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Alcoholics Anonymous Involvement and Positive Alcohol-Related Outcomes: Cause, Consequence, or Just a Correlate? A Prospective 2-Year Study of 2,319 Alcohol-Dependent Men

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A positive correlation between Alcoholics Anonymous (AA) involvement and better alcohol-related outcomes has been identified in research studies, but whether this correlation reflects a causal relationship remains a subject of meaningful debate The present study evaluated the question of whether AA affiliation appears causally related to positive alcohol-related outcomes in a sample of 2,319 male alcohol-dependent patients. An initial structural equation model indicated that 1-year posttreatment levels of AA affiliation predicted lower alcohol-related problems at 2-year follow-up, whereas level of alcohol-related problems at 1-year did not predict AA affiliation at 2-year follow-up. Additional models found that these effects were not attributable to motivation or psychopathology. The findings are consistent with the hypothesis that AA participation has a positive effect on alcohol-related outcomes.

Alcoholics Anonymous (AA) self-help group meetings are sought out more frequently by problem drinkers than are all forms of professional alcohol treatment combined (McCrady & Miller, 1993; Room & Greenfield, 1993; Weisner, Greenfield, & Room, 1995). Millions of AA members and countless practicing clinicians have argued the organization's value (Chang, Astrachan, & Bryant, 1994; Emrick, Tonigan, Montgomery, & Little, 1993; Humphreys & Noke, 1997; Ogborne, 1993), but substantial skepticism remains as to whether AA actually is effective. AA's critics (e.g., Kownacki & Shadish, 1999; Peele, Bufe, & Brodsky, 2000) have argued correctly that popularity with sufferers and clinicians does not prove efficacy. AA's defenders might respond that research evaluations almost always find that greater AA participation is associated with less alcohol consumption and fewer alcohol-related problems (e.g., Emrick et al., 1993; Longabaugh, Wirtz, Zweben, & Stout, 1998; Morgenstern, Labouvie, McCrady, Kahler, & Frey, 1997; Project MATCH, 1997, 1998; Tonigan, Miller, & Connors, 2000), but AA skeptics could counter with the observation that this research base is primarily cross-sectional and correlational in nature, raising the possibility that there is no causal connection between AA participation and better outcome (Peele et al., 2000).

The controversy about whether AA is effective centers on three arguments, which for purposes of scientific analysis are operationalized here as a priori hypotheses. Each presents a different explanation for the commonly identified correlation between greater AA participation and better alcohol-related outcomes (see Figure 1). In simple terms, Hypothesis 1 holds that "AA works"; that is, attending AA causes members to consume less alcohol and experience fewer alcohol-related health and social problems. Hypothesis 2 presents the equally plausible possibility that reduced alcohol abuse causes AA affiliation. In other words, problem drinkers who relapse tend to drop out of AA whereas those who are abstinent are more comfortable continuing to attend meetings. Hypotheses 1 and 2 are not mutually exclusive because AA participation could lessen alcohol consumption, which in turn might increase AA involvement, which in turn could reduce alcohol consumption further, in a reinforcing cycle.

In contrast, Hypothesis 3 is in genuine competition with the others because it holds that the apparent causal link between AA and drinking behavior is an illusion created by a third variable: good prognosis. The most common versions of this hypothesis in the literature are that (a) greater motivation to abstain from alcohol and (b) lack of psychiatric comorbidity cause both AA involvement and better outcome. In support of this conjecture, some studies have found that greater motivation and lower psychopathology predict subsequent AA participation, reduced alcohol abuse, or both (e.g., Isenhart, 1997; McLellan, Luborsky, Woody, O'Brien, & Druley, 1983; Morgenstern et al., 1997; Stöffelmayr, Benishek, Humphreys, Lee, & Mavis, 1989). If such variables fully explain AA affiliation and drinking outcomes, the implication is that AA only looks effective because of self-selection of the easiest cases into the organization.

Lengthy observations periods, multiwave measurement, large samples, and sophisticated analytic strategies are prerequisites for providing a rigorous test of the earlier hypotheses. The Department of Veterans Affairs (VA) multisite substance abuse outcome study (Moos, Finney, Ouimette, & Suchinsky, 1999) had all of these characteristics and hence served as our data source. Using structural equation modeling (SEM; Jöreskog & Sörbom, 1999), we evaluate whether AA involvement is a cause, consequence, or merely a correlate of better alcohol-related outcomes.

