

FROM: Longabaugh R, Wirtz PW (eds.). Project MATCH Hypotheses: Results and Causal Chain Analyses. Project MATCH Monograph Series v. 8 (NIH Pub. No. 01-4238). Bethesda, MD: National Institute on Alcohol Abuse and Alcoholism (NIAAA), 2001.

Part II: Alcohol Dysfunction

**Matching Clients to Alcoholism Treatment
Based on Severity of Alcohol Dependence**

**The Alcohol Involvement Matching Hypothesis
and Findings**

Matching Clients to Alcoholism Treatment Based on Severity of Alcohol Dependence

Ned L. Cooney, Ph.D., Thomas F. Babor, Ph.D., and Mark D. Litt, Ph.D.

ABSTRACT

Several studies have reported significant matching effects based on individual differences in severity of alcohol dependence. An alcohol dependence matching hypothesis developed for Project MATCH predicted that clients who have greater alcohol dependence would have better outcomes following Twelve Step Facilitation (TSF) than following Cognitive-Behavioral Coping Skills Therapy (CBT) or Motivational Enhancement Therapy (MET), relative to clients who have less alcohol dependence. The CBT versus TSF matching contrast was supported in the aftercare arm. However, this matching contrast was not supported in the outpatient arm, and the MET versus TSF matching contrast was not supported in either arm. The significant aftercare CBT versus TSF matching effects were found in the year after treatment, and it is not known whether these matching effects were maintained beyond 1 year because the aftercare sites did not participate in the 3-year followups. Aftercare clients with severe dependence had better drinking outcomes (higher percentage of days abstinent (PDA) and lower drinks per drinking day (DDD)) when assigned to TSF, while those with low levels of dependence had better outcomes (higher PDA and lower DDD) when assigned to CBT. In a post hoc analysis, subjects in the aftercare sample were divided into groups; those with scores on the Ethanol Dependence Syndrome Scale less than or equal to 35 were classified low dependence, and those with scores greater than 35 were classified high dependence. Matched clients had a 10-percent higher success rate than mismatched clients and a 5-percent higher success rate than unmatched (randomly assigned) clients. These effects are not large, so clinicians should expect only modest gains from using this matching strategy. Process analyses supported the hypothesis that the alcohol dependence matching effect in the aftercare arm was mediated by differences in the degree of therapist emphasis on abstinence. Only partial support was found for the other causal chain hypothesis that Alcoholics Anonymous attendance mediated the dependence-treatment matching effect.

In part to address the perceived need for improved nomenclature, consistent classification criteria, and more objective measurement procedures, several investigators have postulated a construct termed the alcohol dependence syndrome (ADS). First introduced in a seminal paper by Edwards and Gross (1976), the construct was given its most formal description in 1977 by a group of investigators convened by the World Health Organization (Edwards et al. 1977) and has recently provided the conceptual underpinnings for the definition

of dependence criteria in DSM-III-R (Rounsaville et al. 1986; American Psychiatric Association 1987), ICD-10 (World Health Organization 1992), and DSM-IV (American Psychiatric Association 1995).

Ned L. Cooney, Ph.D.
VA Connecticut Healthcare System (116B)
950 Campbell Avenue
West Haven, CT 06516
E-mail: ned.cooney@yale.edu

As an empirical clustering of cognitive, behavioral, and physiological phenomena, the ADS includes the following seven elements (Edwards and Gross 1976; Edwards et al. 1977):

- Narrowing of the drinking repertoire, that is, a tendency for the drinking pattern to become stereotyped around a regular schedule of almost continuous daily alcohol consumption.
- Increased salience of drink-seeking behavior, such that alcohol is given greater priority than its adverse consequences or inconveniences.
- Increased tolerance to alcohol, reflected in a capacity to sustain high levels of consumption and the need to drink more alcohol than previously to achieve a constant level of effect.
- Repeated withdrawal symptoms, including affective disturbance, tremor, nausea, and sweating.
- Relief or avoidance of withdrawal by further drinking.
- Subjective awareness of compulsion to drink, including such phenomena as craving for alcohol, impaired control of alcohol intake once drinking has commenced, and difficulty in abstaining from drinking.
- Rapid reinstatement of symptoms if drinking is resumed after a period of abstinence.

The last element is no longer considered as a diagnostic criterion because it describes a characteristic of the syndrome as a whole.

There is now good evidence from interview and questionnaire studies to show that the main components of dependence can be reliably assessed (Stockwell et al. 1983; Babor 1996) and that many of them cluster together to form a core syndrome (Edwards 1986; Babor, Lauer- man, and Cooney 1987). Factor analytic studies have not only provided support for the construct validity of a single alcohol dependence factor (Kosten et al. 1987; Skinner and Allen 1982) but have also demonstrated that the construct has similar characteristics in alcoholic clients and heavy drinkers in different cultures (Babor, Lauer- man, and Cooney 1987; Hall et al. 1993; Allen et al. 1993). Finally, one study has shown that dependence severity predicts the rapidity of reinstatement of dependence symptoms after

a period of abstinence (Babor, Cooney, and Lauer- man 1987).

Evidence for Matching

In addition to research on the construct valid- ity and predictive utility of the ADS concept, several studies suggest that the severity of alco- hol dependence may have implications for treat- ment matching. Polich and associates (1981), for example, looked at higher order interaction effects between alcohol dependence, marital status, age, and relapse to drinking at 18 months and 4 years after treatment. Older men with a high severity of dependence at admission to treatment had a lower risk of relapse if they abstained rather than engaged in nonproblem drinking at 18 months, regardless of marital status. The reverse was true for younger men with low dependence severity. But for older men with low dependence and younger men with high dependence, marital status played a mod- erating role. Those who were married had lower relapse rates if they abstained, whereas non- married men had lower relapse rates if they were nonproblem drinkers. Other studies have also shown that severity of dependence is a strong predictor of the alcoholic's ability to en- gage in nonproblem drinking over time (Sanchez-Craig et al. 1984; Foy et al. 1984; Tay- lor et al. 1986; Vaillant 1983).

Only a few studies have evaluated severity of dependence in relation to treatment in a ran- domized trial. Orford and colleagues (1976) con- cluded that clients who had been classified as severely dependent (i.e., gamma alcoholics) were more likely to have better 2-year outcomes if they had received treatment (outpatient plus inpatient) rather than one session of advice. Conversely, nongamma alcoholics fared better if they received advice rather than treatment. A 10-year followup study of these clients indicated that the better outcome of the more dependent clients was associated with more treatment and Alcoholics Anonymous (AA) involvement (Tay- lor et al. 1986). However, a more recent reanal- ysis of the 1-year outcomes of the Orford group's (1976) study found no evidence for a treatment- matching effect and called into question the

conclusions of the original report (Edwards and Taylor 1994).

Given these conflicting findings, there is reason to evaluate the alcohol dependence hypothesis in a more precise and systematic way. The original study by Orford and associates (1976) and the recent secondary analysis of the 1-year outcome data (Edwards and Taylor 1994) were based on measures of dependence and treatment outcome that were not designed to explore the treatment-matching implications of dependence. The matching hypothesis was tested in an entirely post hoc manner. It was based on a rather crude classification of clients as gamma and nongamma alcoholics, and the predictions dealt with the relationship between dependence and intensity of therapy, rather than dependence and type of treatment. Given these limitations, and the wide acceptance of the original findings, it seemed important to conduct a more systematic test of the dependence severity hypothesis in Project MATCH.

Statement of Hypothesis

This hypothesis is based on research and speculation suggesting that the alcohol dependence syndrome has important implications for treatment matching. It differs from the hypothesis on alcohol involvement discussed elsewhere in this volume in that the matching variable is more specific (alcohol dependence versus alcohol involvement) and the predicted interactions are different. For example, the alcohol involvement hypothesis predicted that Cognitive-Behavioral Coping Skills Therapy (CBT; Kadden et al. 1992) and Twelve Step Facilitation (TSF; Nowinski et al. 1992) would have similar impacts on clients with higher dependence, while the present hypothesis predicted that these treatments would have a differential impact on clients as severity of dependence increased.

All a priori matching hypotheses in Project MATCH were specified as predictions that the slopes of the regression lines of the matching variable on the primary outcome variables would significantly differ across specified treatments. The hypotheses identified the directional nature of the difference in slopes, but

they did not specify whether or where the regression lines intersected. Thus, the alcohol dependence matching hypothesis was specified as follows: *Clients who have greater alcohol dependence will have better outcomes following TSF than following CBT or Motivational Enhancement Therapy (MET; Miller et al. 1992), relative to clients who have less alcohol dependence.*

We tested this hypothesis as two a priori contrasts, one comparing TSF and CBT and the other comparing TSF and MET. As illustrated in figure 1, we predicted that the slope of the TSF regression line would be more positive than the slopes of the CBT or MET regression lines. No prediction was made regarding whether or where the regression lines intersect. The alpha level was divided evenly between the two contrasts.

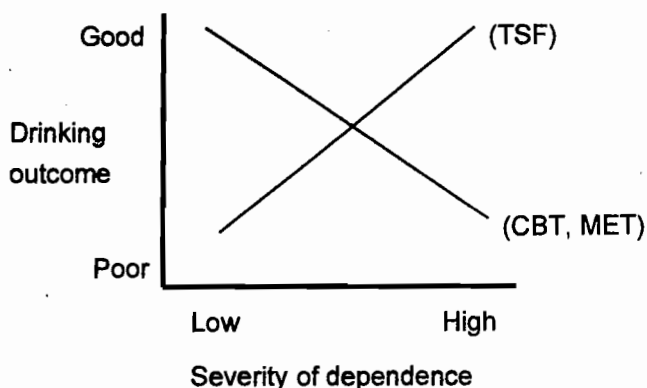


Figure 1. Predicted relationships between severity of dependence and drinking outcome for clients treated with TSF, CBT, and MET.

Measurement of Matching Variable

Matching Variable

Dependence severity was measured by means of the Ethanol Dependence Syndrome Scale (EDSS), a set of 16 self-report items developed and validated by Babor and colleagues (Hesselbrock et al. 1983; Hall et al. 1993; Babor 1996). This scale has been demonstrated to predict intensity of reinstatement of drinking among individuals who relapsed after inpatient treatment (Babor, Cooney, and Lauerma 1987). An analysis of the baseline Project MATCH data (Babor 1996) showed that the scale has a

normal distribution (skewness=0.35, $n=1702$) and good test-retest as well as internal consistency reliability ($\alpha=0.90$, $n=1543$). The total dependence score on the EDSS is highly correlated with the Alcohol Use Inventory G scale ($r=0.69$, $n=1590$).

Dependent Variables

The primary dependent measures used to evaluate the dependence hypothesis were drinks per drinking day (DDD) and percentage of days abstinent (PDA). These were derived from data obtained in Form 90 interviews (Miller and Del Boca 1994) scheduled every 3 months in the year following treatment. Data from these followups were also used to compute a composite outcome variable (Zweben and Cisler 1996) that was used as a secondary outcome measure.

Causal Chain Hypotheses

Two causal chain hypotheses were developed prior to examination of outcome data. The dependence-matching effect was thought to be

mediated by (a) the degree of emphasis that the therapist placed on abstinence as a goal of treatment and (b) differences in the client's frequency of AA attendance. Figure 2 illustrates these hypothesized causal models.

The first causal chain hypothesis predicted a mediating role for the degree of emphasis that the therapist placed on abstinence as a goal. TSF therapists were expected to give a strong message to clients that complete abstinence is necessary because any alcohol consumption is likely to lead to loss of control; CBT and MET therapists were not expected to emphasize abstinence and loss of control as strongly or as explicitly. CBT provided explicit instruction in how to cope after a "lapse."

Highly dependent clients were expected to do poorly with CBT because their coping skills would be inadequate to deal with lapses. In these clients, a high level of dependence is thought to produce rapid reinstatement of dependence symptoms after the reinitiation of drinking. MET used an empathic, client-centered, gently persuasive approach to help clients who are ambivalent about abstinence to consider their options. Severely dependent clients were expected to do poorly with MET because it was thought they might attempt to pursue a moderate drinking goal or they may need more than client-generated strategies.

On the other hand, clients with mild dependence were expected to do well with CBT because they could effectively utilize the lapse-coping skills, and they would also do well with MET because they might have a reasonable chance of success if they chose a moderate drinking goal. In contrast, clients with low levels of dependence were expected to do poorly with TSF because the notion of loss of control that is strongly emphasized in AA would not be consistent with their personal experience of their own drinking history.

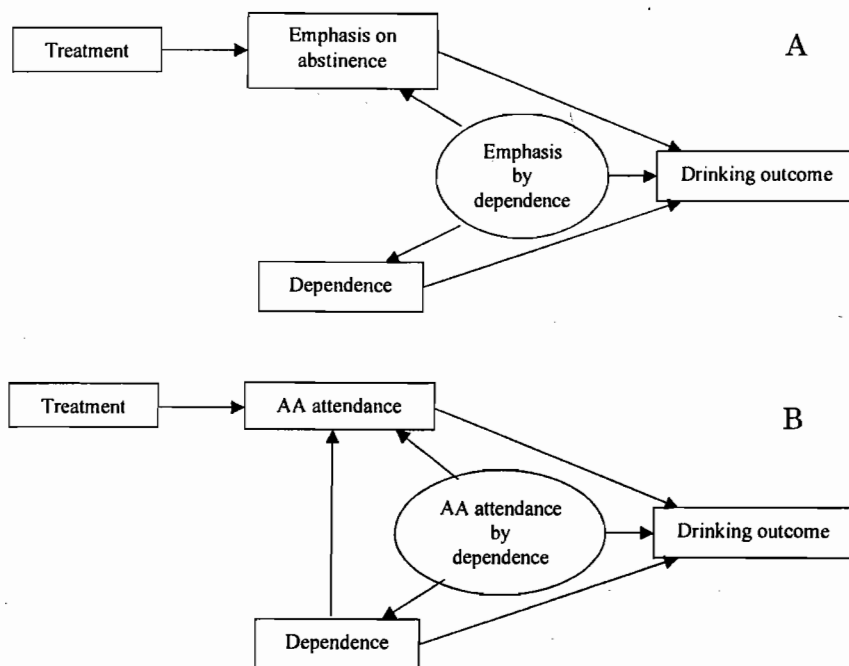


Figure 2. Hypothetical causal chains for matching based on alcohol dependence. (A) Causal chain in relation to therapist's emphasis on abstinence. (B) Causal chain in relation to AA attendance.

A second causal chain hypothesis predicted a mediating role for AA attendance. First, it was predicted that TSF would result in more AA meeting attendance across all types of clients compared with CBT or MET. Second, it was predicted that severely dependent clients would attend more AA meetings than mildly dependent clients. This prediction was based on the expectation that clients who attended AA meetings would be likely to receive the message that any drinking would result in loss of control. This loss of control message was expected to resonate in the highly dependent subjects because they have frequently experienced such loss of control. On the other hand, the loss of control message was expected to be dissonant to clients with mild dependence. The degree of concordance between the loss of control message and previous experience of clients was expected to affect AA meeting attendance.

