Part III: Psychological Dysfunction

Cognitive Impairment as a Client-Treatment Matching Hypothesis

Matching Clients to Alcoholism Treatment Based on Psychopathology

Sociopathy as a Client-Treatment Matching Variable

Alcoholic Typology as an Attribute for Matching Clients to Treatment

Cognitive Impairment as a Client-Treatment Matching Hypothesis

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ABSTRACT

The present study investigated the role of cognitive impairment in drinking behavior during and following the three Project MATCH therapies. It was hypothesized that (1) more impaired clients would have poorer outcomes, (2) impaired clients in Cognitive-Behavioral Coping Skills Therapy (CBT) or Twelve Step Facilitation (TSF) would have better outcomes than those treated in Motivation Enhancement Therapy (MET), and (3) more impaired clients would have better outcomes in TSF than in CBT. The latter two hypothesized relationships represented anticipated matching effects between type of therapy and level of cognitive impairment. Level of impairment was not related to measures of drinking frequency or intensity in the outpatient arm of the trial as either a main effect or as an interaction with type of treatment. However, indirect evidence based on analyses of therapy attendance and completion, therapist-rated working alliance, and Alcoholics Anonymous (AA) involvement suggested that CBT may be less acceptable to more cognitively impaired individuals. Higher levels of AA involvement by the more impaired individuals were related to reduced drinking intensity during the active phase of therapy. Examination of the first causal chain suggested that the hypothesized therapy by impairment matching effect may have failed because the anticipated difference in therapeutic structure between MET and both CBT and TSF was not obtained. The second hypothesized causal chain was partially supported in that impairment level was related to dose of therapy received. In the aftercare arm, there was evidence of matching during the therapy delivery phase, with more impaired clients doing somewhat less well with respect to drinking behaviors in CBT than in TSF. However, these effects were relatively transitory, had disappeared by the end of treatment, and were not evidenced across the 1-year followup period. Examination of the causal chains indicated that the primary elements thought to underlie the observed interaction did not obtain; namely, the three therapies did not differ in their level of structure, and therapy dose did not interact with level of impairment. The results suggest that cognitive impairment, as measured in Project MATCH, is not related to treatment either as a prognostic variable or as a measure that would be useful for assigning individuals to one of the three Project MATCH therapies.

There is clear evidence that cognitive functioning is negatively affected by long-term abusive drinking. Cognitive functioning refers to those intellectual capacities, both learned and innate, that allow individuals to understand and interact adaptively with their environment. There is a high prevalence of impairment of such adaptive abilities among

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detoxified alcoholics, suggesting that the observed deficits are more than just the aftereffects of acute intoxication. From 50 to 80 percent of alcoholics have been found to be significantly more impaired than appropriately matched nonalcoholic control clients (Parsons 1986). It is assumed that such impairments affect treatment process and outcome among alcoholics.

Rationale for the Matching Hypothesis

Cognitive Impairment and the Treatment Process

Alcoholics early in treatment show significant deficits in learning ability (e.g., Goldman 1987) and have difficulty acquiring and remembering treatment-relevant information (Becker and Jaffe 1984; Godding et al. 1992; Roehrich and Goldman 1993). The degree of difficulty in handling information appears to be related to the level of recent heavy drinking and possibly to the level of cognitive impairment experienced by the individual (Alterman et al. 1989; Godding et al. 1992; Sanchez-Craig et al. 1987).

Alcoholics with higher levels of assessed impairment in problem-solving and adaptive abilities have been rated by therapists (blind to the clients' neuropsychological test scores) as having higher levels of psychological distress; as being less able to generalize information, reason, and generate future plans; as participating less in therapy groups; as having functioned less adaptively in treatment; and as showing less clinical improvement over the course of treatment (Fals-Stewart et al. 1995; Kupke and O'Brien 1985; Leber et al. 1985; O'Leary et al. 1979; Parsons 1987). Smith and McCrady (1991) also found that alcoholics who had more impaired abstracting and conceptual abilities had more difficulties in acquiring drink-refusal skills than did those with higher levels of functioning. Alcoholics with greater levels of impairment are significantly less likely to complete inpatient treatment (O'Leary et al. 1979) and are predicted by inpatient therapists as likely to have poor prognoses at 1-year posttreatment (Leber et al. 1985).

In order to benefit from alcoholism rehabilitation, one must be capable of receiving new information, integrating it with existing stores, and translating this input into behavioral changes (Goldman 1983). The prerequisite cognitive competencies involved in this therapeutic process, particularly attention capacity, cognitive flexibility, and abstract reasoning, are often found to be impaired in alcoholics (McCrady and Smith 1986). It has been suggested that standard treatment programs are too fast paced, require attentional and memory skills that are often beyond the capabilities of the patients, and employ materials that are too abstract conceptually for the patient to absorb, process, generalize, and apply (McCrady 1987).

Treatment programs may need to be modified to deal more effectively with cognitively impaired alcoholics (Donovan and Chaney 1985; Gordon et al. 1988; McCrady 1987; McCrady and Smith 1986). Rather than insight-oriented therapy that may require more verbally mediated abstracting and conceptual ability than the individual is capable of, more structured interventions focusing on the development and rehearsal of social and behavioral coping skills have been recommended (Clifford 1986; Donovan and Chaney 1985). Such a therapeutic approach would focus on the development of coping skills and the prevention of relapse (Chaney 1989; Monti et al. 1989; Marlatt and Gordon 1985), with an emphasis on the use of modeling, role playing, behavioral rehearsal of, and performance feedback about coping attempts.

Despite the strong intuitive appeal of structured treatment approaches for cognitively impaired alcohol abusers, this hypothesis has not been directly tested. Smith and McCrady (1991) and Roehrich and Goldman (1993) demonstrated that cognitively impaired alcoholics have difficulty acquiring knowledge and behavioral skills that would help prevent relapse. Sanchez-Craig and associates (1987) found that alcoholic clients tended to forget coping strategies within a month of completing treatment, despite evidence that they had mastered these strategies during treatment. It was suggested that impairment of the cognitive abilities needed to learn, remember, and use such new skills may mitigate against the use of cognitively mediated treatment strategies

among impaired individuals. Thus, questions remain about the appropriateness and relative efficacy of cognitive-behavioral approaches with impaired alcoholics.