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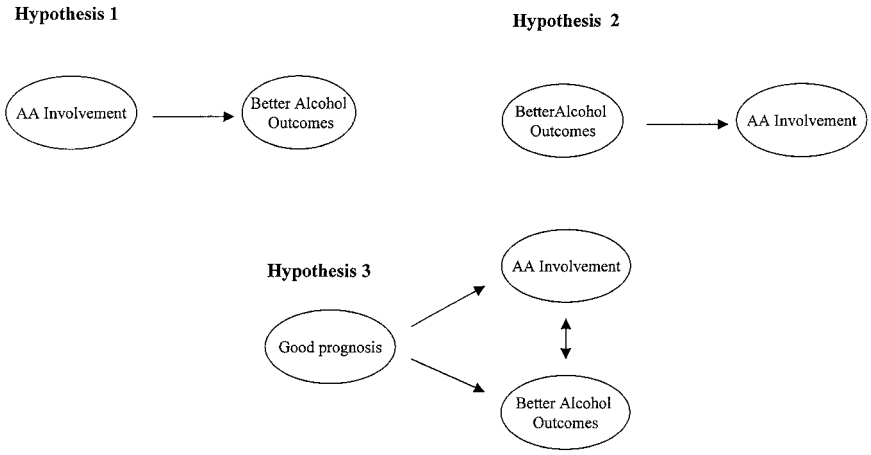

Figure 1. Explanatory models of relationship between Alcoholics Anonymous (AA) involvement and alcohol abuse.

Method

Participants

The present sample was composed of 2,319 male veterans who were seeking alcoholism treatment at one of 15 VA inpatient programs and were followed up 1 and 2 years later. These individuals were a subset of a sample of 3,698 patients participating in a nationwide prospective study of substance abuse treatment effectiveness (Moos et al., 1999; Ouimette, Finney, & Moos, 1997). For the present study, patients who were not diagnosed as alcohol dependent at the time of intake into the study were excluded from the analyses ($n = 653$).

Of the baseline sample of 3,045 alcohol-dependent patients, 2,319 (76%) were successfully located at both 1- and 2-year follow-up. Participants who did ($n = 2,319$) or did not ($n = 726$) provide follow-up data did not differ significantly at baseline in age, education, alcohol-related problems, hazardous alcohol use, motivation for treatment, psychiatric symptoms, or 12-Step group affiliation. The 2,319 participants were primarily African American (42.3%) or non-Hispanic Caucasian (52.3%). At intake most were unemployed (77%) and not currently married (86%). Average age was 43.5 years ($SD = 9.9$). A summary of participants' *International Classification of Diseases* (9th rev.; clinical modification; ICD-9-CM; Health Care Financing Administration, 1991) mental health and substance abuse diagnoses and other demographic variables is included in Table 1.

Procedure

After obtaining informed consent, research staff independent of the treatment program asked participants to complete an inventory at baseline and again at 1 year and 2 years after discharge. More detailed descriptions of procedures can be found elsewhere (Ouimette et al., 1997).

Latent and Indicator Variables

Alcohol problems. Latent variables in SEM are hypothetical constructs that are defined by directly measured indicator variables. The latent variable alcohol problems was created with two indicator variables reflecting the essential elements of alcohol use disorders: high consumption and adverse consequences. Alcohol consumption over the past 3 months was assessed using items from the Health and Daily Living Form (Moos, Finney, & Cronkite, 1990). The first indicator variable, hazardous alcohol use, was defined as the frequency of consuming more than four drinks on a drinking day in beer, wine, or hard liquor, which is the widely used standard in the public health field for high-risk drinking for men (Wechsler & Nelson, 2001).[1] A subset of participants received alcohol tests (e.g., breath sample) during nonrandom patient visits to VA facilities in the first year of treatment, which were significantly associated with patients' self-reports of alcohol consumption (see Ouimette et al., 1997).

The alcohol problems latent variable was also assessed with the Problems From Substance Use Scale (Ouimette, Finney, Gima, & Moos, 1999). This scale assesses the negative consequences (health, legal, monetary, occupational, intra- and interpersonal, and residential) of alcohol and drug use but is referred to here as a measure of alcohol problems because the current alcohol-dependent sample excluded patients who had only a drug-dependence diagnosis. The scale comprises 18 items scored on a 5-point scale ranging from 0 (*never*) to 4 (*often*) that pertain to problems over the prior 3 months.