Frequent AA attendance was expected to be associated with reduced drinking. However, to produce a matching effect, the impact of AA attendance on drinking should be different for clients with severe or mild dependence. Among severely dependent clients, greater AA attendance was predicted to be associated with less drinking, and this AA-drinking correlation was expected to be lower in mild or moderately dependent clients (i.e., AA attendance really helps severely dependent clients while an absence of AA predicts failure in these clients).

Results

The prognostic and matching effects involving alcohol dependence were previously reported in Project MATCH Research Group (1997b). These findings are summarized below.

Prognostic Effects of Severity of Dependence

The prognostic effects of pretreatment dependence on posttreatment alcohol consumption were examined first. Prognostic analyses were conducted using the same latent growth approach that was utilized in the previously reported analysis of matching effects (Longabaugh and Wirtz, this volume, p. 4; Project

MATCH Research Group 1997a). The prognostic model included a backward elimination adjustment for the other significant a priori matching attributes and their matching interaction effects. As previously reported, dependence was a significant predictor of PDA in the outpatient arm ($p < .01$), with more severe dependence associated with a lower frequency of drinking. Dependence did not predict DDD in the outpatient arm, nor did it predict PDA or DDD in the aftercare arm.

Dependence by Treatment Interaction Effects

Interaction effects were modeled as a "latent growth process" as described in the chapter by Longabaugh and Wirtz (this volume, p. 4) and the Project MATCH Research Group (1997a). Table 1 shows F and nondirectional p values for all possible dependence by treatment interaction effects. Our a priori matching hypotheses predicted better outcomes for high-dependence clients in TSF and better outcomes for low-dependence clients in CBT or MET. The predicted interaction effects contrasting CBT versus TSF treatments reached a Bonferroni-corrected level of significance for PDA (directional $p < .01$) and for DDD (directional $p < .01$) outcomes in the posttreatment period in the aftercare arm. Figure 3 shows that these were disordinal interactions. Aftercare clients with severe dependence had better drinking outcomes (higher PDA and lower DDD) when assigned to TSF, while those with low levels of dependence had better outcomes (higher PDA and lower DDD) when assigned to CBT.

To evaluate the clinical relevance of these matching effects, we estimated the PDA and DDD outcomes for clients with pretreatment dependence scores in the highest and lowest decile for the aftercare sample. Matched clients drank on average approximately 7 to 10 percent fewer days or about 2.5 fewer days per month. It is more difficult to interpret differences in DDD because clients who were abstinent for a given posttreatment month were assigned a DDD score of zero for those months.

As shown in table 1, CBT versus TSF treatment by dependence interaction effects were

Table 1. F statistics and nondirectional p values for all dependence by treatment condition interaction effects

Treatment contrast	Within treatment				Posttreatment				
	MV × Tx		MV × Tx × T		MV × Tx		MV × Tx × T		
	PDA	DDD	PDA	DDD	PDA	DDD	PDA	DDD	
Outpatient arm									
CBT vs. MET	F	0.02	0.40	1.99	1.21	0.41	0.72	1.19	0.00
	p	.89	.53	.16	.27	.52	.40	.28	.96
CBT vs. TSF	F	0.40	0.03	0.12	0.25	0.18	0.15	0.56	1.23
	p	.53	.87	.72	.62	.67	.70	.45	.27
MET vs. TSF	F	0.59	0.67	1.23	0.42	1.14	0.25	0.15	1.28
	p	.44	.41	.27	.52	.28	.62	.70	.26
MV × Tx	F	0.35	0.36	1.08	0.60	0.58	0.36	0.62	0.86
	p	.71	.70	.34	.55	.56	.70	.54	.42
Aftercare arm									
CBT vs. MET	F	1.44	1.04	2.53	4.20	2.86	2.13	0.01	0.31
	p	.23	.31	.11	.04	.09	.15	.91	.57
CBT vs. TSF	F	1.30	0.34	0.88	2.46	6.30	5.34	1.37	0.12
	p	.26	.56	.35	.12	.01	.02	.24	.73
MET vs. TSF	F	0.00	0.17	0.35	0.18	0.62	0.69	1.00	0.74
	p	.97	.68	.55	.68	.43	.41	.32	.39
MV × Tx	F	0.95	0.53	1.30	2.37	3.37	2.79	0.78	0.38
	p	.39	.59	.27	.09	.03	.06	.46	.69

NOTE: MV=matching variable, Alcohol Dependence; Tx=treatment; T=time; PDA=percentage of days abstinent; DDD=drinks per drinking day

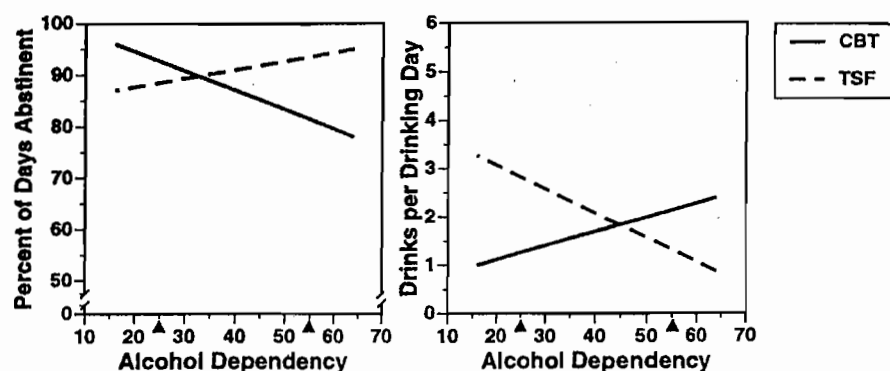


Figure 3. Posttreatment plot of percentage of days abstinent and drinks per drinking day in the aftercare arm showing the interaction between CBT and TSF treatments and baseline alcohol dependence. The vertical axes represent predicted outcome scores, and the horizontal axes represent baseline alcohol dependence, with higher scores indicating higher dependence. The triangles on the horizontal axes indicate the 10th and 90th percentiles for alcohol dependence in the aftercare arm. (Reprinted with permission from *Journal of Studies on Alcohol*, Vol. 58, pp. 7–29, 1997. Copyright by Alcohol Research Documentation, Inc., Rutgers Center of Alcohol Studies, Piscataway, NJ 08854.)

significant predictors of outcome in the aftercare arm in the posttreatment period. However, this matching contrast was not significant during the active treatment period, nor was it significant in the outpatient arm in the within-treatment or post-treatment periods. In addition, none of the expected interaction effects contrasting TSF and MET treatments was significant.

In order to gain another perspective on the magnitude of the alcohol dependence-matching effects, we examined the impact of applying a dependence matching strategy on a composite

outcome variable. The entire sample of aftercare subjects was divided into matched or mismatched groups. High-dependence subjects were considered matched when they were randomly assigned to TSF and mismatched when randomly assigned to CBT, while low-dependence subjects were considered matched when assigned to CBT and mismatched when assigned to TSF. Subjects in the aftercare sample were divided into low- and high-dependence groups with the cut point based on the EDSS score at the intersection point in figure 3. Scores less than or equal to 35 were classified low dependence and scores greater than 35 were classified high dependence.

Outcome was examined using a composite outcome variable based on drinking measures from the Form 90 (Miller 1996) and alcohol-related negative consequences from the DrInC questionnaire ((Miller et al. 1995; see Zweben and Cisler 1996 for a description of the composite outcome variable). Outcome was classified as a "success" when a subject reported no heavy drinking or alcohol-related negative consequences in the preceding 3 months. Outcome was classified as a "failure" when a subject reported any heavy drinking and/or consequences in the 3-month window. Figure 4 reveals that the maximum matching effect in the aftercare arm on the composite outcome measure occurred during the 4 to 9 months after

termination of treatment. Matched clients had an approximately 10-percent higher success rate than mismatched clients and an approximately 5-percent higher success rate than unmatched (randomly assigned) clients.

Causal Chain Results for Emphasis on Abstinence

The first causal chain analysis tested for the possible mediating role of differential emphasis on abstinence versus moderation and loss of control versus lapse coping. The assessment of treatment process in Project MATCH used methodology adapted from the National Institute of Mental Health Collaborative Study on Treatment of Depression (Elkins et al. 1985). Every Project MATCH session was videotaped, and Likert-type items for rating these tapes were generated from treatment manuals. After the MATCH Tape Rating Scale (MTRS) was developed, all session tapes from the second week of treatment and a randomly selected subsample of 150 week-6 session tapes were rated (see Carroll et al. 1998 for a detailed description of the MTRS). The following items from the MTRS were analyzed as potential mediating variables.

- Item 40. To what extent did the therapist discuss or address the patient's commitment to abstinence? (*Commitment to Abstinence*)

- Item 46. To what extent did the therapist explicitly discuss the rationale for/advantages of a treatment goal of abstinence OR the disadvantages of a treatment goal of reduction rather than cessation of alcohol use? (*Abstinence as a Goal*)

- Item 47. To what extent did the therapist convey to the patient that a slip does not necessarily mean that the patient will experience a full-blown relapse? (*Slip Is Not Relapse*)

Is there a greater emphasis on abstinence as the goal of treatment in TSF than in CBT or MET? The mean ratings on

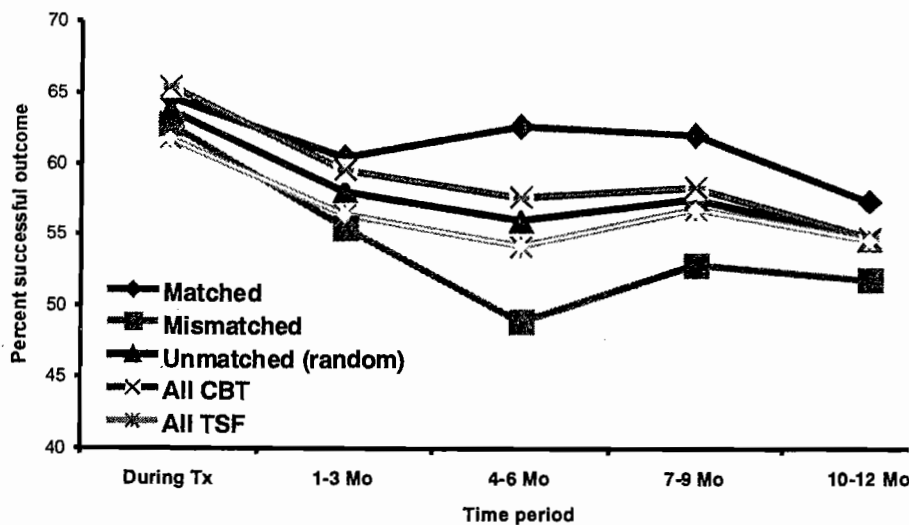


Figure 4. Alcohol dependence matching effects on composite outcome across time. Matching to CBT versus TSF, aftercare arm. Matching strategy: EDSS <35 assigned to CBT; EDSS > 35 assigned to TSF.

items measuring commitment to abstinence, abstinence as a treatment goal, and the belief that a slip is not a relapse were examined by treatment condition for the outpatient and aftercare samples. Multivariate tests indicated main effects of treatment condition on these MTRS items in both the outpatient arm (Wilk's Lambda=0.89; $F(6, 1462)=15.02$; $p<.001$) and the aftercare arm (Wilk's Lambda=0.84; $F(6, 1214)=18.68$; $p<.001$).

In the outpatient arm, univariate tests suggested that the items measuring Commitment to Abstinence ($F(2, 733)=14.08$; $p<.001$) and Abstinence as a Goal ($F(2, 733)=16.76$; $p<.001$) were responsible for the effect. There were no significant differences among treatments on the Slip Is Not Relapse item. Scheffé multiple comparisons, contrary to predictions, indicated the MET sessions were rated higher than CBT or TSF sessions on Commitment to Abstinence. On the other hand, as predicted, TSF was rated higher than CBT or MET on the Abstinence as a Goal item (table 2).

In the aftercare arm, univariate tests again found differences on Commitment to Abstinence ($F(2, 609)=29.38$; $p<.001$), and on Abstinence as a Goal ($F(2, 609)=7.99$; $p<.001$) but not on Slip Is Not Relapse. Scheffé multiple comparisons, contrary to predictions, indicated that MET was higher than TSF, but consistent with predictions, TSF was higher than CBT on Commitment to Abstinence. Also consistent with predictions, TSF was higher than CBT or MET on Abstinence as a Goal.

The answer to the causal chain question posed above is somewhat mixed. In both the outpatient and aftercare arms, there was a greater emphasis on abstinence as a goal of treatment in the TSF sessions. High scores for the MET condition on Commitment to Abstinence may be the result of MET's explicit focus on encouraging commitment to change. The absence of high scores on Abstinence as a Goal in the MET condition suggests that the MET focus on commitment to change was not always a focus on commitment to abstinence. With this pattern of tape-rating results in mind, we decided to conduct further causal chain analyses on the Abstinence as a Goal item, believing that it had the best potential to reflect the process underlying dependence matching effects.

Do differences in emphasis on abstinence have a differential impact on clients with high and low dependence? We expected that a greater degree of emphasis on abstinence would result in less drinking among clients with high dependence, while a lack of emphasis on abstinence would result in less drinking among clients with low dependence. To test this, we examined the dependence by emphasis on abstinence interaction effect in a series of repeated-measures analyses of variance (ANOVA) models containing the following terms: baseline drinking, site, main effect of dependence, and main effect of emphasis on abstinence. Dependent variables were monthly PDA and DDD in separate analyses.

Table 2. Means and (SDs) for Emphasis on Abstinence items from the MATCH Tape Rating Scale

	Outpatient			Aftercare		
	CBT <i>n</i> =233	MET <i>n</i> =249	TSF <i>n</i> =264	CBT <i>n</i> =210	MET <i>n</i> =209	TSF <i>n</i> =193
Commitment to Abstinence	1.76 (.93)	2.22 (1.07)	1.88 (1.02)	1.41 (.79)	2.15 (1.09)	1.65 (.86)
Abstinence as a Goal	1.37 (.71)	1.54 (.86)	1.88 (1.10)	1.18 (.58)	1.27 (.59)	1.56 (.89)
Slip Is Not Relapse	1.28 (.64)	1.17 (.51)	1.25 (.57)	1.23 (.75)	1.22 (.69)	1.25 (.59)

NOTE: MATCH Tape Rating Scale items range from 1 to 5.

