

Problem Drinking and the Dimension of Involvement with Drugs: A Guttman Scalogram Analysis of Adolescent Drug Use

JOHN E. DONOVAN, PhD, AND RICHARD JESSOR, PhD

Abstract: Analyses of data from two nationwide surveys of high school students, one carried out in 1974 and the other in 1978, suggest that problem drinking may be seen as yet another step along an underlying dimension of involvement with both licit and illicit drugs. The dimension of involvement with drugs consists of the following levels: nonuse of alcohol or illicit drugs; nonproblem use of alcohol; marijuana use; problem drinking; use of pills (amphetamines, barbiturates, hallucinogenic drugs); and the use of "hard drugs" such as cocaine or heroin. The dimension possesses excellent Guttman-scale properties in both national samples as well as in subsamples

differing in gender and ethnic background. The ordering of the levels of involvement was confirmed by the ordering of the alcohol-drug involvement groups based on their mean scores on measures of psychosocial proneness for involvement in problem behavior. The excessive use of a licit drug, i.e., problem drinking, appears to indicate greater involvement in drug use than does the use of an illicit drug, marijuana. This finding points to the importance of distinguishing between use and problem use of drugs in efforts to understand adolescent drug involvement. (*Am J Public Health* 1983; 73:543-552.)

Introduction

The present report is concerned with establishing the location of problem drinking along a dimension of adolescent involvement with both licit and illicit drugs. Earlier research on degrees of involvement in drug use was mainly concerned with the "stepping stone hypothesis"—the idea that the use of marijuana, for example, was a "stepping stone" along a path that, once embarked upon, led inexorably to the use of "heavier" drugs such as cocaine or heroin.¹⁻⁴ While no studies support the inevitability of progression from the use of one drug to the use of another, there is evidence of a significant association between the use of any drug and involvement with other drugs.⁵⁻¹³

Other kinds of evidence suggest a normative, developmental sequence of drug involvements, a dimension of temporally-ordered involvement with different types of licit as well as illicit drugs. The position that there may well be a developmental sequence of drug involvements has been

most strongly argued by Kandel and associates.^{12,14,15} Several studies, focusing on patterns of experience with various drugs, have found that a respondent's entire repertoire of drug involvements could be summarized simply by knowing the most "extreme" (least popular, least prevalent) drug the individual had ever used.^{12,16,17} Adolescents or young adults who had used one of the less commonly used drugs tended to have had experience with all of the more commonly used categories of drugs as well. For example, users of marijuana had also drunk alcohol (beer, wine, or liquor); users of psychedelic drugs, stimulants, or barbiturates had used both alcohol and marijuana; and users of cocaine or heroin had used all of the other types of drugs. These or similar patterns of drug use experience satisfy the requirements of a Guttman scale, since they are both cumulative and unidimensional.^{9,12,17-19}

Several other studies, in which respondents reported on the time-order in which they had started using different categories of drugs, suggest that involvement with drugs tends to occur in a relatively orderly sequence of developmental stages that is generally consonant with the order of "difficulty" or extremeness of the drugs in the Guttman scale.^{16,18} Longitudinal analyses of drug use in a statewide sample of New York adolescents led Kandel^{14,15} to propose that there are four stages in adolescent involvement in drug use: the first is marked by starting to drink beer or wine; the second stage starts either with hard liquor (distilled spirits)

From the Institute of Behavioral Science, University of Colorado at Boulder. Address reprint requests to Richard Jessor, PhD, Institute of Behavioral Science, Campus Box 483, University of Colorado, Boulder, CO 80309. This paper, submitted to the *Journal* February 12, 1982, was revised and accepted for publication July 19, 1982.

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or with cigarette smoking; the third stage involves use of marijuana; and the fourth stage includes the use of illicit drugs other than marijuana. At each stage along this developmental dimension of drug involvement, use of drugs characteristic of that stage is accompanied by past as well as current experience with all of the drugs marking the preceding stages of drug involvement. Use of the "harder" drugs did not result in the substitution of these drugs for the drugs used earlier. Rather, the use of the harder drugs involved greater use of all categories of drugs.

A number of issues remain unresolved with regard to the sequence of progression along the dimension of involvement with drugs. First, there is the question of whether such a sequence reflects only the differential popularity or availability of the various drugs at particular times in history, or patterned variation in adolescents' developmental "readiness" to use certain drugs, or whether it is a complex interaction of both of these sources of influence. A second, although related, issue has to do with the generality of this sequence of drug onsets—its invariance across gender, ethnic background, geographic boundaries, and historical time. Several studies of youth in New York, for example, found that Black youth are less likely to use psychedelic drugs, amphetamines, or barbiturates than are White youth, a difference that has implications for the Guttman scaling of their drug involvements.^{10,12,20,21}

Since the use of marijuana and the other illicit drugs mentioned above is proscribed by law, *any use* of these drugs is defined as a problem in our society. However, the same is not true for alcohol. Given the wide prevalence of alcohol use among adolescents, it is the *problem use* of this drug that is of major societal concern. Problem drinking refers to involvement with alcohol that goes well beyond the use of the drug per se and is accompanied by frequent drunkenness and/or the experience of personal and social problems as a result of the use of alcohol. Despite the relationship of adolescent problem drinking to marijuana use and to the use of other illicit drugs,²²⁻²⁹ little is known about its relative position along the dimension of involvement with drugs. Establishing the location of problem drinking along this dimension should provide a better understanding of the interrelationship between the excessive use of a licit drug, alcohol, and the use of illicit drugs. This is the primary focus of the present research.