AA involvement. The AA involvement latent variable was defined using four indicator variables: number of AA meetings attended in the prior 3 months (on a 5-point scale, 1 = *never*, 2 = *1–9*, 3 = *10–19*, 4 = *20–29*, 5 = *30 or more*); frequency of reading AA books and/or pamphlets (on a 5-point scale ranging from *never* to *several times a week*); frequency of talking to one's AA sponsor (on a 5-point scale ranging from *never* to *several times a week*); and the number of AA friends (on a 5-point scale ranging from *none* to *four or more*).

Pretreatment motivation to change. The motivation latent variable was measured using three indicator variables. The indicator variables were the three subscales of the Stages of Change Readiness and Treatment Eagerness Scale (Miller, 1991; Miller & Tonigan, 1996): the Taking Steps subscale, the Recognition subscale, and the Ambivalence subscale.

Psychopathology. Psychopathology was assessed using the ICD-9-CM. To test this variable in our SEM, we created two subgroups of participants for a multisample analysis: participants with ($n = 707$) and participants without a comorbid Axis I psychiatric diagnosis ($n = 1,612$). Diagnoses were derived from participants' charts as given by doctoral-level staff when the patient was discharged from the inpatient episode.

Model Specification and Evaluation Strategy

SEM with LISREL–SIMPLIS 8.3 software (Jöreskog & Sörbom, 1999) was used to evaluate simultaneously Hypothesis 1 (i.e., that AA involve-

[1] SEM analyses were also carried out using the amount of alcohol typically consumed on a drinking day as an indicator variable for alcohol problems. This continuous variable produced results that were nearly identical to the hazardous alcohol variable.

Table 1
Baseline Demographic and Diagnostic Variables

Variable	Sample (%)
Age, years	
18–35	20.0
35–50	60.0
50–65	16.0
65+	4.0
Ethnic background	
African American	42.3
Asian	0.1
Hispanic/Latino	2.9
Native American	2.2
Caucasian	52.0
Education	
Less than high school	16.0
High school	37.4
High school + 2 years	33.0
College	11.4
College+	2.2
Employment	
Unemployed at baseline	77.0
Employed part time	6.9
Employed full time	16.1
ICD-9-CM diagnosis at baseline	
Schizophrenia/paranoid psychosis	3.0
Depressive disorder	12.5
Anxiety disorder	9.3
Posttraumatic stress disorder	6.6
Alcohol dependence	100.0
Drug dependence	45.0

Note. ICD-9-CM = International Classification of Diseases (9th rev., clinical modification).

ment causes reduced alcohol problems) and Hypothesis 2 (i.e., that reduced alcohol problems cause AA involvement). The adequacy of the model was tested using the two-step procedure suggested by James, Mulaik, and Brett (1982) and elaborated by Anderson and Gerbing (1988). The first step specifies the measurement model in which the observed variables (in this case, 18) are tested as indicators of each latent variable (in this case, 6) using confirmatory factor analysis (see Figure 2). In the second step, the full structural model with directional and nondirectional influences was tested. Thus the initial analysis tested the relationship between two variables, AA involvement and alcohol problems, over three time points.

The next analysis used SEM to test for potential third variable influences (i.e., good prognosis) that might account for the relationship between AA involvement and alcohol problems. Support for Hypothesis 3 is indicated if the addition of the positive prognostic variables explains the longitudinal relationships between AA involvement and alcohol problems. As a continuous variable with multiple indicators, baseline motivation was tested by adding it to the original model as a new latent variable. Because the categorical variable for diagnosed Axis I psychiatric disorder is not easily accommodated into the standard SEM framework, we chose instead to use multisample modeling to account for this factor. Multisample models evaluate group differences by testing the equivalence of covariance matrices, factor patterns, factor loadings, and error covariance matrices factor loadings. In the present case, if a positive relationship between AA and alcohol problems holds only within the model for participants without comorbid psychiatric diagnoses, it would support the hypothesis that AA only works for those with a good prognosis. To summarize, the potential third variable influence of motivation was addressed by adding a separate latent variable (for a total of seven latent variables), whereas the potential impact of Axis I psychiatric disorder was accounted for by comparing the SEMs for participants with and without psychiatric comorbidity.