In the outpatient arm, the dependence by emphasis on abstinence interaction effect was not significant for either PDA or DDD. On the other hand, this interaction effect was significant in the aftercare arm for both PDA ($F(1, 351)=5.60$; $p<.05$) and for DDD ($F(1, 351)=4.78$; $p<.05$). Figure 5 shows this interaction effect, revealing that low-dependent aftercare clients had better PDA outcomes when assigned to therapists who did not give an abstinence message. High-dependent aftercare clients had equivalent outcomes regardless of the degree of emphasis on abstinence.

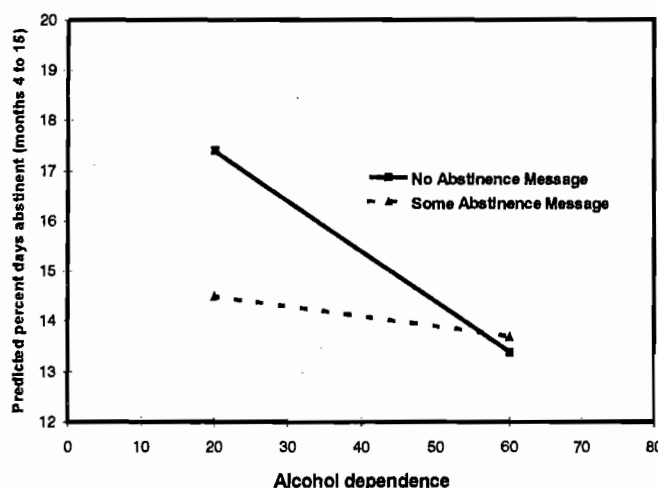


Figure 5. Interaction of therapy emphasis on abstinence with alcohol dependence in the aftercare arm, CBT and TSF clients only.

The ultimate test of whether or not emphasis on abstinence mediated the dependence-matching effect is to examine a repeated-measures ANOVA model containing both a treatment by dependence term and an emphasis on abstinence by dependence term along with their associated main effects. When this was done, the treatment by dependence term was made nonsignificant for PDA outcome ($F(1, 344)=1.85$; $p>.1$) and for DDD outcome ($F(1, 344)=3.40$; $p>.05$). This supports the conclusion that, particularly for PDA outcome, the alcohol dependence matching effect in the aftercare arm was mediated by differences in the degree of therapist emphasis on abstinence.

AA Attendance Causal Chain Results

Do severely dependent clients attend more AA meetings than less dependent clients? Do TSF clients attend more AA meetings than CBT or MET clients? Frequency of AA meeting attendance was assessed by research interviews conducted at posttreatment and at 3, 6, 9, and 12 months following treatment. Repeated-measures analysis of covariance (ANCOVA) using type-1 sum of squares (i.e., a hierarchical procedure) was used to determine the effects of pre-treatment dependence and treatment assignment on the five repeated measures of AA meeting attendance, adjusting for site differences. Factors were entered in the following order: site, treatment assignment, baseline dependence, and the interaction of treatment with dependence.

In the outpatient arm, AA meeting attendance was associated with higher dependence ($F(1, 831)=24.39$; $p<.001$), with treatment assignment ($F(2, 831)=20.48$), and with a significant dependence by treatment interaction ($F(2, 831)=5.31$; $p<.01$). Although dependence was analyzed as a continuous variable, it was trichotomized to illustrate these effects. As shown in figure 6, the high-dependence outpatient clients assigned to TSF treatment attended approximately twice as many AA meetings as did clients assigned to CBT or MET.

Among aftercare clients, AA meeting attendance was also associated with higher dependence ($F(1, 673)=16.31$; $p<.001$) and with treatment assignment ($F(2, 673)=6.36$; $p<.001$). However, the treatment by dependence interaction effect was nonsignificant. Thus, it is concluded that in both the outpatient and aftercare arms, TSF resulted in more AA meeting attendance than CBT or MET, and more severely dependent clients were more likely to attend AA meetings. The relationship between dependence and AA attendance is particularly strong in the outpatient TSF treatment condition.

Is AA attendance predictive of less alcohol consumption? Does AA attendance have a differential impact on clients with high and low dependence? Repeated-measures ANCOVA using type-1 sum of squares was used to determine the predictive effects of within-treatment AA

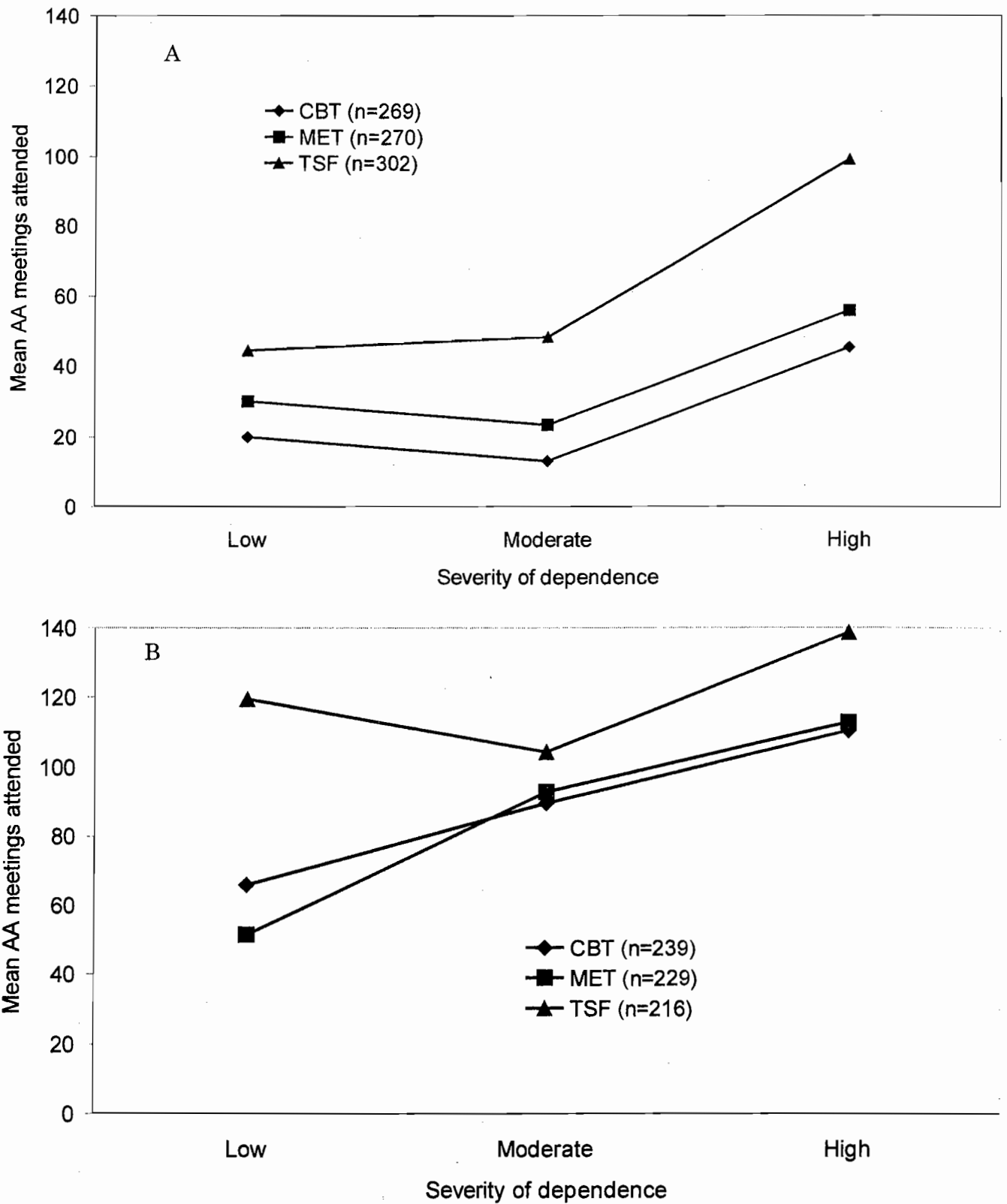


Figure 6. AA attendance by dependence score for each treatment condition. (A) Outpatient arm (N=841). (B) Aftercare arm (N=684)

attendance and treatment assignment on 12 monthly measures of drinking, adjusting for site differences. In these analyses, baseline drinking was the covariate. Factors were then entered in the following order: AA attendance during treatment, baseline dependence score, and the interaction of AA attendance with baseline dependence.

In the outpatient arm, more frequent AA attendance within treatment was positively associated with PDA in the year after treatment ($F(1, 843)=47.13$; $p<.001$), and the AA attendance by dependence interaction was not significant. DDD outcome results were similar, with a significant prognostic effect found for AA attendance ($F(1, 843)=41.07$; $p<.001$) and a nonsignificant AA attendance by dependence interaction.

Aftercare arm results mirrored those in the outpatient arm. AA attendance within treatment was predictive of PDA outcome ($F(1, 670)=40.51$; $p<.001$), with a nonsignificant AA attendance by dependence interaction. Similarly, AA attendance predicted DDD in the aftercare arm, with a nonsignificant AA attendance by dependence interaction.

In summary, in both the outpatient and aftercare arms, TSF clients attended more AA meetings than CBT or MET clients, severity of alcohol dependence was a strong predictor of AA attendance, and AA attendance was a strong predictor of drinking outcome. However, no evidence was found in either arm for an AA attendance by dependence interaction effect. This interaction effect also was not significant when the analyses were repeated using only clients assigned to the CBT and TSF conditions. Thus, we do not have evidence to support the hypothesis that differences in AA attendance mediated the dependence treatment-matching effect involving CBT and TSF treatments. Although elements of the AA attendance causal chain were supported, the overall chain does not explain the dependence-matching effects.

Discussion

The degree of alcohol dependence has long been considered an important variable in planning treatment (Lindstrom 1992). In the

present study, it was hypothesized that TSF, a treatment that was thought to put greater emphasis on the need for total abstinence (because of the alcoholic's assumed powerlessness over alcohol), would be more effective with highly dependent clients than either CBT, which teaches relapse prevention skills, or MET, which focuses on motivating clients to develop their own strategy to achieve abstinence. In addition, it was hypothesized that CBT would be more effective with clients at low levels of dependence because they could make greater use of coping skills. Finally, low-dependence clients were expected to respond well to MET because they might prefer its greater flexibility regarding abstinence versus nonabstinence treatment goals.

In contrast, low-dependence clients treated in TSF were expected to do poorly because the disease concept promoted by AA, with its emphasis on loss of control, would be inconsistent with their experience. To the extent that a major feature of severe dependence is impaired control over drinking, TSF is likely to be more effective with severely dependent alcoholics because of its assumption that loss of control occurs immediately with alcohol ingestion and its emphasis on the need to obtain support from the AA Fellowship.

The results from the aftercare treatment arm of the trial were consistent with the outcome predictions involving the TSF versus CBT contrast. Clients low in dependence had better outcomes when treated in CBT than when treated in TSF, while those high in dependence had better outcomes in TSF than in CBT. When clients were matched to CBT or TSF treatments using a cut point of 35 on the Ethanol Dependence Syndrome Scale, the success rate for matched clients was approximately 10 percent higher than for mismatched clients and approximately 5 percent higher than for randomly assigned clients. These effects are not large, so clinicians should expect only modest gains from using this matching strategy.

Although there was support for the alcohol dependence-matching hypothesis in the aftercare arm, there was no evidence for matching in the outpatient arm. There also was no evidence of matching effects involving the TSF versus MET contrast. TSF versus CBT matching

effects observed in the aftercare arm were not evident during the treatment phase. These effects only emerged in the year following termination of treatment.

There are several possible explanations for the finding of some significant dependence matching only in the aftercare arm. First, the distribution of dependence scores in the aftercare sample contained many more clients with high dependence than did the outpatient sample. Sixty-four percent of the aftercare sample met the definition of high dependence, compared with only 37 percent of the outpatient sample. It is therefore possible that there was not a sufficient number of high-dependence clients in the outpatient sample to find a dependence matching effect. Recent changes in treatment practices might result in a greater number of severely dependent clients being admitted directly to low-intensity outpatient treatment than was the case when Project MATCH was conducted. If the difference in matching effects across Project MATCH arms is due to the baseline dependence distribution, then outpatient settings with greater numbers of highly dependent clients might also find dependence-matching effects.

A second possible explanation for the lack of matching effects in the outpatient arm is that aftercare clients probably received more encouragement to totally abstain from drinking and to attend AA meetings in the context of the intensive treatment delivered prior to randomization to Project MATCH therapies. This may have provided highly dependent aftercare clients assigned to TSF with a greater overall dose of matched treatment, while aftercare clients with low dependence assigned to TSF received an overall greater dose of mismatched treatment. On the other hand, outpatient clients in TSF may not have received enough of a 12-step dose to produce dependence-matching effects. This explanation would imply that a greater intensity or duration of TSF may be needed to produce matching effects among clients directly admitted to outpatient treatment.

A third potential reason for the differences among study arms is that aftercare clients were more likely to have "hit bottom," suffering severe negative consequences of drinking. This

could have made it more likely that they would recognize their need for the support of AA.

The expected TSF versus MET matching effect did not emerge. This hypothesized matching contrast was in part based on the idea that severely dependent clients needed more than the client-generated strategies employed in MET. However, severely dependent clients assigned to MET in the aftercare arm actually received a substantial amount of other therapy prior to the start of their MET aftercare therapy. This prior treatment may have diluted the difference between aftercare MET and TSF in intensity of treatment, washing out any potential MET versus TSF matching effect.

Causal chain analyses shed some light on the processes underlying the aftercare CBT versus TSF matching effects. Ratings of videotapes obtained from therapy sessions confirmed the expectation that TSF treatment had a greater emphasis on abstinence as a goal of treatment than CBT treatment. Research on controlled drinking (Sobell and Sobell 1995) suggests that the recovery of severely dependent individuals predominantly involves abstinence, while the recovery of those who are not severely dependent predominantly involves moderate drinking. The association between dependence severity and outcome type appears to be independent of advice provided in treatment. Thus, dependence-matching effects may have occurred in Project MATCH because clients preferred and participated more actively in treatments that emphasized recovery outcomes that they had an inherent likelihood of achieving.

Another causal chain model that was not fully supported was the idea that the matching effects were mediated by differences in AA attendance. We did find that severely dependent clients were more likely to attend and get involved in AA meetings than were clients without severe dependence. These results are consistent with the findings of a meta-analysis (Emrick et al. 1993) that reported that AA affiliation was modestly associated with variables indicative of dependence (greater loss of control over drinking, higher daily quantity of alcohol consumption, more physical dependence, more severity of dependence, and more obsessive-compulsive involvement with drinking). We

also found that greater AA attendance during treatment was predictive of better posttreatment outcomes. What was missing from this causal chain was evidence that AA attendance had a differential impact on clients with high and low dependence.

