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ABSTRACT

Psychometric properties of the Alcohol Behavior, Attitude, and Awareness Inventory (ABAA Inventory) were assessed using data collected in 1987 from 799 university students. Results suggested that the ABAA Inventory was internally-consistent (alpha = .82) and stable over time (test-retest coefficient = .77). Subscale alphas ranged from .45 to .92, while subscale test-retest coefficients ranged from .59 to .89. A panel of experts determined that the instrument was representative of the domains under study, indicating content validity. Instrument construct validity was appraised using factor analysis. The initial factor analysis produced 15 factors with eigenvalues greater than 1. A principal component factor analysis, set at eight factors with a varimax rotation, produced eight factors with eigenvalues ranging from 6.63 to 1.57. Convergent and discriminant construct validity were studied through general correlation matrices. As measured by the SMOG test, Inventory items were at the seventh grade reading level. The average time needed to complete the instrument ranged from 9.26 to 17.17 minutes. This paper describes the ABAA Inventory's psychometric properties as well as its applications in the school and community health setting. (Author)

A Psychometric Assessment of the Alcohol Behavior, Attitude, and Awareness Inventory

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Abstract

Psychometric properties of the Alcohol Behavior, Attitude, and Awareness Inventory (ABAA Inventory) were assessed using data collected in 1987 from 799 university students. Results suggested that the ABAA Inventory was internally-consistent (alpha = .82) and stable over time (test-retest coefficient = .77). Subscale alphas ranged from .45 to .92, while subscale test-retest coefficients ranged from .59 to .89. A panel of experts determined that the instrument was representative of the domains under study, indicating content validity. Instrument construct validity was appraised using factor analysis. The initial factor analysis produced 15 factors with eigenvalues greater than 1. A principal component factor analysis, set at eight factors with a varimax rotation, produced eight factors with eigenvalues ranging from 6.63 to 1.57. Convergent and discriminant construct validity were studied through general correlation matrices. As measured by the SMOG test, Inventory items were at the seventh grade reading level. The average time needed to complete the instrument ranged from 9.26 to 17.17 minutes. This paper describes the ABAA Inventory's psychometric properties as well as its applications in the school and community health setting.

Introduction

Drinking and driving remains a major health problem in the United States today, with 45 to 60 percent of all youth-related traffic fatalities alcohol-related (Dougliss, 1982). In 1985, alcohol-related traffic accidents cost the United States approximately $12 billion (National Safety Council, 1986).

There is a growing awareness among health education specialists that drinking and driving issues ought to be included in any comprehensive health education curricula (Sarvela, Newcomb, & Duncan, in press; Zobeck, Williams, and Bertolucci, in press). One aspect of the curriculum development process is design and development of reliable and valid data collection instruments to be used in needs assessments, baseline data gathering activities, and formative and summative evaluations. The purpose of this paper is to describe the Alcohol Behavior, Attitude, and Awareness Inventory (ABAA Inventory), an instrument that can be used for assessing drinking and driving behaviors and attitudes, community resources awareness, and traits associated with adult children of alcoholics.

Method

Sample. Data were collected from two samples of university students attending a large midwestern university in 1987. Sample 1, the pilot study sample, was comprised of 110 students. Sample 2, the primary study sample, was comprised of 689 students enrolled in a general studies course. Students in the pilot sample were not included in the primary study sample. Demographic characteristics of the two samples are presented in Table 1.

insert Table 1 about here

Research Design. A cross-sectional design was used for the analysis of internal-consistency reliability, frequency distributions, and the factor analyses. Reliability was also measured using a test-retest design, with a three-day time span between measurements.

Instrumentation. Items comprising the ABAA Inventory were based on results of a literature review that focused on alcohol use and related behavior. The following sources were used in development of this instrument: Johnston, Bachman, and O'Malley (1982), Magruder-Habib, Katherine, and Clynn (1982), Mayer and Filstead (1979), Sarvela (1984), Skinner and Sheu (1982), Skinner (1979), and Woititz (1983).