We assessed model fit using the root-mean-square error of approximation (RMSEA) and the goodness-of-fit index (GFI) because these statistics are more sensitive to model fit in large samples than is a chi-square statistic (Bentler & Bonett, 1980; Coovert, Penner, & MacCallum, 1990; Jöreskog, 1979). As recommended by Jöreskog and Sörbom (1999), all LISREL–SIMPLIS analyses were conducted using covariance matrices and maximum likelihood estimates. All indicator variables were modeled to predict themselves at subsequent time points. This correction for the correlation in measurement error resulting from repeated measurement (autocorrelation) improves overall fit and reduces bias in parameter estimates (Kessler & Greenberg, 1981). The factor loading for one indicator per construct was set to unity to identify the construct's scale of measurement (Bollen, 1989).

Results

Change Across Time for Indicator Variables

The values and significance tests for the indicator variables can be found in Table 2. Nearly all participants (93.0%) reported hazardous levels of alcohol (primarily beer and hard liquor) consumption prior to treatment. For beer, "every day" was the most commonly reported (36.0%) frequency of drinking among those drinking in a hazardous fashion prior to intake to treatment. For hard liquor, "less than once a week" (22.9%), "1–3 days a week" (22.2%), and "every day" (22.4%) were the most commonly reported frequencies of hazardous alcohol consumption prior to intake. The level of use had declined significantly at the time of 1-year follow-up (41.8%) and continued to decline significantly at the time of 2-year follow-up (37.5%). A similar pattern of improvement was evident with participant's report of alcohol-related problems.

Mean levels of AA involvement increased significantly from intake to 1-year follow-up on all variables (see Table 2). From 1-year to 2-year follow-up, overall AA involvement declined somewhat and decreased significantly in terms of frequency of attending meetings and reading 12-Step literature. Described in a different fashion, 46.6% of participants reported having attended from 1 to 10 AA meetings in the past 3 months at the time of intake and only 9.2% reported attending more than 10 meetings. At 1-year follow-up participation increased, as 56% reported attending from 1 to 10 meetings in the past 3 months and 23.3% reported attending 10 or more meetings. At 2-year follow-up attendance dropped slightly, as 48.6% reported attending from 1 to 10 meetings and 19.8% reported attending 10 or more meetings.

Measurement Model

The excellent fit of the measurement model indicated that the indicator variables were good measures of the latent variables, RMSEA = .024 (.020–.029); GFI = .99. All factor loadings in the model were substantial, statistically significant, and in the expected direction (see Figure 2).

Structural model testing Hypotheses 1 and 2: Is AA involvement a cause or consequence of better alcohol-related outcomes (or both)?

The structural model examines the presence of directional relationships between latent variables, thereby testing Hypotheses 1 and 2 in Figure 1. The overall fit of the structural model was very good, RMSEA = .024 (.020–.028), GFI = .99, and accounted for 47% of the variance in 2-year AA involvement and 38% of variance in 2-year alcohol problems. The results support Hypothesis 1 and do not support Hypothesis 2 (Figure 2). After accounting

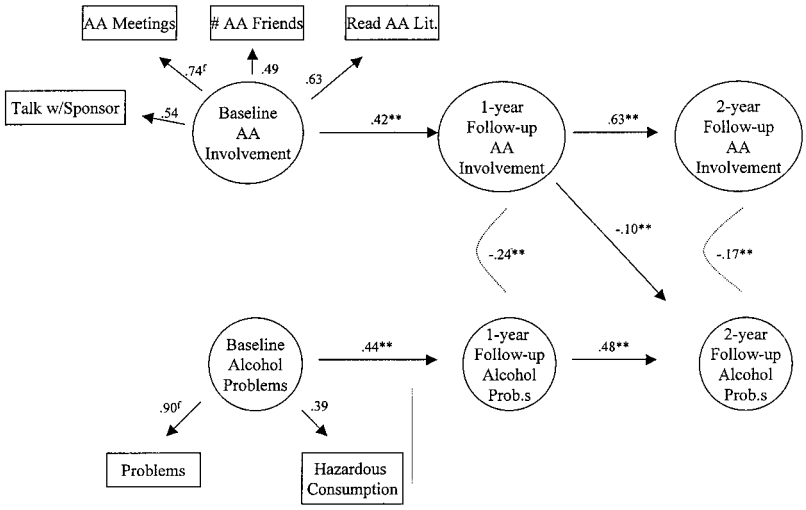

Figure 2. Structural model for Alcoholics Anonymous (AA) involvement and alcohol abuse from intake to 2-year follow-up. Large circles represent latent constructs and rectangles represent manifest variables. Standardized estimates are reported. [f] denotes parameters set to 1.0 in the unstandardized solution. Only significant paths are included in the model. Lit. = literature; Prob.s = problems. ** $p < .01$.

for baseline values of each latent variable, 1-year levels of AA involvement predicted 2-year levels of alcohol problems, but 1-year alcohol problems did not predict 2-year AA involvement.