Cognitive Impairment and Treatment Outcome

The level of cognitive impairment also appears to be predictive of treatment outcome among alcoholics. Alcoholics who were more impaired at the beginning of treatment had poorer outcomes with respect to subsequent drinking behaviors and other aspects of psychosocial adjustment such as employment status (e.g., Donovan et al. 1985; Walker et al. 1983). Parsons, Schaffer, and Glenn (1990) found that alcoholics who had relapsed during a 14-month posttreatment followup period performed significantly more poorly at the beginning of treatment on a global index of neuropsychological performance than did those who had abstained during followup.

Similarly, Sussman and associates (1986) found that nearly 75 percent of alcoholics who recalled less than half the items on an ecologically relevant memory test (i.e., one that involved the recall of familiar stimuli such as products found in markets) at intake to treatment had relapsed by 3 months posttreatment; only a third of clients who had recalled more than half the items on this test had relapsed.

While these results appear promising, there are exceptions to this pattern (e.g., Lennane 1988; Macciocchi et al. 1989), and there is considerable variability in the relative strength of the association between cognitive impairment and treatment outcome when it is found (e.g., Donovan et al. 1984; Eckardt et al. 1988; Glenn and Parsons 1991; Parsons et al. 1990; Wilkinson and Sanchez-Craig 1981).

Cognitive Impairment and Matching With Treatment

Kadden and associates (1989) found a suggestive interaction effect on treatment outcome between level of cognitive impairment among alcoholics and the type of treatment received as aftercare following an inpatient alcohol rehabilitation program. Cognitively impaired alcoholics

had better drinking outcomes following involvement in supportive interactional group therapy, while unimpaired clients had better outcomes in a cognitive-behavioral coping skills group. It was suggested that the focus on training a broad range of skills and the reliance on homework assignments in the coping skills group may have overwhelmed the impaired clients; such individuals may have felt more supported and less cognitively taxed in the interactional groups which emphasized interpersonal relationships.

Jaffe and colleagues (1996) provided additional findings about the role of treatment structure versus support, with cognitively impaired alcoholics receiving one of two types of outpatient psychotherapy. Those with lower levels of verbal learning had poorer drinking outcomes when receiving relapse prevention versus supportive therapy. Higher levels of verbal learning, on the other hand, were associated with better outcomes in relapse prevention than in supportive therapy.

Statement of the Hypotheses

Hypothesized Main Effect

Previous results suggest that those individuals with greater cognitive impairment will have poorer outcomes across a variety of outcome measures than those with less impairment.

Thus, it was hypothesized that individuals with greater cognitive impairment, measured along a continuum, will have poorer outcomes, regardless of type of treatment, than those with less impairment.

Hypothesized Interaction Effects

Structure, Intensity, and Duration

The first hypothesized interaction effects were based on the apparent differences in the level of structure, intensity, and duration of the MATCH treatments. Some findings suggest that more cognitively impaired alcoholics should do better in more structured/intensive or longer treatments than in therapies with less structure or shorter durations. Those with minimal impairment would be expected to do comparably in either form of treatment. Twelve Step Facilitation (TSF; Nowinski et al. 1992) and

Cognitive-Behavioral Coping Skills Therapy (CBT; Kadden et al. 1992) were assumed to be more structured and were scheduled to have more sessions than Motivational Enhancement Therapy (MET; Miller et al. 1992) and were thus expected to lead to better outcomes for more cognitively impaired individuals.

Thus, it was hypothesized that alcoholics who are more cognitively impaired will have better outcomes, defined by percentage of days abstinent (PDA) and drinks per drinking day (DDD), following either CBT or TSF than following MET relative to clients who are less cognitively impaired.

Two measures were used to investigate this hypothesis. The first, the degree of therapeutic structure of each of the interventions, was operationalized using ratings of the Project MATCH Tape Rating Scale. This scale (Carroll et al. 1998) involved raters blind to the therapy condition rating videotapes of therapy sessions on a number of dimensions. These included dimensions, based on ratings of therapists' activities and interventions, that were defined by factor analysis as being relatively specific to each of the three Project MATCH therapies. The therapeutic structure scale appeared to cut across therapies and was defined by items such as therapists' level of verbal activity, the consistency of therapeutic focus over the course of a session, continuity of therapeutic theme from previous session, and a global rating of structure.

The second set of measures involved the intensity of treatments received (versus scheduled) as defined by indices of therapy attendance. These indices included the number of sessions attended, the percentage of scheduled sessions attended, the percentage of clients who attended three or more therapy sessions, and the percentage of clients who attended all

scheduled sessions (e.g., therapy completers). These two causal chains are presented graphically in figures 1 and 2.
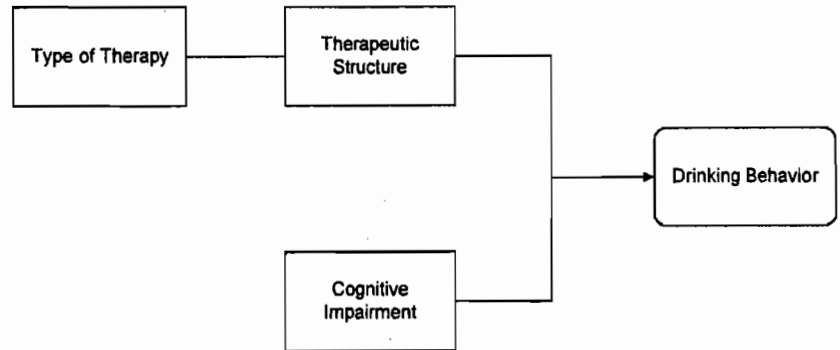