Conclusions

- On intake, clients were administered the 16-item Ethanol Dependence Syndrome Scale (EDSS). After an intensive treatment episode, outcomes were improved by matching those with high dependence (scoring greater than 35 on the EDSS) to TSF and by matching those with low dependence (less than or equal to 35 on the EDSS) to CBT. Matched clients had an approximately 10-percent higher success rate than mismatched clients.
- Matching effects were not observed when clients were directly admitted to the low-intensity 12-session outpatient treatments without prior intensive treatment.
- Process analyses supported the hypothesis that the alcohol dependence-matching effect in the aftercare arm was mediated by differences in the degree of therapist emphasis on abstinence. Only partial support was found for another causal chain hypothesis that differences in AA attendance mediated the dependence treatment matching effect.

Acknowledgments

This work was supported in part by grant number U10-AA10170-08 from the National Institute on Alcohol Abuse and Alcoholism.

References

- Allen, J.P.; Fertig, J.B.; Towle, K.B.; Bryant, K.; Altshuler, V.B.; Vrublevsky, A.G.; and Valentik, Y.V. Structure and correlates of alcohol dependence in clinical samples in the United States and Russia. *Addiction* 88:1535-1543, 1993.
- American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. 3rd ed. rev. Washington DC: American Psychiatric Press, 1987.
- American Psychiatric Association *Diagnostic And Statistical Manual of Mental Disorders*. 4th ed. Washington DC: American Psychiatric Press, 1995.
- Babor, T.F. Reliability of the ethanol dependence syndrome scale. *Psychology of Addictive Behaviors* 10:97-103, 1996.
- Babor, T.F.; Cooney, N.L.; and Lauerman, R.J. The drug dependence syndrome concept as a psychological theory of relapse behaviour: An empirical evaluation of alcoholic and opiate addicts. *British Journal of Addiction* 82:393-405, 1987.
- Babor, T.F.; Lauerman, R.; and Cooney, N. In search of the alcohol dependence syndrome: A cross-national study of its structure and validity. In: Paakkanen, P., and Sulkunen, P., eds. *Cultural Studies on Drinking and Drinking Problems. Report on a Conference*. Reports from the Social Research Institute of Alcohol Studies, ALKO, The Finnish Alcohol Company, Helsinki, vol. 176, 1987. pp. 75-82.
- Carroll, K.M.; Connors, G.J.; Cooney, N.L.; Di Clemente, C.C.; Donovan, D.M.; and Kadden, R.M. Internal validity of Project MATCH treatments: Discriminability and integrity. *Journal of Consulting and Clinical Psychology* 66:290-303, 1998.
- Edwards, G. The alcohol dependence syndrome: Usefulness of an idea. In: Edwards, G., and Grant, M., eds. *Alcoholism: New Knowledge and New Responses*. London: Croom Helm, 1986. pp. 136-156.
- Edwards, G., and Gross, M.M. Alcohol dependence: Provisional description of a clinical syndrome. *British Medical Journal* 1:1058-1061, 1976.
- Edwards, G.; Gross, M.M.; Keller, M.; Moser, J.; and Room, R. *Alcohol Related Disabilities*. WHO Offset Publication No. 32. Geneva: World Health Organization, 1977.
- Edwards, G.E., and Taylor, C. A test of the matching hypothesis: Alcohol dependence, intensity of treatment, and 12-month outcome. *Addiction* 89:553-561, 1994.
- Elkins, I.; Parloff, M.B.; Hadley, S.W.; and Autry, J.H. NIMH treatment of depression collaborative research program: Background and research plan. *Archives of General Psychiatry* 42:305-316, 1985.
- Emrick, C.D.; Tonigan, J.S.; Montgomery, H.; and Little, L. Alcoholics Anonymous: What is currently known? In: McCrady, B.S., and Miller, W.R., eds. *Research on Alcoholics Anonymous: Opportunities and Alternatives*. New Brunswick, NJ: Rutgers Center of Alcohol Studies, 1993.

- Foy, D.W.; Nunn, L.B.; and Rychtarik, R.G. Broad-spectrum behavioral treatment for chronic alcoholics: Effects of training in controlled drinking skills. *Journal of Consulting and Clinical Psychology* 52:218-230, 1984.
- Hall, W.; Saunders, J.B.; Babor, T.F.; Aasland, O.G.; Amundsen, A.; Hodgson, R.; and Grant, M. The structure and correlates of alcohol dependence: WHO collaborative project on the early detection of persons with harmful alcohol consumption. III. *Addiction* 88:1627-1636, 1993.
- Hesselbrock, M.; Babor, T.; Hesselbrock, V.; Meyer, R.; and Workman, K. "Never believe an alcoholic?" On the validity of self-report measures of alcohol dependence and related constructs. *International Journal of the Addictions* 18: 678-691, 1983.
- Kadden, R.; Carroll, K.M.; Donovan, D.; Cooney, N.; Monti, P.; Abrams, D.; Litt, M.; and Hester, R. *Cognitive-Behavioral Coping Skills Therapy Manual: A Clinical Research Guide for Therapists Treating Individuals With Alcohol Abuse and Dependence*. Project MATCH Monograph Series. Vol. 3. DHHS Pub. No. (ADM) 92-1895. Rockville, MD: National Institute on Alcohol Abuse and Alcoholism, 1992.
- Kosten, T.R.; Rounsaville, B.J.; Babor, T.F.; Spitzer, R.L.; and Williams, J.B.W. Substance use disorders in DSM-III-R: Evidence for the dependence syndrome across different abused substances. *British Journal of Psychiatry* 151:834-843, 1987.
- Lindstrom, L. *Managing Alcoholism: Matching Clients to Treatment*. Oxford: Oxford University Press, 1992.
- Miller, W.R. *Form 90: A Structured Assessment Interview for Drinking and Related Behaviors*. Test Manual. Project MATCH Monograph Series. Vol. 5. NIH Pub. No. 96-4004. Rockville, MD: National Institute on Alcohol Abuse and Alcoholism, 1996.
- Miller, W.R., and Del Boca, F.K. Measurement of drinking behavior using the Form 90 family of instruments. *Journal of Studies on Alcohol Supplement* No. 12:112-118, 1994.
- Miller, W.R.; Tonigan, J.S.; and Longabaugh, R. *The Drinker Inventory of Consequences (DrInC): An Instrument for Assessing Adverse Consequences of Alcohol Abuse*. Project MATCH Monograph Series. Vol. 4. NIH Pub. No. 95-3911. Rockville, MD: National Institute on Alcohol Abuse and Alcoholism, 1995.
- Miller, W.R.; Zweben, A.; DiClemente, C.C.; and Rychtarik, R.G. *Motivational Enhancement Therapy Manual: A Clinical Research Guide for Therapists Treating Individuals With Alcohol Abuse and Dependence*. Project MATCH Monograph Series. Vol. 2. DHHS Pub. No. (ADM) 92-1894. Rockville, MD: National Institute on Alcohol Abuse and Alcoholism, 1992.
- Nowinski, J.; Baker, S.; and Carroll, K. *Twelve Step Facilitation Therapy Manual: A Clinical Research Guide for Therapists Treating Individuals With Alcohol Abuse and Dependence*. Project MATCH Monograph Series. Vol. 1. DHHS Pub. No. (ADM) 92-1893. Rockville, MD: National Institute on Alcohol Abuse and Alcoholism, 1992.
- Orford, J.E.; Openheimer, E.; and Edwards, G. Abstinence or control: The outcome for excessive drinkers two years after consultation. *Behaviour Research and Therapy* 14:409-418, 1976.
- Polich, J.M.; Armor, D.J.; and Braiker, H.B. *The Course of Alcoholism: Four Years After Treatment*. New York: Wiley, 1981.
- Project MATCH Research Group. Matching alcoholism treatments to client heterogeneity: Project MATCH posttreatment drinking outcomes. *Journal of Studies on Alcohol* 58:7-29, 1997a.
- Project MATCH Research Group. Project MATCH secondary a priori hypotheses. *Addiction* 92: 1671-1698, 1997b.
- Rounsaville, B.J.; Spitzer, R.L.; and Williams, J.B.W. Proposed changes in the DSM-III substance use disorders: Description and rationale. *American Journal of Psychiatry* 143:463-468, 1986.
- Sanchez-Craig, M.; Annis, H.M.; Bornet, A.R.; and McDonald, K.R. Random assignment to abstinence and controlled drinking: Evaluation of a cognitive-behavioral program for problem drinkers. *Journal of Consulting and Clinical Psychology* 52:390-403, 1984.
- Skinner, H.A., and Allen, B.A. Alcohol Dependence Syndrome: Measurement and validation. *Journal of Abnormal Psychology* 91:199-209, 1982.
- Sobell, M.B., and Sobell, L.C. Controlled drinking after 25 years: How important was the great debate? *Addiction* 90:1149-1153, 1995.
- Stockwell, T.R.; Murphy, D.; and Hodgson, R. The severity of alcohol dependence questionnaire: Its use, reliability and validity. *British Journal of Addiction* 74:145-155, 1983.
- Taylor, J.R.; Helzer, J.E.; and Robbins, L.N. Moderate drinking in ex-alcoholics: Recent studies. *Journal of Studies on Alcohol* 47:115-121, 1986.
- Vaillant, G.E. *The Natural History of Alcoholism: Causes, Patterns, and Paths to Recovery*. Cambridge, MA: Harvard University Press, 1983.
- World Health Organization. WHO Brief Intervention Study Group. A cross-national trial of brief interventions with heavy drinkers. *American Journal of Public Health* 86:948-955, 1992.
- Zweben, A., and Cisler, R. Composite outcome measures in alcoholism treatment research: Problems and potentialities. *Substance Use & Misuse* 31:1783-1805, 1996.

The Alcohol Involvement Matching Hypothesis and Findings

*Robert G. Rychtarik, Ph.D., William R. Miller, Ph.D., and
J. Scott Tonigan, Ph.D.*

ABSTRACT

Individuals high in alcohol involvement were predicted to have better outcomes in Cognitive-Behavioral Coping Skills Therapy and Twelve Step Facilitation relative to Motivational Enhancement Treatment. It was hypothesized that differences in the intensity of these treatments moderated this alcohol involvement by treatment interaction through indirect effects on within-treatment drinking, within-treatment consequences, and post-treatment self-efficacy. However, results failed to show a significant interaction between alcohol involvement and treatment. Closer examination revealed that, contrary to predictions, alcohol involvement was more positively associated with outcome among outpatient clients as the followup period progressed. This positive association with outcome appeared mediated by the greater motivation of high alcohol-involved individuals and their increased likelihood of attending Alcoholics Anonymous (AA). Among aftercare clients, alcohol involvement was associated with poorer overall outcomes. However, alcohol involvement's effects were not moderated by treatment intensity. The results suggest that alcohol involvement's influence on outcome is complex and varies with the treatment population, client motivation, and posttreatment AA attendance.

Alcohol involvement was conceptualized as a broad, multifaceted construct representing the severity of an individual's alcohol problem. The construct was meant to include but extend beyond the narrower concept of alcohol dependence (i.e., psychoperceptual and psychophysical withdrawal symptoms). As such, alcohol involvement also reflects the extent to which an individual's lifestyle is directed and influenced by drinking. These additional facets include the extent to which an individual drinks in a sustained fashion, is obsessed with drinking, and has experienced social consequences as a result of drinking (e.g., unemployment, solitary lifestyle, detention by authorities).

Robert G. Rychtarik, Ph.D.
Research Institute on Addictions
1021 Main Street
Buffalo, NY 14203
E-mail: rychtari@ria.buffalo.edu

The Rationale for the Matching Hypothesis

A basic assumption providing the foundation for the current hypothesis is that as alcohol involvement increases there are fewer abstinent days and more drinks per drinking day after treatment. Although specific measures of alcohol involvement have varied across studies, there exists some empirical support for this assumption (e.g., Horn et al. 1990; Rounsaville et al. 1987). The presumed relationship between alcohol involvement and drinking outcomes also suggests that individuals at different alcohol involvement levels may respond differentially to different treatment types. In particular, it is a common belief that individuals with more severe drinking problems benefit from more intense treatments.

Unfortunately, there has been no direct test of the assumption that high alcohol-involved

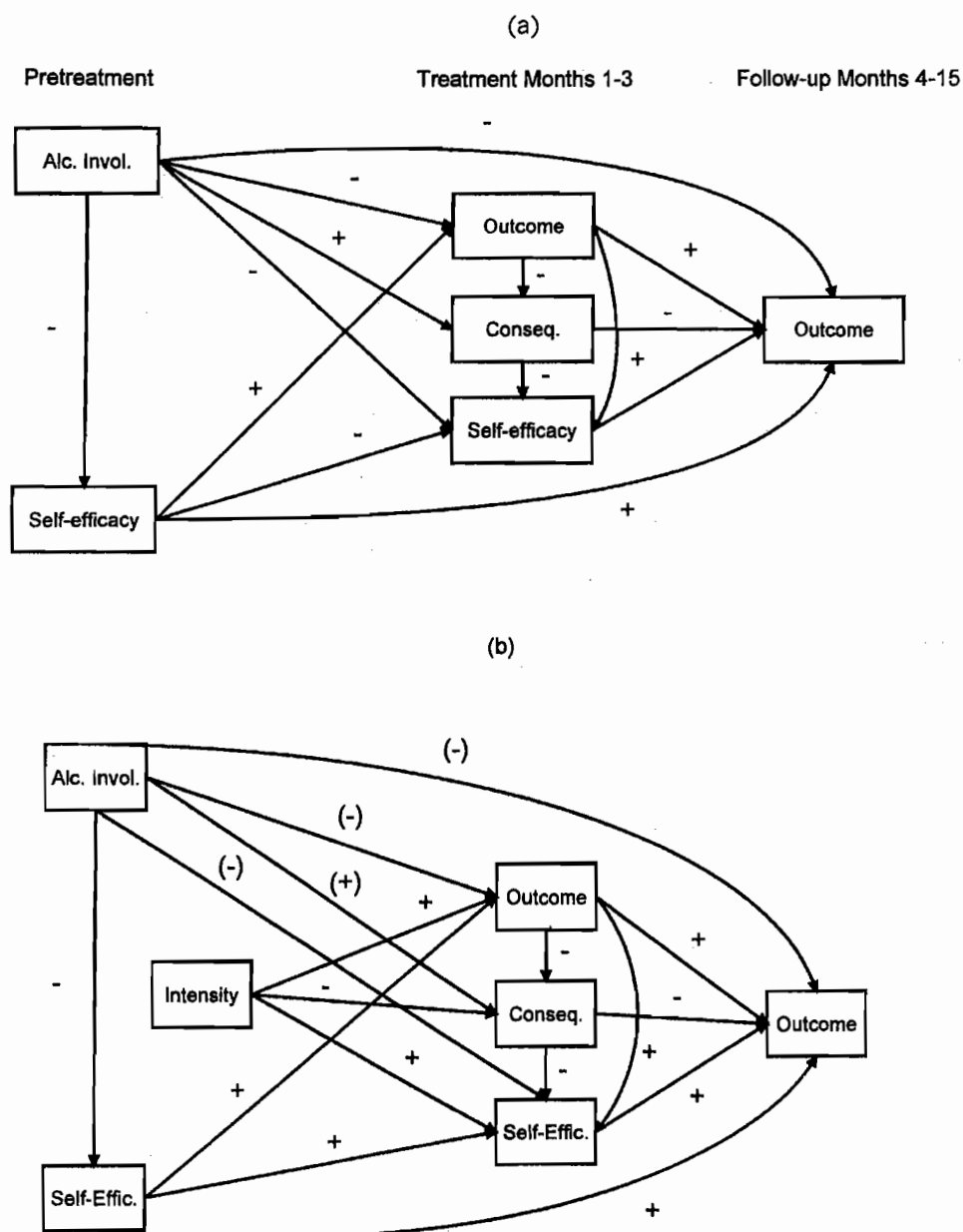


Figure 1. Proposed causal model of (a) alcohol involvement and (b) treatment intensity on outcome. Parentheses in (b) represent alcohol involvement effects moderated by intensity.