Another way to analyze directional effects in an SEM is through the testing of nested effects. When the causal effect of 1-year alcohol problems was set to zero (removing the arrow from 1-year alcohol problems to 2-year AA involvement) the increase in chi-square was not significant, $\chi^2(1, N = 2{,}020) = 3.26$, $p = .76$. In contrast, when the causal effect of 1-year AA involvement on 2-year alcohol problems was set to zero (removing the arrow from 1-year AA involvement to 2-year alcohol abuse) the increase in chi-square was significant, $\chi^2(1, N = 2{,}020) = 20.10$, $p = .001$. Like the prior analysis, this approach indicates that the level of AA involvement predicts subsequent alcohol problems, whereas alcohol problems do not predict subsequent AA involvement.

Testing of Hypothesis 3: Does good prognosis explain the relationship of AA involvement and better alcohol-related outcomes?

To test for possible influences of good prognosis, we first added pretreatment levels of motivation to our model, resulting in a model with 7 latent variables and 22 indicator variables. The fit of the structural model including motivation was poorer than the previous model but still very good, RMSEA = .034 (.031–.037), GFI = .97, and accounted for 44% of the variance in 2-year AA involvement and 35% of variance in 2-year alcohol problems. Motivation was found to be negatively related to AA involvement and positively related to alcohol problems at 1-year follow-up. Although this seems counterintuitive, it is due to the fact that the ambivalence indicator variable is negatively related to AA in-

Table 2
Baseline, 1-Year, and 2-Year Data on 2,319 Substance Abuse Inpatients: Alcohol Abuse and AA Involvement

	Intake			1 year			2 year			
Variable	*M*	*SD*	%	*M*	*SD*	%	*M*	*SD*	%	*F*(2, 2316)
Alcohol impairment										
Hazardous alcohol consumption			93.2			41.8			37.5	
Alcohol- and drug-related problems	23.53	13.62		13.05[a]	13.05		8.85[a,b]	10.81		1162.56***
AA involvement										
No. meetings attended in past 3 months	0.79	1.10		1.32[a]	1.49		1.13[a,b]	1.44		121.34***
How often spoke with sponsor	0.29	0.92		0.81[a]	1.45		.72[a]	1.38		134.91***
No. friends in AA	0.96	1.43		1.52[a]	1.67		1.49[a]	1.68		146.69***
How often read AA material	0.97	1.41		1.45[a]	1.56		1.28[a,b]	1.52		75.88***

Note. Number of Alcoholics Anonymous (AA) meetings attended ranged from 1 to 5, with 1 = *never*, 2 = *1–9*, 3 = *10–19*, 4 = *20–29*, 5 = *30 or more.* Frequency of reading AA materials and talking with sponsor ranged from 1 = *never* to 5 = *several times a week.* The number of AA friends ranged from 1 = *none* to 5 = *4 or more.*

[a] Denotes significantly different from intake value at $p < .001$. [b] Denotes significantly different from 1-year value at $p < .001$.

*** $p < .001$.

volvement and positively related to alcohol problems. Inclusion of the motivation variable did not substantively alter the relationship between AA involvement and alcohol problems (Figure 3). Thus, the relationship between AA involvement and alcohol problems was not explained by baseline levels of motivation (i.e., the idea that people who are motivated at the outset of treatment evidence subsequently lower levels of alcohol problems and greater AA involvement).