A preliminary pool of 81 items was developed from the literature search. This pool was reduced to 54 items for the pilot study. Items were removed from the preliminary pool for reasons of redundancy or irrelevance to the study. After the pilot test, items were reworded, modified, added, or deleted. Content validity reviewers' recommendations, student comments, and item analysis results were considered in making these modifications. The resulting 57 item instrument was comprised of eight sections: demographics, general alcohol use, alcohol abuse, personal experiences with drunk driving, perceptions of drunk driving problems, drunk driving and the law, community resources awareness, and a scale which assessed traits associated with children of alcoholics.

Pilot Test. An important element of the research process is to pilot test data collection instruments (Green & Lewis, 1986; Windsor, Baranowski, Clark, & Cutter, 1984). The ABAA Inventory was pilot tested with a sample of 110 students from several health education and social work classes. Preliminary reliability coefficients were calculated and used by the content validity reviewers in their critique of the instrument (Table 2).

insert Table 2 about here

Data Collection Procedures. In the primary study, the ABAA Inventory was administered by teaching assistants in their respective classes. Teaching assistants were briefed and provided written instructions for data collection. Teaching assistants read aloud the instructions to their classes, and were available for questions throughout the data collection process. These strategies were used to ensure consistent data collection procedures, which in turn increased the reliability of the results (Green & Lewis, 1986).

Participation in the study was voluntary. All students who were present during the scheduled day of data collection were eligible to participate in the survey. Students did not put their names on either the answer sheets or questionnaire forms, to maintain anonymity. For the test-retest reliability estimates, a subsample of students entered a code known only to them on their answer sheets. This code was used to match answer sheets for the data analysis. No attempt was made to trace codes to individual students. All student answers were recorded on computer-scored response sheets to facilitate data analysis.

Data Analysis Procedures. Two types of reliability analyses were conducted: (1) test-retest and (2) internal-consistency. Test-retest reliability was used to measure the stability of the instrument over time. As recommended by psychometric authorities (Guilford, 1954; Nunnally, 1978), a correlational coefficient (Pearson r) was used for this analysis. Internal-consistency reliability, which measures the degree to which each of the items in the scale (and subscales) relate to each other, was measured by calculating Cronbach's alpha (Cronbach, 1951)

Two methods were used to study the validity of the instrument: (1) content validity and (2) construct validity. Content validity, which measures the degree to which an instrument adequately measures the objects under study, was appraised using a consensual validity strategy. With this approach, it is necessary for a panel of experts to "examine and rate the appropriateness of each item in the completed instrument" (Green & Lewis, 1986, p. 106). The panel was comprised of a sociologist who specializes in research design and measurement, a rehabilitation counselor who specializes in substance abuse, and a program director of a major state alcohol abuse education training program. Using a structured checklist based on criteria outlined by Stufflebeam, McCormick, Brinkerhoff, and Nelson (1985) and Windsor et al. (1984) reviewers were asked to reject, accept, or revise the cover sheet, instructions, and items. Preliminary reliability and item analysis data from the pilot study were also used by the reviewers to appraise the quality of the instrument.

Construct validity was estimated using general factor analysis procedures followed by a principal components analysis with a varimax rotation, to determine the structure of the ABAA Inventory. This procedure has been recommended by several authorities (e.g., Guilford, 1954; Kachigan, 1982; Nunnally, 1978) as an appropriate method for studying the composition of measurement instruments. The principal component analysis was set at eight factors, based on seven of the original eight sections of the instrument (demographics were excluded from the factor analysis) plus one additional factor for significant "residuals." Discriminant and convergent construct validity was studied using item correlation matrices.

