Part V: Motivation and Self-Efficacy

Motivation Hypothesis Causal Chain Analysis

Alcohol Problem Recognition and Treatment Outcomes

Self-Efficacy as a Matching Hypothesis: Causal Chain Analysis

Motivation Hypothesis Causal Chain Analysis

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ABSTRACT

The motivation hypothesis examined the interaction of initial motivational readiness to change. This was measured by a single score derived from a revised, alcohol-specific version of the University of Rhode Island Change Assessment, with a Motivational Enhancement Therapy (MET) versus Cognitive-Behavioral Coping Skills Therapy (CBT) contrast. Primary outcome analyses revealed a minimal matching effect, with low-motivation clients in MET having more days abstinent in contrast to CBT clients at the very end of the followup period in the outpatient arm of the Project MATCH trial. Examination of the hypothesized mediating and moderating variables that were assumed to account for any matching effect, however, demonstrated that the treatments did not differentially influence client-therapist working alliance, client coping activities, or attendance during treatment. Nor did the treatments differentially affect the posttreatment variables of motivational readiness to change, processes of change, or alcohol abstinence self-efficacy. There was support for some of the hypothesized generic causal mechanisms. Therapy attendance and client reports of the therapeutic alliance influenced drinking outcomes. However, no supporting evidence was found for any proposed treatment-specific causal mechanisms. Instead, there was strong support across all three treatments for the impact of initial motivational readiness to change on working alliance, client processes of change, and, most importantly, on drinking frequency and intensity outcomes over the 1-year followup period and at the 3-year followup. Findings related to motivation were always more robust among outpatient participants compared to aftercare clients. Implications of these findings for MET and for understanding the process of change in alcoholism treatment are discussed.

The motivation hypothesis in Project MATCH was developed based on the ongoing work on the Stages of Change construct from the Transtheoretical Model of intentional human behavior change (DiClemente and Prochaska 1998; Prochaska and DiClemente 1984, 1992; DiClemente 1993*b*; Prochaska et al. 1992). The Stages of Change identified by the model segment the process of change for addictive as well as other behaviors into five steps or stages. These stages begin with Precontemplation, where the individual is not seriously considering change. As individuals experience the process of change, they progress through Contemplation and Preparation stages before reaching the Action Stage where they actually begin to make the change. Finally, after a significant period of action, they reach the Maintenance stage where the change is firmly estab-

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lished and incorporated into the individual's current behavioral repertoire. Each stage is assumed to have its own tasks and issues that need to be resolved before successfully moving to the next stage. Individuals in earlier stages need motivation and commitment and use cognitive and experiential processes of change to move forward. Individuals in the Action and Maintenance stages need behavioral processes to make the change and sustain it (DiClemente and Prochaska 1998; DiClemente and Scott 1997; Prochaska et al. 1992; Perz et al. 1996).

Stage status is assumed to relate to readiness to change a particular behavior and to determine behavior change activity and outcomes. Stages have been assessed using many different measures. This study used a multi-item, multi-subscale measure based on the University of Rhode Island Change Assessment (URICA) measure (McConnaughy et al. 1989; DiClemente and Hughes 1990). The modified version is alcohol problem specific and has four 7-item subscales measuring attitudes related to the Precontemplation, Contemplation, Action, and Maintenance stages. These subscales combine to form a second-order factor that we have labeled Readiness to Change (Carbonari et al. 1994). Although the stages are conceptualized as discrete steps in the process of change, the motivational readiness score can indicate where each subject is on these stages measured as on a continuum of readiness. The continuous measure increases the power and sensitivity of analytic procedures.

The Matching Hypothesis

The hypothesis related to motivation posited that clients low in motivational readiness to change would have better outcomes in the Motivational Enhancement Therapy (MET; Miller et al. 1992) than in Cognitive-Behavioral Coping Skills Therapy (CBT; Kadden et al. 1992). The underlying mechanism for this matching effect was assumed to be the connection between readiness to change the alcohol behavior (in actuality the lack of readiness) with the specific motivational dimensions of MET and the lack of an adequate motivational emphasis in CBT. The motivational strategies delivered by the MET therapist and received by the client assigned to MET were assumed to promote and interact with motivational readiness to change (DiClemente 1991; Miller and Rollnick 1991; Miller et al. 1992). For example, we would expect a differential response from participants in MET compared to those in CBT to the following questions:

- Did the client feel accepted and understood?
- Did the therapist create the tensions that shifted the pros and cons of the problem behavior and address the ambivalence of the client well enough to create movement?
- Were the therapist and client aligned on the goals and tasks of the therapeutic process?
- Did they develop a viable change plan for this client?
- Did the therapist help the client create the level of alcohol abstinence self-efficacy that would support change?

If these tasks were accomplished in MET and less so or not at all in CBT for the low-motivated clients, we should see differences in drinking outcomes that would support the matching hypothesis.

If the motivational dimensions of MET occurred and functioned as hypothesized, it is assumed that the low-motivated client would become more engaged in the therapy and in the process of change than in the comparison therapy. Once engaged, this client would develop increased motivation to change and move to action with greater probability than a similar client in CBT where the focus was on getting clients to take action right from the start by working on identifying triggers and on developing skills. Low-motivated clients would be mismatched most in the CBT condition, which is more action oriented, and would not engage as completely in treatment nor have as good outcomes in CBT without the specific focus on motivation offered in MET (DiClemente et al. 1992). Although no formal hypothesis was made that included clients in the Twelve Step Facilitation (TSF; Nowinski et al. 1992) treatment, we

thought that TSF approaches and the support and modeling provided by AA meetings would contain more motivational components than CBT (DiClemente 1993*a*). Therefore, in terms of participants' drinking outcomes, TSF would possibly fall somewhere between CBT and MET if clients with low motivation could be engaged in the 12-step and AA program.

The hypothesis focused only on the low end of the motivational readiness scale because of the obvious matching potential between MET and low motivation. CBT could be expected to do well with the highly motivated or ready client. However, a motivated client could do well in most treatments. If there were any mismatching at the high end of motivational readiness, it would most likely occur between high-motivated clients and TSF, since there may be a clash between personal motivation to change and the admonition of the 12-step tradition to admit powerlessness over drinking (DiClemente 1993*a*). No firm hypotheses, however, were developed for the highly motivated client. A more complex, higher order interaction with other variables, like interpersonal skills or environment, would be needed to adequately address the interaction of motivation with other aspects of the client-treatment match, particularly at the high end of motivation.

Assumed Causal Chain

The proposed causal chain analyses for the motivational hypothesis focused on the match between low motivation and readiness to change in the MET versus CBT contrast. If this matching and mismatching occur, the explanation should lie in the motivational enhancement dimensions of MET and the lack of readiness of the client (DiClemente et al. 1992). The hypothesized intermediate variables are displayed in figure 1. The causal chain analysis would proceed in the following sequence of events:

1. The interaction of the baseline readiness and the MET treatment would create a more positive and productive therapeutic alliance for the low-motivated clients in MET.
2. Compliance is both an intermediate matching variable and another possible link in the causal chain analysis (DiClemente and Scott 1997). Low-motivated clients in MET could be expected to attend more treatment

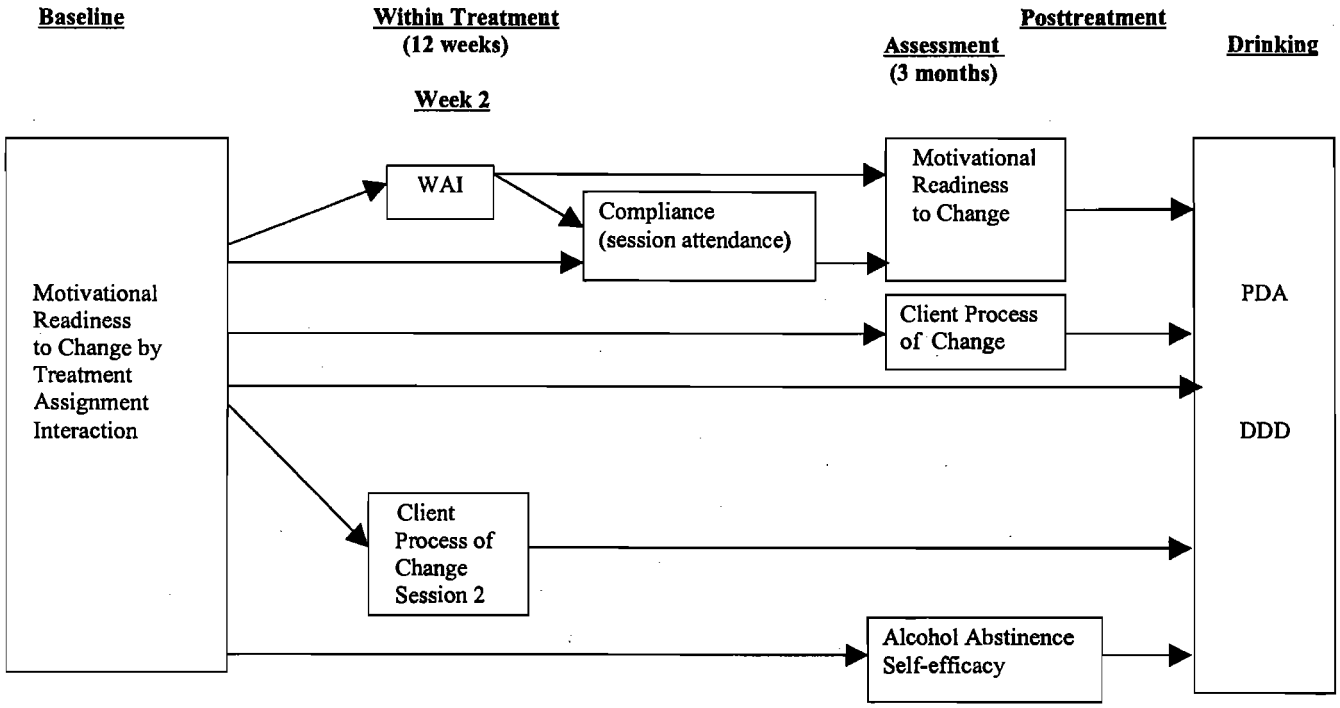

Figure 1. Causal links for the motivation hypothesis.

weeks than would those in CBT. As envisioned for this hypothesis, the therapeutic alliance should influence compliance measured either by the percentage of sessions attended or the number of weeks attended. There should also be a link between compliance and the client's readiness to change at the 3-month followup.

3. Change process activities, as reported by the client at the end of each therapy session and, most comprehensively, at the 3-month evaluation, represent the active coping mechanisms, according to the Transtheoretical Model, by which movement through the stages and behavior change are accomplished. If the MET active ingredients are working as expected, we should see some differences by treatment in process activity either during treatment or posttreatment or at both time points. Change process activity, in turn, should influence drinking outcomes.

4. A more positive therapeutic alliance created through the interaction of MET with low motivation should contribute to an increase in the readiness assessed at the end of treatment. Readiness to change measured at the 3-month followup is the next link in the chain and should ultimately influence posttreatment drinking.

5. Another variable that we believe can influence the matching to outcome connection is client self-efficacy to abstain from drinking measured at posttreatment (DiClemente et al. 1995). Client alcohol abstinence self-efficacy at the 3-month end of treatment evaluation could also serve as an intermediate outcome variable since MET is specifically directed at increasing self-efficacy of the clients in abstaining from their drinking.

6. Drinking outcomes (percentage of days abstinent, PDA; drinks per drinking day, DDD) during treatment and particularly drinking outcomes throughout the 4- to 15-month followup period represent the final links and the criterion variable that all the preceding variables will ultimately impact.

In addition to these causal paths outlined above, motivational readiness could be expected to have some direct effects on intermediate and outcome variables as has occurred in prior research (DiClemente and Prochaska 1998). In figure 2, the arrows suggest all the main effects of motivational readiness on compliance, processes of change, working alliance, and posttreatment drinking.

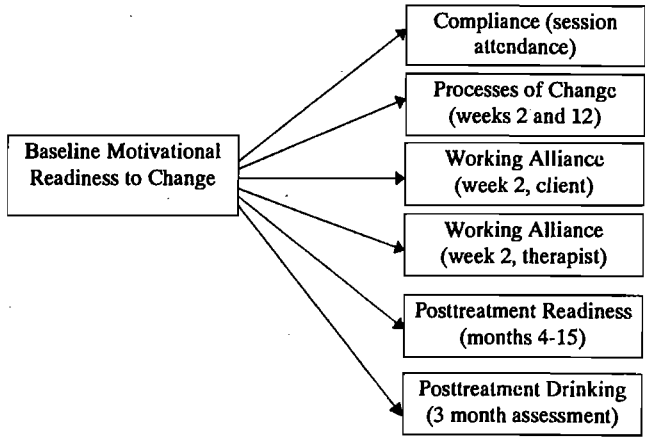

Figure 2. Baseline motivational readiness to change hypothesized main effects.

Measures

Drinking outcome measures used in our analyses were the Project MATCH primary outcome measures of PDA and DDD as reported in the primary matching hypotheses article (Project Match Research Group 1997*a*; Longabaugh and Wirtz, this volume, pp. 4–17). Analyses were done using transformed variables. Tables reflect retransformed percentage of days and number of drinks.

Motivational readiness to change was assessed using a revised URICA. The original version is generic and has four subscales with 8 items representing each subscale (McConnaughy et al. 1989). Items are rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). For our analyses, a 7-item per subscale version was used that had been supported in prior alcoholism treatment research (DiClemente and Hughes 1990; Carney and Kivlahan 1995; Isenhart 1994). This measure

demonstrated solid psychometric properties with Alpha internal consistency coefficients for the four subscales ranging from 0.74 to 0.82 in the aftercare arm and 0.75 to 0.86 in the outpatient arm. The readiness score for each client was calculated by adding the means of the contemplation, action, and maintenance subscales together and then subtracting the precontemplation mean. This scoring reflects a second-order factor reported earlier (Carbonari et al. 1994). This measure was administered at baseline and at the 3-month posttreatment assessments.

Although sometimes used in analyses as a continuous score, readiness scores for clients in each arm of the trial were divided into thirds on this measure in order to create low, medium, and high motivation subgroups. These three subgroups parallel, for the most part, precontemplation, contemplation, and preparation/action stages of change (Carbonari et al. 1994) and may assist in understanding the interactions and effects for the low-motivation subgroup. Table 1 illustrates the overall means, ranges, and standard deviations of readiness scores for outpatient and aftercare clients in the different level of motivation subgroups.

Table 1. Descriptives for readiness groups (trichotomized)

	Motivational readiness group		
Readiness	Low	Medium	High
Outpatient arm	*n*=322	*n*=314	*n*=310
Mean (SD)	8.7 (1.2)	10.5 (0.5)	12.4 (0.7)
Range	2.6–9.7	9.9–11.3	11.4–14.0
Aftercare arm	*n*=249	*n*=262	*n*=257
Mean (SD)	9.4 (1.1)	11.2 (0.5)	12.7 (0.5)
Range	1.6–10.3	10.4–11.9	12.0–14.0

The Working Alliance Inventory (Horvath and Greenberg 1986) was used to assess the working alliance. The WAI is a 36-item measure that consists of three subscales that address the goals of therapy (Goal), agreement about the tasks of therapy (Task), and the bond between the client and therapist (Bond). Ratings are made on a 7-point Likert-type scale (ranging from 1=never to 7=always) on the extent to which the respondent agrees with the statement, and a global score is calculated by taking the sum of the 36 items (after accounting for reverse-scored items). In Project MATCH, the correlations between subscale scores and the total score ranged from 0.87 to 0.96. Parallel forms were used for therapist and client ratings. Since the client and the therapist completed the WAI following the second session (Connors et al. 1997), those ratings were selected for use in these analyses.

Compliance with treatment was measured as the number of weeks of treatment attendance. Although MET consisted of only four sessions, the sessions extended over the 12 weeks. The three treatments were equal in duration but not intensity. Comparable data for all three treatments were available for weeks 1, 2, 6, and 12 (see Mattson et al. 1998 for greater detail).

Processes of change represent client coping activities and measures of processes of change that have been used with different addictive behaviors (DiClemente and Prochaska 1998; Prochaska et al. 1988; Snow et al. 1994). In Project MATCH, processes of change were assessed using a 40-item scale that contained subscales for each of 10 processes with 4 items for each process. Clients were asked to indicate on a 5-point Likert scale (ranging from 1=never to 5=very frequently) how often they had experienced each of the activities or events listed. Twenty of the items comprise experiential processes, which tap into cognitive and affective processes such as consciousness raising and self-reevaluation, and twenty items comprise behavioral processes such as stimulus control and contingency management. Both the 20-item subscales and the 40-item total scale have good psychometric properties with Chronbach Alphas of 0.90 for the experiential and 0.91 for the behavioral subscales (DiClemente et al. 1996).

At posttreatment, clients completed the full 40-item version. A brief 8-item version of the processes of change measure was administered at the end of each therapy session as part of a Client Session Report. This measure contained four behavioral process items, two experiential process items, and two helping relationship items.

Self-efficacy was assessed using the Alcohol Abstinence Self-Efficacy Scale (DiClemente et al. 1994). Clients rated their confidence to abstain from alcohol in 20 different situations on a 5-point Likert-type scale (ranging from 1=not at all to 5=extremely). Clients also rated their degree of temptation to drink in these same 20 situations. Scores were computed separately for confidence and temptation. The mean level of efficacy was computed such that the scores ranged from 1 to 5, with 1 being not very confident and 5 being very confident across all 20 situations. Temptation to drink scores were computed in the same way.

Results

Main Effects

Motivational readiness to change emerged as one of the best predictors of drinking behavior during the treatment period (Project MATCH Research Group 1998*a*) and throughout the posttreatment period for the clients in the outpatient arm of the trial. Motivation predicted both PDA and DDD outcomes for each of the followup periods for these clients (table 2). This initial readiness to change continued to be the best predictor of both PDA and DDD drinking outcomes at the 3-year posttreatment followup (Project MATCH Research Group 1998*b*). However, initial motivational readiness to change did not predict either during treatment or posttreatment drinking outcomes in the aftercare arm. Mean values of motivational readiness to change were slightly higher for clients in the aftercare arm than for those in the outpatient arm. However, assessing readiness while clients were on the inpatient unit or engaged in intensive treatment did not yield scores on this measure of motivation that were related to posttreatment drinking.