Figure 1. Cognitive impairment hypothesis: CBT versus MET as a function of therapeutic structure.
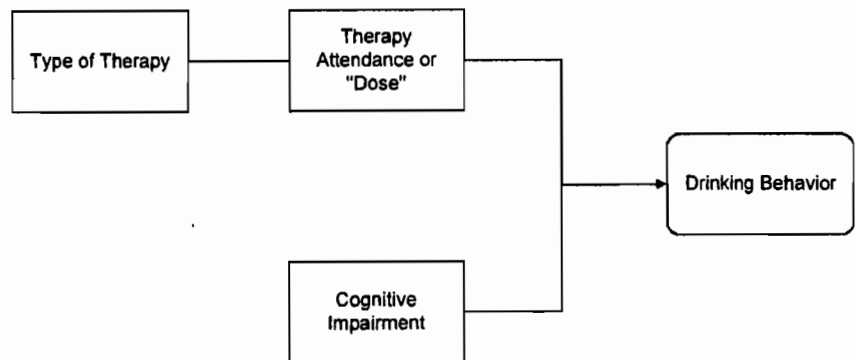

Figure 2. Cognitive impairment hypothesis: CBT versus MET as a function of therapy attendance or dose.

Content, Support, and Cognitive Complexity

The second anticipated interaction was based on differences in the content of therapies, level of support, and cognitive complexity between therapies having comparable levels of intensity and duration. More impaired clients could be predicted to derive greater benefit from either CBT therapy, with its emphasis on training of concrete skills and behavioral rehearsal of them, or TSF, with its straightforward, often repeated messages (e.g., Alcoholics Anonymous (AA) "slogans") that appear to provide simpler, more concrete advice to compensate for cognitive impairment (see Gordon et al. 1988), and

the social support of AA meetings which clients are encouraged to attend.

However, the treatment outcome results of Kadden and associates (1989) and Jaffe and colleagues (1996) suggested that more impaired alcoholics have poorer outcomes in cognitive-behavioral treatments, and additional treatment process evidence indicated that more impaired alcoholics have greater difficulty acquiring knowledge and behavioral skills associated with coping skills (Roehrich and Goldman 1993; Smith and McCrady 1991).

Thus, it was hypothesized that cognitively impaired alcoholics will have better outcomes, defined by PDA and DDD, following TSF than following CBT relative to clients who are less cognitively impaired.

The CBT manual states that the role of the client is one of active participation in the learning of skills for coping with high-risk drinking situations, managing thoughts about alcohol and drinking, problem-solving, refusing drinks, planning for emergencies, coping with lapses, and managing interpersonal and intrapersonal discomfort. These skills are quite complex and typically unfamiliar to many clients. In contrast, the TSF message is less complex, focused on the AA ideas of acceptance, surrender, and getting active. The latter involves social activities of the AA Fellowship through which one might gain additional support.

Given the added assumption about the importance of participation in AA activities for the 12-step clients, the number of AA meetings attended for both CBT and TSF was tracked. Unfortunately, the ratings of videotaped sessions did not include measures that would directly assess the purported differential levels of cognitive complexity associated with the CBT and TSF conditions. In the absence of ratings of the complexity of the therapy sessions, complexity of treatment was indexed by proxy through AA meeting attendance and AA involvement as an indication of additional low complexity treatment. This hypothesized causal chain is presented graphically in figure 3.
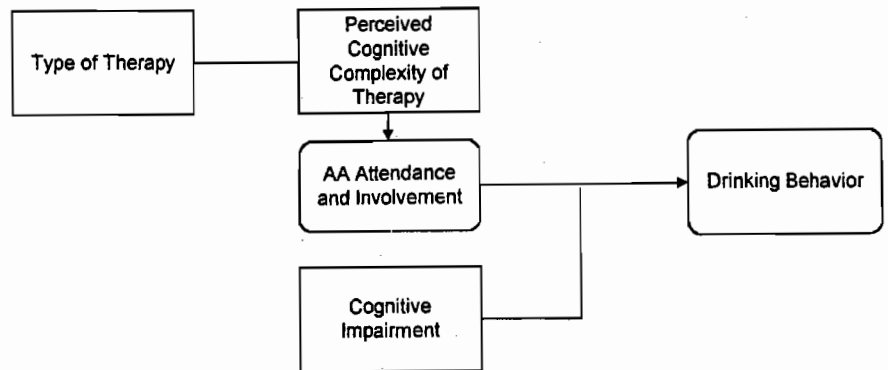

Figure 3. Cognitive impairment hypothesis: CBT versus MET as a function of perceived complexity of the therapy, with AA attendance and involvement serving as proxies.

Operationalization of the Matching Variable

Three relatively brief measures of cognitive function and impairment were included in the Project MATCH assessment protocol: the Shipley Institute of Living Scale (Shipley 1940), the Trail Making Test, Parts A and B (Reitan 1958), and the Symbol Digit Modalities Test (Smith 1973). These measures have been found to be useful in differentiating alcoholics who learn and retain treatment-relevant information from those who do not; have been shown to be related to therapists' ratings of clinical treatment process, progress, and prognosis; and have demonstrated some utility in predicting outcome.

A principal components analysis was conducted using the Trails B, the Symbol Digit Modalities Test, and the Shipley Abstraction T-scores from the 1726 clients from Project MATCH. A single principal component emerged (eigenvalue=1.94), accounting for 64.6 percent of the variance. The component matrix suggested that all three measures loaded highly on this factor (Abstraction T-score=0.76; Trails B total time=-0.83; Symbol Digit=0.82).

Based on these preliminary analyses, it was decided to use a single composite measure, the Cognitive Impairment Index, derived by summing the unit-weighted standardized scores for the Trails B total time, Symbol Digit Modalities Test (number of correct responses in 90 seconds), and the T-score from the Shipley Abstraction scale (Trails B – Abstraction – Symbol Digit). Higher positive scores on this index

indicate higher levels of impairment; lower and negative scores indicate less impairment. Information concerning the distributional properties of this index and the relationship of three levels of impairment (based on a trichotomy of the distribution for the entire sample) to other measures of cognitive function for the total sample and the outpatient and aftercare arms of the trial are presented in table 1. Based upon the scores on other measures of cognitive function, the derived levels of cognitive impairment appear better at accurately classifying clients in the outpatient arm than in the aftercare arm of the trial.