Materials and Method

The Guttman scalogram analyses reported here are based on alcohol and illicit drug use information collected from two independent nationwide samples of adolescents—the 1974 National Study of Adolescent Drinking,³⁰ and the 1978 National Study of Adolescent Drinking.^{31,32} Both studies were carried out by the Research Triangle Institute under the sponsorship of the National Institute on Alcohol Abuse and Alcoholism. These two survey studies were designed to provide baseline data on the prevalence and correlates of adolescent drinking, problem drinking, and illicit drug use. In this paper, the data from the 1978 National Study are used

to confirm the results of exploratory Guttman scalogram analyses³³ carried out on the data from the 1974 National Study. The resulting alcohol and drug involvement groups are also compared on a variety of psychosocial measures representing the framework of problem-behavior theory that are well-established correlates of problem drinking and marijuana use.²⁴ This was done in order to "validate" the ordering of the resulting levels of drug experience along the underlying dimension of involvement with drugs. Since the sampling designs and field procedures employed in the collection of these data are available in detail elsewhere,^{30,31} only brief descriptions will be given here.

Participants

1974 National Study—A sample of 16,181 adolescents in grades seven through twelve in the 48 contiguous states and the District of Columbia was drawn using a two-stage stratified random sampling design. Homerooms of students stratified by grade level (7-8, 9-10, 11-12) were drawn in each of 50 counties selected from strata varying in census region, county population size, and ethnic status. In this design, counties with more than 10 per cent Spanish-speaking people, Native Americans, or Asian Americans were oversampled. A total of 13,122 (81 per cent) adolescents in 643 homerooms (90 per cent of those sampled, or their replacements) completed questionnaires, yielding an overall response rate of 73 per cent.³⁰

The obtained sample in the 1974 National Study is 48 per cent male, and its self-reported ethnic distribution is as follows: Caucasian (Anglo), 69 per cent; Spanish American, 12 per cent; Black, 7 per cent; Native American (Indian), 6 per cent; Asian American, 2 per cent; and Other (or no answer), 4 per cent.

1978 National Study—The sampling design for the 1978 National Study differed in two ways from the design employed in the 1974 National Study. First, adolescents in the younger grades (7-9) were not sampled in 1978; only tenth-through twelfth-grade classrooms were sampled (74 homerooms for each grade level). Second, specific ethnic groups were not oversampled in 1978, as they had been in 1974. Of the 5,638 students in the classrooms selected, 4,918 completed usable questionnaires. The overall response rate for the 1978 National Study was 86 per cent.³¹

The resulting sample obtained for the 1978 National Study is 46 per cent male and its self-reported ethnic distribution is as follows: Caucasian (Anglo), 72 per cent; Spanish American, 5 per cent; Black, 10 per cent; Native American, 3 per cent; Asian American, 1 per cent; and Other (or no answer), 9 per cent. Fewer Spanish American and Native American adolescents, and proportionately more Black adolescents, participated in the 1978 survey than in the 1974 survey.

Procedure and Measures

Procedures used in the collection of data in both the 1974 and the 1978 National Studies of Adolescent Drinking were similar. Data were collected during school hours over a four-week period in the spring for both studies. A 35- or 37-page self-administered questionnaire was used which re-

quired about 45 minutes to complete, and the questionnaires were administered in the homerooms during a free period. To ensure confidentiality, completed questionnaires were placed in manila envelopes and sealed by the participants themselves; the only identification on the questionnaires consisted of an elaborate identification number.

The questionnaires used in the 1974 Study and the 1978 Study were very similar. Both consisted of a series of multiple-response questions about sociodemographic characteristics, drinking contexts, sex-role attitudes, and a number of measures assessing a subset of the psychosocial variables from problem-behavior theory.²⁴ In addition, they included the drinking and drug use measures which constitute the focus of this paper. The dichotomous measures of drinking, problem drinking, marijuana use, psychedelic drug/amphetamine/barbiturate use, and cocaine or heroin use are described in the Appendix, as are the measures representing the psychosocial variables of problem behavior theory.³²

Results

In order for drinking, problem drinking, the use of marijuana, the use of pills (amphetamines, barbiturates, or hallucinogens), and the use of "hard drugs" (cocaine or heroin) to constitute a unidimensional, cumulative (Guttman) scale, adolescents who use one of the less widely-used (more extreme, more "difficult") drugs should report the use of at least one drug in each of the categories of more popular drugs as well. This question was explored first in the data of the 9,658 students in grades 7 through 12 who participated in the 1974 National Study and who also had logically consistent data as well as scores on all five of the dichotomous measures needed for the scalogram analyses.*

Exploratory Scalogram Analyses

In the sample of 9,658 students from the 1974 National Study, 72 per cent were current drinkers, 27 per cent had used marijuana twice or more, 19 per cent were classified as current problem drinkers, 8 per cent had used either amphet-

amines, barbiturates, or hallucinogenic drugs, and 2 per cent had used either cocaine or heroin. Based on these relative prevalences, a Guttman scale of alcohol and drug involvement would be indicated if the students' involvement in the categories of drug use or abuse fell almost exclusively into the following set of six cumulative patterns:

- users of the "hard drugs" who also report the use of "pills", involvement in problem drinking, and the use of marijuana;
- users of pills who also report involvement in problem drinking and in marijuana use;
- problem drinkers who also report the use of marijuana;
- marijuana users who also drink alcoholic beverages (beer, wine, or liquor);
- drinkers not involved in problem drinking or the use of illicit drugs;
- and students who are not involved with either alcohol or illicit drugs.