In addition to reliability and validity analyses, frequency data and discrimination indices were calculated. These psychometric procedures were used to study the general pattern of student responses as well as provide a basis for improving the reliability of the instrument (Miller & Lewis, 1982; Sarvela, 1987). Reading level was measured through the SMOG technique (McGlaughlin, 1969). Minimum and maximum time allotments needed to complete the survey by each class were reported by the teaching assistants. All data were analyzed using the SPSSx and SAS statistical analyses programs.

Results

Fifty-nine students comprised the test-retest sample for the primary study. The test-retest correlation coefficient for the total instrument was .77, while subscale test-retest coefficients ranged from .59 to .89. Internal-consistency reliability was determined using the entire sample of 689 students. The Cronbach alpha for the total instrument was .82. Subscale alphas ranged from .45 to .92. These findings are reported in Table 3.

insert Table 3 about here

Content validity of the ABAA Inventory was determined using a consensual validity procedure. The panel of experts judged the items to be clearly representative of the content under study.

Fifteen factors emerged from the initial factor analysis with eigenvalues greater than 1. A second factor analysis, using a principal components analysis set at 8 factors with a varimax rotation, produced 8 factors with eigenvalues ranging from 6.63 to 1.57. Table 4 summarizes the factor analysis.

insert Table 4 about here

Eight factors were named by: selecting only those variables with factor loadings above .40, examining the direction of the loading (positive or negative), considering the number of significant variables in factor, and assessing the item structure of the factor. The factors were named as follows:

Factor 1: general alcohol experiences
Factor 2: personal expectations
Factor 3: abusive drinking behaviors
Factor 4: interpersonal behaviors
Factor 5: legal attitudes towards drinking and driving
Factor 6: family problems with alcohol
Factor 7: cavalierness
Factor 8: individual community resource awareness

A second set of construct validity studies examined the convergent and discriminant validity of the instrument. With convergent validity, positive correlations were found between peer and personal alcohol use (.47 to .71) as well as personal alcohol use and drinking and driving behaviors (.48 to .59). With regard to discriminant validity, examples of negative correlations included relationships between positive health beliefs and drinking behavior (-.23 to -.28) and legal issues and drinking behavior (-.12 to -.21). In addition, the data indicated that religiosity was negatively correlated with drinking behaviors (-.12 to -.22).

The sample mean, standard deviation, and correlation coefficient of each item to the total instrument and to its subscale were also calculated. These values are reported in Table 5.

Instrument items were written at the seventh grade reading level. The cover sheet and instructions showed a ninth grade reading level. There were no reports of difficulty or misunderstanding of the meaning of individual items. The average time in each class needed to administer the ABAA Inventory ranged from 9.26 minutes to 17.17 minutes. There were no reported difficulties in the administration of the instrument.

insert Table 5 about here

Discussion

Data indicate that the ABAA Inventory was administered without difficulty. Although composed of 57 items, on average, less than 20 minutes were needed to complete the instrument (maximum average range was 17.17 minutes). A readability level of seventh grade on the items indicated that the instrument was well within the readability level of most university undergraduate students. These data suggest that the instrument can efficiently and effectively gather large amounts of data from large numbers of individuals in a relatively short time period.

Based on the reliability analysis, the instrument appeared to be both internally consistent and stable over time. For example, the Cronbach alpha for the total instrument was .82, an acceptable level of internal consistency for basic research projects (Green & Lewis, 1986, based on Nunnally). Subscale alphas ranged from .92 to .45. The community

resource awareness scale value of .45 was expected, because the items in that scale were heterogenous. Likewise, subscales comprised of more homogeneous items, such as the general drinking battery of questions, had high alpha values. Test-retest reliabilities showed acceptable coefficients as well, with subscale values ranged from .89 to .64, and an average test-retest of .77.

The instrument was judged to be valid, based on both content and construct validity activities. With regard to content validity, the panel of experts indicated that the ABAA was a comprehensive data collection instrument. The panel of experts was able to make several suggestions for improving the the quality and consistency of the instrument. One notes that the internal-consistency of the ABAA inventory increased significantly from the pilot test (alpha = .54) to the primary study (alpha = .82). This increase in reliability (which in turn improves validity) can be attributed in part by the reviewers comments and suggestions for improving the quality of the instrument.