Results: Outpatient Arm

Tests for Prognostic and Matching Effects

The primary analyses investigating prognostic main effects and matching interaction effects employed latent growth procedures as outlined in the overall Project MATCH data analysis plan (Project MATCH Research Group 1997; Longabaugh and Wirtz, this volume, pp. 4–17). Cognitive impairment index scores, the three treatment conditions (CBT, MET, and TSF), and the impairment by treatment interaction effects were the independent variables, and PDA and DDD across time were the dependent variables. These analyses also included covar- iate adjustments to control for extraneous variables. The covariate set included the baseline measure of the drinking outcome criterion being used in an analysis, terms for site main effects and site by treatment interaction effects, terms for site by matching variable interactions, and interaction terms for both linear and quadratic time for each of these covariates.

Analyses were conducted to determine the prognostic effects of the cognitive impairment index with respect to PDA and DDD in the outpatient arm of the trial. Cognitive impairment was not predictive of treatment outcome (no

Table 1. Characteristics of the Cognitive Impairment Index and its relationship to other measures of cognitive function

Measure	Outpatient				Aftercare			
	Low	Medium	High	Total	Low	Medium	High	Total
Cognitive Impairment Index								
Mean	-2.42	-0.32	2.37	-0.47	-2.31	-.34	2.90	.56
SD	.90	.59	1.49	2.13	.81	.57	1.92	2.57
Shipley Abstraction T Score[a]	60	55	46	55	54	53	52	54
Shipley Vocabulary T-Score[a]	54	51	46	51	50	49	49	49
Shipley Total T-Score[a]	58	53	45	53	52	51	50	51
Shipley Abstraction Quotient	108	102	93	102	101	102	100	101
Shipley Conceptual Quotient	101	91	79	92	88	89	86	88
WAIS Equivalent IQ	108	100	90	101	99	98	96	97
Trails A (time in seconds)	27	30	37	31	36	35	39	37
Percent impaired[b]	9.7%	14.0%	38.0%	18.2%	29.1%	29.5	36.8%	32.6%
Trails B (time in seconds)	57	70	102	73	87	85	91	88
Percent impaired[c]	5.4%	14.3%	47.1%	19.0%	30.7%	31.8%	37.1	35.4%
Symbol Digit Substitution (number correct in 90 sec)	56	49	43	51	46	47	45	46
Percent impaired[d]	5.6%	18.5%	52.9%	22.1%	36.7%	37.2%	42.9%	37.6%

NOTE: [a] T-Scores are age adjusted and have a mean of 50 and standard deviation of 10; [b] 41 seconds or more is in the impaired range; [c] 91 seconds or more is in the impaired range; [d] Equal to or less than 1.5 SD from the age-adjusted normative mean is in the impaired range (Lezak 1983).

main effect for cognitive impairment) during months 1–3 when the treatments were being delivered or across the 1-year followup period (months 4–15). Similarly, no statistically significant interactions were found between degree of impairment and type of therapy to suggest a matching effect on either the PDA or DDD outcomes during the 1–3 or 4–15 month periods (table 2). Subsequent analyses of outpatients followed at months 37 to 39 similarly found no evidence of prognostic main effects for cognitive impairment or matching interaction effects between level of impairment and type of therapy (Project MATCH Research Group 1998).

CBT Versus MET and TSF Versus MET Contrasts

Therapy Structure

An initial question in relation to the hypothesized causal chain is whether the TSF and CBT therapies were comparable in their level of structure within sessions and had greater structure than MET. A second and related question is whether the levels of structure of the three therapies differ for clients having different levels of cognitive impairment. That is, do individuals who are impaired seem to "pull" for more structure in therapy than do less impaired clients? To address these questions, a factorial analysis of variance (ANOVA) was conducted for each arm of the trial, with the three therapy conditions and three levels

of cognitive impairment (based on trichotomization of the clinical impairment index distribution) as the independent variables and level of structure derived from the Project MATCH Tape Rating Scale as the dependent variable.

No differences were found in rated structure across level of cognitive impairment (F=0.176, p=.84), nor was there a significant interaction between cognitive impairment and type of therapy (F=0.788, p=.533). However, a significant difference (F=3.024, p=.049) was found in the level of structure across the three types of therapy. Subsequent Duncan's paired comparisons (p=.05) indicated that the level of structure of CBT (16.35) was significantly less than MET (17.07); TSF (16.74) was comparable to both CBT and MET in level of structure. Thus, a major underlying assumption of the first hypothesis and causal chain failed to be supported in the outpatient arm of the trial; the level of structure within MET sessions was equal to or greater than that found for the TSF and CBT therapies.

Therapy Attendance and Treatment Dose

Sessions Attended. A second question was whether the three therapies differed with respect to the dose of treatment clients received. A factorial ANOVA was conducted within each arm of the trial, with number of treatment sessions attended serving as the dependent variable and the type of therapies and level of

Table 2. Cognitive Impairment, outpatient

Treatment contrast		Within treatment						Posttreatment					
		MV × Tx		MV × Tx × T		MV × Tx × T^2		MV × Tx		MV × Tx × T		MV × Tx × T^2	
		PDA	DDD	PDA	DDD	PDA	DDD	PDA	DDD	PDA	DDD	PDA	DDD
CBT vs. MET	F	−.21	.89	−.15	.09	.10	−.40	.20	−.33	1.00	−.91	.20	.24
	p	.83	.37	.88	.93	.92	.69	.84	.74	.32	.37	.84	.81
CBT vs. TSF	F	−.16	1.41	.19	−.21	−.27	1.20	.26	.16	.61	−1.25	1.37	−1.08
	p	.87	.16	.85	.83	.79	.23	.79	.87	.54	.21	.17	.28
MET vs. TSF	F	.06	.52	.34	−.30	−.36	1.59	.06	.48	−.38	−.33	1.14	−1.30
	p	.95	.60	.74	.76	.72	.11	.95	.63	.70	.74	.26	.19
MV × Tx	F	.03	1.02	.05	.05	.07	1.36	.04	.12	.51	.84	1.07	.96
	p	.98	.36	.96	.95	.93	.26	.96	.89	.60	.43	.34	.38