Almost 92 per cent of the students in this sample exhibited patterns of involvement that are consistent with the notion of a cumulative dimension of drug use: 28 per cent had used neither alcohol nor illicit drugs; 40 per cent were nonproblem drinkers with no experience with illicit drugs; 10 per cent had used marijuana and were nonproblem drinkers; 9 per cent were problem drinkers who were also involved with marijuana; 4 per cent had used pills, were involved in problem drinking, and had used marijuana; and 1 per cent had used hard drugs and pills, were problem drinkers, and had used marijuana. These adolescents display cumulative patterns of alcohol and drug involvement in which use or abuse of a less common drug is accompanied by experience with all of the more commonly-used drugs. Such a pattern of involvements suggests the following ordering of the levels of involvement with alcohol and illicit drugs: nonuse; nonproblem use of alcohol; use of marijuana; involvement in problem drinking; use of one or more of the pills; and use of either or both of the hard drugs.

The Guttman properties of the scale based on this ordering of the behaviors are excellent. The coefficient of reproducibility (CR) for the scale is .967, indicating that relatively little error is made in assuming that involvement with these drugs is not only unidimensional but cumulative as well.** This reproducibility exceeds by a wide margin the CR of .90 that is usually considered acceptable for a Guttman scale. The CR obtained is also considerably higher than the minimum marginal reproducibility (MMR) of .830, an index which indicates how well individuals' patterns of involvement could be predicted if it were assumed that everyone exhibited a pattern consisting of the modal response in each category of drug use. The coefficient of

**This reproducibility coefficient was calculated using Goodenough's "double-counting" procedure³⁷ to figure the number of "errors" present in the data. The procedure provides a more conservative measure of the reproducibility of a scale than is provided by the better known Cornell or "ranking" method.³⁸ All of the Guttman scale properties were calculated using the GUTTMAN SCALE procedure in Version 8.0 of the Statistical Package for the Social Sciences, 2nd edition.³⁹

*A series of checks of the internal, logical consistency of respondents' answers to the drinking questions and to the drug-use questions was used to exclude respondents whose answers to partially-overlapping questions were questionable. The aim was to minimize the effect of unreliable or random responding on the interrelationships among the various categories of licit and illicit drug use. Since the consistency checks were confined to a single class of drugs at a time (alcohol use or marijuana use), they should have no effect on the size of the relationships between classes of drugs. Of the 13,122 adolescents in the 1974 data set, 11,213 (85%) had relatively few logical inconsistencies, either in their drinking data or in their drug use data. A total of 808 adolescents was excluded who were missing data needed to determine their involvement with marijuana; 625 former drinkers were excluded because of their indeterminate status with regard to drinking and problem drinking; 37 adolescents were missing data needed to classify them with regard to their drinking; and 85 adolescents were excluded because of missing data on their experience with the other illicit drugs. The remaining 9,658 adolescents constitute 74% of the obtained 1974 National sample.

scalability (CS)⁴⁰ of .806 exceeds the suggested minimal acceptable level of .60 by a substantial margin. This index describes the improvement between the MMR and the CR as a proportion of the possible improvement (1-MMR).

Repeating the scalogram analyses using two alternative measures of involvement in problem drinking produced little difference either in the relative position of problem drinking along the dimension or in the magnitude of the Guttman properties of the resulting scales.^{***}

Of the 18 possible noncumulative patterns of involvement ("error types" in Guttman scaling), 13 contained seven or fewer students. The great majority of students exhibiting noncumulative patterns was accounted for by just two patterns: 2 per cent of the sample had used pills without also being involved in problem drinking; and 5 per cent of the sample were involved in problem drinking without having used marijuana. This latter group is of interest because it suggests a reordering of marijuana use and problem drinking along the underlying dimension. However, when Guttman scale properties are calculated for this alternative ordering (drinking, problem drinking, marijuana use, pill use, hard drug use), the reproducibility is slightly lower (.940 in contrast to .967) and the scalability is *much* lower (.654 in contrast to .806) than the coefficients based on the ordering actually obtained. This is also the case when the two alternative definitions of problem drinking are used. In each case there was less error associated with the ordering in which problem drinking is indicative of greater involvement with drugs than is marijuana use.

Subgroup analyses confirm the generality of this dimension of alcohol and drug involvements for adolescents of both sexes and of differing ethnic backgrounds. CRs testing the unidimensionality of the ordering found in the full sample are uniformly excellent across 10 subsamples (Anglo, Spanish American, Black, Native American, and Asian American males and females), varying only between .951 and .990 across the three operational definitions of problem drinking.

These analyses of the 1974 national sample data suggest that adolescent problem drinking does indeed lie along the same dimension of drug involvement as alcohol use, marijuana use, pill use, and hard drug use. They also suggest that problem drinking occupies a position along this dimension that lies between the use of marijuana and the use of other illicit drugs.