The Moderating Effects of Treatment Intensity

Figure 1b presents the alcohol involvement model, including the moderating effects of treatment intensity. Treatment intensity, as measured by the number of treatment sessions attended over the period, was hypothesized to buffer or moderate the direct or indirect effects of alcohol involvement on within-treatment

variables. It was hypothesized that more intense treatments, by definition, provide the opportunity for more frequent monitoring of the individual's efforts to remain abstinent. So, frequent sessions are more likely to detect and address a return to drinking in the 12-week treatment period than would be the case if fewer sessions were attended. Since high alcohol-involved clients, by definition, may be more susceptible to more frequent and heavier drinking

individuals benefit from treatments of higher intensity. There is, however, some evidence in the treatment outcome literature that treatment intensity may interact with problem severity to influence outcome. Most relevant to the current discussion is the study of Orford and colleagues (1976). They differentiated 100 married alcoholics into gamma and nongamma types and found at a 2-year followup that among gammas, all successful outcomes occurred in the more intensive outpatient condition, whereas among nongammas, successes were predominant in the minimal advice condition. So, a cross-over effect was found, with outcome status influenced by the interaction between treatment type and problem severity. It should be noted that recent findings failed to replicate these results in the same sample at the 1-year followup (Edwards and Taylor 1994). Still, the Orford group's results have had wide impact and were extended to develop the present hypothesis for the MATCH trial.

Advice in the study by Orford and associates consisted of a half day's assessment that included a summary evaluation informing the client of the alcohol problem and of the need to do something about it. This condition bears a generic similarity to Motivational Enhancement Therapy (MET; Miller et al. 1992), which in total amounts to several hours of assessment followed by four therapy sessions over 12 weeks. The procedure of providing important feedback to the client as a motivator for change of lifestyle also is shared by Brief Advice and MET.

In like fashion, the MATCH Cognitive-Behavioral Coping Skills Therapy (CBT; Kadden et al. 1992) and Twelve Step Facilitation (TSF; Nowinski et al. 1992) conditions share with the Orford team's intensive outpatient condition a greater amount of therapeutic contact at a more intensive level. The presumed active ingredients of differential intensity and amount of treatment in the Orford group's study would also differentiate CBT and TSF from MET in the MATCH study.

While there is no direct correspondence between gamma and nongamma alcoholism in the Orford study and alcohol involvement as measured here, the constructs do share common attributes. The gamma alcoholic is a more severe type

characterized by both major symptoms *and* physical dependence. Nongamma alcoholics are less severe and do not have signs of both symptoms and physical dependence. In the MATCH study, alcohol involvement, characterized as a continuous variable, included level of alcohol dependence and symptoms/consequences as part of its definition. Thus, the extrapolation of an interaction between alcohol involvement and treatment intensity, much as Orford and colleagues found between alcoholic type and intensity, appears justified.

The Alcohol Involvement Prognostic Model

Figure 1a provides a general model for conceptualizing the effect of alcohol involvement on posttreatment outcome. In this model, alcohol involvement is expected to have a direct negative effect on outcome. In addition, a series of indirect effects of alcohol involvement on outcome are predicted. These indirect effects occur through alcohol involvement's presumed negative effect on pretreatment self-efficacy, within-treatment outcomes, and posttreatment self-efficacy. In addition, alcohol involvement is expected to have a positive association with within-treatment drinking consequences. Pretreatment self-efficacy, posttreatment self-efficacy, and within-treatment drinking outcomes are predicted to be positively associated with followup outcomes. Drinking consequences, on the other hand, are expected to be negatively associated with outcome.

The model assumes that individuals high in alcohol involvement, by definition, have a history of failed treatment attempts which will increase the likelihood of poorer overall outcome in the future. Similarly, this history of treatment failure is presumed to result in lower self-efficacy both initially and at the end of treatment. Self-efficacy at the end of treatment also is expected to be influenced positively by outcome experiences during treatment and negatively by within-treatment drinking consequences. Based on the prior literature (Rychtarik et al. 1992), self-efficacy is assumed to be positively associated with both within-treatment and followup outcome measures. It also is anticipated that within-treatment outcomes will be positively associated with outcomes at followup.

during treatment, the opportunity to monitor drinking status more frequently offers the possibility of increasing the number of abstinent days postintake, subsequently reducing the number of drinking-related consequences during treatment, and in turn, increasing an individual's confidence in resisting further drinking (i.e., self-efficacy). So, while alcohol involvement would tend to lower the percentage of abstinent days within treatment, more and frequent sessions would buffer this effect and diminish the negative within-treatment relationship between alcohol involvement and percentage of days abstinent.

Several features of the model presented in figure 1b should be noted. First, we used the treatment intensity measure (i.e., number of treatment sessions attended) rather than a treatment condition variable to distinguish the low intensity Project MATCH MET from the CBT and TSF. We chose this approach for two reasons. First, although the three treatment conditions varied in philosophy and approach, the current hypothesis assumes that intensity alone moderates the alcohol involvement effect. Clear differences in the average number of sessions attended by MET versus CBT and TSF clients were observed. So, the intensity measure provides a way to discriminate between MET and the CBT and TSF treatments.

Second, inclusion of a treatment condition variable in the model would add error to the intensity measure since the actual number of sessions attended in CBT and TSF varied among clients. Clients attending only a few sessions of CBT and TSF would be expected to benefit no more than individuals in MET. Finally, the model assumes that treatment intensity positively influences outcome through its indirect effects on within-treatment drinking, within-treatment drinking consequences, and post-treatment self-efficacy. No direct effect of treatment intensity on outcome is hypothesized.

Statement of the Matching Hypothesis

On the basis of the above models, it was hypothesized that the greater the client's alcohol

involvement prior to treatment, the higher the percentage of days abstinent (PDA) and the lower the drinks per drinking day (DDD) among clients treated in the TSF and CBT conditions (i.e., the intense conditions) relative to those treated in MET. In statistical terms, it was predicted that the slope of the relationship between alcohol involvement and outcome variables would differ significantly between the intense (CBT/TSF) and less intense (MET) treatment conditions.

Operationalization of the Matching Variable

The raw score of the broad alcohol involvement scale (ALCINVOL) of the Alcohol Use Inventory (AUI; Horn et al. 1990) was used as the matching variable. The AUI and its subscales are widely recognized as among the best developed measures in this area. The AUI also assumes a contemporary, multifaceted view of the alcohol involvement concept which is consistent with that of the current hypothesis. The ALCINVOL scale is a third-order scale that measures a cluster of symptoms representative of the construct of alcohol involvement (i.e., obsession with drinking, sustained drinking, perceptual withdrawal, somatic withdrawal, social role maladaptation, loss of control of behavior). The internal consistency of this scale is good (0.93). In addition, the scale has shown reasonable construct and criterion validity (Horn et al. 1990; Skinner and Allen 1983).

Results

Outpatient Arm

Prognostic Effect of Alcohol Involvement

Contrary to predictions, no significant alcohol involvement effect or alcohol involvement by time interaction was observed for either PDA or DDD during the treatment period. There was, however, a significant ($p < .05$) main effect for alcohol involvement on abstinent days during followup, $F(1, 9809) = 6.37, p = .01$, and a significant

alcohol involvement by linear time interaction, $F(1, 9809)=4.92, p=.03$. On the DDD measure, there was no significant main effect of alcohol involvement, but a significant alcohol involvement by linear time interaction again emerged, $F(1, 9809)=4.73, p=.03$.

The nature of these alcohol involvement by time interactions was explored by examining the partial correlations between alcohol involvement and each of the primary dependent measures for each followup month, controlling for pretreatment abstinent days, clinical research unit, and treatment assignment. Figure 2 presents the partial correlations between alcohol involvement and PDA and DDD across followup months. As shown, the relationship between alcohol involvement and PDA *increased* linearly from nonsignificant levels in the first few months to a small significant association by month 15. For DDD, the relationship was reversed, with the association between alcohol involvement and DDD decreasing from a nonsignificant level in month 4 to a significant negative association at month 15. In sum, greater severity of alcohol involvement was associated with *better* outcomes (i.e., more abstinent days and fewer DDD) as the followup progressed. This unanticipated positive association between alcohol involvement and outcome was maintained at a 39-month followup. At 39 months, alcohol involvement was correlated positively with PDA ($r=0.15, p<.001$) and negatively with DDD ($r=-0.08, p<.05$).

Interaction of Alcohol Involvement With Treatment

Table 1 presents the results of the tests of the overall alcohol involvement by treatment interaction terms for PDA and DDD for both treatment and followup periods. Also included are tests of the effects of the interaction over linear and quadratic time as well as tests of the individual predicted contrasts. No overall significant treatment by alcohol involvement interaction was found. Individual contrasts also showed no significant difference in slope between CBT or TSF and MET conditions for either PDA or DDD either during treatment or in the 4–15 month followup period. These contrasts also did not vary with time in either

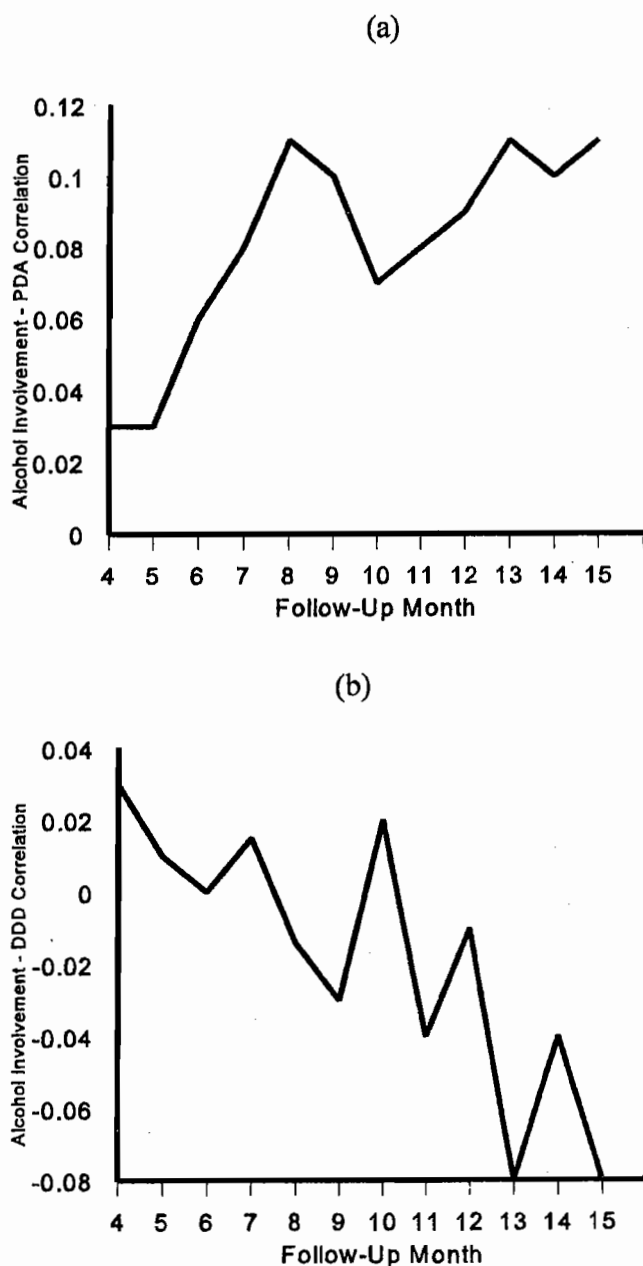


Figure 2. Partial correlations between pretreatment alcohol involvement and (a) percentage of days abstinent (PDA) and (b) drinks per drinking day (DDD) across followup months 4–15. Pretreatment PDA/DDD, clinical research unit, and treatment type are controlled for.

period. At the 39-month followup, there was no significant alcohol involvement by treatment interaction.

Table 1. Alcohol involvement, outpatient

Treatment contrast		Within treatment						Posttreatment					
		Mv × Tx		Mv × Tx × T		MV × Tx × T ²		Mv × Tx		Mv × Tx × T		MV × Tx × T ²	
		PDA	DDD	PDA	DDD	PDA	DDD	PDA	DDD	PDA	DDD	PDA	DDD
CBT vs. MET	<i>F</i>	-1.03	1.19	0.30	0.49	1.61	-0.76	-1.63	1.20	0.89	-0.70	1.70	0.26
	<i>p</i>	.30	.23	.77	.62	.11	.45	.10	.23	.38	.48	.09	.79
CBT vs. TSF	<i>F</i>	-0.53	0.85	-1.10	0.80	-0.10	-0.34	-0.96	1.17	1.96	-1.78	0.75	-0.46
	<i>p</i>	.60	.40	.27	.43	.92	.74	.33	.24	.05	.08	.46	.64
MET vs. TSF	<i>F</i>	0.56	-0.41	-1.40	0.27	-1.79	0.46	0.76	-0.10	1.00	-1.02	-1.05	-0.73
	<i>p</i>	.58	.68	.16	.78	.07	.64	.44	.92	.32	.31	.30	.46
MV × Tx	<i>F</i>	0.53	0.75	1.12	0.32	1.89	0.29	1.34	0.92	1.93	0.37	1.45	0.58
	<i>p</i>	.59	.47	.33	.73	.15	.75	.26	.40	.14	.94	.23	.79

NOTE: MV=matching variable, Alcohol Involvement; T=linear time ; T²=quadratic time; Tx =treatment ; PDA=percentage of days abstinent; DDD=drinks per drinking day

Examination of the A Priori Alcohol Involvement Model

The reversal of the predicted relationship between alcohol involvement and outcome indicated a significant failure of the proposed causal models, which had predicted a negative association. In itself, a positive association between alcohol involvement and PDA would be sufficient to obviate the predicted matching effect. Path analyses using EQS (Bentler 1992) subsequently were conducted to examine both direct and indirect effects of alcohol involvement on outcome in the alcohol involvement and treatment intensity models presented in figure 1. Since these models deviated from multivariate normality, the significance of individual parameter coefficients was determined using robust estimation methods (Bentler 1992). For similar reasons, we used the Satorra-Bentler chi square statistic as an indication of model fit. We refrained from using model fit indexes since model fit already is reflected in the model chi square. Also, model fit indexes can be deceptive given the high specificity of the models (i.e., nearly all potential pathways are included in the model). Standardized values for direct effects are used in the remainder of this chapter.

