ounces of alcohol consumed per day ($r^2 = 0.35$), the degree of relief drinking ($r^2 = 0.34$), severity of the dependence syndrome ($r^2 = 0.43$), medical conditions ($r^2 = 0.36$), physical consequences ($r^2 = 0.45$) and the pseudo-MAST ($r^2 = 0.38$). In addition, the deletion of either subsample (those with ASPD, *or* those with early onset of alcoholism) individually from the male sample had no major effect on clustering results.

The exclusion of individuals with ASPD and those with early onset of alcohol dependence from the female sample resulted in clusters of 145 and 58 (28.6%) for Types A and B, respectively. For this subgroup of alcohol-dependent women, the clustering solution for Types A and B is similar to the full group in Table 2, with a slight decrease in the average proportion of variance explained ($R^2 = 0.19$). Among these females, the same dimensions appear influential as in males, including the ounces of alcohol consumed per day ($r^2 = 0.51$), the degree of relief drinking ($r^2 = 0.33$), severity of the dependence syndrome ($r^2 = 0.50$), medical conditions ($r^2 = 0.34$), physical consequences ($r^2 = 0.41$), social consequences ($r^2 = 0.41$) and pseudo-MAST ($r^2 = 0.48$), with the exclusion of ASPD symptoms.

Table 5. *Clinical characteristics of Type A and B men and women focusing on categorical items not used to generate the 17 domains*

	Males		Females	
Characteristic	Type A	Type B	Type A	Type B
Marital status§ (for males)				
Married	47.46	29.8	45.34	30.95
Widowed	0.99	0.31	3.63	3.17
Separated	4.66	11.29	8.29	10.32
Divorce	12.29	22.88	16.06	21.43
Never married	34.60	35.74	26.68	34.13
Household gross income §(for males) †(for females)				
$1000–9999	14.39	32.48	20.52	31.45
$10,000–19,999	15.25	20.06	13.77	25.81
$20,000–29,999	17.84	17.20	16.62	17.74
$30,000–39,999	14.24	10.51	16.10	7.26
$40,000–49,999	11.37	5.10	9.09	6.45
$50,000–74,999	15.25	7.32	15.06	7.26
$75,000–99,999	6.19	4.78	4.16	2.42
$100,000–149,999	3.31	2.55	2.60	0.00
$150,000 +	2.16	0.00	2.08	1.61
Psychiatric diagnoses and substance use disorders (% among users)				
ASPD	12.99§	37.93	4.40§	23.02
Primary alcohol dependence	62.01§	30.72	60.10§	31.75
Major depressive episode (clean)	7.20§	16.30	19.95	23.02
Mania	0.56§	4.70	2.85†	8.73
Panic disorder	1.98§	7.84	5.70§	18.25
Obsessive–compulsive disorder	0.71§	5.33	1.30*	4.76
Amphetamine abuse	2.07	2.50	0.69	2.50
Amphetamine dependence	21.07§	50.00	25.69§	56.25
Cannabis abuse	1.69	1.60	1.03	1.63
Cannabis dependence	36.21§	68.40	33.06§	62.89
Cocaine abuse	0.84	1.27	1.09	0.00
Cocaine dependence	40.73§	73.00	39.89§	72.55
Opiate abuse	0.60	2.17	0.00	2.94
Opiate dependence	21.69§	38.59	11.76§	38.24
Sedative abuse	1.58	3.41	0.86	1.15
Sedative dependence	11.05§	38.54	8.62§	41.38
Dependence on substances other than alcohol	62.50§	88.17	59.75§	90.83
% Alcohol treatment (any)	44.63§	94.36	32.90§	90.48
% Inpatient treatment	34.60§	85.27	22.54§	74.60
% Currently abstinent (6 months)	25.42†	33.86	37.56§	50.00

*χ^2 for comparison is significant at $p < 0.05$ or better.
†χ^2 for comparison is significant at $p < 0.01$ or better.
§χ^2 for comparison is significant at $p < 0.001$ or better.

Finally, a review of the 17 dimensions suggests that a subset of the items most closely correlated with cluster assignment in Table 2 might perform as well as the full set of 17 for producing clusters with Type A and Type B characteristics. To examine this more closely, the cluster analyses on the full sample (males and females separately) were run again using only the five most influential dimensions. Taken from Table 2, these included the ounces of alcohol consumed, relief drinking, medical conditions, physical consequences and the social consequences. Two additional items, the life-time severity and the dependence syndrome, were highly correlated with some of the other items and with each other. Because of this and the desire to test the smallest number of items possible, these two measures were not included. These analyses replicated the basic results for the full 17 dimensions. This approach resulted in Types A and B

groups of 740 and 287 (27.9%), respectively, among males, and 458 and 54 (10.5%) among females, with clinical characteristics consistent with the concepts described by Babor *et al.* (1992). Type B males and females scored higher on each of the five dimensions than their Type A counterparts. In addition, the average proportion of variance in cluster assignment accounted for by this subset of five dimensions increased in both males ($R^2 = 0.43$) and females ($R^2 = 0.76$). These higher average R^2 values, as compared to those reported in Table 2, reflect the deletion of items from the list of variables included in the analysis which had little or no correlation with cluster assignment.

Discussion

Men and women with alcohol dependence are heterogeneous. Treatment needs and/or prognoses appear to be related to the presence or absence of pre-existing antisocial personality disorder, co-morbid Axis I psychiatric disorders, evidence of additional substance use disorders and a variety of other characteristics. Enhanced knowledge of important subgroups among alcoholics can help in the appropriate assignment of patients to more focused treatments (Rohsenow *et al.*, 1991).