In the second test of Hypothesis 3, psychopathology was included in the model by the use of a multisample analysis comparing patients with and without psychiatric comorbidity. The analysis with 7 latent variables and 21 manifest variables indicated a somewhat poor fit between the two groups (RMSEA = .735, GFI = .88) and led to the examination of separate SEMs for each group (see Figure 4). Analysis of the separate models yielded a good fit for the group with diagnosed psychopathology (RMSEA = .033, GFI = .95) and for the group without diagnosed psychopathology (RMSEA = .035, GFI = .97). As can be seen in Figure 3, the relationship between greater AA involvement at 1-year follow-up and better alcohol-related outcomes at 2-year follow-up is equivalent across groups. Hence, contrary to Hypothesis 3, the presence or absence of psychopathology does not change the relationship between AA involvement and positive outcome. The primary difference between the SEMs for each group lies in the fact that the motivation variable did not influence subsequent AA affiliation or alcohol problems for individuals with a diagnosed psychiatric disorder.

Discussion

The present findings are consistent with the hypothesis that AA involvement causes subsequent decreases in alcohol consumption and related problems. Specifically, higher first-year levels of AA involvement predicted better second-year alcohol-related outcome (Hypothesis 1), but first-year alcohol-related outcomes did not predict second-year AA involvement (Hypothesis 2). Further, the relationship between AA participation and better outcomes was present even after accounting for baseline levels of AA involvement and alcohol problems severity prior to treatment, indicating that AA's effect does not depend on prior experience with AA nor does it depend on having less-severe substance abuse problems at the beginning of treatment. These results are in accord with Project MATCH findings showing that participants randomized to 12-Step facilitation benefited from subsequent 12-Step group attendance (Project MATCH, 1997).

The addition of participants' level of motivation to our model did not alter the relationship between AA participation and lower subsequent alcohol problems. This finding casts doubt on the hypothesis that the apparent positive effects of AA are simply a reflection of motivated individuals being more likely to become involved in AA. The addition of psychopathology to our model also did not substantively alter the relationship between AA involvement and alcohol problems. The inclusion of psychopathology, however, did change the effects of motivation. For alcohol-dependent participants with an additional psychiatric disorder, the influence of motivation drops out of the model. Motivation may exert less influence for dual diagnosis participants than does their comorbid psychiatric disorder, relative to patients who only have an alcohol-dependence diagnosis. The findings of the different effects of motivation for dual diagnosis participants, though interesting, were not the subject of a prior hypothesis and, thus, require future replication.

The fact that motivation did not change the relationship between AA and positive outcome is only surprising if one construes motivation as a stable trait. As has been demonstrated experimentally and clinically, motivation to change is a dynamic variable that shifts depending on what helpers do (Kanfer & Schefft, 1988). The difference therefore between someone who attended 100 versus 2 AA meetings may have less to do with prior motivation than it does with what happened at initial AA meetings, that is, whether they nurtured motivation. From this perspective, the notion that

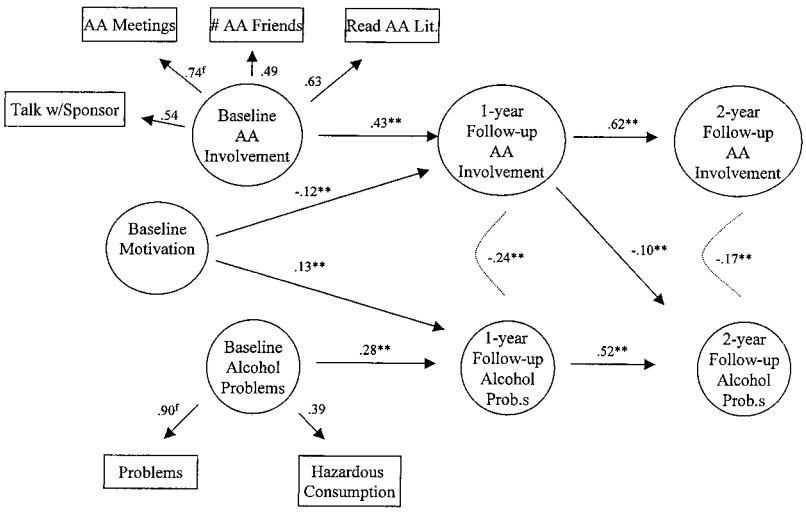

Figure 3. Structural model for AA involvement and alcohol abuse from intake to 2-year follow-up including baseline motivation. Large circles represent latent constructs and rectangles represent manifest variables. Standardized estimates are reported. [f] denotes parameters set to 1.0 in the unstandardized solution. Only significant paths are included in the model. Lit. = literature; Prob.s = problems. ** $p < .01$.