Matching Effects

The test of the motivation matching hypothesis provided some support for the matching hypothesis only in the outpatient arm. For outpatient clients, significant interaction effects for the hypothesized CBT versus MET contrast as well as for the CBT versus TSF contrast occurred for posttreatment drinking outcomes but not for drinking during treatment (table 3). For the aftercare clients, there were no significant

Table 2. Comparison of group means and standard deviations for quarterly posttreatment drinking

Posttreatment drinking	Motivational readiness group			Comparisons
	Low	Medium	High	
Outpatient arm				
PDA				
Quarter 1***	.72 (.33)	.76 (.31)	.81 (.29)	low<high
Quarter 2***	.69 (.33)	.75 (.33)	.80 (.30)	low<medium,high
Quarter 3***	.68 (.34)	.74 (.35)	.78 (.31)	low<medium,high
Quarter 4***	.65 (.36)	.76 (.32)	.78 (.32)	low<medium,high
DDD				
Quarter 1***	5.5 (6.4)	4.3 (4.9)	4.3 (5.3)	low>medium,high
Quarter 2***	5.5 (5.5)	4.5 (5.1)	4.3 (5.5)	low>medium,high
Quarter 3***	5.5 (5.9)	4.5 (5.3)	4.1 (5.5)	low>medium,high
Quarter 4***	5.5 (5.7)	4.1 (5.0)	4.1 (5.4)	low>medium,high
Aftercare arm				
PDA				
Quarter 1	.84 (.28)	.85 (.28)	.85 (.28)	ns
Quarter 2	.83 (.28)	.81 (.32)	.81 (.32)	ns
Quarter 3	.81 (.30)	.80 (.33)	.81 (.32)	ns
Quarter 4	.81 (.31)	.78 (.34)	.80 (.34)	ns
DDD				
Quarter 1	4.1 (6.9)	4.0 (7.0)	3.7 (5.9)	ns
Quarter 2	3.9 (6.7)	4.6 (7.1)	4.9 (8.1)	ns
Quarter 3	3.8 (5.5)	4.5 (7.3)	4.6 (8.2)	ns
Quarter 4	4.0 (6.1)	4.7 (7.5)	4.2 (8.0)	ns

NOTE: The four different quarters by group were analyzed individually using ANOVA procedures. Post hoc comparisons were made using the Tukey's B procedure. Pairwise comparisons that were significant are designated by a < or > symbol. If differences were not significant, a comma was used. For outpatient arm, *N*'s ranged from 288 to 313. For aftercare arm, *N*'s ranged from 229 to 250; all comparisons were nonsignificant. PDA=percentage of days abstinent; DDD=drinks per drinking day. ***$p<.005$

Table 3. Hierarchical linear modeling results for the matching hypothesis

MV × Tx contrast	Overall effect (*F*)	CBT-MET (*t*)	CBT-TSF (*t*)	MET-TSF (*t*)
Outpatient arm				
Within Tx				
MV × Tx				
PDA	0.05	-0.02	-0.27	-0.24
DDD	0.68	-0.69	0.48	1.16
MV × Tx × T				
PDA	0.44	-0.35	0.59	0.92
DDD	0.03	0.20	-0.02	-0.22
Posttreatment				
MV × Tx				
PDA	0.03	-0.16	-0.23	-0.05
DDD	0.17	-0.04	0.50	0.50
MV × Tx × T				
PDA	4.50**	-2.83**	2.25**	-0.76
DDD	3.43*	-1.63	-2.58**	-0.77
Aftercare arm				
Within Tx				
MV × Tx				
PDA	2.61	-2.23*	-1.52	0.73
DDD	1.38	1.66	0.82	-0.84
MV ×Tx × T				
PDA	2.16	-1.79	-1.79	0.03
DDD	1.36	1.60	1.11	-0.51
Posttreatment				
MV × Tx				
PDA	2.15	-0.89	-2.07*	-1.14
DDD	2.10	1.80	1.72	-0.10
MV ×Tx × T				
PDA	0.67	1.05	0.93	-0.13
DDD	0.37	-0.85	-0.28	0.56

NOTE: MV=matching variable, Motivational Readiness; Tx =treatment; T=linear time; PDA=percentage of days abstinent; DDD=drinks per drinking day. F tests were used for the overall effect, and t-tests were used for pairwise treatment contrasts. *$p<.05$ **$p<.025$ (refers to Bonferroni-corrected level of significance)

motivational readiness by treatment interaction effects (Bonferroni corrected) for the within treatment or posttreatment drinking outcomes for the hypothesized contrast.

As mentioned, there was a significant attribute by treatment by time interaction for outpatient clients on posttreatment drinking that is illustrated in figure 3. These results are complicated. In the month immediately following the end of treatment, low-motivated clients in the CBT condition had significantly more days abstinent compared to those in MET, contrary to the hypothesis. However, with the passage of time, low-motivated CBT clients increased their drinking and decreased their percentage of days abstinent. In contrast, toward the end of the followup period, low-motivated MET clients appeared to gain more days abstinent, so that by the last month of the followup period, low-motivated clients in MET had significantly more abstinent days than low-motivated clients in CBT. This late-emerging effect could be due to the MET clients beginning to take more responsibility for their drinking, as was urged in the MET condition, combined with the failure of the CBT clients to sustain abstinence over time. However, a late-emerging effect that lasted for only 1 month provided minimal support for the motivation by treatment interaction hypothesized. Thus, it would be interesting to see if the proposed causal chains assumed to be operating were actually visible in the subsequent analyses.

At the 3-year followup, which assessed drinking outcomes for the 90 days prior to the end of the third year posttreatment for outpatient participants, there was no support for the motivation matching contrast. Percentage of days abstinent for the low-motivated CBT clients was approximately 58 percent (*SD*=39 percent) and for the MET clients was 54 percent (*SD*=38 percent). Thus, this late-emerging effect at the end of the first year did not continue to produce a long-term effect. However, it is not known when that effect disappeared between the posttreatment month 12 assessment and the 36-month assessment.

A nonhypothesized significant interaction of motivation by treatment by time occurred in the CBT versus TSF contrast for both PDA and DDD, again only in the outpatient arm (not

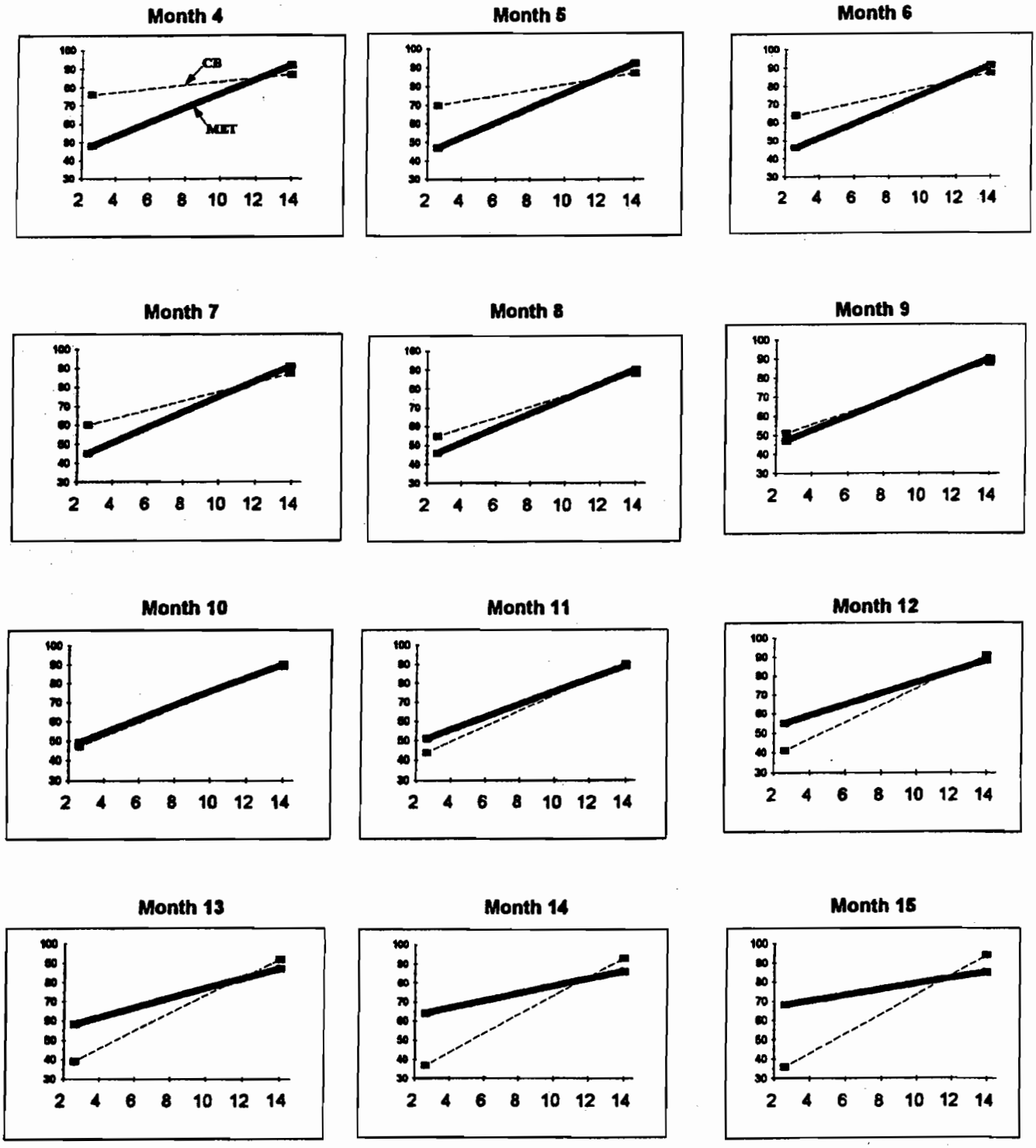

Figure 3. Monthly posttreatment plots of percentage of days abstinent for treatment by time by attribute interaction for motivation contrast between CBT and MET among outpatients. The interaction at month 15 was significant in the predicted direction ($p<.05$). The vertical axis represents percentage of days abstinent and the horizontal axis represents motivation scores. (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.)

shown). What seems to be occurring in this contrast is that at the high end of the readiness to change scale, TSF clients were reporting more abstinence and fewer drinks per drinking day than their CBT counterparts immediately posttreatment at the beginning of the followup period. However, these differences disappeared by the end of the followup period.

Causal Chain Analysis

Working Alliance

The first interaction between motivation and treatment was assumed to be an interaction with the working alliance as evaluated independently by both the client and the therapist. Analyses of the client and therapist reports completed immediately after the second session of treatment indicated that there was a significant main effect for motivational readiness. In both the outpatient and the aftercare arms of the trial, individuals with greater readiness to change at baseline reported significantly higher levels of alliance with the therapist on therapeutic task, goals, and bond, compared with their low-readiness counterparts (table 4). Therapist reports of task and goal on the WAI were also related to client readiness in the outpatient

Table 4. Comparison of group means and standard deviations for working alliance scores at Session 2

Working Alliance	Motivational readiness group			Tukey's B comparison
	Low	Medium	High	
Outpatient arm				
Client ratings				
Total score***	205.0 (24.7)	209.9 (24.8)	219.1 (21.0)	low<medium<high
Task subscale***	68.9 (9.0)	70.8 (8.8)	74.1 (7.2)	low<medium<high
Goal subscale***	68.4 (8.8)	69.5 (9.0)	73.5 (7.5)	low,medium<high
Bond subscale***	67.6 (9.3)	69.7 (9.4)	71.4 (8.6)	low<medium<high
Therapist ratings				
Total score***	188.0 (25.0)	191.1 (24.2)	196.2 (24.0)	low,medium<high
Task subscale***	62.2 (8.7)	63.5 (8.1)	65.2 (8.5)	low,medium<high
Goal subscale***	60.7 (9.9)	61.9 (9.7)	64.2 (9.3)	low,medium<high
Bond subscale	65.1 (8.6)	65.7 (8.5)	66.8 (8.1)	ns
Aftercare arm				
Client ratings				
Total score*	208.2 (25.6)	213.6 (20.8)	221.1 (22.6)	low<medium<high
Task subscale*	70.1 (8.9)	71.7 (7.7)	74.6 (8.1)	low,medium<high
Goal subscale*	69.2 (9.2)	71.4 (7.6)	73.6 (8.2)	low<medium<high
Bond subscale*	68.9 (9.8)	70.4 (7.9)	72.9 (8.3)	low,medium <high
Therapist ratings				
Total score*	192.9 (26.5)	195.4 (24.5)	196.8 (26.6)	ns
Task subscale*	64.6 (8.8)	65.4 (8.3)	66.3 (8.5)	ns
Goal subscale*	62.9 (10.2)	64.2 (9.3)	64.6 (10.0)	ns
Bond subscale	65.5 (9.1)	65.8 (8.8)	65.9 (9.4)	ns

NOTE: The total score and three different subscale scores by group were analyzed individually using ANOVA procedures. Post hoc comparisons were made using the Tukey's B procedure. Pairwise comparisons that were significant are designated by a < symbol. If differences were not significant, a comma was used. *N*'s range from 247 to 269 in the outpatient arm and from 181 to 213 in the aftercare arm.
*p<.05 ***p<.005

but not the aftercare arm of the trial in exactly the same manner (higher client readiness= greater reported alliance).

Working alliance ratings at Session 2, whether provided by the client or the therapist, were significant predictors of treatment participation and drinking behavior during treatment and the 12-month posttreatment period in the outpatient arm of the trial (Connors et al. 1997). Ratings of the therapeutic alliance by the clients at Session 2 in the aftercare arm were not predictive of participation or outcome. However, ratings of the alliance by the therapists in the aftercare sample did predict PDA during treatment and follow-up. Thus, there is evidence of a significant effect of working alliance on participation and drinking outcomes that is most strongly demonstrated in the outpatient arm. However, this effect is modest in the amount of variance (3.5 percent at most) explained. Moreover, there were no significant differences among the three therapies on the WAI scores in either arm.

Additional analyses of the alliance data revealed that the best predictor of the client WAI ratings was the client's motivational readiness to change, with Beta weights of 0.25 in outpatient and 0.23 in aftercare (Connors et al. 2000). Motivation acts as a mediator of the effect of the alliance on drinking outcomes. When motivation is added into the WAI prediction equation, the ability of the WAI to predict drinking outcomes is weakened significantly, indicating a connection between motivation and ratings of the alliance.

In all these analyses, however, there were no significant interactions between type of treatment and motivational readiness related to the WAI scores. Nor were there any significant differences in WAI scores by treatment. Thus, WAI scores appeared related to client readiness to change independently of the type of treatment offered. There was no support for the hypothesized causal link connecting specific treatment effects on the working alliance depending on level of motivation. Low-motivated MET clients did not demonstrate significantly better working alliances with the therapist than did their CBT counterparts.

Compliance

Project MATCH clients had very high levels of compliance with treatment attendance. On average, clients attended 7 to 8 of the scheduled 12 sessions and 3 to 4 of the 4 MET sessions (Mattson et al. 1998). Treatment attendance correlated moderately with drinking outcome (PDA) immediately posttreatment for both CBT (r=0.39) and TSF (r=0.44) clients in both arms of the trial. However, there was little demonstrated connection between treatment attendance and PDA for the MET clients (r=0.12 at posttest and 0.06 at the 1-year followup), possibly due to a ceiling effect in their 4-session attendance. Thus, there was a link between compliance and outcomes as hypothesized.

However, there was no relationship between client motivational readiness and treatment compliance in either arm of the trial. Moreover, there was no interaction between treatment condition and motivational readiness in terms of compliance in either arm of the trial. As can be seen in table 5, weeks in treatment were very similar for all treatment groups. Motivational readiness to change did not predict compliance as was hypothesized. There was no support for the hypothesized causal link between levels of readiness, type of treatment, and compliance. This finding is at variance with several prior studies where Stage of Change was predictive of attendance and compliance (Smith et al. 1995; DiClemente et al. 1991).

Table 5. Comparison of group means and standard deviations for treatment compliance by motivational readiness group

Treatment compliance	Motivational readiness group		
	Low	Medium	High
Outpatient	n=322	n=314	n=310
Number of treatment weeks	8.6 (4.2)	8.7 (4.3)	8.6 (4.2)
Aftercare	n=249	n=262	n=257
Number of treatment weeks	7.7 (4.9)	8.0 (4.7)	8.4 (4.4)

NOTE: The number of treatment weeks by group was analyzed using ANOVA procedures. Post hoc comparisons were made using the Tukey's B procedure. All comparisons were nonsignificant.

During-Treatment Change Process Activity

In both arms of the trial, behavioral and experiential processes of change reported by clients at the 3-month posttreatment assessment were not significantly different across the three treatments (table 6). The brief assessments of process activity reported by clients during treatment in their client session reports indicated that TSF clients had slightly but significantly higher levels of experiential process activity than CBT clients in the outpatient arm, and than MET clients in the aftercare arm. With this minor exception, individuals in all three treatments reported similar levels of experiential and behavioral process activity despite the fact that the three treatments had very different philosophies, therapists, and active ingredients as assessed by objective and independent observers (Carroll et al. 1998).

There were, however, significant effects of baseline motivational readiness to change on client process activity both during and immediately after treatment in both the outpatient and aftercare arms of the trial (table 7). Clients with higher levels of motivational readiness to change at baseline reported significantly higher levels of process activity during treatment and at the posttreatment assessment. In the outpatient arm, the differences in process activity between groups high and low in motivation were more pronounced. However, there were no significant interactions between motivational readiness and the specific treatments on process activity at any time point. Low-motivated clients did not demonstrate more process activity in MET than in CBT. Thus, there was no support for the causal link assumed to involve the processes of change. However, for the outpatient and aftercare clients, their behavioral process activity reported at Session 2 and both behavioral and experiential process activity at the end of treatment did predict posttreatment drinking outcomes. Once again, there was support for the hypothesized relationship between processes of change and drinking outcomes in general but not for the treatment-specific contrast between MET and CBT.

Posttreatment Readiness to Change

Another element in the causal chain predicted significant differential shifts in readiness to change from baseline to posttreatment

Table 6. Comparison of group means and standard deviations for processes of change by treatment assignment

Processes	CBT	MET	TSF	Comparisons
Outpatient arm				
Session 2				
Total	3.1 (0.7)	3.1 (0.8)	3.1 (0.7)	ns
Behavioral	3.5 (0.9)	3.3 (1.0)	3.4 (0.9)	ns
Experiential*	2.6 (1.0)	2.8 (1.0)	2.9 (1.0)	CBT<TSF
Helping relationship	2.8 (1.1)	2.9 (1.1)	2.7 (1.0)	ns
Posttreatment				
Total	3.1 (0.6)	3.1 (0.6)	3.1 (0.7)	ns
Behavioral	3.2 (0.7)	3.1 (0.7)	3.1 (0.8)	ns
Experiential	3.0 (0.6)	3.0 (0.6)	3.1 (0.7)	ns
Aftercare arm				
Session 2				
Total	3.4 (0.8)	3.3 (0.8)	3.4 (0.7)	ns
Behavioral	3.7 (0.9)	3.6 (0.9)	3.7 (0.9)	ns
Experiential*	2.9 (1.0)	2.8 (1.0)	3.0 (0.8)	MET<TSF
Helping relationship	3.3 (1.1)	3.3 (1.1)	3.2 (1.1)	ns
Posttreatment				
Total	3.3 (0.6)	3.3 (0.6)	3.3 (0.6)	ns
Behavioral	3.4 (0.7)	3.3 (0.7)	3.4 (0.7)	ns
Experiential	3.2 (0.7)	3.2 (0.7)	3.2 (0.6)	ns

NOTE: The four different types of processes by group were analyzed individually using ANOVA procedures. Post hoc comparisons were made using the Tukey's B procedure. Pairwise comparisons that were significant are designated by a < symbol. Mean values range from 1 to 5. *N*'s range from 229 to 318 (outpatients) and from 213 to 234 (aftercare) for posttreatment processes and are smaller for Session 2 processes.
*$p<.05$

Table 7. Comparison of group means and standard deviations for processes of change by motivational readiness group

Processes	Motivational readiness group			Tukey's B comparisons
	Low	Medium	High	
Outpatient arm				
Session 2				
Total***	2.8 (0.7)	3.1 (0.7)	3.3 (0.7)	low<medium<high
Behavioral***	3.2 (0.9)	3.3 (1.0)	3.7 (0.9)	low,medium<high
Experiential***	2.4 (1.0)	2.9 (1.0)	3.0 (1.0)	low<medium<high
Helping relationship***	2.5 (1.0)	2.8 (1.0)	3.0 (1.2)	low<medium<high
Session 6				
Total***	2.9 (0.7)	3.2 (0.7)	3.3 (0.8)	low<medium,high
Behavioral***	3.4 (0.9)	3.5 (0.9)	3.8 (0.9)	low,medium<high
Experiential***	2.3 (0.9)	2.8 (1.0)	2.8 (1.1)	low<medium,high
Helping relationship*	2.7 (1.0)	3.0 (1.0)	3.0 (1.1)	low<medium,high
Posttreatment				
Total***	2.9 (0.6)	3.1 (0.5)	3.3 (0.6)	low<medium<high
Behavioral***	2.9 (0.7)	3.2 (0.6)	3.4 (0.7)	low<medium<high
Experiential***	2.8 (0.7)	3.1 (0.6)	3.2 (0.7)	low<medium<high
Aftercare arm				
Session 2				
Total***	3.2 (0.7)	3.4 (0.8)	3.6 (0.8)	low,medium<high
Behavioral***	3.5 (0.9)	3.7 (0.9)	3.9 (0.9)	low<high
Experiential***	2.7 (0.9)	2.8 (1.0)	3.1 (0.9)	low,medium<high
Helping relationship***	3.0 (1.1)	3.2 (1.1)	3.5 (1.1)	low,medium<high
Session 6				
Total***	3.1 (0.9)	3.3 (0.8)	3.5 (0.8)	low<high
Behavioral***	3.4 (1.0)	3.6 (0.9)	3.8 (0.9)	low<medium<high
Experiential	2.7 (1.0)	2.7 (1.0)	2.8 (1.0)	ns
Helping relationship	3.2 (1.1)	3.2 (1.1)	3.4 (1.1)	ns
Posttreatment				
Total***	3.1 (0.6)	3.3 (0.6)	3.5 (0.7)	low<medium<high
Behavioral***	3.2 (0.7)	3.4 (0.7)	3.6 (0.8)	low,medium<high
Experiential***	3.0 (0.7)	3.2 (0.6)	3.4 (0.7)	low,medium<high