Confirmatory Scalogram Analyses

Identical analyses were subsequently carried out on the drinking, problem drinking, and illicit drug use data collected

^{***}Both alternative definitions of problem drinking have been used in earlier research.²² The first alternative defined problem drinking solely on the basis of drunkenness twice a month or more in the past year (10% qualify by this definition); the second alternative is based solely on a measure of negative consequences due to drinking (9% experienced consequences twice in one area in the past year, plus at least once in a second area). Using the drunkenness definition of problem drinking results in a CR of .972 and a CS of .812; using the negative consequences definition of problem drinking results in a CR of .964 and a CS of .761.

in the 1978 National Study of Adolescent Drinking. The sample for these analyses consisted of the 3,958 10–12th grade adolescents who had logically consistent data as well as data on all of the measures needed in the scalogram analyses.[‡]

Within this sample, all of whom are senior high school students, 83 per cent are current drinkers, 49 per cent have used marijuana, 30 per cent are classified as problem drinkers, 21 per cent have used hallucinogens, stimulants, or barbiturates, and 10 per cent have used either cocaine or heroin. (Comparable percentages for the 1974 10–12th graders are 82 per cent, 39 per cent, 27 per cent, 13 per cent, and 3 per cent, respectively.) Table 1 presents the distribution of this 1978 sample of adolescents into the same scale types that were identified in the 1974 data; it also presents the distribution for the comparable subsample of 10–12th grade adolescents in the 1974 data.

In both the 1978 and 1974 senior high school samples, almost 90 per cent of the adolescents have patterns of alcohol and drug involvement that fit into one of the six "pure" scale types described earlier. The percentage of each sample that displays each of these patterns of alcohol/drug involvement is also fairly similar for four of the six groups; the only exceptions are that in 1978 fewer adolescents are drinkers without any experience with illicit drugs than in 1974 (31 per cent in 1978 vs 37 per cent in 1974), and that more adolescents in 1978 were hard drug users than there were in 1974 (7 per cent in 1978 vs 2 per cent in 1974). The results were similar even in the noncumulative patterns of drug involvement that were found: in both 1974 and 1978 the largest "error types" were composed of problem drinkers who had not used marijuana (Group 20), and marijuana and pill users who were not also problem drinkers (Group 16). The former error type was half as large in the 1978 sample as it was in the 1974 sample.

Table 2 presents the results of the confirmatory scalogram analyses for the comparable 10–12th grade samples in the 1974 data and in the 1978 data. Overall, the results based on the 1978 survey data provide an impressive replication of the Guttman scale properties obtained in the 1974 study data. For these analyses, the order of "difficulty" or intensity of the alcohol and drug involvements was *fixed* to be in the same order as in the exploratory analyses. Separate scalogram analyses were run for the males and females in each sample using both the primary definition of problem drinking and the two alternative definitions mentioned in the preceding section. All of the coefficients of reproducibility (CRs) are above .90, and all of the coefficients of scalability meet or exceed the acceptable level of .60. There are only minor differences between the scale properties obtained for the males and those obtained for the females.

In order to check on the generality of the scalogram results within the 1978 data set, confirmatory scalogram

[‡]Of the 4,918 students in the 1978 National Study, 4,726 (96%) had given logically consistent answers in both the drinking and the drug use sections of the questionnaire. Of the 4,726 adolescents, 124 were former drinkers, 180 were missing data needed to classify them on the drinking measures, and 464 were missing data on their experience with one or more of the categories of illicit drugs.

TABLE 1—Patterns of Alcohol and Drug Use Experience in the 1978 and 1974 National Studies of Adolescent Drinking—10–12th Grade Males and Females Combined

Group No.	Group Name	Substance Use Experience					Size of Groups			
		Used Alcohol	Used Marijuana	Problem Drinking	Used Pills	Used Hard Drugs	1978 National Sample		1974 National Sample	
							%	N	%	N
<i>"Pure" Scale Types</i>										
1	Abstainers	No	No	No	No	No	16.5	654	17.6	838
2	Drinkers	Yes	No	No	No	No	30.5	1208	37.2	1768
3	Marijuana Users	Yes	Yes	No	No	No	15.3	606	13.5	640
4	Problem Drinkers	Yes	Yes	Yes	No	No	11.7	462	12.1	574
5	Pill Users	Yes	Yes	Yes	Yes	No	6.9	274	6.6	315
6	Hard Drug Users	Yes	Yes	Yes	Yes	Yes	6.9	272	2.0	95
<i>"Error" Types</i>										
7	Abst., Marijuana Only	No	Yes	No	No	No	0.7	29	0.4	17
8	Abst., Pills Only	No	No	No	Yes	No	0.0	1	0.0	2
9	Abst., Hard Drugs Only	No	No	No	No	Yes	0.1	2	—	0
10	Abst., Marij. & Pills	No	Yes	No	Yes	No	0.1	3	0.1	3
11	Abst., Marij. & Hard Drugs	No	Yes	No	No	Yes	0.0	1	—	0
12	Abst., Pills & Hard Drugs	No	No	No	Yes	Yes	0.0	1	—	0
13	Abst., All 3 Illicit Drugs	No	Yes	No	Yes	Yes	—	0	0.0	2
14	Drk., Pills Only	Yes	No	No	Yes	No	0.8	33	0.3	13
15	Drk., Hard Drugs Only	Yes	No	No	No	Yes	0.1	2	0.0	1
16	Drk., Marij. & Pills	Yes	Yes	No	Yes	No	3.8	149	3.3	159
17	Drk., Marij. & Hard Drugs	Yes	Yes	No	No	Yes	0.5	19	—	0
18	Drk., Pills & Hard Drugs	Yes	No	No	Yes	Yes	0.1	2	0.0	1
19	Drk., All 3 Drugs	Yes	Yes	No	Yes	Yes	2.0	78	0.6	28
20	Problem Drinker Only	Yes	No	Yes	No	No	3.0	118	6.1	290
21	Prob. Dr., Pills Only	Yes	No	Yes	Yes	No	0.2	6	0.1	3
22	Prob. Dr., Hard Drugs Only	Yes	No	Yes	No	Yes	—	0	—	0
23	Prob. Dr., Marij. & Hard Drugs	Yes	Yes	Yes	No	Yes	1.0	38	0.0	1
24	Prob. Dr., Pills & Hard Drugs	Yes	No	Yes	Yes	Yes	—	0	—	0
Total Numbers							3958		4750	