The initial factor analysis showed that 15 factors with eigenvalues greater than 1 were present in the instrument. By using a principal component analysis restricted to 8 factors (using the varimax rotation method) eigenvalues ranged from 6.63 to 1.57. Results of the factor analysis indicated that general alcohol use, alcohol abuse, and drunk driving and the law scales, were relatively distinct. Drunk driving subscale items were found in both the general alcohol use and alcohol abuse scales. The adult children of alcoholics items were divided among three factors, while the community resources awareness scale contained two factors.

The results strongly suggested that the ABAA Inventory had an acceptable degree of convergent validity. For example, peer and personal alcohol use variables were highly correlated with each other, consistent with the findings of previous research (Sarvela & McClendon, 1983; Sarvela, Takeshita, & McClendon, 1986). In terms of discriminant validity, correlations were found in the expected direction as well. For example, negative correlations were found between religiosity and various alcohol use behaviors.

The ABAA Inventory appears to be a reliable and valid instrument for use with university students, and has many possible uses in the field of health education. The Inventory could be used in the beginning stages of curriculum development, as a needs assessment instrument. By identifying the behavioral, attitudinal, and emotional aspects of the target population, an appropriate health education drunk driving prevention program could be designed and developed. This instrument could also be used in formative and summative evaluations of programs. As a process tool, it could be used to measure sample changes during program operation. As a summative tool, it could be used to measure program effectiveness in either an impact (immediate effects) or outcome (long term effects) evaluation study.

Future research includes conducting a study to estimate the criterion-related validity of the instrument, as the cross-sectional nature of this study does not allow us to make judgments concerning <u>future</u> behavior. A larger sample size should be used to study the test-retest reliability of instrument, with a longer time span (preferably two weeks) between test-retest measurements. If the instrument is used in an experimental design setting, it is recommended that parallel forms of the instrument be developed, to offset internal experimental validity problems related to testing.

The ABAA Inventory has been developed for use with university students. If the instrument is used with other populations (i.e., junior high school students) it should be modified appropriately, as has been recommended for other health education instruments (Torabi & Veenker, 1986). If modifications occur, the instrument should be pilot tested a second time, since changes in item characteristics may change the reliability and validity of the instruments.

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Table 1: Demographic Profile of Sample (expressed in percentages)

	Pilot Study N = 110	Primary Study N = 689
	Percent	Percent
Age		
19 or less	13	55
20-21	42	28
22-23	29	11
24-25	10	02
26+	06	03
Gender		
female	55	54
male	45	46
Marital Status		
single (never married)	87	86
married	10	07
separated/divorced	00	02
cohabitant (live with someone in an intimate relationship)	03	04
widowed	00	01
Family Income		
$15,000 or less	13	09
$16,000 to $25,000	16	16
$26,000 to $35,000	16	27
$36,000 to $45,000	16	17
$45,000 or more	39	28
Race		
Hispanic	00	02
Black	16	11
Asian/Oriental	00	04
White/Caucasian	84	79
other	00	01
Religion		
Protestant	35	20
Catholic	35	35
Jewish	07	02
Islamic	00	01
other	23	33

Table 2: Reliability Statistics for ABAA Inventory Pilot Study

	Test-retest (N=31)	Cronbach alpha (N=110)
Total	.77	.54
GAU Subscale	.88	.87
AAB Subscale	.63	.66
DD Subscale	.64	.39
PDD Subscale	.71	.66
CRA Subscale	.85	-.07
COA Subscale	.83	.53

GAU = general alcohol use scale
AAB = alcohol-related abusive behavior scale
DD = drinking and driving scale
PDD = perceptions of drinking and driving scale
CRA = community resources awareness scale
COA = adult children of alcoholic scale