NOTE: MV=matching variable, Cognitive Impairment; Tx=therapy condition; T=time; T^2=quadratic time; PDA=percentage of days abstinent; DDD=drinks per drinking day

cognitive impairment serving as the independent variables. In the outpatient arm, as predicted, clients in MET (3.26 sessions) attended significantly fewer therapy sessions (F=193.21, p=.000) than those in either CBT (8.12 sessions) or TSF (7.51 sessions). However, CBT and TSF also differed significantly, a result that was not consistent with the causal chain assumption of these two therapies being equal in attendance. Although the overall differences across cognitive impairment levels failed to reach significance (F=2.533, p=.08), subsequent post hoc analyses indicated that the low impairment group (6.58 sessions) differed (p=.05) from the high impairment group (6.00 sessions).

There was also a significant therapy by cognitive impairment interaction (F=3.283, p=.011). This appears to be due to a significant difference within the CBT condition in the attendance among the high impairment group (6.97 sessions) and the level of attendance by the low (8.88 sessions) and medium (8.52 sessions) impairment groups, and in comparison to the pattern of attendance across the MET and TSF conditions. Thus, as anticipated, therapies differed in session attendance/treatment dose. However, TSF was found to involve nearly one session less than CBT, although the causal chain was predicated on these two being equivalent. Also, outpatient clients in the high impairment group attended fewer CBT sessions than did those in the medium and low impairment groups (figure 4).
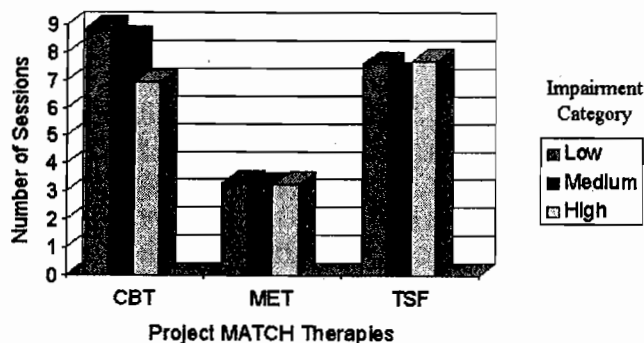

Figure 4. Number of outpatient therapy sessions attended as a function of type of therapy and level of cognitive impairment.

Percentage of Sessions Attended. The relationship of cognitive impairment to attendance was explored further by examining the percentage of sessions attended across levels of impairment. Factorial ANOVAs were conducted for each arm of the study with percentage of sessions attended as the dependent variable and type of therapy and level of cognitive impairment as the independent variables. In the outpatient arm, a significant effect was found for the type of therapy, with MET (81.49 percent) having a higher percentage of sessions completed than either CBT (67.7 percent) or TSF (62.59 percent) (F=28.64, p=.000).

There were no differences in percentage of sessions attended as a function of level of cognitive impairment (F=2.158, p=.116); however, the interaction between type of therapy and impairment approached significance (F=2.369, p=.051). This appears related to the large falloff in percentage of sessions attended by highly impaired clients in the CBT condition (58.1 percent) compared with those in the medium impairment (71.0 percent) or low impairment (74.0 percent) group, and in comparison to the consistent pattern of attendance found across levels of impairment in the MET and TSF groups (figure 5).
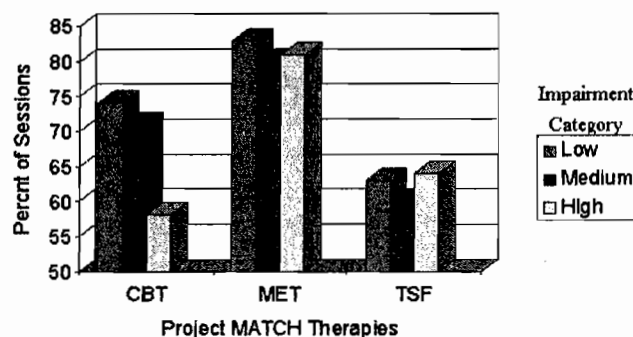

Figure 5. Percentage of outpatient sessions attended as a function of type of therapy and level of cognitive impairment.

Categorical Attendance Indices. A final method to analyze the relation of impairment to attendance was to examine two variables categorizing therapy attendance. The first classified clients having attended 0–2 sessions as low attendees (17.4 percent in outpatient) and those having attended 3 or more sessions as high attendees. This cutoff coincides with the fact that

all three interventions presented their first two therapy sessions in the same timeframe, namely, during the first 2 weeks of treatment. The second variable classified those having attended 100 percent of scheduled therapy sessions as therapy completers (37 percent of total outpatient sample and 44.8 percent of those attending 3 or more outpatient sessions), while those with less than 100-percent attendance were classified as noncompleters.

These data were analyzed using a 2×3 chi-square analysis. No significant relationship was found in the outpatient arm on the level of attendance; however, the chi square for complete/noncomplete approached significance ($X^2 = 5.763$, $p = .056$). This latter value suggested a trend in which only 32.8 percent of clients in the high impairment group completed therapy compared to 41.6 percent and 34.9 percent, respectively, for the low and medium impairment groups

When the type of therapy was factored into multilevel chi-square analyses, a significant relationship was found for the CBT condition in the outpatient arm for both the level of attendance ($X^2 = 6.970$, $p = .031$) and therapy completion status ($X^2 = 8.585$, $p = .014$). These relationships appear attributable to the higher percentage of clients in the high impairment group who were classified as low therapy attendees (22.1 percent) and noncompleters (83.1 percent) compared to the low (9.6 percent low attendees, 64.5 percent noncompleters) and medium (11.1 percent low attendees, 75 percent noncompleters) impairment groups. The relationship of attendance and impairment within CBT for the outpatient sample is depicted in figure 6.
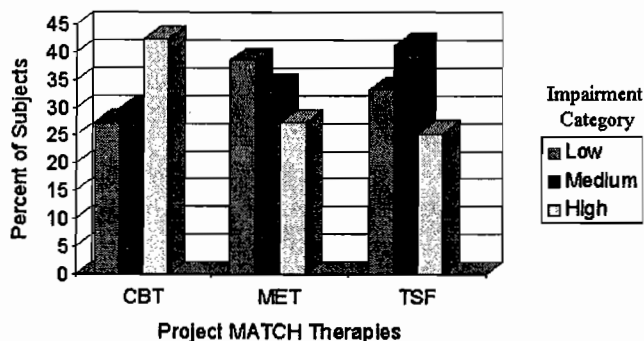

Figure 6. Percentage of outpatients classified as low attenders (≤2 sessions) as a function of type of therapy and level of cognitive impairment.