Note—The frequency distributions of the patterns of involvement in alcohol and drug use are based on the primary definition of problem drinking. All possible cross-tabulations between the five dichotomous statuses can be derived for both samples using the data in this table.

analyses were also performed for each of six subsamples differing in gender and ethnic background (Anglo, Spanish-American, and Black males and females). Even though the ordering of drug involvements was specified in advance, without reference to their relative prevalences within each subsample, the Guttman scale properties were acceptable for all six subsamples and for all three definitions of problem drinking.

The data demonstrate that the alcohol/drug involvement dimension found in the 1974 National Study is equally unidimensional and cumulative in the 1978 National Study, and that this result holds for both male and female adolescents. These analyses all indicate that problem drinking represents a level of involvement with drugs that is further along this dimension than is marijuana use, but not as far along as is the use of hallucinogenic drugs, amphetamines, or barbiturates.

Problem-Behavior Proneness and Involvement with Alcohol and Drugs

Previous analyses of these and other data have shown that higher levels of involvement in adolescent problem

behaviors are associated with greater psychosocial proneness for problem behavior on the measures in problem-behavior theory.^{22-24,41,42} To the extent that increasing involvement with drugs along this dimension of alcohol and drug use can be shown to be associated with increasing levels of psychosocial proneness to problem behavior, there would be further evidence for the validity of the obtained ordering of the groups and for the location of problem drinking.

Table 3 presents mean scores on the psychosocial measures of problem-behavior theory for the six "pure" scale types. In this Table, the data for the males and females in the 1978 survey are combined. On every measure there is a statistically significant relationship ($p < .001$) between membership in the various alcohol-drug involvement groups and variation in psychosocial proneness for problem behavior.

In all but a few cases, the means on the psychosocial measures vary in a linear fashion across these six groups differing in levels of involvement with alcohol and other drugs. Students with greater involvement with drugs had scores on these measures indicating greater psychosocial

TABLE 2—Guttman Scale Properties of the Alcohol-Drug Involvement Scale in the 1978 and 1974 National Samples—10–12th Graders Only

Guttman Scale Properties	Combined Sexes		Males		Females	
	1978 (n = 3871)	1974 (n = 4748)	1978 (n = 1725)	1974 (n = 2205)	1978 (n = 2146)	1974 (n = 2543)
I. Using the primary definition of problem drinking:						
Coefficient of Reproducibility	.952	.956	.949	.948	.954	.963
Minimum Marginal Reproducibility Improvement	.745	.801	.734	.787	.757	.813
Coefficient of Scalability	.207	.155	.215	.161	.197	.150
	.812	.779	.809	.754	.812	.803
II. Using the drunkenness definition of problem drinking:						
Coefficient of Reproducibility	.942	.959	.946	.957	.939	.961
Minimum Marginal Reproducibility Improvement	.768	.826	.762	.818	.776	.833
Coefficient of Scalability	.174	.133	.184	.139	.163	.128
	.752	.766	.774	.765	.729	.767
III. Using the negative consequences definition of problem drinking:						
Coefficient of Reproducibility	.921	.949	.926	.947	.917	.950
Minimum Marginal Reproducibility Improvement	.784	.827	.776	.818	.795	.835
Coefficient of Scalability	.137	.122	.150	.129	.122	.115
	.632	.705	.667	.711	.595	.698

Note—The Guttman scaling was performed using the procedure available in the Statistical Package for the Social Sciences (SPSS), Version 8.0. For this comparison, the ordering of the statuses was specified in advance (nonproblem alcohol use, marijuana use, problem drinking, pill use, and hard drug use).

proneness for problem behavior than did adolescents with less involvement. Increasing alcohol and drug involvement seems to be associated, as expected, with higher personal instigations for problem behavior, lower personal controls against problem behavior, less of an orientation toward parents than toward peers, higher social support for drinking, greater involvement in other problem behaviors, and lower involvement with the conventional institutions of church and the schools. This consistent ordering of the mean scores on the psychosocial measures helps to validate the obtained ordering of the groups along the dimension of drug involvement.

Of central importance in these psychosocial comparisons is the location of the group of problem drinkers relative to the other groups. In comparison with the marijuana users, the problem drinkers exhibit *greater* proneness for problem behavior on all but two of the psychosocial measures (value on independence, church attendance frequency.)^{‡‡} In comparison with the pill-user group, on the other hand, the problem-drinker group is consistently *less* problem behav-

ior-prone, as expected.^{‡‡‡} The level of psychosocial proneness toward problem behavior shown by the problem drinkers thus falls *between* that of the marijuana users and that of the pill users, an outcome that is completely consonant with, and helps to validate, the position of the problem drinkers on the dimension of involvement with drugs—between the marijuana users and the pill users. A highly similar ordering of the psychosocial means emerges from comparable analyses (not tabled) of the 1974 data.