NOTE: The four different types of processes by group were analyzed individually using ANOVA procedures. Post hoc comparisons were made using the Tukey's B procedure. Pairwise comparisons that were significant are designated by a < symbol. If differences were not significant, a comma was used. Mean values range from 1 to 5. *N*'s range from 290 to 310 (outpatient) and from 214 to 233 (aftercare) for posttreatment processes and are smaller for Sessions 2 and 6 processes.
*** $p<.005$ * $p<.05$

produced by the matching of treatments with motivational readiness group. Once again, there were significant differences between groups of individuals high and low in motivational readiness in terms of their changes in readiness during the course of treatment but no significant effects by treatment or any treatment by readiness interactions. There were changes in motivational readiness from pretreatment to posttreatment that differed by initial level of motivation. However, the direction of the change was somewhat surprising. The high-readiness group showed a decrease in motivational readiness larger than the

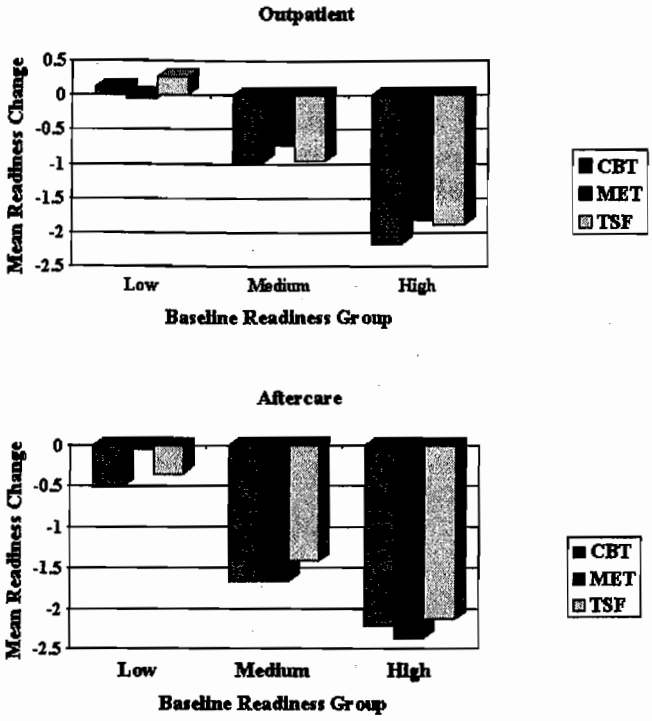

Figure 4. Mean motivational readiness by baseline readiness groups.

medium-readiness and low-readiness groups. This occurred in both arms of the trial (figure 4). Contrary to what we hypothesized, a decrease in readiness score from pretreatment to posttreatment was a positive indicator of drinking outcome. In addition, end of treatment (3-month assessment) readiness scores did not predict posttreatment drinking outcomes in either outpatient or aftercare arms.

Client motivation as assessed by the URICA at the end of treatment was problematic and confusing. What seemed to be occurring was that client ratings on the four URICA subscales shifted in understandable but unexpected directions once the clients had achieved some successful cessation of drinking (Carbonari et al. 1994; Carbonari and DiClemente 2000). Thus, the overall readiness scores at posttreatment were not comparable to pretreatment readiness scores. When decomposed back into the constituent subscales, however, some end of treatment subscales were predictive of posttreatment drinking, wth the action subscale scores being a positive predictor of drinking outcomes and maintenance scores being a negative predictor. It was also clear that these shifts occurred differentially by readiness group. The high baseline readiness group changed drinking behaviors and responses to the URICA items differently from the low readiness group. Once again, however, there were no treatment-specific differences found in the shifts in motivational readiness from pretreatment to posttreatment as was found with the other hypothesized causal links.

Alcohol Abstinence Self-Efficacy

Efficacy to abstain from drinking across a number of situations was examined to see if the assumed motivational readiness by treatment interaction in the prediction of client abstinence self-efficacy at the 3-month assessment existed. However, no significant interactions were found in either arm of the trial. Moreover, efficacy did not differ by treatment condition. Posttreatment self-efficacy was related to drinking outcomes during the followup period for outpatients (DiClemente et al. this volume; Project MATCH Research Group 1997*b*). However, there was no support for a causal link or even a differential impact of baseline motivational readiness interacting with the treatments to affect client efficacy to abstain from drinking.

Discussion

There was some support among outpatient clients for a delayed matching effect for motivational readiness to change in Project MATCH. However, the hypothesized superiority of MET for the low-motivated clients occurred during the last month of the 12-month followup period. Moreover, immediately posttreatment, PDA and DDD outcomes were in the opposite direction from those hypothesized, with the low-motivated CBT clients doing better. This suggested that the hypothesized relationships forming the causal chain for this hypothesis would not emerge. Indeed, none of the causal linkages between treatments and motivation were demonstrated in our analyses. There were no significant differences or interactions for low-motivated clients in MET compared to CBT on reported working alliance, compliance, processes

of change, posttreatment readiness, or abstinence self-efficacy.

What did emerge in these analyses was support for a generic, across treatment, modest positive relationship link among baseline motivation, the therapeutic alliance, and treatment attendance/compliance with posttreatment drinking outcomes. The most striking findings, however, were the strong, independent, predictive effects of baseline motivational readiness to change on drinking outcomes and other variables. Motivation at intake predicted working alliance during treatment, processes of change during and after treatment, and shifts in posttreatment readiness to change across both arms of the trial. Motivation at intake also predicted drinking outcomes throughout the 1 year and also at a 3-year followup after treatment in the outpatient arm of the trial.

MET did not differentially affect low-motivated clients as expected in the motivational hypothesis, even though MET was discriminable from the other two treatments and MET therapists did appear to be adhering to the manual (Carroll et al. 1998). With the exception of the one posttreatment matching outcome finding at month 12, MET did not interact with motivation as hypothesized. At the end of the 3-year followup, the hypothesized motivation by treatment effect was not evident. It may be that these less motivated MET clients did learn that change of their drinking was their responsibility so that over time they began to achieve greater abstinence during the 1-year posttreatment period. However, there were few indications on any process measures during or after treatment to support this claim. Low-motivated MET clients did not have any higher abstinence self-efficacy or process activity immediately posttreatment. Motivation by treatment interactions were almost nonexistent. Therefore, it is not surprising that there was not much support for matching effects.

In marked contrast to the lack of interaction effects between treatments and motivation were the highly significant effects of motivational readiness to change on the working alliance as reported by both client and therapist as well as on client processes of change both during and immediately after treatment. These effects were always in the expected direction, with higher levels of motivation for change associated with better working alliance and greater process activity. Moreover, the baseline motivational readiness to change predicted drinking throughout the posttreatment period (Project MATCH Research Group 1997*a*) and all the way out to 39 months postbaseline for the outpatients (Project MATCH Research Group 1998*b*). Motivation related to all positive predictors of drinking outcomes and demonstrated a moderator effect on the relationship between working alliance and drinking outcomes. Both process and outcome data supported the role of motivational readiness to change in achieving and sustaining abstinence and decreasing the intensity of drinking.

Although significant relationships in the expected direction were found for motivational readiness to change with working alliance and processes of change among the aftercare clients, results in this arm of the study were more variable and less predictive overall. Baseline values of readiness to change were not predictive of posttreatment drinking, contrary to outpatient results. There are several possible explanations for these differences between outpatient and aftercare clients in terms of their self-assessments at baseline and at posttreatment. One possible explanation is that the URICA scales are useful only for clients entering treatment and measure Precontemplation, Contemplation, and Action better when clients currently have the problem and are in a pre-action stage. Most prior studies using the URICA have examined outpatients who were at the initial entry point of therapy. Aftercare clients, on the other hand, were assessed for the first time while they were on an inpatient unit or at an intensive day treatment setting. Abstinence was supported by the restrictions and safety of being in a hospital or day treatment setting. Thus, their perceptions of their readiness to change could be overly optimistic. Inaccuracies in self-evaluation could lead to poor predictive ability of the measure. This interpretation is supported by the findings related to self-efficacy (DiClemente et al. this volume).

In addition, once individuals have achieved abstinence, responses to the questions in the

Precontemplation, Contemplation, Action, and Maintenance subscales of the URICA become more problematic. Once abstinence is achieved, action and maintenance subscale scores become better predictors of continuing successful abstinence since these subscales contain items reflecting commitment to stop drinking and struggling with relapse (Carbonari et al. 1994). In fact, once clients become abstinent, they begin to increase their agreement with precontemplation items since they see themselves as resolving the problems and not resisting change. Evaluation of state-like constructs such as readiness to change and self-efficacy are sensitive to current status in making the behavior change and to an intensive/inpatient treatment setting. In retrospect, if we could have assessed readiness and efficacy during the first week after clients were released from the more intensive treatment, we might have obtained a measure of these constructs that would be a more relevant predictor of outcomes.

In the aftercare arm, there was a lawful, expected relationship between motivation and process activity, with more motivated clients using more processes during and after treatment. More motivated clients were doing more to change. However, differences between the motivational groups were not large. Even the less motivated clients were using processes of change at rather high levels, so there may not have been enough variability to make a difference in drinking outcomes. In aftercare, there were fewer significant differences by motivation for process activity at Session 2, Session 6, and posttreatment. Low-motivated aftercare clients had process scores that were equal to medium or high groups among outpatients. However, despite restriction in range, even for these aftercare clients, process activity in Session 2 and posttreatment significantly predicted posttreatment drinking.

Although there are compelling data supporting a common path of change where readiness to change and processes of change are related to each other and to drinking outcomes, there is little evidence that the treatments differentially affected or interacted with any of these variables. Clients in all three treatments reported similar working alliance scores, process of change activities, abstinence self-efficacy, and levels of compliance. Across all three treatments, there was good evidence for client differences in readiness to change. We need to continue to examine this homogeneity of treatment effect among a heterogeneous population of participants. Clients appear to be experiencing a common process of change that is being influenced similarly across the three different treatments.

Through a variety of experiences and contextual variables (i.e., life events), individuals enter therapy with varying levels of motivation that lead to change activity occurring in the pretreatment period. Thus, many clients may have done significant work getting ready to make changes in their drinking prior to entry into treatment. The predictive ability of the Session 2 variables (working alliance, processes of change) indicates that clients were employing critical coping activities early in the treatment. MET may not be able to influence this process with only the two initial sessions in any significant way above and beyond what has already occurred.

These results indicate that we need to understand better the larger process of change for drinking behavior in order to be able to better promote movement through that change process. Very different treatments delivered in different doses of intensity did not affect this change process differentially. Over the long run, Motivational Enhancement Therapy did as well as more established and intensive treatments. However, in the variables assessed in Project MATCH, MET did not affect client motivation or movement through the process of change in any way that differed from CBT and TSF. Clearly, we need to understand how to influence motivational readiness to change.

It has been argued that this trial had only very motivated clients and that the level of motivation was too high for the entire sample to influence outcomes with our treatments. However, the motivational levels on the URICA reported among outpatients in this trial were comparable to those from a general outpatient treatment program with few exclusion criteria (DiClemente and Hughes 1990). Moreover, the fact that baseline levels of motivation continue

to predict drinking outcomes well beyond the end of treatment indicates that there was enough variability to affect drinking outcomes. However, none of the treatments interacted with initial levels of motivation sufficiently to disrupt the relationship between motivation on entry to treatment and drinking outcomes. Clearly, we need to understand better how treatments interact with the process of change in order to improve our ability to influence motivation to change.

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Alcohol Problem Recognition and Treatment Outcomes

William R. Miller, Ph.D., and J. Scott Tonigan, Ph.D.

ABSTRACT

A matching hypothesis within Project MATCH predicted better outcomes for clients low in problem recognition (as measured by the SOCRATES) when treated in Motivational Enhancement Therapy (MET), as compared with two other treatment approaches. SOCRATES scores, both before and after treatment, did reliably predict drinking outcomes during followup in both outpatient and aftercare arms of the trial. These prognostic relationships were observed in all three treatment conditions, and no support was found for the predicted matching effect. As predicted, aftercare clients in the MET condition did show significantly greater increases in problem recognition during treatment. Also as expected, initial motivation (recognition) predicted the quality of therapist-client working alliance in the other two treatments but not in MET, a finding observed in both arms of the trial. That is, MET appears to have removed the prognostic effect of pretreatment motivation on working alliance. The causal chain broke down, however, because neither change in problem recognition nor working alliance was reliably related to treatment outcomes. Taking Steps proved to be the most reliable predictor (among the SOCRATES scales) of treatment outcome. This is consistent with a larger literature showing that client action toward change (sometimes called adherence or compliance) is a robust predictor of more successful outcomes.

Project MATCH afforded an opportunity to test the prognostic properties of pretreatment motivation for change. The matching hypothesis regarding motivation was based on the University of Rhode Island Change Assessment (URICA) scale, a report of which is found elsewhere in this volume (DiClemente et al.). Because the items of the URICA are phrased in general terms for applicability to a broad range of possible problems, it seemed useful to determine whether more alcohol-specific motivation is predictive of treatment outcomes.

The Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES) was designed to query motivational aspects specific to problem drinking. Its initial item pool was constructed to sample stages of change as they may apply to drinking behavior, with items intended to correspond to the Precontemplation, Contemplation, Determination, Action, and Maintenance stages of the Transtheoretical Model (Prochaska and DiClemente 1986). In subsequent waves of factor analyses, however, we were unable to reproduce factors corresponding directly to these constructs. Instead, the SOCRATES consistently yields three factors with test-retest reliability and good cross-cultural and internal consistency (Miller and Tonigan 1996). The first of these scales, termed Recognition, contains items originally assigned to the Determination (loading positively) and Precontemplation (loading negatively) scales and seems to center around the drinker's awareness and acknowledgment of alcohol-

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related problems. A second factor, labeled Taking Steps, combines the Action and Maintenance items, all loading in the same direction, and reflects the drinker's prior and current efforts to change. Items from the Contemplation domain, as contained in the SOCRATES, form a separate third factor. These were written to capture uncertainty about alcohol problems within their sentence structure ("There are times when I wonder if I drink too much"), and the scale is termed Ambivalence. Given the observed difference in factor structure, names of the URICA stages and combination scales were specifically avoided so as not to suggest that the SOCRATES taps the same general constructs.

The Matching Hypothesis

Following logic similar to that for the motivation hypothesis, we reasoned that *less motivated clients would benefit differentially from the Motivational Enhancement Therapy (MET; Miller et al. 1992) as compared with MATCH's two more action-oriented treatments, Cognitive-Behavioral Coping Skills Therapy (CBT; Kadden et al. 1992) or Twelve Step Facilitation (TSF; Nowinski et al. 1992).* A similar finding was reported by Heather and associates (1996) such that at earlier stages of readiness (precontemplation, contemplation), motivational interviewing was associated with better outcomes in comparison to behavioral skill training, whereas clients in action and maintenance stages showed similar responses to the two treatment methods.

Our original intention was to subtract the SOCRATES Precontemplation scale score from its Determination scale score, as a measure focused on earlier motivational stages. The discovered factor structure of the SOCRATES, while not corresponding to stages of change, fortunately did lend itself to the testing of this hypothesis because the Recognition factor manifests this difference score in its item loadings (original Determination items loading positively and Precontemplation negatively). Thus, the SOCRATES Recognition scale score was chosen as the matching variable. A difference in dependent variable slopes was hypothesized for MET versus the other two treatments, predicting a higher percentage of abstinent days and fewer drinks per drinking day in the MET condition at lower levels of alcohol problem recognition.

The Causal Chain

The SOCRATES Recognition interaction was expected because MET was designed specifically to address client motivation (including problem recognition), whereas the other approaches were more action oriented. Two core assumptions drove the causal model specified below. First, the MET condition would disrupt the normally strong prognostic effect of motivation on favorable outcome by raising awareness of alcohol-related problems among clients with low pretreatment motivation. Second, action-oriented therapies are intended for highly motivated clients, but low-motivation clients are disadvantaged when assigned to action-based therapy. This disadvantage was predicted to result in poorer working alliance and treatment outcomes in CBT and TSF. This effect was hypothesized to operate via a specified causal chain including the following assumptions:

- Higher motivation levels both before and after treatment will predict better outcomes.
- For clients initially low in problem recognition, MET will result in a greater increase in Recognition than will occur in CBT or TSF.
- Therefore, baseline level of problem recognition will be positively related to therapist working alliance in the combined CBT and TSF conditions but not in the MET condition.
- As a result, the prognostic effect of baseline problem Recognition on outcome will be stronger in the combined CBT and TSF groups relative to the MET condition.
- Better therapeutic working alliance will be related to end-of-treatment problem Recognition levels in MET, which in turn will influence drinking outcomes.

- The differential effect of MET on working alliance and/or on problem recognition will account for the predicted matching interaction of treatments with outcomes, such that clients low in Recognition will fare better in MET than in the combined CBT and TSF conditions.

Working alliance was determined through the Working Alliance Inventory (WAI; Horvath and Greenberg 1986), a brief self-report measure intended to assess client impressions of client-therapist therapeutic alliance. In Project MATCH, the WAI was generally administered after the second week of therapy, which most often corresponded to the end of the second therapy session. The WAI yields three scales and a total score, with higher scores indicating higher endorsement or agreement. The three scales were client impressions of client-therapist *bonding*, and client agreement with designated therapeutic *tasks* and *goals*.

Procedures for testing the final matching hypothesis, including use of covariates in the analyses and control of site, treatment, and matching variable interactions, have been described in detail elsewhere (Project MATCH Research Group 1997*a*; Longabaugh and Wirtz, this volume, pp. 4–17). Path analyses within treatment groups were used as the primary tool for testing links of the causal chain. As throughout Project MATCH, these analyses were conducted separately in the two arms (aftercare and outpatient) of the trial.

Results

Findings are presented separately for the aftercare and outpatient arms of the MATCH trial. Presented separately for each arm, findings first focus on the prognostic value of SOCRATES scores (including the matching variable, Recognition) on the two primary dependent measures during posttreatment months. Various strategies to aggregate daily drinking data were evaluated. Description of client drinking as during (months 1–3) and after (months 4–15) treatment has heuristic advantages, but post hoc analyses of monthly drinking during the 12 months of followup (months 4–15) substantially increase type-1 error rate. This concern is especially acute in the context of conducting causal chain analyses, where alternative choices of monthly values to evaluate proposed causal models may substantially alter findings. For these reasons, monthly values for these two dependent measures across the 12 months of followup were recalculated and divided into proximal followup (months 4–9) and distal followup (months 10–15).

This is followed by results of the formal tests of the matching hypothesis using hierarchical linear modeling (HLM). Finally, causal chain analyses are presented to clarify secondary HLM matching analyses, highlighting unanticipated aspects of the causal chain and showing how the purported mechanisms of the matching hypothesis varied by aftercare and outpatient study arms.