Table 3: Reliability Statistics for ABAA Inventory Primary Study

	Test-retest (N=59)	Cronbach alpha (N=689)
Total	.77	.82
GAU subscale	.89	.92
AAB subscale	.59	.74
DD subscale	.85	.61
LDD subscale	.79	.77
PDD subscale	.62	.63
COA subscale	.64	.73
CRA subscale	.80	.45

GAU = general alcohol use scale
AAB = alcohol-related abusive behavior scale
DD = drinking and driving scale
PDD = perceptions of drinking and driving scale
CRA = community resources awareness scale
COA = adult children of alcoholic scale
LDD = drinking, driving and the law

Table 4: Summary of Factor Analysis

Ite	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Communality
[illegible]	.82	.10	.00	.11	-.13	.05	-.14	.09	.74
GAU2	.80	.08	.15	.05	-.10	-.01	-.15	.04	.71
GAU3	.81	.08	.09	.06	-.17	.01	-.20	.03	.74
GAU4	.70	.10	-.14	.14	-.05	-.03	-.17	.19	.61
GAU5	.74	.13	-.06	.09	-.01	-.02	-.18	.15	.64
GAU6	.76	.07	-.06	.05	-.04	-.07	-.22	.09	.65
AAB1	.00	.06	.58	.11	.03	-.11	.05	.18	.40
AAB2	.29	-.22	.24	.11	.06	.11	.35	-.10	.35
AAB3	.53	.01	.30	-.02	-.00	.10	-.00	-.12	.40
AAB4	.20	-.01	.52	.13	.05	.21	-.18	-.13	.42
AAB5	.32	-.11	.44	17	.00	.09	-.09	-.09	.36
AAB6	.50	.01	.24	.08	-.13	.08	-.05	-.17	.37
AAB7	.01	-.10	.58	.05	.11	-.11	.01	-.04	.38
AAB8	.13	-.00	-.35	.06	.13	.07	.03	-.12	.18
UB	.19	-.15	-.00	.06	-.01	-.03	-.30	.01	.15
DD1	.68	-.01	.22	-.07	-.13	-.04	.22	-.02	.58
DD2	.75	.04	.22	-.06	-.20	-.04	.13	-.07	.69
DD3	.10	.03	.40	.19	-.04	-.07	-.03	.18	.24
DD4	.56	.00	-.01	.01	.05	-.12	.17	-.05	.36
PB1	.24	-.15	-.11	-.14	.31	-.09	-.17	.17	.28
PB2	.66	-.09	-.07	-.06	.17	-.10	.07	-.02	.50
PDD1	-.19	.09	.15	.04	.31	.03	.06	-.12	.18
PDD2	-.21	.03	.04	.05	.78	.05	-.04	.05	.66
PDD3	-.10	-.04	-.02	-.05	.80	.07	.00	.04	.66
CA1	.05	-.01	.12	.02	.05	.08	-.03	.76	.60
CA2	.09	-.03	.05	-.22	.04	.11	.01	.60	.44
CA3	.06	.04	.01	.26	-.03	-.32	-.05	.07	.18
CA4	-.06	.04	-.13	-.05	.04	.79	.09	.08	.67
CA5	.06	.08	.01	.21	.24	-.12	.05	.17	.16
CA6	-.02	-.01	-.23	.02	.05	.77	.00	.12	.66
CA7	-.23	.03	.18	.19	.01	-.05	.07	.35	.25
CA8	.15	.20	-.11	.14	-.19	-.06	-.16	-.04	.16
HBM	-.27	-.09	-.03	-.20	.23	.23	.09	-.24	.29
COA1	.01	.01	.19	.47	.12	-.09	.03	.01	.28
COA2	.12	.07	.12	.57	.00	.08	-.19	-.06	.40
COA3	.05	.20	.04	-.39	-.06	.16	.42	.09	.41
COA4	.10	.69	.04	.09	-.06	.07	.14	.00	.53
COA5	-.15	-.25	-.12	.39	.13	-.04	.47	-.08	.50
COA6	.17	.66	.06	-.12	.03	.09	-.00	-.19	.55
COA7	.03	-.07	-.01	.57	.00	-.01	.31	-.03	.42
COA8	-.02	.66	-.10	-.10	.01	-.06	.11	.15	.49
COA9	-.03	.46	-.08	.01	.11	-.21	.10	.04	.29
COA10	.01	.34	14	-.44	-.01	-.03	.12	.15	.36
COA11	.06	.58	.09	.11	-.04	.05	-.09	-.05	.41
COA12	.08	.08	.04	.44	-.20	-.02	.03	.06	.25
COA13	-.10	.12	-.16	.04	-.05	.03	.07	.04	.38
AAB9	.13	.04	.46	-.02	.05	-.14	-.00	.04	.25
Eigen Values	6.63	2.42	2.30	2.08	1.89	1.71	1.59	1.57	