In the models evaluated, the confidence minus temptation score of the Alcohol Abstinence Self-Efficacy Scale (DiClemente et al. 1994) was

used as a measure of self-efficacy both at pre-treatment and at the end of treatment. The total consequence score of the Drinker Inventory of Consequences (Miller et al. 1995) was used as the measure of drinking consequences within treatment. Within-treatment PDA and DDD each were computed by averaging across treatment weeks. Followup PDA and DDD similarly were averaged across followup months. Arcsine and square root transformations subsequently were applied, respectively, to average PDA and DDD measures.

Results of tests of the alcohol involvement models for PDA and DDD are presented in figure 3. A decomposition of alcohol involvement effects is presented in table 2. Consistent with the results presented above, but contrary to our hypothesized causal model, alcohol involvement had a small, significant positive direct effect on both within-treatment and posttreatment PDA. No significant overall indirect effect of alcohol involvement on followup PDA was found.

Nevertheless, several indirect pathways were at least partially consistent with our model. For example, alcohol involvement was positively associated with drinking-related consequences during treatment. However, within-treatment drinking consequences were associated with *better* outcomes during followup (i.e., a greater PDA) rather than worse outcomes, as had been predicted.

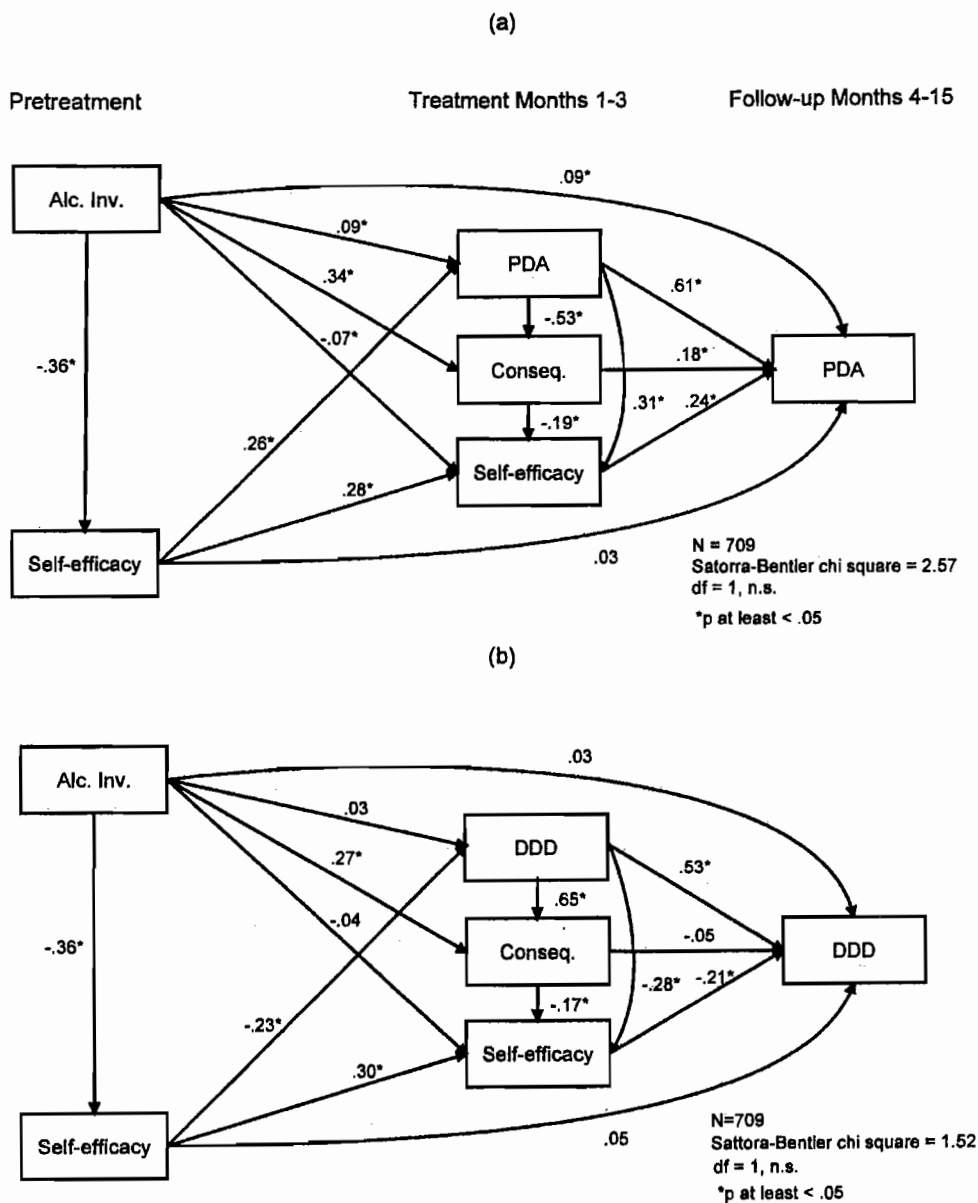


Figure 3. Outpatient alcohol involvement model applied to (a) percentage of days abstinent (PDA) and (b) drinks per drinking day (DDD).

Other indirect pathways were more consistent with the proposed model. Alcohol involvement was negatively associated with pretreatment self-efficacy. Pretreatment self-efficacy also was positively and significantly related to both within-treatment PDA and posttreatment self-efficacy. Pretreatment self-efficacy was not directly associated with posttreatment outcome. Posttreatment self-efficacy, however, was positively associated with posttreatment PDA. Moreover, as predicted, within-treatment PDA

was negatively associated with within-treatment consequences, and both within-treatment drinking and consequences were associated with posttreatment self-efficacy in the predicted directions.

The alcohol involvement model applied to the DDD variable resulted in no significant direct effect of alcohol involvement. A significant positive indirect effect of alcohol involvement was found that was accounted for largely through alcohol involvement's negative effect on

Table 2. Decomposition of outpatient total and indirect alcohol involvement and treatment intensity effects for the alcohol involvement and treatment intensity models

Effect	Alcohol involvement model		Treatment intensity model	
	PDA	DDD	PDA	DDD
Total AI	.08*	.10*	.08*	.10*
Direct AI	.09*	.03	.09*	.03
Indirect AI	-.00	.07*	-.00	.07*
AI-SE1-SE2		.02		.02
AI-SE1-PDA/DDD		.04		.04
AI-Cons.-SE2		.01		.01
AI-SE1-PDA/DDD-SE2		.00		.00
AI-SE1-PDA/DDD-Cons.-SE2		.00		.00
AI-INT-PDA/DDD-SE2		NA		.00
AI-INT-PDA/DDD-Cons.-SE2		NA		.00
AI-INT-Cons.-SE2		NA		.00
Total treatment intensity			.22*	-.23*
Direct treatment intensity			NA	NA
Indirect treatment intensity			.22*	-.23*
INT-PDA/DDD			.23	-.21
INT-PDA/DDD-Cons.			-.03	ns
INT-PDA/DDD-Cons.-SE2			.01	-.01
INT-Cons.			-.02	ns
INT-Cons.-SE2			.01	-.00
INT-PDA/DDD-SE2			.03	-.02

NOTE: PDA=percentage of days abstinent; DDD=drinks per drinking day; AI=alcohol involvement; SE1=pretreatment self-efficacy; SE2=end of treatment self-efficacy; Cons.=within-treatment drinking consequences; INT=number of treatment sessions; ns=not significant; NA=not applicable (not included in the model). For significant indirect effects, only individual pathways in which all segments are significant are shown. Due to rounding and elimination of pathways with at least one nonsignificant segment, individual indirect pathway effects may not add up to total indirect effects. Significance level of individual pathways not computed. * $p < .01$

pretreatment self-efficacy, pretreatment self-efficacy's negative effect on within-treatment DDD, and the positive effect of within-treatment DDD on followup DDD. So, at least for the DDD variable, we found some support for our hypothesized indirect positive effect on outcome. It should be cautioned, however, that the causal model results vary somewhat from the main findings, which revealed no significant main effect of alcohol involvement on DDD. The different findings may reflect the absence of pretreatment DDD in the model. The pretreatment value of DDD was controlled for in the main trial analyses.

To summarize, our model appeared to fail in the outpatient arm because alcohol involvement was positively associated with PDA both within treatment and during the followup period. Also, negative consequences during treatment, contrary to our prediction, were positively associated with PDA posttreatment. Finally, the predicted indirect effects of alcohol involvement on PDA were not found. Some support for an indirect effect of alcohol involvement on DDD was found, but the observed effects occurred only when pretreatment DDD were not controlled for.

The Moderating Effects of Treatment Intensity

We subsequently examined the predicted moderating effects of treatment intensity on the alcohol involvement model (see figure 4). The direct and indirect effects of both alcohol involvement and number of sessions attended in this model are summarized in table 2. Consistent with our prediction, treatment intensity had a significant indirect effect on both followup PDA and DDD. This indirect effect was largely accounted for by the positive and negative effects of intensity, respectively, on PDA and DDD.

It is noteworthy, however, that two indirect pathways actually lowered the total overall effect of treatment intensity on followup PDA. Specifically, treatment intensity lowered within-treatment drinking consequences both directly and through its positive effect on within-treatment abstinent days. However, as noted earlier, consequences within treatment were associated positively with followup

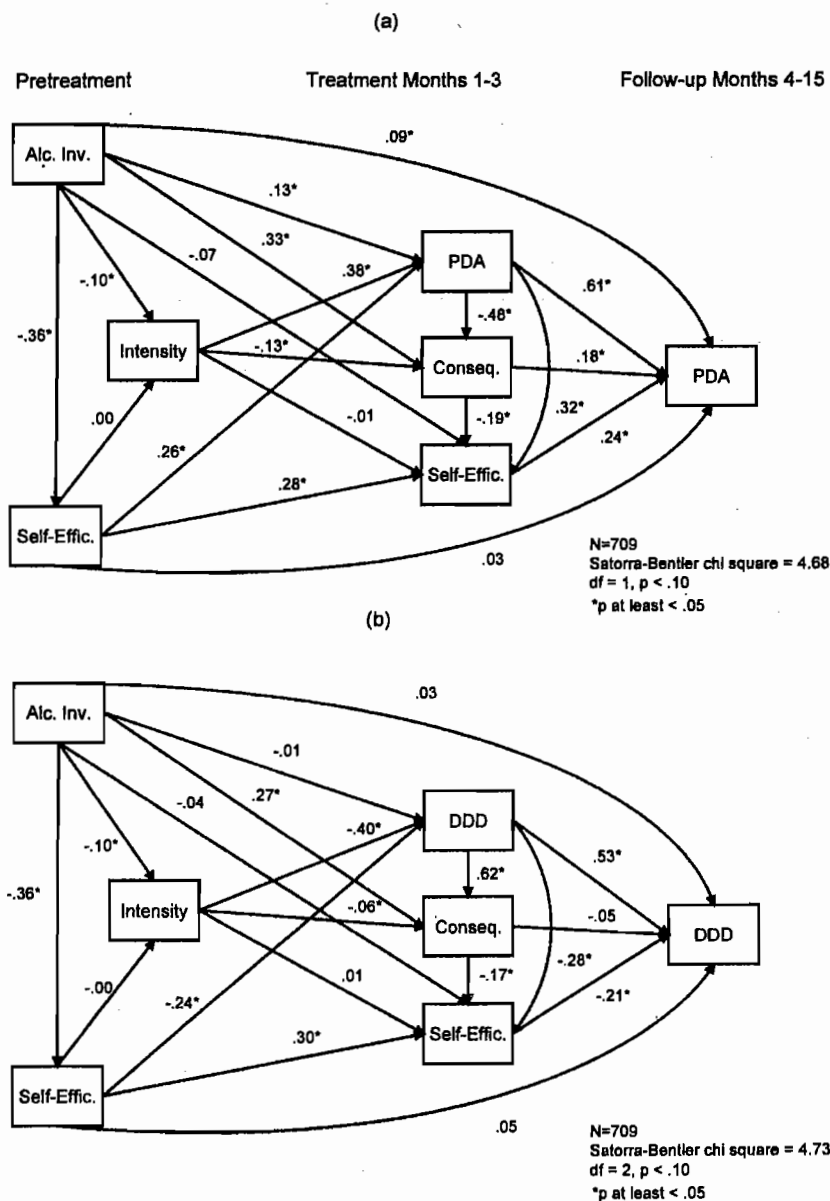


Figure 4. Outpatient treatment intensity model applied to (a) percentage of days abstinent (PDA) and (b) drinks per drinking day (DDD).

abstinent days. So, lowering consequences through more intense treatment caused a small decrement in the overall association between treatment intensity and abstinent days. In this case, within-treatment consequences appeared to moderate the treatment intensity effect.

No support was found for the predicted direct effect of treatment intensity on posttreatment self-efficacy. Also noteworthy is the support for the notion that treatment intensity influences outcome predominantly through indirect effects

on within-treatment factors. This conclusion is exemplified in the fact that adequate model fit was obtained without a hypothesized direct effect of intensity on followup outcomes. Despite support for the role of treatment intensity in affecting outcome, there was no evidence of a moderating effect on alcohol involvement. Note in table 2, for example, that addition of treatment intensity effects to the alcohol involvement model did not alter either direct or indirect effects of alcohol involvement on outcome.

Moreover, as shown in figure 4, alcohol involvement was found to have a small negative effect on treatment intensity. Individuals high in alcohol involvement attended fewer sessions. This finding was not predicted and could have contributed further to our failure to find any moderating effect of treatment intensity.

Overall, except for a small negative effect of alcohol involvement on the number of sessions attended, alcohol involvement and number of sessions appear to function quite independently in influencing posttreatment drinking outcomes.

Exploratory Analyses

The models tested were averaged across the followup months to obtain followup drinking outcome measures. They did not take into account the changing relationship between alcohol involvement and outcome observed in the alcohol involvement by time interactions depicted in figure 2. As noted above, the increasing positive association between alcohol involvement and outcome across the followup period itself negated the proposed pathways hypothesized.