Outpatient Arm

Prognostic Effects of SOCRATES

Table 1 provides the most liberal interpretation of the prognostic value of the SOCRATES in predicting the two primary dependent variables in MATCH: percentage of days abstinent (PDA) and drinks per drinking day (DDD) at proximal and distal followups in the outpatient arm. Based upon transformed PDA and DDD measures, second-order partial correlations

Table 1. Prognostic main effect of SOCRATES scales on outpatient proximal and distal treatment outcome for both primary dependent measures [1]

SOCRATES scale	Proximal followup Months 4–9		Distal followup Months 10–15	
	PDA	DDD	PDA	DDD
Ambivalence	-.01	-.03	-.01	-.00
Recognition	.11*	-.10*	.11*	-.10*
Taking Steps	.21*	-.18*	.18*	-.17*

[1] Second-order partial correlations between SOCRATES scales and PDA and DDD, controlling for baseline PDA and DDD.
* $p<.05$

controlling for intake values of PDA and DDD, but not treatment condition, indicate that the Recognition and the Taking Steps scales significantly and positively predict PDA and DDD at both proximal and distal followup intervals. Clients higher in Recognition and Taking Steps at intake reported both higher rates of abstinence and less drinking intensity across followups. In contrast, Ambivalence scores were unrelated to frequency and intensity of drinking at both followup intervals.

Hierarchical multiple regression analysis (MRA) was used to examine the joint and unique contribution of the three SOCRATES scales in predicting PDA (proximal and distal), after controlling for baseline values of PDA and DDD, and for treatment main effects (effect coded). This approach was judged more conservative than the former because, unlike the partial analyses which did not control for treatment main effects, these analyses also discarded redundant variance among the three SOCRATES scales in predicting client drinking status. MRA results (N=866) indicated that, in combination, the three scales accounted for a significant increment in variance (4.5 percent) above that predicted by baseline values of PDA and DDD and treatment group assignment (11.5 percent), $F(3, 858)=15.24$, $p<.001$. Single degree of freedom (df) tests of the beta weights (β) showed, like the partial analyses, that Recognition (β= 0.07) and Taking Steps (β=0.19) were jointly and uniquely predictive of early followup PDA, whereas client ambivalence was unrelated to frequency of drinking. At distal followup, the three SOCRATES scales jointly added a significant increment in variance (3.5 percent) in PDA, above baseline drinking measures and treatment group assignment, $F(3, 835)=11.72$, $p<.001$. Single df tests indicated that pretreatment Taking Steps (β=0.16, $p<.001$) and Recognition (β=0.08, $p<.03$) again uniquely predicted distal PDA, while client pretreatment Ambivalence was unrelated to distal PDA.

A second wave of prognostic analyses included an HLM approach that controlled for the variables already described as well as site effects and matching variable by site and matching variable by treatment interactions. This analysis was conducted only for the Recognition scale, which was the matching variable. Here, and across the entire 12 months of followup, both PDA and DDD were significantly related to clients' Recognition scores such that higher self-reported problem recognition at baseline was associated with higher PDA ($p<.0001$) and lower DDD ($p<.014$).

Testing the Matching Hypothesis

Table 2 provides the unadjusted probability values (α=0.05) of the HLM tests of the recognition matching hypothesis reported in Project MATCH during (Project MATCH Research Group 1998) and after treatment (Project MATCH Research Group 1997*b*). Also included are pairwise treatment contrasts not predicted nor previously reported but provided as an aid to interpret how the Recognition matching variable may have unanticipated mediating effects.

Bonferroni-corrected HLM analyses using PDA did not support the a priori hypothesis when time was collapsed for the during ($p<.40$)

Table 2. Summary of outpatient HLM problem recognition matching tests: Probability values associated with tests of during and after treatment client-treatment matching

Variable	Predicted match	Unplanned matching contrasts		
	MET vs. CBT&TSF	CBT–MET	CBT–TSF	MET–TSF
During treatment				
PDA	.40	.55	.75	.38
PDA linear	.58	.76	.71	.51
PDA quadratic	.14	.12	.59	.32
DDD	.99	.87	.75	.88
DDD linear	.61	.97	.42	.41
DDD quadratic	.08	**.05**	.40	.27
After treatment				
PDA	.52	.69	.74	.48
PDA linear	**.04**	**.04**	.70	.11
PDA quadratic	.15	.93	.22	.21
DDD	.72	.73	.96	.78
DDD linear	.65	.81	.20	.31
DDD quadratic	.53	.17	.11	.82

or posttreatment ($p<.52$) phases of the trial. Tests of the predicted matching effect when the contrast was examined across time as a linear or as a quadratic function likewise did not support the hypothesis during ($p<.58$, linear; $p<.14$, quadratic) or after treatment ($p<.04$, linear; $p<.15$, quadratic). None of the post hoc monthly contrasts supported the prediction that clients with lower intake recognition fared better (higher PDA) in the MET condition relative to low-recognition clients assigned to the combined CBT and TSF conditions. Figure 1 depicts the general relationship tested in the HLM analyses, and one can see the modestly prognostic effect of client recognition but the absence of a statistically significant and/or clinically relevant differential relationship between recognition and PDA by treatment condition at proximal followup. Probability values (α) associated with the unplanned paired contrasts in table 2 likewise indicate that problem recognition did not mediate treatment response in regard to PDA during or after treatment.

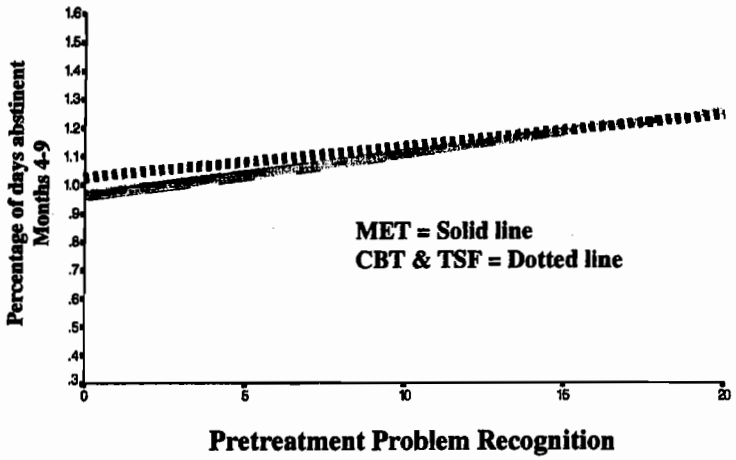

Figure 1. Pretreatment Problem Recognition and proximal percentage of days abstinent in the outpatient sample: A priori matching hypothesis

Parallel HLM analyses using drinking intensity (DDD) also failed to support the problem recognition hypothesis when time was collapsed during ($p<.99$) and after treatment ($p<.72$). When the contrast was modeled across months in linear or quadratic functions, no support was found either during ($p<.61$, linear; $p<.08$, quadratic) or after treatment ($p<.04$, linear; $p<.53$, quadratic) after Bonferroni correction for the two primary dependent measures ($\alpha=0.05/2$). None of the post hoc monthly contrasts supported the a priori prediction. Unplanned pairwise treatment contrasts also failed to indicate a problem recognition mediation effect.

Causal Chain Analyses

Figure 1 highlights one faulty assumption about the change mechanisms predicted to operate in the MET and combined CBT and TSF conditions. Inconsistent with our predication, the prognostic effect of client Recognition at intake was *not* stronger in the combined CBT and TSF conditions. This section examines the factors that may explain this breakdown in the Recognition matching hypothesis.

Figure 2 presents the standardized coefficients (β) for the separate path analyses for the MET and combined CBT and TSF conditions in the outpatient sample. Site effects were partialed out from all relationships shown in these figures. As predicted, pretreatment Recognition was significantly and positively related to therapist working alliance in the combined CBT and TSF conditions but not in the MET condition. Unexpectedly, therapeutic working alliance was not related to end-of-treatment problem Recognition in *any* group. Here, we anticipated positive relationships, with a significantly more positive relationship in the MET condition. We predicted a strong and positive relationship between pretreatment and end-of-treatment Recognition in the CBT and TSF condition, and a smaller relationship between these variables in the MET condition. This prediction was not supported. Finally, in the MET group, pretreatment Recognition was equally (if not more) prognostic of PDA and DDD both at proximal and distal followups as it was in the combined CBT and TSF groups. This finding is contrary to the prediction in our causal model.

The path analyses do not answer whether the corresponding slopes for the MET and the combined CBT and TSF conditions were statistically different from one another. These slope contrasts were accomplished using factorial MANCOVA. Here, variables specified in the

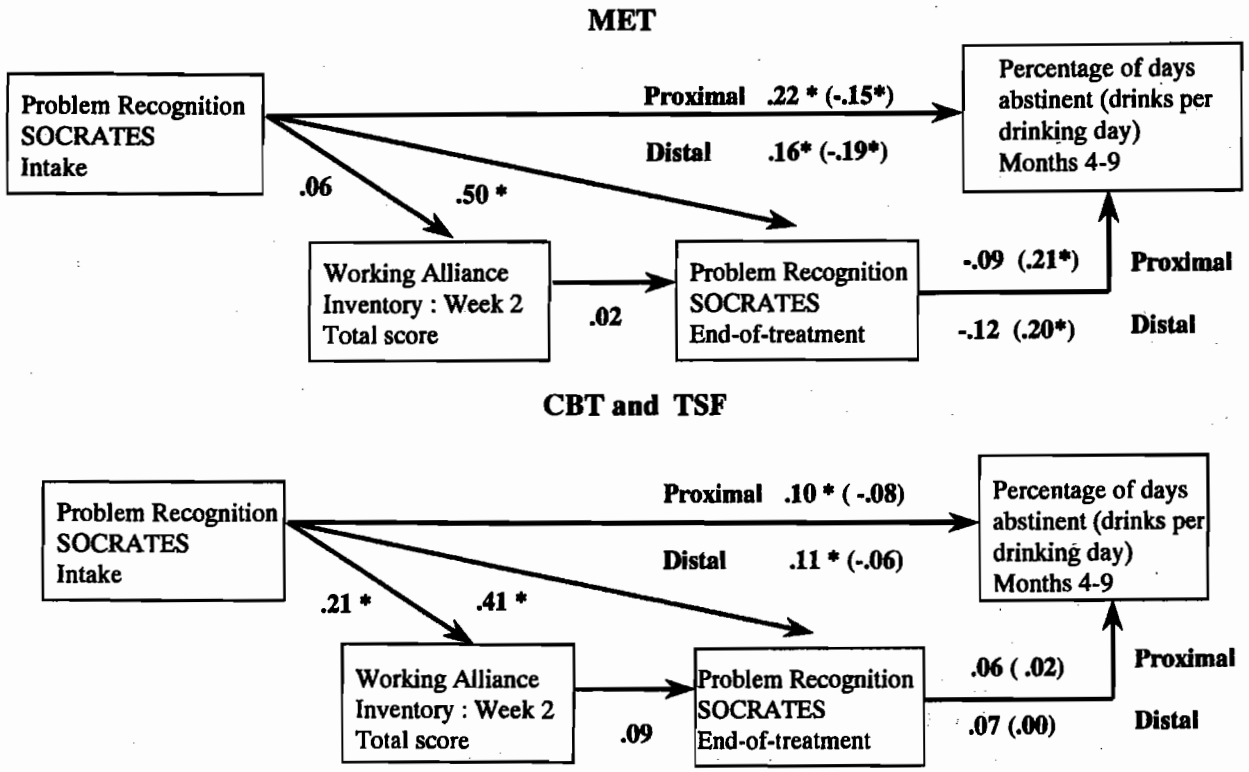

Figure 2. Outpatient Problem Recognition causal chain findings. Standardized coefficients are provided for proximal (above line) and distal (below line) followups. Results of regressing percentage of days abstinent on the Recognition measures (intake and end of treatment) are reported without parentheses, and results of regressing drinks per drinking day on the Recognition measures are reported in parentheses. *p<.05

causal chain (e.g., working alliance and end-of-treatment Recognition) were separately treated as dependent measures with pretreatment Recognition scores treated as a covariate. Standard tests of the homogeneity of regression coefficients (product term) indicated whether a differential relationship was present between Recognition and a causal variable when nested within treatment conditions. Also included as covariates in the analyses were baseline drinking (PDA and DDD), site, treatment, and pretreatment Recognition main effects. Because of the importance of the therapeutic working alliance construct to the matching hypothesis, these finer grained slope contrasts were conducted separately for each of the two subscales as well as the total score of the WAI. In addition, one variable representing client satisfaction with treatment was included in these analyses for exploratory purposes.

Table 3 summarizes slope contrast findings. A reported significant interaction in the column labeled interaction with Recognition indicates that the relationship between client pretreatment Recognition and the causal chain variable differed reliably between MET and CBT plus TSF. Unstandardized slope coefficients below the columns headed MET and CBT plus TSF can be interpreted as describing the direction of the relationship of interest within the two treatment modalities. As our model predicted, pretreatment Recognition was significantly and differentially related to therapeutic working alliance by treatment condition. Pretreatment Recognition was unrelated to client report of alliance of treatment Goal and Task or to the total WAI score in MET. However, in the combined CBT and TSF conditions, pretreatment Recognition was significantly and positively related to the two WAI scales and the total WAI score.

No difference in slopes was found, however, for the treatment group nested relationship between pretreatment and end-of-treatment Recognition. The predicted situation wherein

Table 3. Slope contrasts in the a priori causal chain model: Problem Recognition in the outpatient sample

Causal chain variable	Interaction with Recognition	MET	CBT and TSF
WAI week-2 Goal	p<.04	.05	.19
WAI week 2 Task	p<.02	.03	.20
WAI week 2 total score	p<.02	.04	.19
End-of-treatment Recognition	p<.83	.43	.48
General satisfaction with treatment	p<.03	.07	-.09

NOTE: Coefficients are unstandardized.

before and after treatment Recognition would be more strongly related in the combined CBT and TSF conditions was not realized. Unplanned slope contrasts indicated that client satisfaction with treatment (collected at week 12) was significantly and differentially related to pretreatment Recognition by treatment condition. Specifically, higher pretreatment problem recognition was modestly and negatively related to satisfaction with treatment in the CBT and TSF conditions. A modest and positive relationship between treatment satisfaction and pretreatment Recognition was obtained in the MET condition.

Slope analyses indicated several faulty assumptions in our predicted model in the outpatient sample. The next step therefore was to assess how, if at all, problem recognition changed during treatment. Table 4 provides the difference scores on the three SOCRATES scales between intake and end of treatment. In the ideal situation, and in both study arms, we predicted that Recognition would increase significantly more during treatment for clients assigned to MET. Heightened problem recognition was presumed, in turn, to improve treatment outcome. The basic assumption of increased gains in Recognition in the MET condition was not supported, and gains in Taking Steps to achieve abstinence actually was higher in the action-oriented CBT and TSF conditions ($p<.05$). The third and last columns in table 4 show identically calculated difference scores, but only for those clients at intake with the lowest Recognition scores (lowest third of the distribution). Presented as a purer test of our assumptions, independent t-tests indicated that changes in motivation during treatment did not vary between MET and combined CBT and TSF on any of the three SOCRATES scales for low-Recognition clients assigned to MET versus CBT or TSF.

Did changes in client motivation *during treatment* significantly add to prediction of proximal and distal PDA and DDD beyond that of pretreatment motivation? Using hierarchical multiple regression, and separately regressing proximal and distal PDA and DDD (four regressions), we entered baseline values of the two primary dependent measures (PDA and DDD), site effects, and treatment main effects. Baseline measures of client Ambivalence, Recognition, and Taking Steps were then entered. Finally, and of primary interest, the three SOCRATES scales collected at 3 months (*end of treatment*) were entered into the model. The 3-month SOCRATES measures accounted for a significant increment in variance above that associated with the baseline motivation measures for

Table 4. Mean (SD) comparison of pretreatment and end-of-treatment SOCRATES motivational scales: Difference scores by matching hypothesis for full and restricted outpatient samples

SOCRATES scale	Full sample		Lowest third in distribution	
	MET	CBT and TSF	MET	CBT and TSF
Ambivalence	.14 (.35)	.15 (.35)	.10 (.30)	.15 (.35)
Recognition (MV)	2.60 (4.96)	2.48 (5.42)	.33 (4.02)	.29 (5.99)
Taking steps	2.25 (6.92)	3.42 (6.63)*	2.14 (5.19)	3.56 (7.15)

MV=matching variable
* $p<.05$

both proximal PDA (17-percent increment, $F(3, 790)=70.64$, $p<.001$) and proximal DDD (17 percent, $F(3, 790)=59.91$, $p<.001$). Separate t- tests of slope coefficients indicated that all three measures of motivation collected at 3-month followup—on both PDA and DDD—added significantly and uniquely ($p<.05$) to prediction of the frequency and intensity of proximal drinking, with the Taking Steps scale accounting for the largest unique contribution ($\beta=0.42$ for PDA and $\beta=-0.41$ for DDD).

At distal followup, changes during treatment in recognition accounted for a significant increment in PDA beyond that associated with pretreatment SOCRATES Recognition scales (8 percent, $F(3, 768)=26.86$, $p<.001$) and in DDD (11 percent, $F(3, 768)=33.45$, $p<.001$). For the distal PDA measure, change in Ambivalence was significantly and negatively predictive ($\beta=-0.11$, $p<.002$), and change in Taking Steps was positively and significantly predictive ($\beta=0.26$, $p<.001$). Changes in problem recognition were unrelated to frequency of drinking at distal followup. For the distal DDD measure, problem recognition was not predictive, while changes in Ambivalence ($\beta=0.14$, $p<.001$) and Taking Steps ($\beta=-0.30$, $p<.001$) uniquely predicted drinking intensity.

Aftercare Arm

Prognostic Effects of SOCRATES

The second-order partial correlations in table 5 for the aftercare arm suggest that clients' pretreatment Recognition was mostly unrelated to PDA and DDD at both proximal and distal followups, the one exception being a small but significant negative relationship between Recognition and drinking intensity during early followup. A more consistent pattern with the aftercare arm was found for the Taking Steps scale. Specifically, both PDA and DDD were significantly predicted by this scale at both followups.

The more conservative hierarchical multiple regression analysis ($N=693$) approach indicated that the three SOCRATES scales jointly contributed a significant increment in variance (2.0 percent) in proximal PDA above that attributable to the baseline drinking measures and

Table 5. Prognostic main effect of SOCRATES scales on aftercare proximal and distal treatment outcome for both primary dependent measures[1]

SOCRATES scale	Proximal followup Months 4–9		Distal followup Months 10–15	
	PDA	DDD	PDA	DDD
Ambivalence	.04	-.10*	.02	-.03
Recognition	.07	-.09	.07	-.07
Taking steps	.13*	-.15*	.12*	-.13*

[1] Second-order partial correlations between SOCRATES scales and PDA and DDD, controlling for baseline PDA and DDD
* $p<.05$

treatment assignment (3.3 percent), $F(3, 685)=4.89$, $p<.002$. Single df tests showed that only the Taking Steps scale ($\beta=0.13$, $p<.001$) uniquely predicted PDA at early followup after controlling for the remaining SOCRATES scales and baseline PDA, DDD, and treatment assignment.

At distal followup, the three SOCRATES scales again added a significant increment in variance, accounted for in the PDA measure (3.0 percent), $F(3,667)=3.53$, $p<.02$. Single df tests indicated that the Taking Steps measure alone and uniquely predicted distal PDA ($\beta=0.11$, $p<.01$). In the HLM analyses, which controlled for site effects and first-order interactions of Recognition with treatment and sites, no prognostic effect of the Recognition scale was identified with PDA ($p<.57$) nor with DDD ($p<.90$) across the entire 12-month followup interval.

Testing the Matching Hypothesis

Table 6 presents the unadjusted probability values ($\alpha=0.05$) of the HLM tests of the Recognition matching hypothesis reported in Project MATCH corporate papers (Project MATCH Research Group 1997*b*). Unplanned pairwise treatment contrasts are again provided as an aid to interpret how the Recognition matching variable may have unanticipated mediating effects.