The data in Table 3 also permit an examination of the amount of alcohol intake, frequency of drunkenness, negative consequences associated with alcohol use, and of the extent of use of illicit drugs in the various drug-involvement groups. Daily intake of alcohol increases linearly across all of the groups that drink, as does frequency of drunkenness and of negative consequences due to drinking. There is clearly no substitution of illicit drugs for alcohol shown here. Similarly, frequency of marijuana use increases across all four groups that have had experience with the drug; again, “harder” drugs do not serve as substitutes for “softer”

^{‡‡}According to multiple comparison tests among the group means, problem drinkers have *significantly* lower values on academic achievement, lower expectations for academic recognition, lower intolerance of socially-disapproved behavior, greater disjunction between positive and negative functions of drinking, greater friends' approval of and pressure for drinking, more friends models for drinking, greater involvement in socially-disapproved behavior, and less involvement with school than do the marijuana users.

^{‡‡‡}Only half of the mean differences on the psychosocial measures, however, reach significance by the highly conservative, Multiple Range Test⁴³ that was used. Pill users valued independence more highly than achievement, had lower expectations of success in school, were less intolerant of deviant behavior, were somewhat less religious, were more oriented toward their friends than toward their parents, engaged in general deviant behavior more frequently, and went to religious services less frequently than did adolescents in the problem-drinker group.

TABLE 3—Means on the Psychosocial Measures for the Six Alcohol-Drug Involvement Groups—Males and Females Combined—1978 National Study of Adolescent Drinking

	Means for the Alcohol-Drug Involvement Groups						F-ratio	η ²	r ²
	Abstainers (N = 654)	Drinkers (N = 1208)	Marijuana Users (N = 606)	Problem Drinkers (N = 462)	Pill Users (N = 274)	Hard Drug Users (N = 272)			
Personality System Measures									
Personal Instigations									
Value on Academic Achievement	21.46 _a	20.74 _b	20.77 _{ab}	19.86 _c	18.90 _{cd}	18.10 _d	33.3	.046	.043
Value on Independence	20.13 _a	20.96 _b	21.42 _{bc}	21.24 _{bc}	21.99 _{cd}	22.29 _d	17.9	.025	.022
Independence-Achievement Value Discrepancy	18.68 _a	20.22 _b	20.66 _{bc}	21.38 _c	23.09 _d	24.21 _d	68.5	.091	.087
Expectations for Academic Achievement	18.88 _a	18.38 _{ab}	17.97 _b	17.14 _c	16.11 _d	15.91 _d	34.1	.048	.047
Personal Controls									
Tolerance of Deviance	44.10 _a	41.58 _b	40.12 _c	38.31 _d	36.41 _e	35.19 _e	212.0	.237	.234
Religiosity	15.48 _a	13.58 _b	12.38 _c	12.06 _c	10.93 _d	9.91 _e	115.6	.149	.141
Drinking Functions Disjunction	14.91 _a	15.96 _b	17.48 _c	21.02 _d	21.54 _d	22.25 _d	93.2	.128	.120
Perceived Environment System Measures									
Distal Structure									
Parent-Friends Influence	2.65 _a	2.88 _b	3.02 _{bc}	3.07 _c	3.46 _d	3.47 _d	35.6	.059	.056
Proximal Structure									
Family Approval of Teenage Drinking	3.01 _a	3.93 _b	3.95 _{bc}	4.09 _{bc}	4.28 _{cd}	4.67 _d	55.2	.086	.064
Friends' Approval of Drinking	2.82 _a	3.43 _b	3.52 _b	3.87 _c	3.93 _c	3.89 _c	119.8	.158	.125
Friends' Pressure for Drinking	1.85 _a	1.97 _{ab}	1.93 _{ab}	2.20 _c	2.24 _c	2.10 _{bc}	11.1	.016	.011
Family Models for Drinking	3.22 _a	4.06 _b	4.16 _b	4.21 _b	4.20 _b	4.19 _b	70.7	.099	.046
Friends Models for Drinking	5.67 _a	7.07 _b	7.47 _c	8.21 _d	8.36 _d	8.35 _d	264.4	.283	.234
Behavior System Measures									
Problem Behavior Structure									
General Deviant Behavior/Past Year	13.97 _a	15.42 _b	17.27 _c	19.30 _d	20.95 _e	21.61 _e	331.7	.327	.323
Average Daily Intake of Alcohol (oz. AA)	0.01 _a	0.14 _b	0.27 _c	0.85 _d	1.03 _e	1.59 _f	263.0	—	—
Times Drunk in Past Year	1.00 _a	1.70 _b	2.52 _c	6.61 _d	6.91 _e	7.25 _f	4087.6	—	—
Negative Consequences Drinking/Past Year	6.04 _a	6.54 _b	7.11 _c	9.41 _d	9.78 _d	10.66 _e	318.3	—	—
Involvement with Marijuana	0.03 _a	0.15 _a	3.79 _b	4.61 _c	5.89 _d	6.95 _e	3683.5	—	—
Frequency Marijuana Use/Last 6 Mo.	1.00 _a	1.05 _a	5.68 _b	8.06 _c	10.41 _d	11.40 _e	1318.2	—	—
Conventional Behavior Structure									
Church Attendance Frequency	5.26 _a	4.52 _b	3.98 _c	4.07 _c	3.44 _d	2.96 _d	71.5	.097	.089
School Performance	5.37 _a	5.21 _a	4.91 _b	4.56 _c	4.43 _{cd}	4.07 _d	55.7	.075	.074

Notes—All of the overall F-ratios are significant at the .001 level or beyond. Eta² (η²) is the correlation ratio, which reflects the proportion of the variance in each psychosocial measure accounted for by group membership. r² expresses the proportion of the variance in each psychosocial measure accounted for assuming a linear function holds across the groups. Subscript letters below the means refer to the results of a multiple comparison test among the means: Groups that share a subscript have means on that specific measure that are not significantly different by Scheffé's Multiple Range Test (with the "experiment-wise" alpha set at .10). Groups that do not share any subscripts have significantly different means by this test.

drugs.* Rather, a deepening of regular substance use appears to go along with a widening of experience in the drug domain.