Working Alliance. Although not part of the original causal chain, another possible process measure with which cognitive impairment might interact is the development of a working alliance during the course of treatment. The Working Alliance Inventory (WAI; Horvath and Greenberg 1986) was completed by both clients and therapists after the second therapy session. Univariate factorial ANOVAs with the therapist- and client-rated WAI total scores, with level of impairment and type of therapy as independent variables, were conducted in each arm of the study.

No differences or interactions were found on the client-rated WAI total score. A significant effect was found on therapist-rated WAI total scores as a function of type of therapy ($F = 3.777$, $p = .023$) and level of impairment ($F = 3.176$, $p = .042$); however, there was no significant therapy by cognitive impairment interaction effect. The therapy group difference is related to the TSF having a significantly higher WAI-therapist total score (199.35) than the CBT group (193.43); no differences were found between MET (196.94) and either the TSF or CBT groups. The impairment main effect is accounted for by the high impairment group (193.48) being significantly lower than the low impairment group (199.43); there were no differences between the medium impairment group (195.79) and either the low or high impairment groups.

The Bond, Goals, and Task subscale scores from the WAI were entered into multivariate analyses of variance (MANOVA) as the dependent variables, with level of cognitive impairment and type of therapy as the independent variables. There were no multivariate differences among outpatients on the client-rated WAI subscales as a function of level of cognitive impairment (Pillai's=0.002, $F = 0.232$, $p = .966$) or its interaction with type of therapy (Pillai's= 0.022, $F = 1.433$, $p = .143$); there was, however, a significant difference as a function of type of therapy (Pillai's=0.02, $F = 2.577$, $p = .017$). This appears to be accounted for by differences across therapy conditions on the Bond subscale ($F = 4.818$, $p = .008$), in which MET (72.08) had a significantly higher score than either the CBT (69.65) or TSF (70.34) groups, which did not differ from one another.

There were no significant differences in the outpatient arm on the therapist-rated WAI subscale scores as a function of the type of therapy or its interaction with level of impairment; while not significantly different (Pillai's=0.014, $F=1.811$, $p=.093$), the level of impairment approached this level. Univariate ANOVAs conducted as part of the MANOVA process to test between-client effects found a significant difference as a function of level of impairment on the Task subscale ($F=3.528$, $p=.03$) and an interaction effect on the Bond scale ($F=2.50$, $p=.041$). The interaction appears to be accounted for by the high impairment group's Bond score (63.34) in the CBT condition in contrast to that of the low (67.68) and medium (66.68) impairment groups and in comparison to the pattern of scores in the other therapy conditions (figure 7).
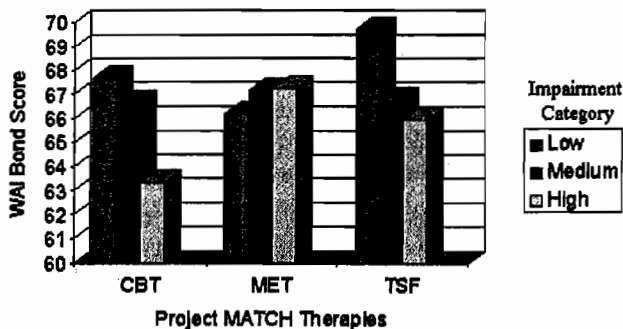

Figure 7. Therapist ratings of therapeutic bond in outpatient therapies as a function of level of cognitive impairment.

CBT Versus TSF Contrast

AA Meeting Attendance and Involvement

The number of AA meetings attended and scores on the AA Involvement Scale (AAIS, Tonigan et al. 1996) reflecting involvement in other 12-step activities (e.g., reading the *Big Book*, having a sponsor, doing steps) were collected across the followup from the Form 90 (Miller 1996). Analyses were conducted on each of these sets of variables within each arm; only those results that involve level of impairment and its interaction with treatment are reported.

AA Attendance. A repeated-measures ANOVA was conducted with therapy type and level of impairment as the independent

variables and AA meeting attendance across the followup period as the repeated measure. No main effects for level of impairment, 2-way interactions of impairment by time, or 3-way interactions involving therapy condition, impairment level, and AA meeting attendance across followup points were found in any of the analyses.

Two summary variables were derived from the AA meeting attendance and involvement measures, representing the average of these variables collapsed across the 3- through 15-month followup period. These were then trichotomized based on their respective distributions to provide for high, medium, and low AA attendance and AA involvement categories. No significant relationship was found between level of impairment, type of therapy, and frequency of AA meeting attendance in the outpatient arm.

AA Involvement. Similar analyses were conducted with the AA Involvement Scale. A repeated measures ANOVA was conducted with therapy type and level of impairment as the independent variables and AA involvement scores across the followup period as the repeated measure and dependent variable. A significant effect was found for the interaction between level of impairment and AA involvement in the outpatient sample (Pillai's=0.033, $F=2.438$, $p=.024$, within-clients $F=2.753$, $p=.012$). This difference appears attributable to the differential increase in the level of AA involvement among clients in the high impairment group relative to that in the other impairment categories (figure 8). Subsequent post hoc comparisons indicate that the high impairment group, while not differing at baseline from the other conditions, had higher AA involvement scores at the 1–3- and 4–9-month periods than the other two impairment groups, which did not differ from one another.