Table 6. Summary of aftercare HLM Problem Recognition Matching tests: Probability values associated with tests of during and after treatment client-treatment matching

Variable	Predicted match	Unplanned matching contrasts		
	MET vs. CBT&TSF	CBT–MET	CBT–TSF	MET–TSF
During treatment				
PDA	.10	.14	.93	.19
PDA linear	.41	.25	.43	.76
PDA quadratic	.54	.44	.66	.77
DDD	.08	.23	.49	.07
DDD linear	.19	.16	.63	.40
DDD quadratic	.55	.37	.49	.87
After treatment				
PDA	.76	.56	.56	.97
PDA linear	.83	.63	.59	.93
PDA quadratic	**.005**	**.04**	.41	**.006**
DDD	.63	.65	.96	.71
DDD linear	.69	.49	.54	.98
DDD quadratic	**.04**	.11	.62	**.05**

No support was found for the Recognition matching hypothesis when time was collapsed during treatment ($p<.10$) or after treatment ($p<.76$). With time modeled, no linear function across monthly PDA values was found during ($p<.41$) or after treatment ($p<.83$). A significant Recognition contrast by quadratic interaction ($p<.005$), however, was found using monthly PDA as the dependent measure. Contrary to prediction, post hoc monthly contrasts indicated that low-recognition clients assigned to the MET condition tended to drink *more* frequently than low-recognition clients assigned to the combined CBT and TSF groups during months 4 and 5, $p<.01$ and $p<.05$, respectively. This finding is depicted in figure 3 where, in proximal followup, the largest slope differences were during the first few months of early followup. No differences were found in monthly PDA values for high-recognition clients assigned to MET and the combined CBT and TSF group.

Replicating the HLM analyses using the drinking intensity measure (DDD) yielded similar findings. Specifically, the recognition contrast was not significant when time was collapsed during ($p<.08$) or after treatment ($p<.63$) nor when the contrast was modeled across time as a linear function during ($p<.19$) or after treatment ($p<.69$). In a quadratic context, however, the recognition contrast was significant ($p<.04$), and monthly tests showed that low-recognition clients assigned to the MET condition tended to drink significantly more alcohol per drinking occasion than low-recognition clients in CBT and TSF in the first month after the end of treatment (month 4, $p<.02$). This difference quickly faded, however, and no differences were found between high-recognition clients assigned to the different treatments.

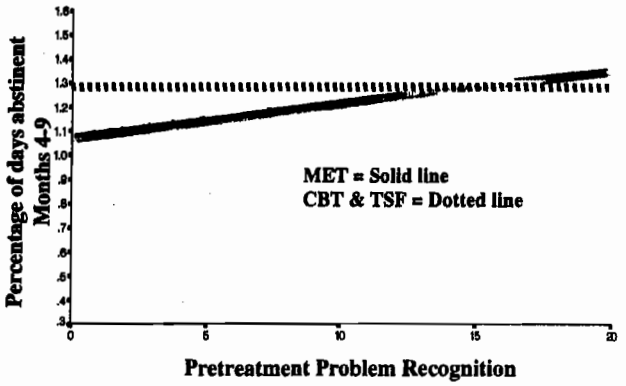

Figure 3. Pretreatment Problem Recognition and proximal percentage of days abstinent in the aftercare sample: A priori matching hypothesis

Causal Chain Analyses

Contrary to our prediction, figure 4 shows a prognostic effect of pretreatment problem recognition in the MET condition and no prognostic effect of recognition in the combined CBT and TSF conditions. The proposed causal model was the same for aftercare and outpatient samples and is not repeated here.

Figure 4 shows the standardized coefficients (β) for the two path analytic models in the aftercare sample. All relationships of interest controlled for site effects. As predicted, pretreatment Recognition score was not predictive of therapeutic working alliance collected at Week

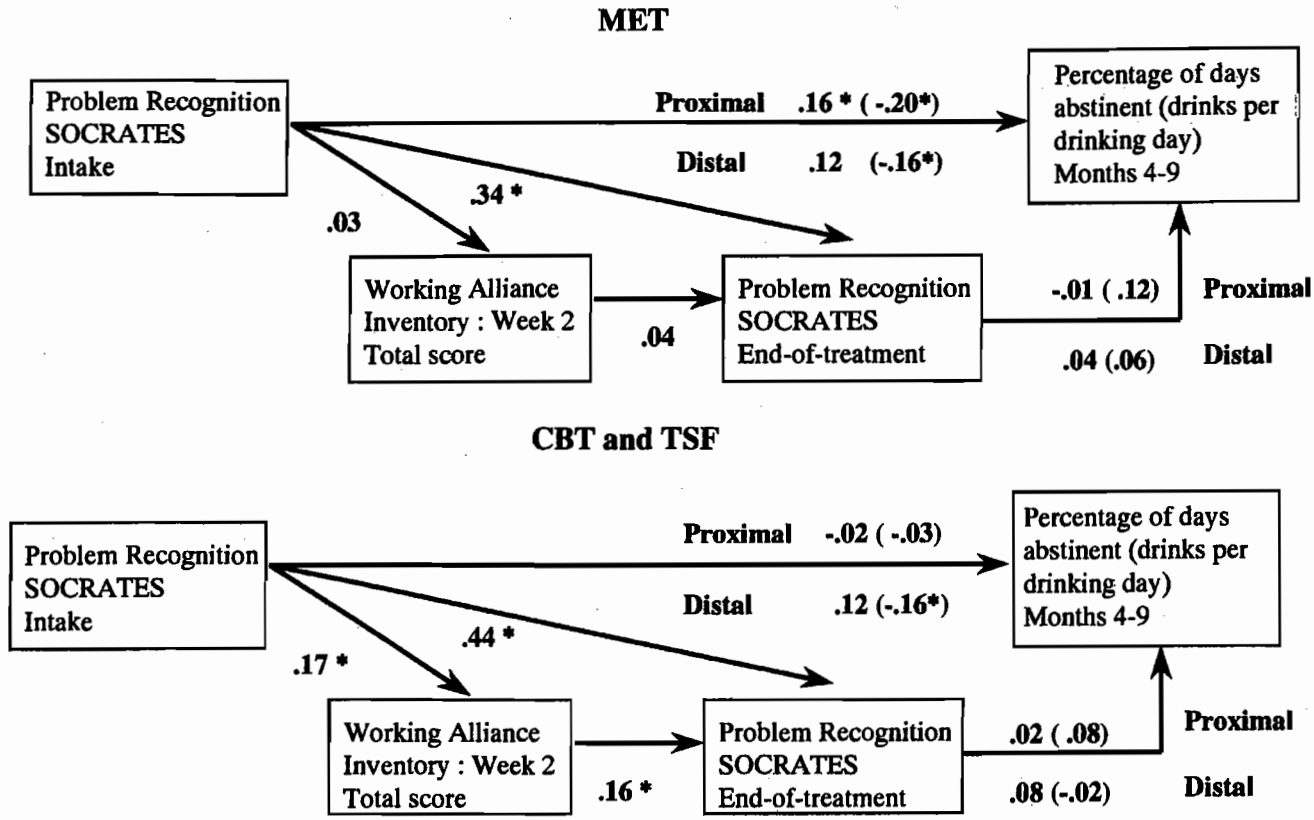

Figure4. Aftercare Problem Recognition causal chain findings. Standardized coefficients are provided for proximal (above line) and distal (below line) followups. Results of regressing percent days abstinent on the Recognition measures (intake and end of treatment) are reported without parentheses, and results of regressing drinks per drinking day on the Recognition measures are reported in parentheses. *p<.05

2 in the MET condition. Opposite to our predictions, pretreatment recognition for MET clients was significantly and positively related to end-of-treatment problem recognition, indicating that MET did not alter a client's relative standing in the before and after treatment motivational distributions. Also, contrary to our predictions, therapeutic working alliance at Week 2 was unrelated to end-of-treatment problem recognition in the MET group. Finally, our prediction that the prognostic value of pretreatment recognition on PDA and DDD would be mitigated at proximal and distal followups in the MET condition was not supported.

In most aspects, the path analysis models were quite similar for the aftercare and outpatient MET conditions. Where the path analysis findings *differed* from outpatient to aftercare arms is in findings for the CBT and TSF conditions. As predicted for the MET conditions, pretreatment recognition was not predictive of proximal or distal PDA and DDD. Uniquely, aftercare CBT and TSF clients were the only ones who, as a group, reported a positive and significant relationship between therapeutic working alliance at week 2 and end-of-treatment problem recognition. This relationship had been predicted to occur only in the MET condition. Consistent with our predictions, and similar to the outpatient CBT and TSF conditions, a significant and positive relationship was found between pretreatment recognition and Week-2 therapeutic working alliance.

Factorial MANCOVA was used to conduct formal statistical contrasts of corresponding slopes illustrated in the two aftercare path models. The rationale and analytical approach to these contrasts were described in the outpatient causal chain analyses and are not repeated. Table 7 presents the probability values

Table 7. Slope contrasts in the a priori causal chain model: Problem recognition in the aftercare sample

Causal chain variable	Interaction with Recognition	MET	CBT and TSF
WAI week-2 Goal	p<.05	.02	.18
WAI week-2 Task	p<.13	.04	.18
WAI week-2 total score	p<.05	.02	.19
End-of-treatment Recognition	p<.31	.32	.46
General satisfaction with treatment	p<.67	.07	.03

NOTE: Coefficients are unstandardized.

(α) associated with the test of a differential relationship between a causal chain variable and pretreatment Recognition by treatment condition, labeled Interaction with Recognition. As predicted, pretreatment recognition was differentially related with Week-2 therapeutic working alliance, contingent upon treatment assignment. In the MET condition, as predicted, pretreatment recognition was not predictive of therapeutic relationship, whereas Recognition score was significantly and positively related to goal and total working alliance in the CBT and TSF conditions. No difference, however, was observed between treatment groups in the relationship between pretreatment and end-of-treatment problem recognition. Here, MET and combined CBT and TSF groups both reported significant and positive associations between before and after treatment Recognition scores. Pretreatment problem recognition was not differentially related by treatment condition with client satisfaction with treatment.

Analyses indicated several points at which therapeutic change mechanisms did not differentially relate to the motivation matching variable. An important related question is whether the matching variable itself changed as predicted during treatment. One of the core assumptions of the recognition hypothesis was that the motivational focus of the MET condition would produce greater gains in Recognition and Taking Steps scores relative to the CBT and TSF conditions. Also implied was that MET would be associated with a greater decline in Ambivalence about change relative to the CBT and TSF conditions.

Table 8 presents the pretreatment and end-of-treatment difference scores for the three SOCRATES scales. Difference scores were computed by subtracting pretreatment from end-of-treatment scores. Positive difference scores therefore suggest an increase in the measured attribute. As predicted, significantly greater gains in recognition of alcohol problems were made in the MET condition relative to the CBT and TSF conditions ($p<.05$). Unexpectedly, Taking Steps scores declined during the 12 weeks of treatment, with no group differences observed in the magnitude of this decline. Ambivalence about change remained relatively stable from the beginning to end of treatment, with no treatment effect observed.

The third and fourth columns in table 8 compare before/after changes in SOCRATES scores for that portion of the aftercare sample with the lowest third of scores in the pretreatment Recognition distribution. This comparison is

Table 8. Mean (SD) comparison of pretreatment and end-of-treatment SOCRATES motivational scales: Difference scores by matching hypothesis for full and restricted aftercare samples

SOCRATES scale	Full sample		Lowest third in distribution	
	MET	CBT and TSF	MET	CBT and TSF
Ambivalence	.12 (.33)	.11 (.32)	.09 (.29)	.16 (.37)
Recognition (MV)	3.65 (5.98)	2.47 (4.97)*	1.33 (6.37)	.77 (5.40)
Taking Steps	-.61 (5.98)	-.35 (5.80)	-.44 (4.87)	1.22 (.06)

MV=matching variable
* p<.05

regarded as a purer test of the motivational impact of MET. Here, no mean differences were observed between the two comparison groups on any of the three SOCRATES scales.

Four hierarchical multiple regressions were conducted to examine if before/after *changes* in the three SOCRATES scales predicted proximal and distal PDA and DDD after controlling for site and treatment effects as well as baseline drinking (PDA and DDD) and SOCRATES scores. Three-month SOCRATES scales accounted for a significant increment in variance in both proximal PDA (13 percent, $F(3, 605)= 34.07$, $p<.001$) and DDD (11 percent, $F(3, 605)= 27.32$, $p<.001$). Problem recognition was not predictive of proximal PDA ($p<.26$) after controlling for baseline problem recognition. Three-month Taking Steps ($\beta=0.37$, $p<.001$) and extent of Ambivalence ($\beta=-0.14$, $p<.01$), however, uniquely predicted proximal PDA after controlling for baseline values. Regarding drinking intensity, all three SOCRATES scales uniquely and significantly predicted consumption patterns, with the Taking Steps scale ($\beta=-0.34$, $p<.001$) uniquely accounting for the bulk of variance in DDD.

End-of-treatment motivation scales added significant variance in the prediction of distal abstinence (6 percent, $F(3, 590)=13.01$, $p<.001$) and drinking intensity (5 percent, $F(3, 590)=12.23$, $p<.001$) beyond that offered by baseline motivation alone. End-of-treatment Recognition score was not predictive of either the frequency (PDA) or intensity (DDD) of alcohol consumption after controlling for baseline measures. Ambivalence about change at the end of treatment was negatively and significantly predictive of distal frequency of abstinent days ($\beta=-0.11$, $p<.01$) and positively and significantly predictive of distal drinking intensity ($\beta= 0.12$, $p<.006$) after controlling for baseline measures. End-of-treatment Taking Steps was a strong predictor of distal alcohol consumption after controlling for pretreatment motivation. Here, Taking Steps was positively related with distal abstinence ($\beta=0.23$, $p<.001$) and significantly and negatively predictive of drinking intensity ($\beta=-0.22$, $p<.001$).

Did We Choose the Wrong Scale?

The Recognition matching hypothesis was not supported in either the aftercare or the outpatient study, and causal chain analyses were only partially supported. Causal chain analyses highlighted the complex and poorly understood nature of readiness for change and how motivation for change influences and is influenced by the active ingredients of therapy. Especially important is gaining a better understanding of how the dimensions of motivation relate to one another, and how these relationships change across time. Figure 5, for example, shows the relationship between Recognition and Taking Steps before-and-after difference scores by study arm. Rationally, one would expect in a treatment-seeking population—and for clients actually engaged in therapy—a strong positive relationship between gains in awareness of problems and taking actions to eliminate these problems. This was the case for aftercare clients, but much less so for clients recruited in the outpatient sample. Why might this be so?

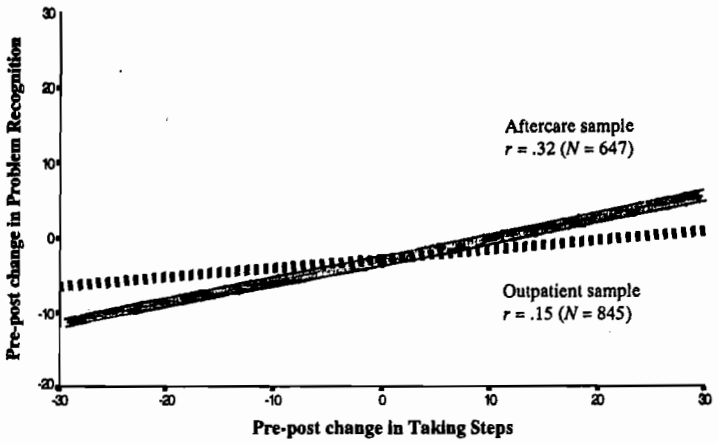

Figure 5. Relationship between pre-post change in Problem Recognition and Taking Steps by Project MATCH study arm

Analyses suggested that Taking Steps is prognostic of positive outcome, and in most cases, a stronger indicator of success than Recognition. We wondered whether the SOCRATES Taking Steps scale might be a client matching variable worthy of attention. To this end, we replicated most analyses reported

scale as the matching motivation variable. Classical multivariate repeated-measures analyses failed to support the Taking Steps matching hypothesis (same predictions as for Recognition) on either primary dependent measure.

The four Taking Steps path-analysis models differed from the Recognition models in two key respects. First, significant positive relationships were obtained between working alliance at Week 2 and end-of-treatment Taking Steps in all four models (r's=0.20, 0.19, 0.17, and 0.22). With the Recognition matching variable, this positive relationship was only present in the CBT and TSF aftercare conditions. Second, end-of-treatment Taking Steps was a significant predictor of both proximal and distal outcome, while the end-of-treatment Recognition measure partially predicted proximal outcome but generally failed to predict distal outcome reliably.

Table 9 shows the core slope contrasts in the causal chain model with the Taking Steps scale used as the motivational matching variable. Findings for the outpatient and aftercare samples are combined into a single table. Unlike the Recognition scale, product terms indicated that the relationship between pretreatment Taking Steps and the working alliance variables and end-of-treatment Taking Steps did not differ between MET and the combined CBT and TSF. In agreement with the path models using Taking Steps as the matching variable, strong positive relationships were found regardless of treatment assignment.

Table 9. Slope contrasts in the post hoc causal chain analysis: SOCRATES Taking Steps as the matching variable in the total sample

Variable	Interaction with Taking Steps	MET	CBT and TSF
Outpatient sample			
WAI week-2 Goal	$p<.25$	.08	.19
WAI week-2 Task	$p<.36$	.11	.22
WAI week-2 total score	$p<.42$	.12	.22
End-of-treatment Taking Steps	$p<.83$	.17	.30
Aftercare sample			
WAI week-2 Goal	$p<.28$	.06	.19
WAI week-2 Task	$p<.25$	.06	.19
WAI week-2 total score	$p<.33$	.07	.18
End-of-treatment Taking Steps	$p<.31$	.21	.25

NOTE: Coefficients are unstandardized.

Discussion

The rationale for the predicted matching effect was that MET would differentially benefit clients with lower pretreatment levels of problem recognition by enhancing their motivation for change. Where did the hypothesis fail? Some early components of the predicted causal chain were confirmed, but later links were not. We did find the expected prognostic effect of pretreatment SOCRATES scores on treatment outcomes, but it occurred regardless of treatment assignment. Problem Recognition predicted both PDA and DDD throughout followup, but only among outpatients. The Taking Steps subscale score, in contrast, predicted both outcome measures throughout followup in both arms of the trial. The more a client had already been taking steps toward change before beginning treatment, the better the outcomes.

Similarly, clients' posttreatment motivation scores on SOCRATES were significantly predictive of both outcome measures at both proximal and distal followup intervals in both arms of the trial, even after removing variance accounted for by baseline drinking and motivation measures, treatment groups, and sites. Effects of change in Recognition were inconsistent, but in both arms of the trial, better outcomes on both dependent measures were consistently related to greater increases in Taking Steps and decreases in Ambivalence. That is, when treatment was associated with increased motivation (less ambivalence and more taking steps), outcomes were better throughout followup.

MET also showed a few of the predicted differential effects on intermediate variables. As

expected, pretreatment Recognition scores predicted therapeutic alliance only in the CBT and TSF conditions and not in MET. That is, MET appeared to obviate the relationship between low problem recognition and poor working alliance that was observed in the action-oriented treatments. In the aftercare arm, change in problem recognition also occurred only in MET and not in CBT and TSF. The problem is that these intermediate variables, while differentially affected by MET, did not significantly influence drinking outcomes, and that is where the causal chain broke down.

So where does this leave us? Our findings do support the importance of motivation as at least a predictor, if not a determinant, of drinking outcomes. The Taking Steps score, both prior to and after treatment, was a good predictor of outcomes. In analyses from another multisite outcome study (Miller et al. 1996), we similarly found that Taking Steps toward change, as measured by the SOCRATES, was a strong predictor of continued improvement (rather than relapse) among alcoholics.

This is consistent with a larger literature linking higher client adherence or compliance to better outcomes (e.g., Pettinati et al. 1996; Robson et al. 1965; Fiorentine and Anglin 1996). Similarly, the degree of attendance or involvement in Alcoholics Anonymous is predictive of more favorable outcomes (Emrick et al. 1993; Montgomery et al. 1995). Even compliance with placebo medication has been found to predict more favorable treatment outcomes (e.g., Fuller et al. 1986). It appears that clients' *doing something* toward change is a reliable predictor of better outcome.

The other measure of motivation in Project MATCH (URICA, DiClemente et al., this volume) also proved to be a good predictor of outcomes. It also appears to be the case that the more client motivation improves during treatment (on all three SOCRATES scales), the better the prognosis. Changes in motivation predict later changes in behavior.