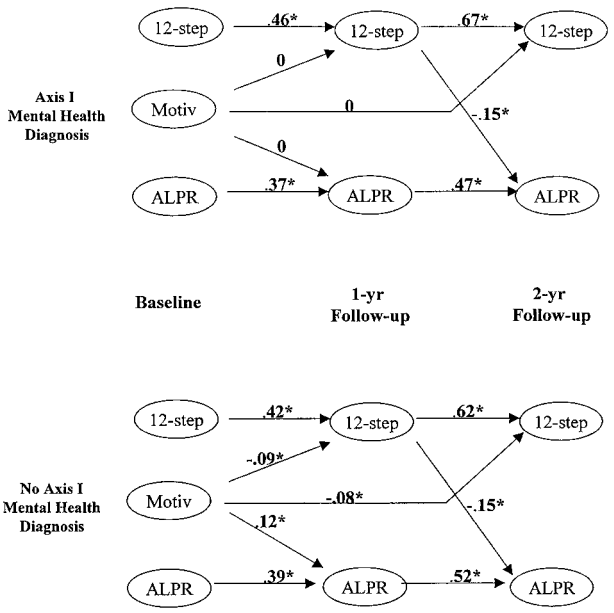

Figure 4. Multisample model shows separate structural equation models for the groups with and without a comorbid Axis I mental health diagnosis. Latent variables: 12-Step = level of 12-Step participation; Motiv = motivation; ALPR = level of alcohol problems; yr = year. * indicates the path is statistically significant.

long-term AA affiliates do not really benefit from AA but from their own motivation treats as a criticism of AA what may be one of its strengths: helping maintain motivation to change.

Several potential limitations of this study deserve comment. First, the absence of women from the sample may limit generalizability because of significant sex differences in how social relationships and substance abuse interact (Moos, Finney, & Cronkite, 1990). Second, because individuals were not randomly assigned to attend self-help groups, one could argue that the apparently positive outcomes are due to self-selection on prognostic variables other than those we tested, such as available social support or willingness to self-disclose. Third, although all patients in the sample were alcohol dependent, some also used illicit drugs. Thus, even though most aftercare referrals were directed toward AA, some patients may have also attended either Narcotics Anonymous or Cocaine Anonymous. Finally, substance use was determined by self-report. Although biological tests tended to confirm self-reports (Ouimette et al., 1997) only a subset of participants received such assays.

The current study increases confidence in the effectiveness of AA by using multiwave longitudinal data and by accounting for potential third variable influences such as motivation and psychopathology. However, questions remain concerning what specific mechanisms or mediational processes are involved in AA's success (see Finney, 1995; Humphreys, Mankowski, Moos, & Finney, 1999; Morgenstern et al., 1997). Previous research has suggested that the relationship between 12-Step self-help group participation and positive drinking outcomes is mediated by factors such as increased active coping behavior, improved social support for abstinence, and improved self-efficacy (Humphreys et al., 1999; Morgenstern et al., 1997). Such factors are present as well in behavioral treatments such as cognitive–behavioral therapy (Parks, Marlatt, & Anderson, 2001), coping skills training (Monti & Rohsenow, 1999), and perhaps as well in non-12-Step self-help groups such as SMART Recovery and the Secular Organization for Sobriety. Future studies comparing AA with other interventions might help answer important questions such as (a) Does AA provide specialized benefits in lowering long-term alcohol problems when compared with other self-help groups or outpatient after care programs? or conversely; (b) Does AA affiliation (attending meeting, working the steps, etc.) provide the same benefits that any good therapeutic treatment would provide (i.e., hope, treatment rationale, therapeutic alliance, mitigation of isolation; Bergin & Garfield, 1994)?; (c) Finally, does meeting attendance alone predict the same outcomes and to the same extent as does degree of engagement in 12-Step practices (doing service, reading literature), which may matter more for other outcomes such as subjective well-being (Montgomery, Miller, & Tonigan, 1995)?

The positive findings here should be viewed in light of the fact that a significant number of substance abuse patients never attend self-help groups after discharge (McKay et al., 1998). Hence, future research should focus on how clinicians might more effectively facilitate patients' participation in AA. Twelve-step oriented treatment programs appear to produce higher levels of AA involvement for patients after treatment (Humphreys & Moos, 2001). One direction for clinical research might involve investigating techniques for non-12-Step oriented treatment programs to better link participants to AA or, where available, to cognitive–behavioral self-help groups such as SMART Recovery.

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