A significant chi square was found between level of impairment and AA involvement category for the outpatient sample, collapsing across type of therapy ($X^2=10.260$, $p=.036$). This appears to be related to the relatively large number of individuals in the high impairment group who had a high level of AA involvement, particularly when compared to those in the low impairment range who were low in their AA involvement (figure 9).
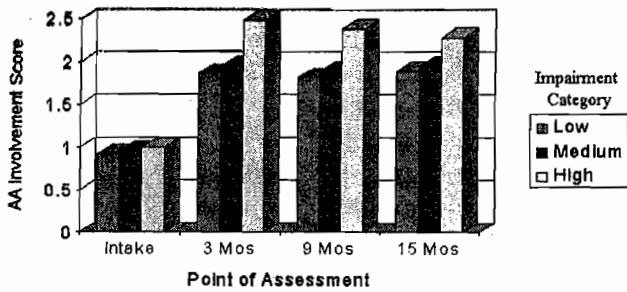
Figure 8. AA involvement score as a function of level of cognitive impairment: Outpatient sample.
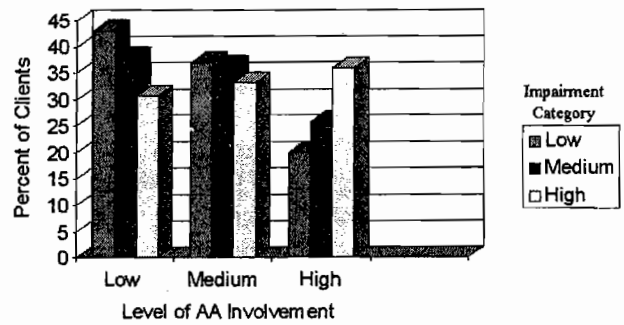

Figure 9. Relationship between level of AA involvement and level of cognitive impatient: Outpatient sample.

The relationship between AA involvement and level of impairment on drinking and abstinence during the therapy delivery period was examined. Two variables were included as indices. The first was whether abstinence or drinking occurred in a given week; the second indicated whether a heavy drinking occasion (five or more drinks on a drinking day) occurred in a given week. Repeated-measures ANOVAs were conducted for each variable, with the level of AA involvement during months 1 to 3 (trichotomized) and level of cognitive impairment as the independent variables.

In the outpatient arm, a significant interaction was found between weeks including heavy drinking across time, level of impairment, and AA involvement (F=1.422, p=.029). The interaction, depicted in figure 10, appears to be attributable to the difference between clients in the high impairment group who are either low or high on their AA involvement. Highly impaired clients who were highly involved in AA had considerably fewer weeks involving heavy drinking
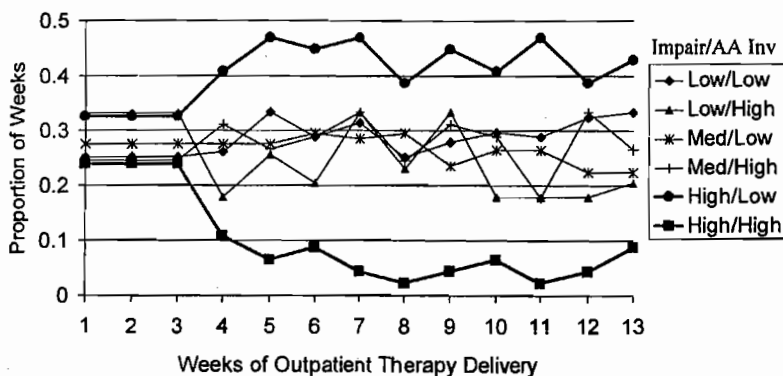
episodes. There was no relationship between level of AA involvement, impairment, and abstinent weeks in the outpatient arm of the trial.

Examination of the trichotomized classification of AA meeting attendance during months 1 to 3 indicated that it may be related differentially to abstinent weeks during this period for individuals differing in their level of cognitive impairment. In the outpatient arm, a significant multivariate interaction was found involving these three variables (Pillai's=0.076, F= 1.387, p=.04); the within-client interaction approached significance (F=1.318, p=.072). The interaction appears to be attributable to the relatively larger proportion of abstinent weeks for those in the high impairment category who were also in the high frequency of AA meeting attendance group during months 1 to 3, particularly in comparison to highly impaired clients who were in the lowest AA attendance category.

Summary of Outpatient Findings

The results of analyses in the outpatient arm suggest the following:

■ Cognitive impairment does not appear to be prognostic of drinking-related outcomes during the therapy delivery period, across the 1-year posttreatment followup, or at a 3-year posttreatment followup.

■ There appear to be no matching effects between cognitive impairment and type of therapy at any of these time points.

Figure 10. Proportion of weeks with a heavy drinking episode during outpatient therapy as a function of level of cognitive impairment.

- MET was found to have significantly more structure than CBT, while CBT is comparable to TSF, and TSF and MET are comparable.

- MET clients attended fewer therapy sessions than either CBT or TSF clients, while those receiving TSF attended significantly fewer sessions than did CBT clients.

- Individuals with a high degree of cognitive impairment who received CBT attended fewer therapy sessions, were more likely to be classified as low therapy attendees (≤ 2 sessions), and were less likely to complete therapy than those with low levels of impairment.

- Those with high levels of impairment appear to have a less positive working alliance with their therapists overall than those who are in the low impairment category.

- Those with high levels of impairment who were in CBT appear to have developed less positive interpersonal bonds with their therapists than those with low impairment; clients with high levels of impairment had significantly greater AA involvement than those with low impairment.

- Those in the high impairment group who had a high level of AA involvement had significantly fewer weeks in which heavy drinking occurred during the therapy

delivery period than those who were low in AA involvement.

Results: Aftercare Arm

The analyses conducted in the aftercare arm of the study paralleled those in the outpatient arm. This section presents the results of these analyses for the aftercare arm of the trial.