An unanswered question is how this occurs, and more specifically, why Motivational Enhancement Therapy works at all (Miller 1998). Even a single session of motivational interviewing has been found to improve substance abuse treatment outcomes substantially (e.g., Bien, Miller, and Boroughs 1993; Brown and Miller 1993; Saunders et al. 1995), and brief interventions more generally have been shown to trigger behavior change when offered as stand-alone treatments (Bien, Miller, and Tonigan 1993). Clinical descriptions of motivational interviewing have emphasized impact on cognitive/affective variables such as problem recognition, ambivalence, distress, and discrepancy (Miller 1983; Miller and Rollnick 1991), and findings from this study support that emphasis. Yet an intervention designed specifically to have impact on these variables largely failed to do so differentially.

This indicates a further need to separate prognostic from causal and intervention effects in clinical research. Motivational variables such as self-efficacy, alcohol expectancies, problem recognition, and readiness have been shown to predict outcomes. It does not necessarily follow, however, that interventions designed to act upon these variables will thereby improve outcomes. Data from both Project MATCH (reported here) and a prior multisite study (Miller et al. 1996) question the mediating role of such cognitive variables and point instead to a key role of action and coping strategies. This would suggest that a treatment may succeed to the extent that it engages and retains clients in active personal efforts toward change.

In a prior study (Miller et al. 1996), we found that self-efficacy and other motivational variables did not contribute to variance accounted for in predicting relapse, once coping skills had been taken into account. It is possible that motivational variables to which causal importance has been attributed may represent instead more passive reflections of behavioral coping skills. In any event, the causal mechanisms underlying the efficacy of motivational interventions remain to be explicated.

Acknowledgment

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Self-Efficacy as a Matching Hypothesis: Causal Chain Analysis

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ABSTRACT

One of the matching hypotheses included in the Project MATCH trial involved Bandura's concept of self-efficacy. Client efficacy to abstain from drinking was hypothesized to interact with the three MATCH treatments. Clients low in efficacy would do better in Cognitive-Behavioral Coping Skills Therapy (CBT) than in Motivational Enhancement Therapy (MET), with those high in efficacy doing better in MET than in Twelve Step Facilitation (TSF). However, those highly tempted to drink (i.e., those with high temptation to drink and low self-efficacy to abstain) would do better in TSF compared to those in MET. In the aftercare arm, low efficacy clients in CBT showed drinking outcomes superior to those in MET during the period of treatment, but these differences did not persist into the followup period. For highly tempted individuals, TSF demonstrated more abstinence than MET during the first few weeks of the treatment period but not during the followup period. These interaction effects on drinking during treatment in the aftercare arm were the only hypothesized matching contrasts that were supported. Analyses of the assumed causal mechanisms indicated that some interactions between the treatments and changes in self-efficacy over time supported aspects of the matching effects in the aftercare arm. However, overall, there was little support for treatment-specific effects on efficacy or treatment interactions with efficacy. Pretreatment self-efficacy was predictive of posttreatment drinking for outpatients but not for aftercare clients and predicted amount of drinking at the 3-year followup for these outpatients. Both for outpatient and for aftercare, clients' abstinence self-efficacy assessed immediately posttreatment predicted client drinking during the 1-year followup period. Self-efficacy was distinct from measures of motivation, peaked during treatment, remained stable during followup, and played an important and interesting role in the cessation of drinking.

Self-efficacy is a construct developed by Bandura (1986) as a central element of his Social Cognitive Theory. Self-efficacy is a personal evaluation of the ability of an individual to perform a target behavior and differs from outcome expectancies, which involve expectations of the effects or consequences of performing the target behavior. Self-efficacy is assumed to influence motivation, information processing, personal effort, and thus, effective action. Various naturally occurring and treatment-specific activities and experiences are thought to influence levels of self-efficacy.

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Mastery experiences involving the target behavior are theorized to most strongly influence self-efficacy, followed by vicarious experience (modeling), verbal persuasion, and emotional arousal. Thus, self-efficacy is assumed to be a changeable, state variable associated with and predictive of specific behavior change.

Self-efficacy has long been considered a theoretically relevant construct for alcoholism treatment and recovery (DiClemente 1986; Marlatt and Gordon 1985; Rollnick and Heather 1982). In Marlatt and Gordon's (1985) Relapse Prevention model, efficacy to cope with high-risk situations is a central component of their conceptualization of the relapse process. Alcohol researchers have developed instruments to measure efficacy for coping with or resisting the urge to drink heavily (Annis 1986; Annis and Davis 1989) and efficacy to abstain from drinking (DiClemente et al. 1994) across a variety of high-risk relapse situations previously identified by Marlatt and colleagues. In order to evaluate the saliency or importance of these situations, many instruments include separate ratings of either the frequency or occurrence of these high-risk situations or the individual's temptation to drink in these situations (DiClemente et al. 1995).

Previous research has found that self-efficacy evaluations change during treatment for alcohol problems (DiClemente et al. 1995). Treatments have been found to affect self-efficacy differentially; for example, specific skills training has been found to be superior to more generic interventions (Burling et al. 1989; Donovan and Ito 1988). Moreover, differences between individuals' experienced temptation to drink and their abstinence self-efficacy have been identified as an indicator of highly tempted individuals who have a sense of hopelessness about change (DiClemente and Hughes 1990).

Treatment-Specific Effects

Although self-efficacy is theorized to be a common pathway in all human behavior change (Bandura 1986), treatments may differ in their ability to engender self-efficacy. From a treatment-matching perspective, it is assumed that each treatment would influence self-efficacy in a differential manner depending on how the techniques employed by the treatment influenced efficacy evaluations of the client. According to the theory, there are several ways to influence efficacy evaluations that vary in the strength of their influence. Treatments that allow for mastery experiences would be expected to be more powerful in increasing perceived efficacy than would be those treatments that rely solely on vicarious experience or verbal persuasion. From Bandura's social cognitive perspective, long-term behavior change would be the direct result of a treatment's ability to increase the individual's self-efficacy. In Project MATCH, the three chosen treatments were thought to influence self-efficacy differently.

Motivational Enhancement Therapy

One of the explicitly stated goals of Motivational Enhancement Therapy (MET) is to increase clients' self-efficacy by allowing them to draw upon their own resources and make a change plan to reduce or eliminate alcohol consumption (Miller et al. 1992). MET provides feedback to the client about the problem and consequences of alcohol use, places the responsibility for change on the client, and emphasizes the client's ability to change. However, the influence of MET on self-efficacy comes primarily from verbal persuasion and emotional arousal, which are considered potent but not the most powerful sources of efficacy enhancement (Bandura 1986). Therefore, individuals who enter treatment with low efficacy to abstain from drinking may not respond well to the techniques of MET and the fewer sessions in MET. Clients with higher initial self-efficacy would respond better to messages that they can be in charge of the change process and, thus, could be expected to do well in MET. Individuals low in self-efficacy could be expected to do better in a treatment that provides techniques to provide mastery experiences as well as verbal persuasion, such as in Cognitive-Behavioral Coping Skills Therapy (CBT).

Cognitive Behavioral Therapy

CBT has as one of its specific aims the development of skills that would increase the ability

of the individual to cope with high-risk situations by teaching clients to manage their emotions and change their behavior in situations that have triggered drinking in the past (Kadden et al. 1992). This situation specificity and the concentration on the development of skills should contribute directly to an increase in alcohol abstinence self-efficacy. CBT teaches clients coping skills, uses role-plays to test these skills, and prescribes homework that would provide in vivo tests of these skills. It could be assumed that over the 12 weeks of CBT, clients' efficacy would increase, and this increase would translate into greater abstinence at the end of treatment and particularly during the followup periods. Although all individuals in CBT treatment would be expected to need additional help no matter what their level of efficacy, individuals higher in self-efficacy may not need as much assistance and may find the skills training somewhat redundant or more than they need. The most obvious match between self-efficacy and CBT appears to be with the low abstinence self-efficacy clients.

Twelve Step Facilitation

Twelve Step Facilitation (TSF) should have an interesting and potentially inverse relation with self-efficacy. TSF teaches clients that reliance on willpower alone will not achieve sobriety, but that reliance on and relinquishing of control to a higher power is necessary to achieve sobriety (Nowinski et al. 1992). TSF emphasizes that the client is powerless over alcohol and must abstain "one day at a time." For individuals who have a high level of abstinence self-efficacy and want to rely on their own ability to abstain, TSF may be a mismatch (DiClemente 1993). These highly efficacious clients may have more difficulty seeking recourse to a higher power and renouncing their own sense of control. Thus, attrition from TSF may be higher among those clients reporting high self-efficacy. However, since they have higher efficacy to abstain from alcohol compared to other clients at the start of treatment, drinking outcomes may be less affected by this mismatch. Individuals with low self-efficacy, and particularly those with high levels of temptation to drink combined with low levels of efficacy to abstain across situations, may actually find the powerlessness message very compatible with their experiences and benefit most from TSF. The clearest match between TSF and self-efficacy seems to be with individuals having very high temptation levels and very low efficacy levels who are overwhelmed by the drinking habit.

Self-Efficacy Across Treatments

Since efficacy is considered a mediator of all behavior change, baseline and particularly posttreatment levels of efficacy should be predictive of drinking outcomes across all treatments. All treatments, if they produce nondrinking outcomes, could be expected to cause an increase in efficacy. Posttreatment efficacy should be negatively predictive of relapse, positively related to abstinence, and negatively related to levels of drinking posttreatment. Any matching effects would have to emerge in the context of these potential main effects. Since all three treatments could be expected to interact with either high or low levels of abstinence self-efficacy, only the most compelling contrasts were included in the matching hypotheses.

Matching Hypotheses

We predicted differential matching effects for clients who have higher and lower levels of self-efficacy with MATCH therapies. Several contrasts were examined. These contrasts made up the a priori matching hypotheses developed for Project MATCH and are reported elsewhere (Project MATCH Research Group 1997*b*). We articulated the following contrasts on theoretical and empirical grounds.

Hypothesis 1

Clients lower in self-efficacy will have better drinking outcomes in CBT when compared to MET. Conversely, clients higher in self-efficacy will have better drinking outcomes in MET when compared to CBT (figure 1). This second contrast, at the other end of the efficacy spectrum, is expected to have less influence on drinking outcomes, since CBT is specifically

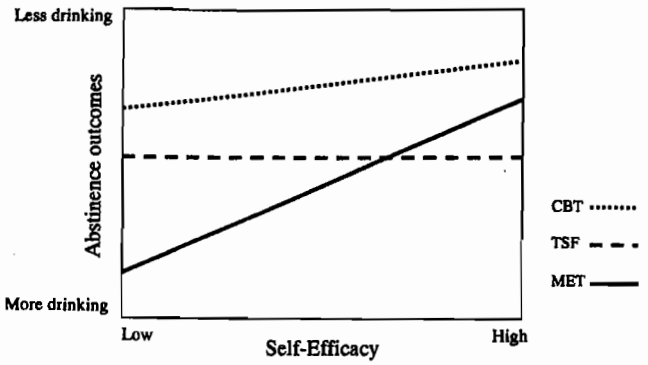


Figure 1. Hypothesized interactions between treatments and self-efficacy on abstinence outcomes

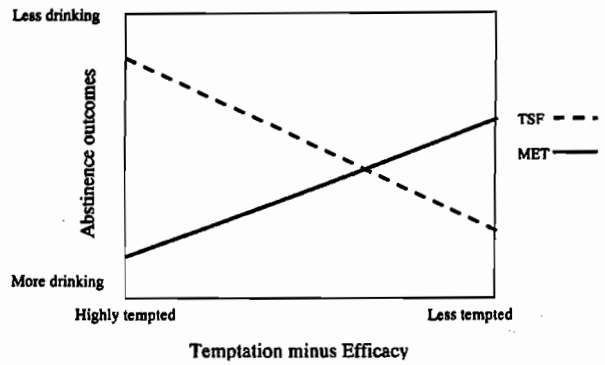


Figure 2. Hypothesized interactions between treatments and temptation minus self-efficacy on abstinence outcomes

designed to remediate low self-efficacy to abstain from alcohol.

Hypothesis 2

Individuals higher in self-efficacy will have better outcomes in terms of abstinence from drinking in MET than TSF. This contrast bets on the mismatching effect between TSF and higher efficacy clients. It could also be hypothesized that individuals lower in self-efficacy could get more support and assistance from TSF and have better outcomes than the low efficacy clients in MET. However, any effect at the lower end of the efficacy dimension may depend on how low is low self-efficacy. Since MET is also designed to increase self-efficacy, this contrast with TSF could be moderated among some of the lower efficacy clients. Therefore, with low self-efficacy clients, TSF may not show significant differences in drinking outcomes when compared with MET low efficacy clients. The best way to identify the low self-efficacy clients and test a contrast at the low end of perceived efficacy would be to use both experienced temptation as well as perceived efficacy as is done in hypothesis 3.

Hypothesis 3

A final contrast associated with self-efficacy compares individuals using a temptation minus efficacy difference score, where larger scores indicate that the client feels more overwhelmed by the alcohol problem. *Highly tempted individuals with larger positive differences will do better with the intense support and the message delivered in the TSF treatment of needing a higher power than with the message of personal responsibility given in MET* (figure 2).

Hypothesized Causal Chain

The self-efficacy hypotheses had a clear and measurable causal chain. Treatments were assumed to influence the clients' efficacy to abstain from drinking and temptation to drink (figure 3). The differential ability of any of the treatments to produce positive changes in self-efficacy over the treatment period would be considered responsible for improved posttreatment outcomes. Self-efficacy was assessed multiple times throughout the trial: at baseline, immediately posttreatment (month 3), and at the 9- and 15-month followup assessments (6 and 12 months posttreatment, respectively). Multiple assessments of perceived efficacy made it possible to examine changes in efficacy during and after treatment in order to determine if different treatments produced differential changes in efficacy and then to assess the effect of changes in efficacy on drinking outcomes. Lastly, we tested whether certain treatments performed better for clients with high or low levels of efficacy and positive or negative differences between temptation and efficacy at the baseline assessment.

In addition to the hypothesized direct effect of matching on the client's efficacy at the end of treatment, treatment matching should also influence other process variables. For example, higher efficacy clients enrolled in TSF should show less compliance, measured in weeks of

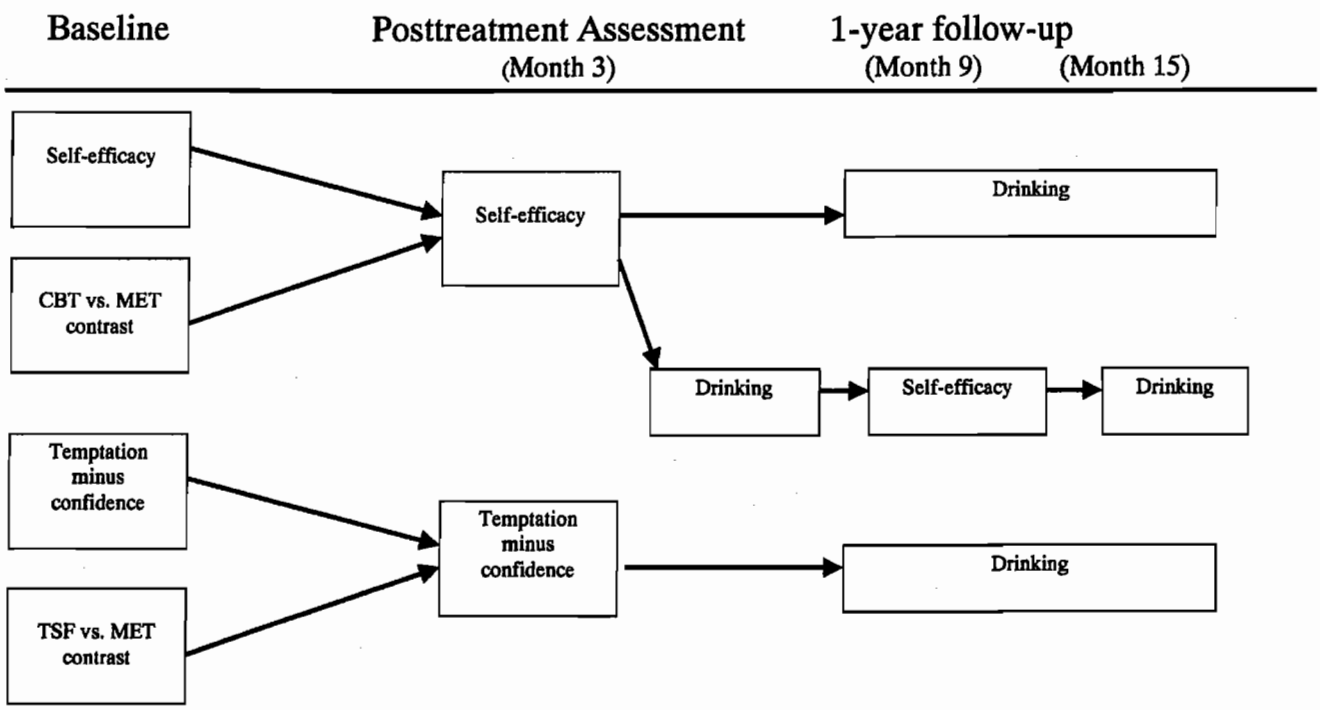


Figure 8. Hypothesized causal chain for self-efficacy contrasts

attendance at therapy, than high efficacy clients enrolled in MET. If CBT helped lower efficacy clients engage in greater use of behavioral processes of change to increase efficacy, then low efficacy CBT-matched clients should demonstrate greater use of behavioral process activity than those in MET. Active coping skills are the focus of the CBT treatment but not the focus of MET, and thus differences in behavioral processes should be seen particularly in the CBT versus MET contrast. Highly tempted individuals with low efficacy should report more AA attendance in TSF than similar clients in MET.

Measures

Alcohol Abstinence Self-Efficacy

For these hypotheses, both temptation to drink and self-efficacy to abstain were assessed using the Alcohol Abstinence Self-Efficacy Scale (AASE; DiClemente et al.1994). This scale consists of 20 items with four 5-item subscales representing types of relapse precipitants: negative affect, social situations and positive emotions, physical and other concerns, and withdrawal and urges. In the efficacy scale, items are rated for "how confident are you that you can abstain from drinking" on a 5-point Likert-type scale (ranging from 1=not at all confident to 5=extremely confident). Item scores are averaged to form the mean level of abstinence self-efficacy across the 20 situations. In a separate form, the same high-risk situations are evaluated and rated for "how tempted are you to drink" with a similar 5-point Likert-type scale. Mean temptation scores are also computed across the 20 situations to evaluate the overall level of temptation to drink. Although subscale scores can be calculated using this scale, only total scores were used in the subsequent analyses.

Alpha reliabilities for the total self-efficacy scale were very good (0.92). They were a little lower for the subscales, but all were above 0.80. Similar alpha coefficients were found for the temptation scale. Initial evaluation of construct validity of the efficacy scale has been supported, with the scale demonstrating substantive correlation with related constructs (DiClemente et al. 1994). The scale has good psychometric properties and produces a respectable range of scores with alcohol-dependent populations

similar to those in Project MATCH. Although temptation and efficacy have been moderately correlated in prior research, they appear to be rather independent (DiClemente et al. 1995; Velicer et al. 1990).

Drinking Outcomes

Our analyses used the main outcome variables from the MATCH trial, percentage of days abstinent (PDA) and drinks per drinking day (DDD). Analyses used transformed variables, and tables presented retransformed data for the PDA and DDD (Project MATCH Research Group 1997*a*; Longabaugh and Wirtz, this volume, pp. 4–17).

Processes of Change

Processes of change represent client coping activities, and measures of processes of change have been used with different addictive behaviors (DiClemente and Prochaska 1998; Prochaska et al. 1988; Snow et al. 1994). In Project MATCH, processes of change were assessed at posttreatment using a 40-item scale that contained subscales for each of 10 processes with 4 items for each process. Clients were asked to indicate on a 5-point Likert-type scale (ranging from 1=never to 5=very frequently) how often they had experienced each of the activities or experiences listed. Twenty of the items comprised experiential (cognitive/affective) processes, and twenty items comprised behavioral processes. Both the 20-item subscales and the 40-item total scale have good psychometric properties, with Chronbach alphas of 0.90 for the experiential and 0.91 for the behavioral subscales (DiClemente et al. 1996). At posttreatment, clients completed the full 40-item version. A brief 8-item version of the processes of change measure was administered at the end of each therapy session as part of a Client Session Report. This measure contained four behavioral process items, two experiential process items, and two helping relationship items.