Discussion

Analyses of data from two nationwide samples of high school students suggest that problem drinking among youth may be seen as yet another step along a dimension of involvement with licit and illicit drugs. To our knowledge,

*Analyses of the 1974 data not only replicate these mean differences on the alcohol use and marijuana use measures, but also show that the group of hard drug users used psychedelic drugs, amphetamines, or barbiturates more frequently during the past six months than did the group of pill users.

this is the first report of an effort to locate problem drinking along a dimension of degree of involvement with drugs. According to these data, involvement with problem drinking appears to represent a level of drug involvement that is greater than that represented by the use of marijuana, yet not as great an involvement as that shown by adolescents who have used illicit drugs other than marijuana. The relative ordering of these levels of involvement with drugs was confirmed not only by its replication in the scalogram analyses of data from the 1978 National Study, but also by the consistent ordering of the mean scores of adolescents at these different levels of drug involvement on various measures of psychosocial proneness for problem behavior.

While these findings demonstrate the location of problem drinking in a unidimensional, cumulative scale of levels of involvement in alcohol and illicit drug use, they cannot

demonstrate that these levels of involvement are actually *stages* in a developmental sequence of transitions into greater drug use. Such a sequence of involvements would, of course, be compatible with the present findings. And Kandel's earlier longitudinal analyses^{14,15} showed quite clearly that alcohol use, marijuana use, and the use of other illicit drugs do constitute stages in the progression of involvement with drugs among adolescents. Our findings, being cross-sectional, must remain limited to the question of order or level rather than sequence.

In addition to the limitation imposed on the present analyses by the lack of longitudinal data, there is the additional limitation due to the restriction of the sampling to only those adolescents who were still in school. The exclusion of school drop-outs may affect the representativeness of our findings for the larger populations of minority youth, especially Black, Spanish-American, and Native American adolescents.

Despite these limitations, the generality of this dimension of involvement with alcohol and illicit drugs was demonstrated across samples, over time, and across gender and ethnic group differences, using three different alternative definitions of problem drinking, as well as different measures of illicit drug use in the two questionnaires. The present analyses also suggest that, despite the significant increase in marijuana use and in the prevalence of use of other illicit drugs between 1975 and 1978,⁴⁴ the same relative ordering of the levels of involvement with drugs obtains in both the 1974 and the 1978 National Study samples. And, in spite of the fact that males and females differ in their likelihood of problem drinking in adolescence,²² the same order of levels of involvement is found for both sexes in both of the national samples.

This widespread generality of the obtained ordering along the dimension of involvement with drugs suggests that these levels of involvement may reflect a patterned structure of opportunity for the use or misuse of different drugs that is linked to their availability among American high school students in the middle-to-late 1970s. Whether this ordering is still extant among American youth in the early 1980s, or if this same order of drug involvements holds in societies or cultures with different drinking norms or different patterns of drug availability, are issues worth further investigation (see Adler and Kandel⁴⁵).

The present scalogram analyses of drug involvement are important because they indicate that the different levels of involvement with alcohol—abstention, nonproblem drinking, and problem drinking—have quite different implications for adolescent involvement with illicit drugs. The results emphasize the necessity for dealing separately with use and with abuse of alcohol in any efforts to understand the use of illicit drugs among adolescents. Abstention from alcohol tends to be associated with the nonuse of any illicit drug. Nonproblem drinking is associated with nonuse of illicit drugs (the modal pattern) or with the use of marijuana, but it is not associated with the use of illicit drugs other than marijuana. Problem drinking, in contrast, tends to be accompanied by the use of illicit drugs, and such drug use—especially the use of illicit drugs other than marijuana—tends

not to occur in the absence of problem drinking.

The existence of the noncumulative patterns of drug involvement suggests that, for a small percentage of adolescents, problem drinking does not always involve the use of marijuana; nor is the use of other illicit drugs accompanied by the misuse of alcohol in every case. These alternative pathways into heavier involvement with drugs, however, are found among a relatively small number of adolescents in comparison with the more general dimension of involvement that has been demonstrated.

Neither the 1974 nor the 1978 National Study data provide support for the idea that when drugs indicating greater involvement are used there is less use of the drugs at the lower levels of involvement (the "substitution hypothesis"). On the contrary, both alcohol use and misuse as well as marijuana use increase with wider experience in the drug domain.

The fact that adolescents who were problem drinkers showed a greater frequency of marijuana use did raise the possibility that these youth might be "problem users" of marijuana as well. Supplemental analyses of the 1978 data were carried out to examine this possibility. The findings show that this was not the case; only 15 per cent of the problem drinker group could be considered "problem" marijuana users by the criterion employed.**

Beyond the importance of locating problem drinking along a cumulative dimension of drug involvement, a contribution of the present study may well be this emphasis on the importance of distinguishing between the use of a drug and its excessive, or heavy, or chronic use. Such a distinction has usually been ignored in the domain of illicit drugs where any use has been seen as "problem" use. Investigation of the distinction between use and heavy or problem use within the domain of illicit drugs would seem to be a worthwhile endeavor. It should certainly advance our understanding of the general dimension of degree of involvement with drugs among adolescents.