Until recently a number of separate, although overlapping, approaches have been proposed for subdividing alcohol dependent individuals on relatively unitary concepts. Subsequently, Babor *et al.* (1992) used an overarching pattern of characteristics derived from 17 dimensions or domains to synthesize the information available from prior dichotomous approaches. Those authors demonstrated that Type A and B alcoholics differ at the time of entering treatment in a number of important ways. In particular, Type B men and women were likely to have an earlier onset of more severe alcohol-related problems in the context of greater evidence of additional psychopathology and additional substance use disorders.

This paper describes the basic replication of the Type A/B approach when a similar clustering technique was applied to 1539 alcohol dependent men and women. A two-cluster solution that generated two groups that have characteristics similar to those described by Babor *et al.* (1992) was consistently present for men and women alcohol dependent probands and their alcoholic relatives, and in those with and without histories of inpatient treatment for alcoholism. By extending the Babor *et al.* (1992) analysis to a sample including 841 untreated alcoholic subjects and to an alcoholic population which is relatively diverse regarding age and racial background, the present data demonstrate that the concept remains robust. In distinction from the Type I versus II approach (Irwin *et al.*, 1990), clustering remained robust even after excluding the potential impact of ASPD and an early age of onset of alcoholism.

At the same time, it is important to recognize the limitations of the Type A/B approach overall. The specific domains of greatest use in the present analyses were not defined in a manner identical to those reported by the original study. Similarly, the relative importance of each domain differed a little depending upon the subgroups examined. Thus, future work will be required to determine more about the reliability of these domains and the optimal way of measuring them.

Regarding the present work, the absence of evidence that the family history status contributes significantly to the differentiation between Type A and B groups is interesting. In fact, the most impressive items from Tables 2 and 3 are those that deal with the intensity of alcohol-related problems, medical complications, social difficulties and other aspects of life-time severity, as well as those subscales tapping upon ASPD-like characteristics. It is possible that the absence of an effect of family history here might reflect the incorporation of both subjects and their family members into the regression analyses, although the replication of the results on the smaller samples of 533 alcohol-dependent probands and separately on the 910 alcoholic relatives yielded similar results. It is more likely that the high level of familial loading for subjects enrolled in the COGA study could have minimized the ability of any measure of the intensity of the family history to discriminate between groups. Thus, this factor will deserve further analysis in samples chosen through other mechanisms.

Table 2 also indicates a relative absence of a potential impact of the symptoms of anxiety. This finding occurred despite the fact that anxiety symptoms were evaluated routinely in subjects in the detailed, standardized SSAGA interview. In addition, anxiety symptoms were

recorded for the worst episode, even if that syndrome was only observed in the context of alcohol- or drug-related problems.

A major criticism of some prior dichotomous approaches, such as Type I vs. Type II, is that the ability of those schemes to identify unique subgroups of alcoholics might overlap greatly with much simpler concepts such as early versus late onset of alcoholism and the presence or absence of ASPD (Irwin *et al.*, 1990; Vaillant, 1994). In the present sample, the Type A/B concept remained robust even when those individuals with ASPD and/or an early onset of alcohol dependence were excluded from the analysis. Therefore the clustering approach is not a simple restatement of more straightforward schemes.

While the Type A/B approach offers potential advantages, the possible enhanced sophistication carries liabilities. The emphasis on 17 domains results in a complex procedure that might not be appropriate for clinical settings. Also, in the absence of large prospective studies, it is not clear if the dichotomy really offers new information regarding prognosis or treatment needs that go beyond that which could be gleaned from primary diagnosis, demography or more direct aspects of the clinical course (e.g. age of onset).

In carrying out these evaluations, we attempted to test whether the original procedure recommended by Babor *et al.* (1992) might be improved or simplified. Regarding the latter, our analyses revealed that much of the influence of the 17 domains on clustering is carried by five items. Thus, at least for the present sample, the Type A/B dichotomy can be replicated substantially by the ounces of alcohol consumed per day, relief drinking, medical conditions, physical consequences and social consequences. Cluster assignment for the five-item and 17-item analyses were strongly correlated for both males ($\phi = 0.78$, $p < 0.001$) and females ($\phi = 0.53$, $p < 0.001$). Whether this abbreviated approach to defining Types A and B will have more general clinical applicability must await replication in additional samples. However, if replicated, these analyses would indicate that clinicians can review a shorter set of alcohol-related events than the 17 dimensions proposed by Babor *et al.* (1992). Thus, following the conclusions of those original authors, clinicians may target alcoholics with high scores on these five items (Type B alcoholics) for additional treatment or follow-up and explore additional intervention strategies, as these individuals are likely to have a worse prognosis than others.

Of course, the results of the present study must be interpreted in light of the methodology employed. The investigation would have been better if a prospective design had been incorporated so that the prognostic implications of the full Type A/B approach, or the modified five-item version suggested here, could have been determined. A second caveat is that, similar to Babor *et al.* (1992), the bulk of the sample studied here was ascertained from a group of individuals receiving treatment and, thus, the generalizability to other types of samples cannot be guaranteed. A third problem is that there are no perfect measures for the 17 original concepts proposed by Babor *et al.* (1992) and in our analyses only approximations could be used here for several of the domains. Thus, for example, the level of robustness of the clusters used to separate Type A from Type B might have been enhanced had a more sensitive measure of alcohol dependence been used. Finally, there is debate regarding the optimal approach for carrying out cluster analyses when the items used intercorrelate. Following the procedures of Babor *et al.* (1992), the approach used here for the full sample in Table 2 did not correct for this factor.

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