Treatment Compliance

Treatment compliance was measured as the number of weeks of treatment attendance. Although MET consisted of only four sessions, the sessions extended over the 12 weeks. Thus, the weeks of treatment provided an equivalent measure across treatments (Mattson et al. 1998).

Results

Alcohol Abstinence Self-Efficacy

Clients in each arm of the trial were divided into three groups according to their baseline AASE scores in order to examine the distribution of efficacy scores between arms and among treatment conditions. The lowest third in each arm was the low efficacy group, the middle group in each arm was the medium efficacy group, and the highest third in each arm was the high efficacy group. The three groups in each arm were not exactly equivalent in number since cut points were never made within the same value.

Table 1 reports the means and standard deviations of the AASE scores at the baseline assessment for the trichotomized groups and the overall means for both the outpatient and the aftercare participants in Project MATCH. There were significant differences between the outpatient and aftercare groups, with the aftercare clients demonstrating higher overall levels of

Table 1. Means and standard deviations for baseline abstinence self-efficacy groups (trichotomized)

	Baseline abstinence self-efficacy			
	Low	Medium	High	Overall
Outpatient arm	*n*=322	*n*=295	*n*=307	*n*=924
Mean (*SD*)	2.13 (.38)	2.91 (.19)	3.84 (.49)	2.94 (.80)
Range	100–2.59	2.60–3.20	3.21–5.00	1.00–5.00
Aftercare arm	*n*=244	*n*=248	*n*=246	*n*=738
Mean (*SD*)	2.02 (.56)	3.24 (.27)	4.31 (.41)	3.20 (1.03)
Range	1.00–2.78	2.80–3.70	3.75–5.00	1.00–5.00

NOTE: Efficacy items were scored from 1=not at all to 5=extremely.

abstinence self-efficacy than the outpatients at both baseline and 3-month (immediately posttreatment) assessments. Since aftercare clients completed the baseline efficacy measure during the course of an inpatient or intensive day treatment episode, these higher evaluations are not surprising. Abstinence was achieved and supported by the aftercare environment. Thus, despite the fact that aftercare clients had significantly more baseline dependence symptoms and more consequences and problems related to drinking prior to the intensive treatment, they appeared more confident in their ability to abstain from drinking than their outpatient counterparts did at the initial assessment. This significant difference persisted but got smaller at 3 months and then disappeared at the final followup assessment. These differences were also reflected in the fact that the aftercare clients had greater levels of abstinence at the beginning of the MATCH treatments as well as throughout the treatment period (Project MATCH Research Group 1997*a*, 1998*a*). These differences support the separate analysis of this variable by arm.

At the baseline assessment, client-perceived self-efficacy demonstrated low correlations with most of the other primary and secondary matching variables in both arms of the trial. Client efficacy was not correlated ($r<0.10$) with motivational readiness to change as measured by the University of Rhode Island Change Assessment scale (Carbonari et al. 1994) or the Stages of Change Readiness and Treatment Eagerness Scale, to Alcoholics Anonymous (AA) involvement in the prior 3 months, social support for drinking, or psychopathology. Efficacy was most related to Alcohol Involvement, as measured by the Alcoholics Anonymous Involvement Scale (Tonigan et al. 1996), in the outpatient ($r=-0.14$) and aftercare ($r=-0.23$) arms of the trial. Efficacy evaluations appeared rather independent of most other client characteristics.

As expected, efficacy was highly related to the temptation minus efficacy measure ($r=-0.82$ aftercare and -0.88 outpatient). Temptation minus efficacy was also unrelated to motivational readiness to change and AA involvement. However, this temptation minus confidence measure was more highly correlated with alcohol involvement ($r=0.37$ outpatient and 0.31 aftercare) and with meaning seeking ($r=0.27$ outpatient and 0.31 aftercare), social functioning ($r=-0.25$ outpatient and aftercare), and alcohol dependence ($r=0.29$ outpatient and 0.24 aftercare). The high temptation measure, compared to the efficacy measure, was related more to physiological and psychological dependence and disrupted social functioning, as would be expected.

Matching Hypotheses

Outpatient Arm

For the hypotheses that used baseline self-efficacy as the matching variable, there was little evidence for any matching effect or matching effect by time interactions with hypothesized treatment contrasts in the outpatient arm of the trial, using Bonferroni-adjusted levels of significance (table 2). This was true for drinking outcomes both during treatment and following the treatment period. Only one contrast (CBT versus MET) demonstrated an interaction effect on DDD in the posttreatment period that reached an unadjusted level of significance, $p<.05$. This finding indicated that low self-efficacy clients had fewer drinks per drinking day in MET than comparable clients in CBT, contrary to the hypothesized interaction.

Table 2. Hierarchical linear modeling results for within treatment and posttreatment drinking in the outpatient arm for the abstinence self-efficacy matching hypotheses

MV × Tx	Overall effect (*F*)	CBT–MET (*t*)	CBT–TSF (*t*)	MET–TSF (*t*)
Within treatment				
PDA	1.13	1.50	0.86	-0.68
DDD	0.81	-1.22	-0.33	0.92
Posttreatment				
PDA	0.78	0.93	1.19	0.25
DDD	2.12	-2.00*	-0.63	1.43

NOTE: MV=matching variable, Self-Efficacy; Tx=treatment. *F* tests were used for the overall effect, and *t*-tests were used for pairwise treatment contrasts.
*$p< .05$

There were no indications in the outpatient arm of any matching effect for the hypothesis about the highly tempted clients (temptation minus confidence) doing better in TSF as opposed to MET either during treatment or at posttreatment assessments (table 3).

Table 3. Hierarchical linear modeling results for within treatment and posttreatment drinking in the outpatient arm for the temptation to drink minus abstinence self-efficacy matching hypotheses

MV × Tx	Overall effect (*F*)	CBT–MET (*t*)	CBT–TSF (*t*)	MET–TSF (*t*)
Within treatment				
PDA	1.04	-1.40	-1.03	0.42
DDD	0.62	1.09	0.39	-0.75
Posttreatment				
PDA	0.30	-0.50	-0.76	-0.24
DDD	0.83	1.12	0.04	-1.12

NOTE: MV=matching variable, Temptation to Drink minus Self-Efficacy; Tx=treatment. *F* tests were used for the overall effect, and *t*-tests were used for pairwise treatment contrasts. All effects were nonsignificant.

Aftercare Arm

Several matching effects appeared during the within-treatment period but disappeared after treatment (table 4). No significant matching effects were found for any contrast during the posttreatment period. For drinking during treatment, however, the overall self-efficacy by treatment interaction was significant for the PDA outcome ($p<.008$). The specific CBT versus MET contrast during treatment demonstrated Bonferroni-corrected significant effects for the PDA outcome and unadjusted significant effects on the DDD outcome. As hypothesized, the means across the 3-month treatment period demonstrated that the low efficacy CBT clients had significantly more days abstinent during the treatment period than low efficacy MET clients (figure 4). Again during treatment, clients in MET with higher levels of self-efficacy were doing better in terms of DDD and PDA than similar CBT clients, although these differences were not statistically significant (Project MATCH Research Group 1997*b*). In addition, there was an unadjusted significant effect for the MET versus TSF contrast on the PDA outcome. Again as hypothesized, higher self-efficacy clients in MET had slightly more days abstinent than TSF clients did during the treatment period.

Table 4. Hierarchical linear modeling results for within treatment and posttreatment drinking in the aftercare arm for the abstinence self-efficacy matching hypotheses

MV × Tx	Overall effect (*F*)	CBT–MET (*t*)	CBT–TSF (*t*)	MET–TSF (*t*)
Within treatment				
PDA	5.49**	-3.26**	-0.94	2.30*
DDD	2.67	2.23*	0.47	-1.73
Posttreatment				
PDA	1.06	1.00	-0.51	-1.44
DDD	0.87	-1.30	-0.35	0.93

NOTE: MV=matching variable, Self-Efficacy; Tx=treatment. *F* tests were used for the overall effect, and *t*-tests were used for pairwise treatment contrasts. *$p<.05$ **$p<.008$ (Bonferroni-corrected level of significance)

These results offer strong support for the first specific hypothesized contrast (CBT versus MET) and some support for the second specific hypothesized contrast between treatments (MET versus TSF) and client baseline levels of self-efficacy among aftercare participants. However, even the CBT versus MET hypothesis was not supported completely since the hypothesized effects were not significant after correction for both of the drinking outcomes. Moreover, these significant effects were limited to drinking outcomes during aftercare treatment and did not appear at all in the posttreatment period, where matching effects are traditionally sought. Nevertheless, for clients entering aftercare treatment, the level of their efficacy assessed during the more intensive prior therapy did have interesting interactions with the MATCH treatments.

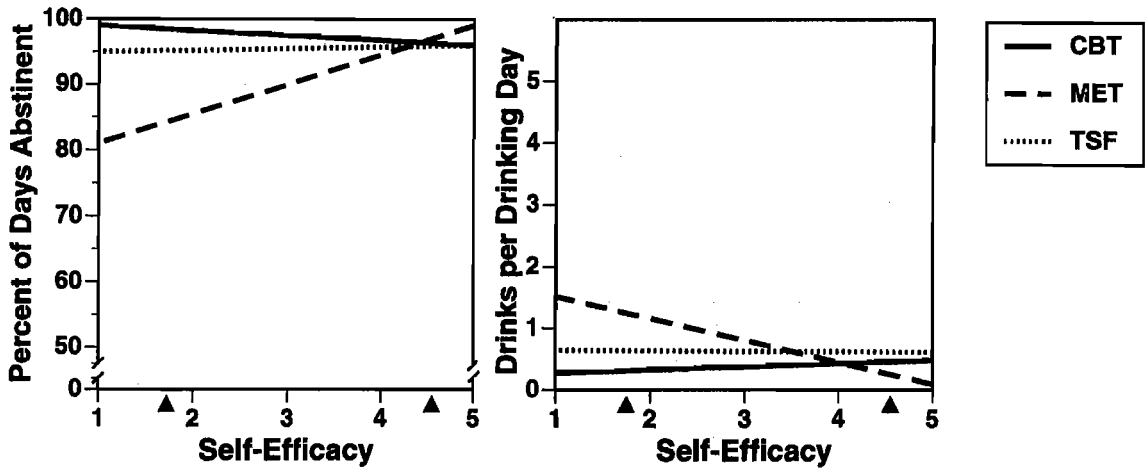


Figure 4. Within-treatment plots of percentage of days abstinent and drinks per drinking day showing the interaction between the three treatments and self-efficacy in the aftercare arm. The vertical axes represent predicted outcome scores and the horizontal axes represent baseline self-efficacy, with higher scores indicating higher self-efficacy. The triangles on the horizontal axes indicate the 10th and 90th percentiles for self-efficacy in this study arm.

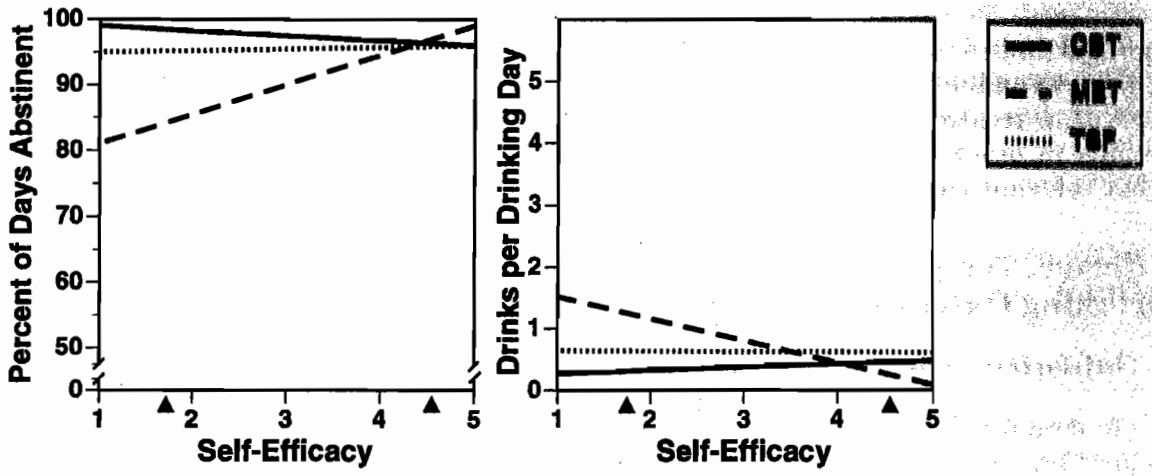
There were no significant effects for the one hypothesized contrast between TSF and MET using the temptation minus confidence variable in the aftercare arm. One nonhypothesized interaction of treatment and baseline temptation minus efficacy emerged that reached an unadjusted level of significance. Similar to the results reported above, these effects were in the CBT versus MET contrast, indicating that highly tempted clients (i.e., those with high temptation to drink and low self-efficacy to abstain) did somewhat better in CBT than in MET. Once again, these effects occurred only within treatment and not during the posttreatment period (table 5).

In summary, there was support for the self-efficacy matching hypotheses only in the aftercare arm and only for abstinence from drinking within the period during which aftercare treatment was administered. However, these within-treatment aftercare effects were interesting because clients had their efficacy assessed during an inpatient or intensive day treatment episode and most were abstinent at the beginning of the aftercare treatment. Thus, efficacy interactions with treatment during the aftercare treatment period represented the initial testing of the clients' abstinence self-efficacy for immediate posthospitalization drinking outcomes as well as the success of various treatments in sustaining the gains made during the inpatient treatment. MET seemed to do well with the high self-efficacy aftercare clients, and there was evidence that CBT did better than MET with the less efficacious clients on drinking outcomes immediately after release from intensive

Table 5. Hierarchical linear modeling results for within treatment and posttreatment drinking in the aftercare arm for the temptation to drink minus abstinence self-efficacy matching hypotheses

MV × Tx	Overall effect (*F*)	CBT–MET (*t*)	CBT–TSF (*t*)	MET–TSF (*t*)
Within treatment				
PDA	2.91	2.41*	1.29	-1.16
DDD	1.24	-1.54	-1.02	0.55
Posttreatment				
PDA	1.08	-1.35	-0.11	1.23
DDD	1.71	1.80	0.47	-1.34

NOTE: MV=matching variable, Temptation to Drink minus Self-Efficacy; Tx=treatment. *F* tests were used for the overall effect, and *t*-tests were used for pairwise treatment contrasts. *$p<.05$



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In summary, there was support for the self-efficacy matching hypotheses only in the aftercare arm and only for abstinence from drinking within the period during which aftercare treatment was administered. However, these within-treatment aftercare effects were interesting because clients had their efficacy assessed during an inpatient or intensive day treatment episode and most were abstinent at the beginning of the aftercare treatment. Thus, efficacy interactions with treatment during the aftercare treatment period represented the initial testing of the clients' abstinence self-efficacy for immediate posthospitalization drinking outcomes as well as the success of various treatments in sustaining the gains made during the inpatient treatment. MET seemed to do well with the high self-efficacy aftercare clients, and there was evidence that CBT did better than MET with the less efficacious clients on drinking outcomes immediately after release from intensive

Table 5. Hierarchical linear modeling results for within treatment and posttreatment drinking in the aftercare arm for the temptation to drink minus abstinence self-efficacy matching hypotheses

MV × Tx	Overall effect (*F*)	CBT–MET (*t*)	CBT–TSF (*t*)	MET–TSF (*t*)
Within treatment				
PDA	2.91	2.41*	1.29	-1.16
DDD	1.24	-1.54	-1.02	0.55
Posttreatment				
PDA	1.08	-1.35	-0.11	1.23
DDD	1.71	1.80	0.47	-1.34

NOTE: MV=matching variable, Temptation to Drink minus Self-Efficacy; Tx=treatment. *F* tests were used for the overall effect, and *t*-tests were used for pairwise treatment contrasts. *$p<.05$

treatment. Since these matching effects emerged and then disappeared in the aftercare arm, we examined the assumed causal linkages for within treatment and posttreatment interactions in order to evaluate how efficacy and other relevant variables were interrelated.

Efficacy, Temptation, and Drinking Outcomes

Outpatient Arm

For both the PDA and DDD outcomes over the 4- to 15-month followup periods, client abstinence self-efficacy predicted frequency and intensity of drinking in the outpatient arm of the trial (Project MATCH Research Group 1997*b*). Initial levels of abstinence self-efficacy played some role in drinking outcomes both during treatment and throughout the 1-year followup. Moreover, baseline efficacy was predictive of drinking intensity even at a 3-year followup (Project MATCH Research Group 1998*b*). Along with motivational readiness to change, abstinence self-efficacy was considered one of the most important overall predictors of drinking for outpatients (DiClemente et al., this volume; Project MATCH Research Group 1998*b*). As is illustrated in table 6, baseline abstinence self-efficacy had a small but consistent relationship with reported PDA at the end of treatment and at the 9- and 15-month drinking assessments. There was a smaller and less consistent relationship between efficacy and DDD during the posttreatment period.

Baseline self-efficacy was also related to baseline drinking in the 3 months prior to entry into treatment. As Bandura has indicated, efficacy appears to reflect past behavior as well as predict future behavior. This reciprocal relationship was also supported by the pattern of correlation between efficacy at one time point

Table 6. Correlations between abstinence self-efficacy and temptation to drink at baseline and 3, 9, and 15 months and PDA and DDD at baseline, week 12 of treatment, and 9 and 15 months: Outpatient arm

	PDA				DDD			
	BL	Wk 12	9 mo	15 mo	BL	wk 12	9 mo	15 mo
ASE								
Baseline	.07*	.14***	.14***	.10**	-.07*	-.03***	-.09**	-.07
3 mo		.35***	.29***	.25***		-.33***	-.26***	-.21***
9 mo			.41***	.37***			-.39***	-.33***
15 mo				.44***				-.39***
Temp								
Baseline	-.19***	-.20***	-.15***	-.11**	.14***	.19***	.09**	.12***
3 mo		-.38***	-.33***	-.31***		.40***	.31***	.31***
9 mo			-.55***	-.45***			.52***	.40***
15 mo				-.54***				.53***
PDA								
Baseline					.01			
Wk 12						-.76***		
9 mo							-.65***	
15 mo								-.64***

NOTE: PDA=percentage of days abstinent; DDD=drinks per drinking day. PDA and DDD are the average of PDA and DDD reported by clients during the prior 3 months. * $p<.05$, ** $p<.01$, *** $p<.001$

and concurrent and future drinking. The greater consistency in the pattern of correlation between efficacy and both drinking outcomes (PDA and DDD) posttreatment as compared to during treatment is related to the fact that PDA and DDD become more highly correlated after the initial evaluation, when abstinence is greater.

Client reports of temptation at baseline demonstrated a larger and more consistent relationship with drinking outcomes than did self-efficacy, both during treatment and throughout the posttreatment period. Posttreatment temptation appeared to have a stronger relationship with relapse than efficacy. There was a correlation of over 0.5 between temptation to drink reported at the 9-month assessment and client drinking in the 3 months prior to the assessment, indicating the influence of relapse on level of temptation. There was a correlation of 0.4 between temptation to drink reported at the 9-month assessment and drinking during the next 3 months that was reported at the end of the followup year (month 15), supporting the relationship between temptation and future drinking frequency and quantity.