Table 5: ABAA Inventory Item Analysis Results

Item	Mean	SD	r(1)	r(2)
GAU1	3.21	1.01	.51	.79
GAU2	3.21	1.22	.46	.77
GAU3	2.60	1.11	.47	.80
UB	2.95	1.36	.22	(4)
GAU4	3.55	0.95	.51	.74
GAU5	3.66	1.13	.49	.78
GAU6	3.12	1.02	.49	.79
AAB1	1.04	0.27	.35	.35
AAB2	1.28	0.47	.30	.38
AAB3	1.50	0.52	.41	.49
AAB4	1.13	0.37	.3[illegible]	.45
AAB5	1.22	0.44	.39	.46
AAB6	1.39	0.50	.40	.48
AAB7	1.02	0.20	.42	.41
AAB8	1.06	0.29	.25	.20
AAB9	1.05	0.25	.37	.38
DD1	1.58	0.53	.47	.49
DD2	2.95	1.32	.41	.67
DD3	1.05	0.25	.40	.18
DD4	1.75	0.46	.47	.48
PB1	1.73	0.49	.31	(4)
PB2	1.75	0.47	.50	(4)
PDD1	1.72	0.51	.18	.21
PDD2	2.85	1.19	.13	.63, .62(3)
PDD3	4.03	1.04	.26	.63, .60(3)
CRA1	1.55	0.57	.29	.19
CRA2	1.74	0.53	.28	.17
CRA3	1.38	0.89	.16	.10
CRA4	2.54	1.68	.12	.38
CRA5	1.31	0.73	.18	.19
CRA6	2.67	1.68	.19	.47
CRA7	1.99	1.30	.09	.10
CRA8	3.18	1.33	.24	.05
DEM01	1.66	0.98	.12	(4)
DEM02	1.45	0.53	.25	(4)
DEM03	1.23	0.73	.20	(4)
DEM04	3.34	1.37	.28	(4)
DEM05	3.59	0.94	.41	(4)
DEM06	2.70	1.69	.07	(4)
DEM07	2.32	1.02	.04	(4)
DEM08	3.50	1.31	.19	(4)
DEM09	2.45	0.87	.29	(4)
DEM010	1.57	0.66	.34	(4)
HBM	3.27	0.88	.17	(4)
COA1	1.48	0.68	.25	.18
COA2	1.51	0.66	.26	.18
COA3	1.32	0.70	.21	.30
COA4	2.42	0.94	.25	.41
COA5	1.94	0.79	.17	.27
COA6	2.21	0.91	.18	.40
COA7	1.85	0.95	.22	.27
COA8	1.96	0.94	.28	.51
COA9	2.42	0.95	.29	.49
COA10	1.67	0.90	.28	.45
COA11	2.68	0.92	.30	.48
COA12	3.26	0.92	.27	.31
COA13	2.17	0.95	.30	.31

(1) correlation of item to total
(2) correlation of item to subscale
(3) items included on two different subscales
(4) no subscale r calculated