Two alternate pathways to account for the observed positive alcohol involvement-PDA relationship and its change over time subsequently were studied. It should be recalled that associations between alcohol involvement and outcome became more positive as the followup proceeded. To account for this finding, we first speculated that high alcohol-involved participants may have sought out more treatment within the first 6 months following the MATCH treatment and/or sought more affiliation with AA. We also speculated that high alcohol-involved clients may have been hospitalized or incarcerated more over this period. This higher level of involuntary abstinence and/or treatment-seeking behavior during followup could possibly account for the observed increase in

the association between alcohol involvement and PDA as the followup period progressed. In other words, high alcohol-involved clients may have received more treatment over the period immediately following treatment to account for their better outcome later in the followup period.

The second potential pathway hypothesized that high alcohol-involved participants, because by definition they had experienced more negative consequences *before* treatment, may have been more motivated to change to begin with. This higher motivation also could counterbalance any negative effect of the severity of their problem on outcome.

To examine these two post hoc hypotheses, an exploratory path model, including both alternative pathways, was examined (figure 5). In this model, we studied the relationship between alcohol involvement and pretreatment readiness

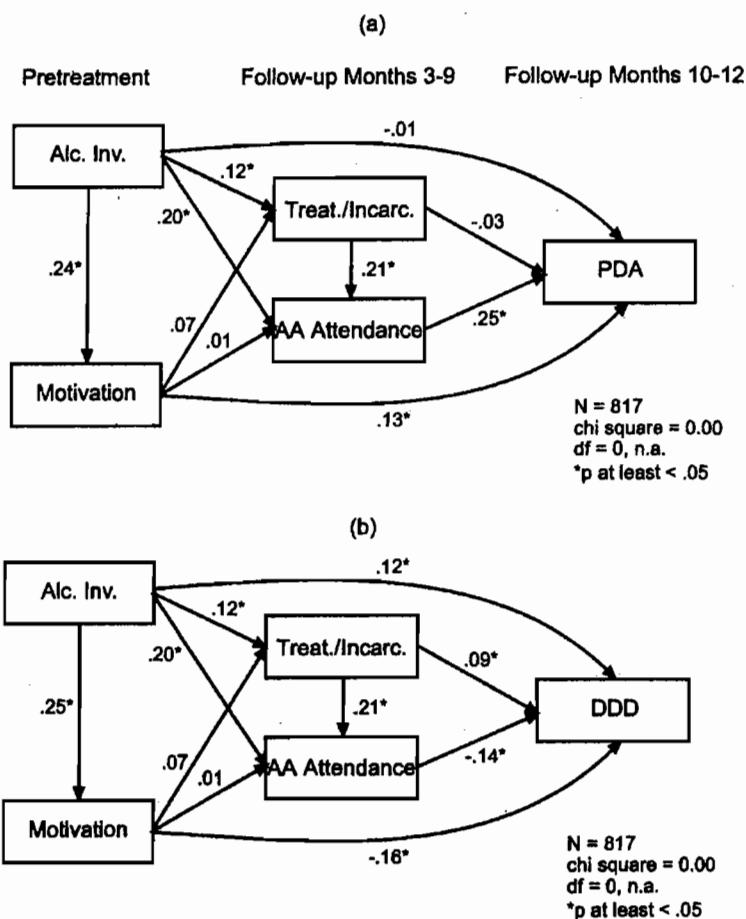


Figure 5. Outpatient exploratory model applied to (a) percentage of days abstinent (PDA) and (b) drinks per drinking day (DDD).

to change. In addition, the effects of alcohol involvement and readiness to change on subsequent treatment/incarceration and AA attendance in followup months 4–9 were examined. Finally, the direct and indirect effects of alcohol involvement, motivation, month 4–9 treatment/incarceration, and months 4–9 AA attendance on PDA during the subsequent 10- to 12-month period were assessed.

In this model, motivation to change was measured using the Readiness score derived from the University of Rhode Island Change Assessment Scale (DiClemente and Hughes 1990). AA involvement was a categorical variable (coded 1=yes, 0=no) indicating whether the individual had reported attending an AA meeting over the assessed period. Finally, since individual rates of subsequent treatment/incarceration episodes were relatively low across the MATCH sample and highly skewed, a composite measure of treatment/incarceration was used. This measure formed a dichotomous variable (coded 1=yes, 0=no) indicating whether an individual had been hospitalized, detoxified, or incarcerated; admitted to residential alcohol, drug, or psychiatric treatment; or received outpatient alcohol or drug treatment during the 4- to 9-month followup period.

To summarize, we hypothesized that the positive effect of alcohol involvement on 10- to 12-month drinking outcomes would be mediated by pretreatment motivation, AA attendance, and/or episodes of treatment/incarceration in months 4–9 immediately following treatment. Total, direct, and indirect effects are summarized in table 3.

Support was found for both pathways. Alcohol involvement had a significant indirect positive effect on both PDA and DDD. Moreover, this indirect relationship appeared mediated in large part by alcohol involvement's positive associations with both AA and motivation to change. Importantly, these pathways appeared to operate independently since there was no significant association between motivation and AA attendance. Alcohol involvement also was positively associated with subsequent treatment/incarceration, but the latter was not associated with subsequent outcome. Treatment/incarceration was associated positively with more AA

Table 3. Decomposition of total, direct, and indirect effects of exploratory model for outpatients

	PDA	DDD
Total	.08*	.06
Direct	-.01	.12*
Indirect	.09*	-.06*
AI-Treatment-AA	.01	-.00
AI-AA	.05	-.03
AI-Motivation	.03	-.04
AI-Treatment		.01

NOTE: PDA=percentage of days abstinent; DDD=drinks per drinking day; AI=alcohol involvement; Treatment=inpatient or outpatient treatment or incarceration. Only pathways with all significant sections are shown; significance of individual component indirect effects not shown. * $p < .01$

attendance, but this pathway contributed only a small amount to the alcohol involvement indirect effect.

Particularly noteworthy is that once the indirect effect of alcohol involvement on subsequent outcome was accounted for, its direct relationship with PDA became negative, consistent with our initial hypothesis. So, the positive relationship between alcohol involvement and PDA at followup may be at least partially mediated by alcohol involvement's positive associations with both pretreatment motivation and AA attendance in the first few months following the MATCH treatments.

A similar pattern was observed when the model was applied to the DDD variable, although here, as with the full model, alcohol involvement continued to have a significant direct effect on DDD during months 10–12. Again, however, the positive association between alcohol involvement and AA attendance and readiness to change appeared to buffer this effect, as noted in the reduced total effect on DDD.

Summary of Outpatient Arm Analyses

No significant alcohol by treatment interaction was observed in the outpatient arm. The a priori hypothesis failed, in part, because alcohol

involvement was unexpectedly associated with better overall outcome as the followup period progressed. The cause of this positive association with outcome appears to result from a tendency for high alcohol-involved clients to be more motivated initially and more likely to attend AA posttreatment. Together, these account for most of the observed positive total effect of alcohol involvement on PDA outcomes. Finally, although intensity of treatment did not moderate the effects of alcohol involvement, results suggested that its observed positive effect on outcome was mediated largely by its positive indirect effect on within-treatment outcome.

Aftercare Arm

Prognostic Effect of Alcohol Involvement

In the aftercare arm, alcohol involvement again showed no main effect or interaction with time on either dependent measure during the treatment period. There was, however, a significant main effect for alcohol involvement on both PDA, $F(1, 7678)=5.25, p=.02$, and DDD, $F(1, 7678)=6.71, p=.01$. In each case, the relationship was in the predicted direction, with alcohol involvement negatively associated with PDA and positively associated with DDD. For PDA, however, there was a significant alcohol involvement by quadratic time interaction, $F(1, 7678)=4.87, p=.03$.

This change in the relationship between alcohol involvement and PDA across followup is depicted in figure 6. From month 4 thru month 7, the relationship between alcohol involvement and PDA showed a near linear decrease from nonsignificant to significant negative association. The relationship then stabilized before becoming less negative in months 11–15. Although significant, it should be noted that these changes in relationship are small and remain negative throughout the period. The clinical relevance of this change over time is not clear.

Interaction of Alcohol Involvement With Treatment

Results of overall and individual contrast tests in the aftercare arm are presented in table 4. As in the outpatient arm, no significant

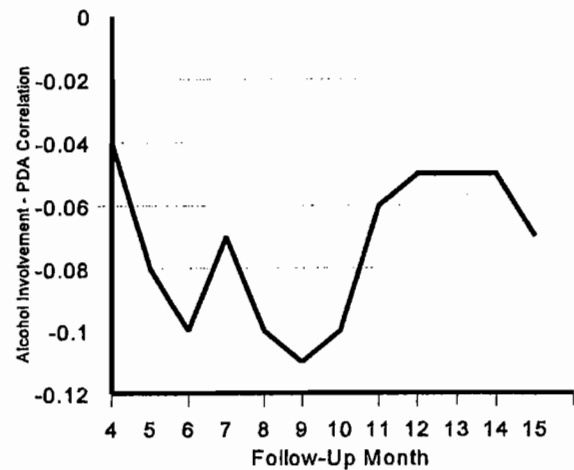


Figure 6. Partial correlations between pretreatment alcohol involvement and percentage of days abstinent (PDA) across followup months 4–15. Pretreatment PDA, clinical research unit, and treatment type are controlled for.

interaction or individual contrast effects were observed.

Examination of the Alcohol Involvement Causal Model

Figure 7 presents path analytic results for the alcohol involvement model. Table 5 summarizes alcohol involvement direct and indirect effects. There was no significant direct or indirect effect of alcohol involvement on PDA, although the effects were in the predicted direction. Contrary to our prediction, alcohol involvement was not significantly related to either within-treatment or followup PDA. Involvement was significantly and positively related to within-treatment consequences, but within-treatment consequences were not related directly to post-treatment drinking. Alcohol involvement at pretreatment did have a small but significant negative relationship with posttreatment self-efficacy, as had been predicted. Within-treatment PDA and posttreatment self-efficacy significantly predicted posttreatment PDA in the expected direction.

The model applied to DDD was in accord with predictions. Pretreatment alcohol involvement had both significant direct and indirect effects

Table 4. Alcohol involvement, aftercare

Treatment contrast		Within treatment						Posttreatment					
		Mv × Tx		Mv × Tx × T		Mv × Tx × T ²		Mv × Tx		Mv × Tx × T		Mv × Tx × T ²	
		PDA	DDD	PDA	DDD	PDA	DDD	PDA	DDD	PDA	DDD	PDA	DDD
CBT vs. MET	<i>F</i>	-.84	.50	-1.02	1.09	.27	-1.02	-.86	-.23	-.19	.55	-.93	.70
	<i>p</i>	.40	.62	.31	.28	.78	.31	.39	.82	.85	.58	.35	.49
CBT vs. TSF	<i>F</i>	.08	-1.24	-.13	.87	-.27	1.51	.02	-.36	.61	-.59	.40	.17
	<i>p</i>	.94	.22	.90	.39	.78	.13	.98	.72	.54	.55	.67	.86
MET vs. TSF	<i>F</i>	.85	-1.65	.81	-.15	-.52	2.39	.81	-.14	.76	-1.07	1.26	-.47
	<i>p</i>	.40	.10	.42	.88	.61	.02	.42	.89	.45	.28	.21	.64
MV × Tx	<i>F</i>	.48	1.43	.65	.69	.93	2.88	.47	.07	.31	.58	.85	.25
	<i>p</i>	.62	.24	.77	.50	.51	.06	.62	.93	.73	.56	.43	.78

NOTE: MV=matching variable, Alcohol Involvement; Tx=treatment; T=linear time; T²=quadratic time; PDA=percentage of days abstinent; DDD=drinks per drinking day

Table 5. Decomposition of aftercare total and indirect alcohol involvement and treatment intensity effects for the alcohol involvement and treatment intensity models

Effect	Alcohol involvement model		Treatment intensity model		Effect	Treatment intensity model	
	PDA	DDD	PDA	DDD		PDA	DDD
	Total AI	-.10*	.28*	-.10*		.28*	Total treatment intensity
Direct AI	-.06	.16*	-.06	.16*	Direct treatment intensity	NA	NA
Indirect AI	-.04	.13*	-.04	.13*	Indirect treatment intensity	.20*	-.20*
AI-SE1-SE2		.02		.02	INT-PDA/DDD	.17	-.13
AI-PDA/DDD		.05		.05	INT-PDA/DDD-Cons.-SE2	.01	-.01
AI-PDA/DDD-Cons.-SE2		.00		.00	INT-SE2	.02	-.03
AI-SE2		.02		.02	INT-Cons.-SE2	.00	-.00
AI-PDA/DDD-SE2		.01		.01	INT-PDA/DDD-SE2	.01	-.02
AI-Cons.-SE2		.01		.01			

NOTE: PDA=percentage of days abstinent; DDD=drinks per drinking day; AI=alcohol involvement; SE1=pretreatment self-efficacy; SE2=end of treatment self-efficacy; Cons.= within-treatment drinking consequences; NA= not applicable (not included in the model). For significant indirect effects, only individual pathway effects in which all segments are significant are shown. Due to rounding and the elimination of pathways with at least one nonsignificant segment, individual indirect pathway effects may not add up to total indirect effects. Significance level of individual pathways not computed.

**p*<.01

on followup outcomes. Much of the effect was accounted for by the direct positive effect on DDD that was predicted. Only alcohol involvement's positive effect on within-treatment DDD appeared to contribute substantially to the positive indirect effect found on this measure.