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**Heavy or problem use of marijuana was defined as use four or more times a week and/or the experience of four or more negative consequences due to marijuana use (e.g., being stopped by the police, having trouble getting along with friends, getting lower grades in school). By this definition, 27% of the marijuana users in the sample met the criterion for problem use of marijuana.

It is of interest to note that the percentage of "problem" marijuana users was only 7% in the marijuana user group, but was 45% in the pill user group and 70% in the hard drug user group.

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APPENDIX

Measurement of Alcohol Use and Problem Drinking

Approximately halfway through the 1974 and 1978 questionnaires, respondents were asked a number of questions regarding their experience with drinking, their intake of alcohol, and their experience of drunkenness and other drinking-related problems. Participants were considered drinkers if they had had a drink of beer, wine, or liquor more than two or three times in their lives; all others were considered abstainers.

Within the drinker category, current drinkers (those who had had a drink in the past year) were further classified as either minimal, nonproblem, or problem drinkers. Adolescents were considered minimal drinkers if they usually drank less than a can of beer, a glass of wine, or a drink of liquor on any given occasion. Only the more-than-minimal drinkers consume enough alcohol to be liable to the sorts of negative consequences of drinking that are associated with problem drinking among adolescents.²² Among the more-than-minimal drinkers, adolescents were categorized as problem drinkers if they had been "drunk or very, very high" six or more times in the past year, and/or if they had experienced negative personal or social consequences, as a result of drinking, at least twice in the last year in at least three of five areas (trouble with teachers, difficulties with friends, criticism from dates, trouble with the police, and driving while under the influence of alcohol).^{*} Adolescents were categorized as nonproblem drinkers if they had not been drunk that often and had encountered fewer negative consequences as a result of their drinking. The measures of drinking and of problem drinking that were used are identical in both the 1974 and the 1978 questionnaire data. The drinking measure was dichotomized for the scalogram analyses into abstainers vs drinkers; and the problem drinking measure was dichotomized into non-problem drinkers vs problem drinkers for the same purpose.

Measurement of Illicit Drug Use

Near the end of the 1974 National Study questionnaire, respondents were asked a series of questions regarding their experience with illegal drugs. Among these questions were the following: "Have you ever tried marijuana (pot, grass, Mary Jane, weed, reefers, hash)?" "Have you ever tried other drugs like hallucinogens (e.g., LSD), amphetamines (speed), or barbiturates?" and, finally, "Have you tried any of the 'hard' drugs like heroin or cocaine?" Respondents were considered users of a drug or category of drugs if they had used any of the drugs in that set twice or more in their life.

In the 1978 Study, somewhat different questions were

^{*}Adolescents classified as problem drinkers in the 1974 Study drank five times more alcohol in a day than did adolescents classified as nonproblem drinkers (1.5 vs 0.3 ounces of absolute alcohol per day, on the average). They also had been drunk an average of 18 times in the past year, compared to an average of once in the past year among the nonproblem drinkers.²² Equivalent differences were obtained in the 1978 Study when adolescents classified as problem drinkers were compared to adolescents classified as nonproblem drinkers.³²

used to assess illicit drug use. With regard to marijuana use, respondents were asked: "Altogether, since you first started, about how many times have you *ever* used marijuana or hashish?" Respondents were considered marijuana users if they had used the drug twice or more, the same definition as in 1974. With regard to the use of other illicit drugs, a standard question format was used. For each of seven drugs, respondents were asked: "How old were you when you first tried _____?" The drugs asked about were the following: inhalants, heroin, cocaine, hallucinogens, stimulants, tranquilizers, and barbiturates. Respondents who reported an age at first use for a drug were classified as users. In order to increase the comparability of the data between the two surveys, the seven drugs were re-grouped for better correspondence with the three general questions that were asked in 1974. Respondents who indicated they had tried either hallucinogens, stimulants, or barbiturates were grouped as "pill" users; while respondents who indicated they had tried either heroin or cocaine were classified as "hard drug" users.

Measurement of the Psychosocial Variables of Problem-Behavior Theory

Both the 1974 and the 1978 National Studies of Adolescent Drinking used the social-psychological framework of "problem-behavior theory"²⁴ as a part of their conceptual organization. According to this theory, adolescent involvement in problem behavior, including problem drinking and illicit drug use as well as other behaviors, is a result of the interaction of three sets of explanatory factors—variables representing the personality system, the perceived environment system, and the behavior system. The greater the theoretical proneness for involvement in problem behavior that is present in each system, the greater the likelihood of occurrence of such behavior for a given adolescent.

Within the personality system, proneness for problem behavior consists of lower value on academic achievement, higher value on independence, higher value on independence than on achievement, lower expectations of attaining academic recognition, less *intolerance* of socially-disapproved behavior, lower religiosity, and greater weight on the positive relative to the negative functions of drinking.

Within the perceived environment system, problem-behavior proneness is indicated by a greater orientation toward friends than toward parents, greater parental approval of teenage drinking, greater friends' approval of and pressure for drinking, and greater exposure to family and to friends as models for drinking.

Within the behavior system, proneness for involvement in a particular problem behavior is reflected in greater involvement in *other* behaviors that are socially labeled as problem behaviors for adolescents, and in lower involvement with the conventional institutions of church and the schools.

The 1974 and the 1978 questionnaires included somewhat abbreviated versions of measures of the three systems. Despite their brevity, the shortened scales used in the nationwide surveys possess more than adequate scale properties³² as indicated by their *alpha* reliabilities³⁴ and by their homogeneity ratios.^{35,36}