Aftercare Arm

In the aftercare arm, there were no significant effects for initial baseline level of abstinence self-efficacy on either within-treatment or posttreatment drinking outcomes (Project MATCH Research Group 1997*b*). Posttreatment abstinence self-efficacy, however, presented a different picture (table 7). Efficacy assessed immediately posttreatment (AASE month 3) and efficacy to abstain assessed at the 9- and 15-month followup periods were highly correlated with drinking outcomes. In these posttreatment assessments, the relationships between efficacy and drinking were similar to those found among outpatients. Once again,

Table 7. Correlations between abstinence self-efficacy and temptation to drink at baseline and 3, 9, and 15 months and PDA and DDD at baseline, week 12 of treatment, and 9 and 15 months: Aftercare arm

	PDA				DDD			
	BL	Wk 12	9 mo	15 mo	BL	wk 12	9 mo	15 mo
ASE								
Baseline	.01	.02	.06	.01	-.10**	-.02	-.12**	-.07
3 mo		.32***	.32***	.25***		-.35***	-.28***	-.30***
9 mo			.41***	.32***			-.40***	-.34***
15 mo				.48***				-.47***
Temp								
Baseline	-.05	-.06	-.14***	-.11**	.21***	.07	.18***	.14***
3 mo		-.33***	-.28***	-.26***		.36***	.28***	.29***
9 mo			-.46***	-.37***			.45***	.38***
15 mo				-.55***				.53***
PDA								
Baseline					.14			
Wk 12						-.85***		
9 mo							-.76***	
15 mo								-.73***

NOTE: PDA=percentage of days abstinent; DDD=drinks per drinking day. PDA and DDD are the average of PDA and DDD reported by clients during the prior 3 months. $p<.05$, $^{**}p<.01$, $^{***}p<.001$

this supports the view that efficacy and temptation assessed during the intensive treatment were problematic and perhaps not as accurate as assessments made when clients were freer to drink.

Baseline levels of temptation demonstrated robust and significant relationships with posttreatment drinking. Temptation appeared to be a better measure of relapse potential for these aftercare clients than efficacy. Temptation may be a better way to assess craving and urges to drink that are more critical when they are present after the client achieves abstinence. Temptation evaluations are influenced by and, in turn, influence the client's ability to be abstinent, as does self-efficacy.

In Summary

In the outpatient arm, baseline self-efficacy predicted both the intensity and quantity of drinking throughout the posttreatment period. This main effect on drinking outcomes of client efficacy to abstain from drinking is consistent with the theoretical assumption that efficacy is influenced by and also influences drinking outcomes. Baseline self-efficacy predicted drinking outcomes for the outpatient clients but not for the aftercare clients, who were assessed during a more intensive therapy. However, efficacy assessed during the posttreatment and followup assessments was significantly and highly related to drinking both for outpatient and aftercare clients. Temptation to drink, which represents clients' acknowledgment of how highly tempted they are across a range of situations, was also a potent predictor of both intensity and quantity of drinking in both arms of the trial.

Changes During Treatment

One of the central hypothesized causal mechanisms for the interaction of efficacy and treatment was that matched clients would demonstrate higher self-efficacy posttreatment compared to their pretreatment baseline levels. In both arms of the trial, there was a significant effect for time. Efficacy increased from baseline to the assessment immediately posttreatment and then leveled off at the 9- and 15-month assessments (table 8). It should be noted that differences between levels of efficacy immediately posttreatment and at the end of the 1-year followup represent a decline of only 5 percent or less, indicating that, for the most part, overall efficacy stabilized posttreatment.

Table 8. Means and standard deviations for alcohol abstinence self-efficacy over time by treatment assignment

Treatment assignment	Baseline *M* (*SD*)	3 mo *M* (*SD*)	9 mo *M* (*SD*)	15 mo *M* (*SD*)
Outpatient arm				
CBT	2.92 (0.8)	3.47 (0.9)	3.36 (1.1)	3.41 (1.1)
MET	2.98 (0.8)	3.38 (0.9)	3.40 (1.1)	3.45 (1.1)
TSF	2.93 (0.8)	3.47 (1.0)	3.47 (1.1)	3.44 (1.1)
Aftercare arm				
CBT	3.25 (1.0)	3.73 (1.0)	3.54 (1.2)	3.52 (1.2)
MET	3.22 (1.0)	3.48 (1.0)	3.41 (1.1)	3.46 (1.1)
TSF	3.10 (1.0)	3.56 (1.1)	3.47 (1.2)	3.44 (1.2)

NOTE: Efficacy items were scored from 1=not at all to 5=extremely. No significant differences were found for treatment assignment except for aftercare arm at 3 months where MET < CBT ($p<.05$).

We examined the changes in self-efficacy from baseline to posttreatment by efficacy group and by treatment using a series of ANOVAs with efficacy changes and drinking outcomes as the dependent variables. There was a significant main effect for initial amount of perceived efficacy on changes in efficacy. The low self-efficacy group increased most during treatment, followed by the medium and then the high groups. High self-efficacy participants showed only slight increases, perhaps due to a ceiling effect.

There were no differences in before/after treatment changes in self-efficacy among the three MATCH treatments in the outpatient arm, although the MET clients showed the least average change (table 9). There was, however, a significant interaction between treatment and these changes in efficacy, $F(4, 682)=2.62$, $p<.05$.

Table 9. Comparison of group means and standard deviations for change in abstinence self-efficacy (posttreatment – baseline) by treatment assignment in outpatient and aftercare arms

Change in Self-Efficacy	CBT	MET	TSF	Tukey's B comparisons
Outpatient	.63 (.98)	.41 (1.2)	.54 (1.1)	ns
Aftercare*	.59 (1.2)	.30 (1.2)	.43 (1.2)	MET<CBT

NOTE: One-way ANOVAs were used. Post hoc comparisons were made using the Tukey's B procedure. Pairwise comparisons that were significant are designated by a < symbol. *p<.05

Low efficacy MET clients had a greater increase in efficacy (M=1.27) than did their counterparts in the other two treatments (CBT=1.04; TSF=1.07), contrary to the hypothesized mechanism. The opposite was true in the medium and high self-efficacy groups, in which MET clients increased less in efficacy than did those in CBT. The TSF clients at the upper levels of efficacy had changes that fell between the MET–CBT split.

In the aftercare arm, there was a significant overall difference between treatments in changes in before/after efficacy. MET clients demonstrated less change than the CBT clients did. In addition, at the 3-month posttreatment assessment, there was a significant difference between MET and CBT clients, with the CBT clients having significantly higher levels of efficacy. However, there were no significant interactions between levels of efficacy and treatments for changes in self-efficacy. Although nonsignificant, examination of the changes within the levels of efficacy revealed that low self-efficacy CBT clients had the most increase in self-efficacy, as hypothesized (before/after average difference=1.46 versus MET average difference=1.23). Differences between MET and TSF for clients at the higher levels of efficacy were not in the hypothesized direction (TSF before/after average difference=-0.22 versus -0.42 for MET). Again, these interactions were not significant and, as noted above, clients with initial high levels showed little change or a slight decline.

In summary, there was an overall increase in efficacy from baseline to posttreatment for all treatments and for both arms of the trial, indicating changes in efficacy during the treatment period. However, only a few changes in efficacy were related to differences among treatments or to the interaction of treatment and levels of baseline efficacy.

In the outpatient arm, there was a significant interaction between changes in efficacy and treatment condition, with MET doing better than CBT and TSF with low self-efficacy clients and not as well with the high efficacy clients. Contrary to our best guess, there was evidence that MET interacted with low levels of efficacy with outpatients to produce slightly more change in efficacy than the other treatments. There was also a lack of hypothesized matching effects in this arm, so that there was consistency between effects and mechanisms. On the other hand, among these outpatients, their baseline perceived efficacy was a significant predictor of drinking posttreatment across all three treatments.

In the aftercare arm, where a matching effect for the CBT and MET contrast was found during the treatment period, there were also treatment differences in the shifts in efficacy from baseline to posttreatment. Clients in CBT demonstrated greater positive changes in efficacy compared to clients in MET, but there was no significant interaction between treatments and level of efficacy on before/after changes in efficacy. Thus, CBT did better in fostering changes in self-efficacy across all levels of efficacy.

Overall, CBT produced greater changes in self-efficacy than the MET treatment, consistent with its focus on skills and efficacy. This finding supported the matching effects on drinking within treatment. However, CBT did not produce significant shifts in self-efficacy differentially by level of baseline efficacy as would be expected from the matching effect, thus the specificity of this mechanism for lower self-efficacy clients has not been identified. In the aftercare arm, MET clients did not maintain efficacy as well as clients in the other treatments, irrespective of initial level of efficacy. Finally, TSF did not interact with changes in efficacy as was hypothesized. Changes in efficacy for TSF

clients appeared to lie between the CBT and MET clients across levels of baseline efficacy. There was no support for a conflict between the messages of TSF and clients with higher initial levels of abstinence self-efficacy.

Efficacy and Processes of Change

A set of experiential and behavioral processes of change was assessed after each treatment session and at the end of treatment as described above. Client-reported process activity was examined for its relationship with baseline efficacy and treatment condition. Although not part of the putative causal chain, outpatient clients in CBT reported significantly less experiential process activity at Session 2 than did those in TSF. However, this difference was not evident at the end-of-treatment assessment period. Also, in the outpatient arm, the low baseline self-efficacy group reported significantly more cognitive/experiential process activity at the end of treatment than did those in the high self-efficacy group ($p < .05$). Neither at Session 2 nor at posttreatment were there any significant interactions between efficacy and treatment condition on process activity, consistent with the lack of matching found in this arm.

In the aftercare arm, at the Session 2 assessment, clients in MET reported less cognitive/experiential process activity compared to those in TSF. Again, there were no differences at the posttreatment assessment and no significant interactions between efficacy and treatment on process activity. In the aftercare arm, clients low in self-efficacy reported less frequent use of helping relationships than those in the high self-efficacy group at Session 2, but there were no differences between efficacy groups at the posttreatment assessment. Efficacy levels did not interact with behavioral process activity by treatment in order to produce any matching effect. The within-treatment matching effect found between CBT and MET and between TSF and MET did not have concomitant differential behavioral process activity. Thus, there was no support for a causal link between treatment and efficacy evaluations through the processes of change assessed during or after treatment.

Treatment Compliance and Efficacy

Compliance with treatment was another potential process link between efficacy and treatment. There was a small and clinically insignificant main effect of treatment on number of weeks in treatment. CBT had a slightly higher average number of weeks compared to TSF (8.8 versus 8.1) across both arms of the trial (Mattson et al. 1998). There were no differences in compliance due to baseline efficacy levels. Finally, there was no treatment by efficacy interaction on weeks in treatment in either arm of the trial. There was no evidence for an intermediary role for compliance in any of the aftercare within-treatment matching effects.

Efficacy and Attendance at AA

One final interesting relationship that could be involved in the interaction of efficacy with treatment involves the clients' attendance at AA and its impact on efficacy evaluations. We examined this question with a simple correlation matrix of AA attendance reported for the 3 months prior to an assessment point with the reported efficacy at that assessment. In the outpatient arm of the trial, the relationships between efficacy and AA attendance were small, with the largest correlation between AA attendance in the months 12 through 15 and abstinence self-efficacy assessed at month 15 ($r = 0.11$). Efficacy at the posttreatment assessment was significantly but minimally correlated with amount of AA attendance during treatment ($r = 0.10$). Most relationships were nonsignificant, even with this large number of subjects.

In the aftercare arm, in which there was substantially more AA attendance compared to the outpatient arm, a greater number of correlations were significant. The absolute level of the correlations was moderate at best, with the highest correlation occurring between AA attendance from months 6 through 9 with abstinence self-efficacy assessed at month 9 ($r = 0.18$). Relationships between perceived efficacy assessed at one time point and AA attendance in the months prior to that assessment were about the same as the correlations of current efficacy with future AA attendance, indicating a small,

interactive relationship between the two constructs. However, it does not appear that the overall relationship between AA attendance and efficacy would confound our causal chain analysis since posttreatment efficacy was only minimally related to AA attendance.

To further clarify these relationships, we examined the correlations between AA attendance and efficacy within treatment groups since mean levels of attendance differed by treatment, with TSF showing the greatest attendance in both the outpatient and aftercare arms of the trial. Among outpatients, the correlations between AA and efficacy were minimal and not significant for clients in CBT and MET. Significant modest correlations, ranging from 0.16 to 0.21, were found for the TSF clients. Temptation to drink demonstrated a more modest association that was negative in sign. More temptation at one time point was associated with less AA attendance at the next, and more AA attendance in the prior months was associated with less temptation at the next assessment.

Among aftercare clients, similar low levels of association between AA attendance and efficacy were found for CBT. However, for MET clients, the relationships were a bit stronger, ranging from r=0.12 to 0.20. For TSF clients, the correlations between AA and efficacy ranged from r= 0.15 to 0.23. Temptation to drink measures correlated less strongly and negatively as in the outpatient sample for all three treatments but were stronger (r=0.18 to 0.23) for both MET and TSF clients. Overall, the correlations between efficacy and AA attendance were stronger for TSF clients than for the other treatments. However, the actual correlations were small and supported a reciprocal interactive effect of efficacy on AA attendance and AA attendance on efficacy. The similar negative direction of the association between temptation and AA attendance across all three treatments indicated that there was no positive interaction of TSF with temptation to drink as was hypothesized.

Summary of Causal Chain Analyses

Although there was some support for a matching effect in the aftercare arm of the trial on drinking during treatment, there was little evidence to suggest that levels of self-efficacy related in any consistent manner to the proposed causal mechanisms. Efficacy levels demonstrated a few significant interactions with specific treatments on changes in self-efficacy during the treatment period. For example, CBT had significantly greater positive changes in self-efficacy during treatment compared to MET in aftercare, where there emerged matching effects during treatment.

In addition, as would be expected, the level of baseline efficacy was related to changes in self-efficacy during treatment, with low efficacy clients demonstrating the greatest change. However, there were no significant interactions between treatments and levels of efficacy on before/after changes in efficacy. In the aftercare arm, self-efficacy interacted with treatment immediately after discharge from the intensive treatment to affect drinking during aftercare treatment but did not do so during the posttreatment period, where matching effects disappeared. However, causal mechanisms were developed largely to predict posttreatment matching rather than during treatment matching. Specific proposed causal mechanisms were not supported as causal links in the within-treatment matching effects.

In the outpatient arm, there was little support for causal mechanisms as well. This would be expected, since there was no support for the hypothesized matching effects on drinking outcomes either during treatment or in the posttreatment period. There was one difference between treatments by self-efficacy groups on drinking outcomes. Baseline self-efficacy in the outpatient arm was a predictor of drinking outcomes, with high levels of efficacy predicting greater abstinence posttreatment. Level of efficacy also predicted changes in efficacy during treatment. However, there was no overall effect of treatment on changes in self-efficacy.

Although there was no matching, there was an interaction between efficacy and treatment on before/after changes in efficacy. MET showed the largest positive change in efficacy for low efficacy clients and the smallest change for the high efficacy clients compared to clients in both the other treatments. This interaction was opposite to that hypothesized but was consistent

with the finding of no support for the matching hypotheses.

Discussion

The self-efficacy matching hypothesis that predicted a superior effectiveness of CBT for low self-efficacy participants and a problematic interaction of TSF with high self-efficacy clients received little support. Only within-treatment drinking in the aftercare arm demonstrated some effects for matching, but these were weak, and only one was in the hypothesized direction. However, these findings indicated that clients emerging from intensive treatments with higher levels of temptation and lower levels of efficacy would do better in the short term in the more extensive CBT treatment rather than in MET.

The causal chain analyses reported above yielded interesting information. There were clear differences in level and predictive ability of efficacy evaluations given by outpatients and those reported by clients assessed during intensive treatment, clearly supporting an effect of assessment setting (arm of trial) on efficacy levels. Aftercare clients' assessments of self-efficacy prior to entry into aftercare were not predictive of outcomes and showed few interactions with process variables. We concluded that these efficacy evaluations taken during intensive treatment were less valid or, possibly, less accurate than those gathered from outpatients who had opportunity and freedom to drink when evaluating their confidence to abstain from alcohol.

However, aftercare clients' efficacy evaluations showed some interesting interactions with treatments in terms of drinking outcomes during treatment. There were indications that CBT has some ability to increase efficacy during aftercare treatment better than MET does. CBT also produced more abstinence for low self-efficacy clients compared to MET, as was hypothesized. On the other hand, MET produced a bit more abstinence than CBT and TSF for high self-efficacy clients in the first couple of months of treatment and during the month immediately posttreatment for aftercare clients. No matching effect extended into the entire posttreatment period. Thus, there were matching interactions but no main effect for efficacy in the aftercare arm.

In the outpatient arm, there were fewer interactions but a clear ability of self-efficacy to predict drinking intensity and frequency. Baseline efficacy was a better predictor of future drinking with clients who were struggling to establish and maintain abstinence in this outpatient setting, where it can be assumed that the cues for drinking were more readily available than for those coming into an aftercare setting. There was some evidence that MET supported self-efficacy for the less efficacious but no evidence of a mismatching between high self-efficacy clients and the TSF treatment. Both of these findings are contrary to the hypothesized causal chain.

In terms of the three treatments, our assumed mechanisms of action were not supported to any great extent. Although supporters of CBT and MET could claim some differential effect of these treatments on efficacy, these differences were neither dramatic nor consistent enough to support an overall interpretation of the effect. The TSF treatment did not negatively interact with the high self-efficacy clients. Either the high efficacy clients found that the powerlessness message was not about abstinence self-efficacy or these clients ignored any personal powerlessness connotations and benefited from the support and modeling of the TSF and associated AA intervention. Whatever the mechanism, there were not many differences by level of efficacy for TSF clients in either arm of the trial. Relationships between AA attendance and efficacy were modest and positive as well as interactive in nature.

When studying efficacy, securing a sample with a broad enough range of efficacy scores to allow for an examination of the effects of efficacy would be important. In the Project MATCH samples, there was a broad range of efficacy scores, with the high efficacy clients very different from the low efficacy clients, who had mean scores hovering at 2 on a 1 to 5 scale. Additionally, efficacy levels had good variability within both the outpatient and aftercare arms. Low efficacy clients did worse in terms of drinking in the outpatient arm. Thus, there was enough diversity and breadth of efficacy scores

to produce effects. Moreover, efficacy levels changed over time from before to after treatment differentially by level of initial perceived efficacy. These changes either supported an effect for the treatment or, at the very least, demonstrated that individuals taking action and achieving significant numbers of abstinent days in the posttreatment period had commensurate changes in their levels of abstinence self-efficacy.

More interesting insights follow from these analyses. Although efficacy evaluations were sensitive to setting (arm of trial) and clearly tracked the process of achieving abstinence from drinking, it is noteworthy that temptation to drink was as good, if not a little better, predictor of drinking outcomes in both the outpatient and aftercare arms. Change process activity, which was highly related to baseline motivation (DiClemente et al., this volume), was mostly unrelated to level of self-efficacy. In studies of smoking abstinence self-efficacy, the relationship between efficacy and processes of change varied according to the client's stage of change (DiClemente et al. 1985). If clients had been differentiated according to stage of change in these analyses, then perhaps a more meaningful relationship between efficacy and processes of change might have emerged (DiClemente et al. 1992). Efficacy evaluations were not related to baseline motivational readiness to change and thus appeared to be independent of motivation, as has been discussed in a prior review of efficacy (DiClemente et al. 1995).

Although the three MATCH treatments were hypothesized to have differential impacts on clients with various levels of baseline abstinence self-efficacy, there was little evidence that the three treatments influenced efficacy in unique ways or had any unique influence on clients depending on their levels of efficacy. If future research were to seek self-efficacy matching effects, very different treatment parameters or more complex and multidimensional matching hypotheses should be considered. Several examples come to mind. A future study could match prospectively on efficacy levels to some type of self-help versus formal treatment. Another strategy would be to match different relapse prevention strategies to groups who have achieved abstinence but are high or low on efficacy. Finally, one could segment by stage of change and then attempt to match high and low efficacy participants with stage-specific interventions.

Matching treatments to efficacy levels is certainly more complicated than had been proposed in the literature. The analyses in this chapter have provided one of the most indepth views of alcohol abstinence self-efficacy and its interaction with the process of treatment in a controlled trial. There is still much to learn about how treatments influence efficacy and how efficacy influences treatment outcomes. The reciprocity of the influence of efficacy on behavior and of behavior on attributions makes this a challenging enterprise. Our hope is that the analyses provided here contribute to this body of knowledge and assist in understanding this interesting and important self-evaluation called alcohol abstinence self-efficacy.

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