The Moderating Effects of Treatment Intensity

Results of the path analysis on the treatment intensity model are presented in figure 8, and direct and indirect alcohol involvement and

intensity effects are summarized in table 5. As in the outpatient arm, the addition of treatment sessions attended did not show any evidence of moderating the direct or indirect effects of alcohol involvement. Treatment intensity, however, did have a significant indirect effect. As with the outpatient arm, this effect was largely accounted for by the positive and negative effects, respectively, on PDA and DDD outcomes. Also, the model showed adequate overall fit without inclusion of a direct effect of intensity on outcome. As in the outpatient arm, the total effect

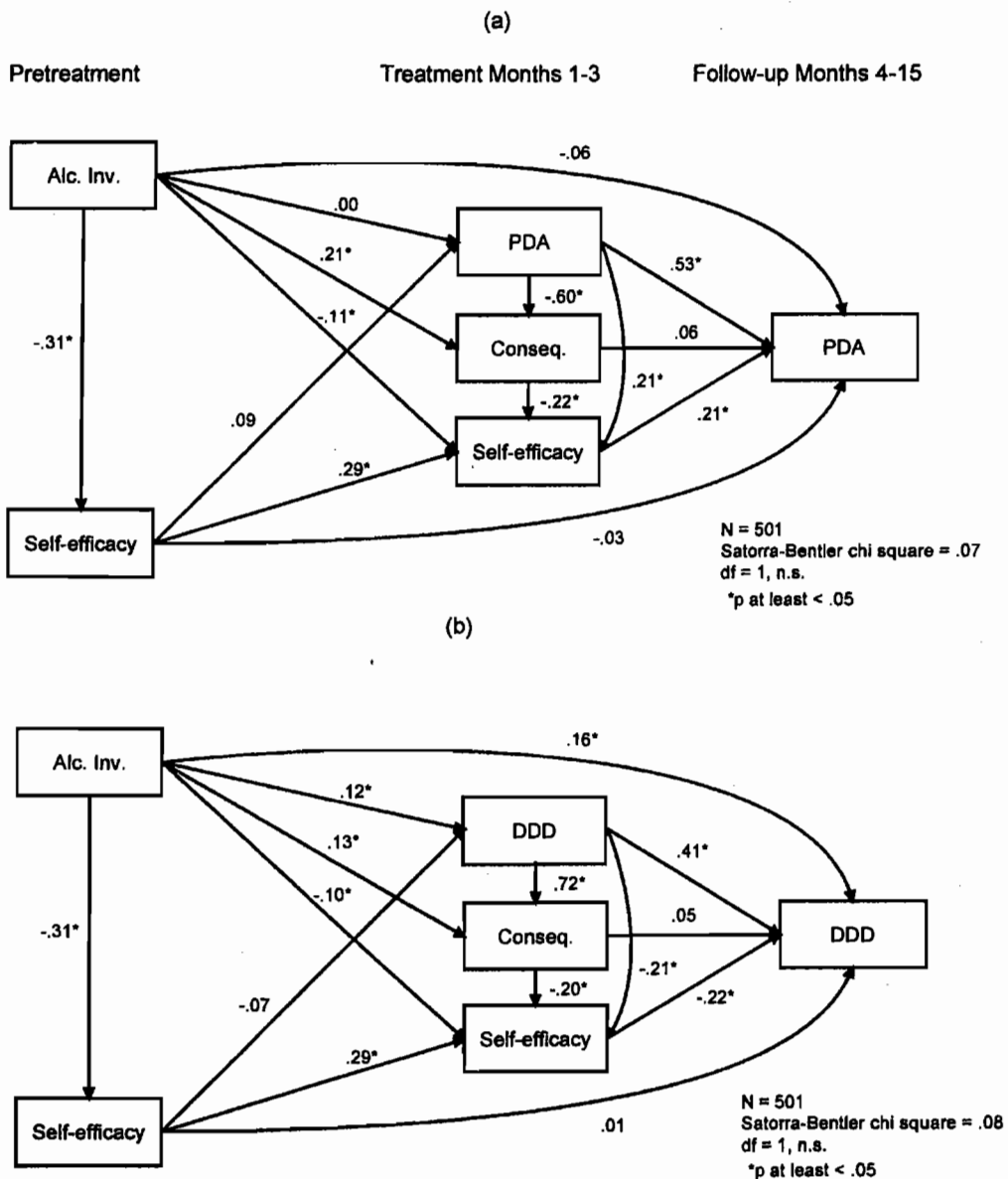


Figure 7. Aftercare alcohol involvement model applied to (a) percentage of days abstinent (PDA) and (b) drinks per drinking day (DDD).

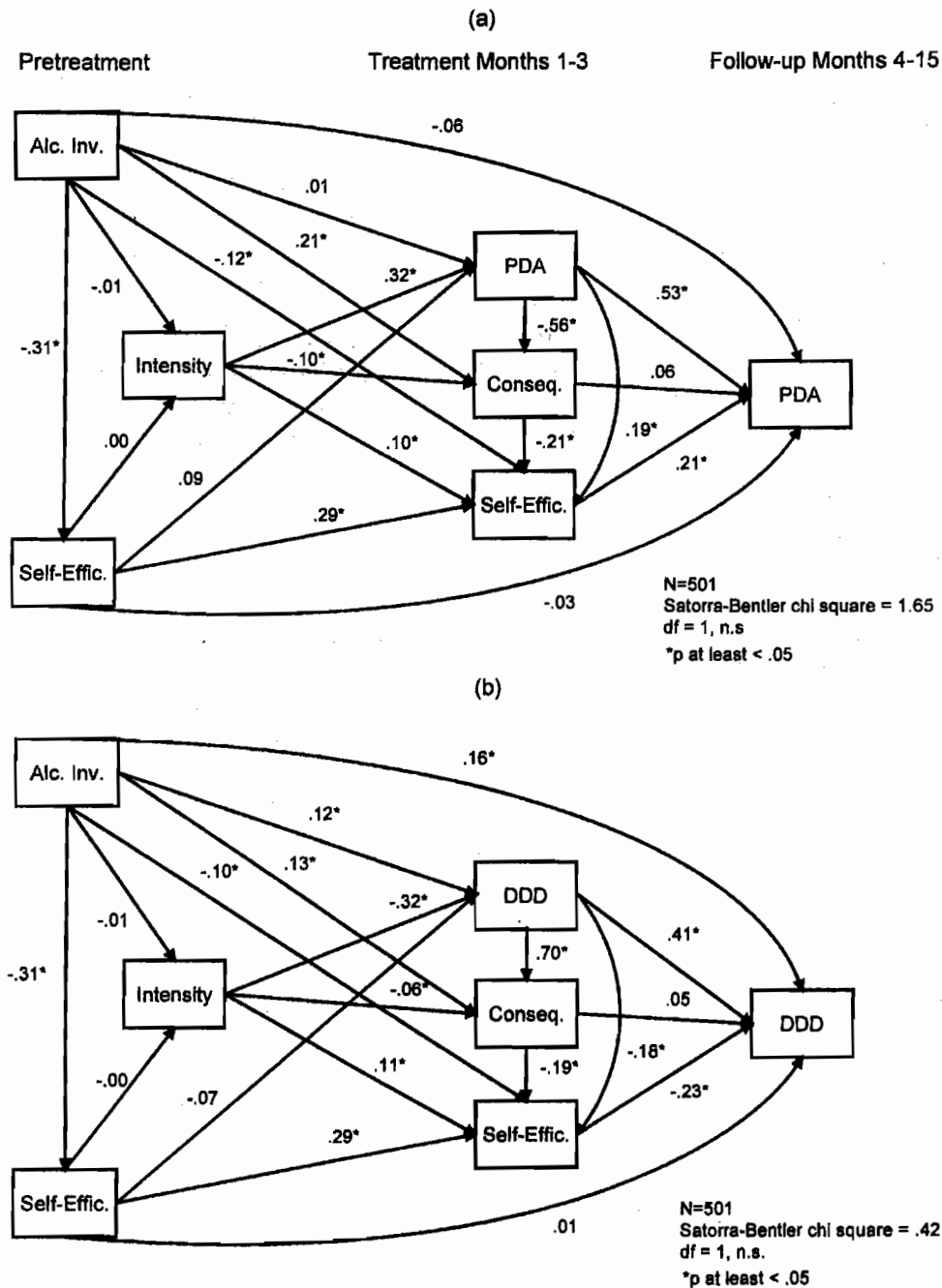


Figure 8. Aftercare treatment intensity model applied to (a) percentage of days abstinent (PDA) and (b) drinks per drinking day (DDD).

of treatment intensity on outcome appears largely accounted for by its indirect effects.

Summary of Aftercare Arm Findings

The alcohol involvement causal model applied to the aftercare sample more closely approximated that predicted than did the model applied to outpatients. No direct or indirect

effect of alcohol involvement on PDA was found, possibly due to the curvilinear relationship between alcohol involvement and PDA across followup. Still, this relationship was in the predicted direction. As with the outpatient arm, however, there was no evidence of treatment intensity moderating alcohol involvement effects. Treatment intensity, however, did have a

predicted indirect effect on followup outcomes, largely through its positive effect on outcomes during treatment.

Discussion

The common belief that outpatients with high levels of alcohol involvement benefit most from more intense treatments was not supported in this study. The causal model analyses suggest a number of reasons for failure to support this predicted interaction. Foremost among these was the unanticipated finding that high alcohol-involved clients had relatively better outcomes as the followup period progressed. In this population, at least, it appears that individuals with high levels of alcohol involvement also are more ready to change and seek out AA more. These pathways appear to counteract any direct negative influence of alcohol involvement on outcome. The relationship between alcohol involvement and outcome in the aftercare arm was more consistent with our predictions. However, here too, the relationship between alcohol involvement and abstinent days was complex and varied in a curvilinear manner over the follow-up months.

Overall, the results suggest that the relationship between alcohol involvement and outcome as measured by abstinent days and DDD is complex, influenced by the tendency for high alcohol-involved subjects to seek out AA more in the ensuing months and to be more motivated for change in the first place. The AA findings highlight the importance of studying posttreatment factors and their influence on overall outcome (Moos et al. 1990).

It is important to note here that others also have failed to find a significant association between alcohol dependence/involvement measures and posttreatment abstinent days (Cooney et al. 1986). A more reliable finding was the consistent negative relationship between alcohol involvement and DDD in both the aftercare arm and, when other factors were not partialled out, in the outpatient arm. It would appear that alcohol involvement is more reliably associated with drinking intensity than drinking frequency measures.

The direction of other pathways in the causal model also were unanticipated and may have contributed to the failure of the proposed model, even in the aftercare arm where more predictions were confirmed. Specifically, we had not anticipated the negative association between alcohol involvement and number of sessions attended in the outpatient arm. While increased number of sessions is associated with better outcomes, the negative effect of alcohol involvement on sessions appears to attenuate this effect. Similarly, increased drinking consequences during treatment was associated with more abstinent days during followup among outpatients. In the aftercare arm, alcohol involvement continued to be associated negatively with posttreatment self-efficacy, also attenuating any positive effect of number of sessions on this measure.

In sum, the relationship between alcohol involvement and outcome appears to be influenced by the outcome measure assessed, client motivation, posttreatment help-seeking, and the population under study. In hindsight, the proposed hypothesis was too simple. Further exploratory analyses of secondary outcome measures and multiple predictor variables may elucidate the role of alcohol involvement, either alone or in conjunction with other measures, in predicting outcome and interacting with treatment type. It also may be that alcohol involvement interacts with the content and not the intensity of treatment to influence outcome.

In the preceding chapter (Cooney et al.), alcohol dependence was found to interact with treatment in a different manner than that predicted here. Unfortunately, although the alcohol involvement measure used in this analysis was highly correlated with that of Cooney and associates (0.69), we were unable to replicate their findings using the alcohol involvement measure or those portions of the measure more directly related to physical dependence symptoms.

Finally, it should be cautioned that the intensity of CBT and TSF treatments in MATCH was considerably less than that seen in intense outpatient or inpatient programs in the community. The possibility remains that the predicted interaction exists only when particularly high levels of treatment are involved. Similarly,

intensity and content of treatment were confounded in Project MATCH, such that content and intensity may have interacted in complex ways to negate the hypothesized interaction. Further exploration of these issues is needed.

Acknowledgments

This research was supported by grants U10-AA08431 and U10-AA08435 from the National Institute on Alcohol Abuse and Alcoholism. We gratefully acknowledge the collaboration of the Project MATCH Research Group and, in particular, the helpful comments of Richard Longabaugh and Philip W. Wirtz on the conceptualization of this hypothesis and on its writeup.

References

- Bentler, P.M. *EQS: Structural Equations Program Manual*. Encino, CA: Multivariate Software, Inc., 1995.
- Cooney, N.L.; Meyer, R.E.; Kaplan, R.G.; and Baker, L.H. A validation study of four scales measuring severity of alcohol dependence. *British Journal of Addiction* 81:223-229, 1986.
- DiClemente, C.C.; Carbonari, J.; Montgomery, R.; and Hughes, S. The Alcohol Abstinence Self-Efficacy Scale. *Journal of Studies on Alcohol* 55: 141-148, 1994.
- DiClemente, C.C., and Hughes, S.O. Stages of change profiles in outpatient alcoholism treatment. *Journal of Substance Abuse* 2:217-235, 1990.
- Edwards, G., and Taylor, C. A test of the matching hypothesis: Alcohol dependence, intensity of treatment, and 12-month outcome. *Addiction* 89:553-561, 1994.
- Horn, J.L.; Wanberg, K.W.; and Foster, F.M. *Guide to the Alcohol Use Inventory*. Minneapolis, MN: National Computer Systems, Inc., 1990.
- Kadden, R.; Carroll, K.M.; Donovan, D.; Cooney, N.; Monti, P.; Abrams, D.; Litt, M.; and Hester, R. *Cognitive-Behavioral Coping Skills Therapy Manual: A Clinical Research Guide for Therapists Treating Individuals With Alcohol Abuse and Dependence*. Project MATCH Monograph Series. Vol. 3. DHHS Pub. No. (ADM) 92-1895. Rockville, MD: National Institute on Alcohol Abuse and Alcoholism, 1992.
- Miller, W.R.; Tonigan, J.S.; and Longabaugh, R. *The Drinker Inventory of Consequences (DrInC): An Instrument for Assessing Adverse Consequences of Alcohol Abuse*. Project MATCH Monograph Series. Vol. 4. NIH Pub. No. 95-3911. Rockville, MD: National Institute on Alcohol and Abuse, 1995.
- Miller, W.R.; Zweben, A.; DiClemente, C.C.; and Rychtarik, R.G. *Motivational Enhancement Therapy Manual: A Clinical Research Guide for Therapists Treating Individuals With Alcohol Abuse and Dependence*. Project MATCH Monograph Series. Vol. 2. DHHS Pub. No. (ADM) 92-1894. Rockville, MD: National Institute on Alcohol Abuse and Alcoholism, 1992.
- Moos, R.H.; Finney, J.W.; and Cronkite, R.C. *Alcoholism Treatment: Context, Process, and Outcome*. New York: Oxford University Press, 1990.
- Nowinski, J.; Baker, S.; and Carroll, K. *Twelve Step Facilitation Therapy Manual: A Clinical Research Guide for Therapists Treating Individuals With Alcohol Abuse and Dependence*. Project MATCH Monograph Series. Vol. 1. DHHS Pub. No. (ADM) 92-1893. Rockville, MD: National Institute on Alcohol Abuse and Alcoholism, 1992.
- Orford, J.; Oppenheimer, E.; and Edwards, G. Abstinence or control: The outcome for excessive drinkers two years after consultation. *Behaviour Research and Therapy* 14:409-418, 1976.
- Rounsaville, B.; Dolinsky, Z.S.; Babor, T.F.; and Meyer, R.E. Psychopathology as a predictor of treatment outcome in alcoholics. *Archives of General Psychiatry* 44:505-513, 1987.
- Rychtarik, R.G.; Prue, D.M.; Rapp, S.R.; and King, A.C. Self-efficacy, aftercare and relapse in a treatment program for alcoholics. *Journal of Studies on Alcohol* 53:435-440, 1992.
- Skinner, H.A., and Allen, B.A. Differential assessment of alcoholism—Evaluation of the Alcohol Use Inventory. *Journal of Studies on Alcohol* 44:852-862, 1983.