Tests for Prognostic and Matching Effects

Level of cognitive impairment was not predictive of treatment outcome (no main effect for cognitive impairment) either during the treatments (months 1–3) or across the 1-year followup period (months 4–15) for aftercare clients. However, matching effects were apparent within treatment (table 3). A time by treatment by attribute effect was observed for both frequency (PDA, $p<.02$) and intensity (DDD, $p<.02$) of drinking. Examination of the weekly p values suggests that as treatment progressed, clients with greater cognitive impairment did progressively better in CBT than in MET, as hypothesized, relative to those with less cognitive impairment. However, these relative gains disappeared by the end of the active treatment phase, and no differences were found in the months 4–15 data. The within-treatment effects are depicted in figures 11 and 12.

Table 3. Cognitive Impairment, aftercare

Treatment contrast		Within treatment						Posttreatment					
		MV × Tx		MV × Tx × T		MV × Tx × T²		MV × Tx		MV × Tx × T		MV × Tx × T²	
		PDA	DDD	PDA	DDD	PDA	DDD	PDA	DDD	PDA	DDD	PDA	DDD
CBT vs. MET	t	.94	-.42	2.39	-2.34	-.29	.23	.57	-.25	-.06	-.25	.06	-.27
	p	.39	.67	.02	.02	.78	.82	.57	.81	.95	.80	.95	.79
CBT vs. TSF	t	-1.10	.27	1.71	-2.16	.41	-.16	.38	-.24	1.18	.08	-.58	-.25
	p	.27	.79	.09	.03	.68	.87	.70	.81	.24	.93	.57	.80
MET vs. TSF	t	-1.81	.62	-.71	.27	.62	-.35	1.19	.02	1.07	.29	-.55	.03
	p	.07	.54	.48	.79	.54	.73	.85	.99	.29	.77	.59	.97
MV × Tx	F	1.65	.19	3.25	3.70	.19	.06	.18	.04	.83	.05	.21	.05
	p	.19	.82	.04	.02	.82	.94	.84	.96	.44	.95	.81	.95

NOTE: MV=matching variable, Cognitive Impairment; Tx=therapy condition; T=time; T²=quadratic time; PDA=percentage of days abstinent; DDD=drinks per drinking day
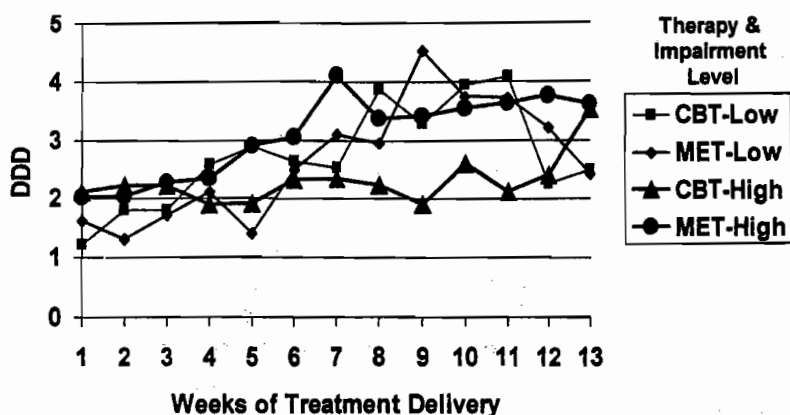
Figure 11. Drinks per drinking day (DDD) in aftercare during months 1–3 as a function of level of cognitive impairment: CBT versus MET contrast. Predicted contrasts are represented by heavy lines.

Figure 12. Percentage of days abstinent (PDA) in aftercare during months 1–3 as a function of level of cognitive impairment: CBT versus MET contrast. Predicted contrasts are represented by heavy lines.
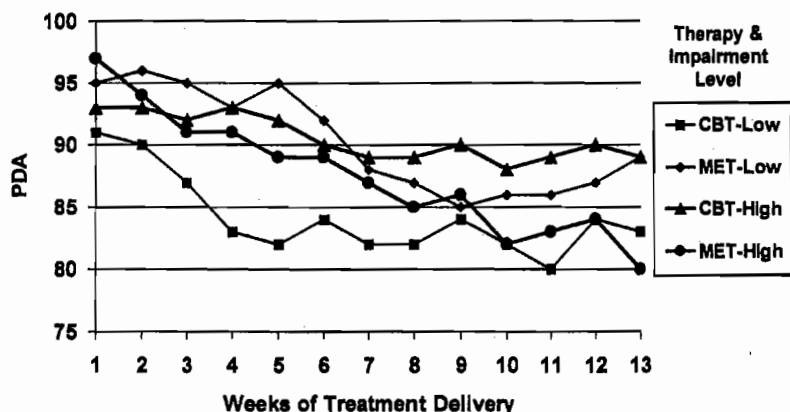
It was also hypothesized that clients higher in cognitive impairment would have better drinking outcomes when treated in TSF than when treated in MET, relative to those with less cognitive impairment. This hypothesis was also supported through the treatment period (months 1–3) but also disappeared during the subsequent 12-month followup period.

Lastly, it was hypothesized that TSF would be more helpful than CBT for aftercare clients high in cognitive impairment. Examination of the attribute by treatment by time interaction on DDD ($p<.03$) at the weekly level suggests that highly impaired clients treated in TSF tended to drink less on drinking days during the first week or two of treatment than if treated in

CBT. However, as the weeks of treatment went on, this effect disappeared.

CBT Versus MET and TSF Versus MET Contrasts

Therapy Structure

No differences were found in the level of structure in the aftercare arm as a function of level of cognitive impairment ($F=0.767$, $p=.465$), type of therapy ($F=0.289$, $p=.749$), or the interaction between these two variables ($F=0.822$, $p=.512$). Thus, as in the outpatient arm, a major component of the putative causal chain, that CBT and TSF would be rated as having greater structure than MET, was not supported.

Therapy Attendance and Treatment Dose

Sessions Attended. A significant effect for type of therapy was found with respect to the number of therapy sessions attended (CBT, 8.12; MET, 3.15; TSF, 7.36) ($F=125.31$, $p=.000$). However, there were no significant differences in therapy attendance as a function of level of cognitive impairment or its interaction with type of treatment.

Percentage of Sessions Attended. Differences were found in the percentage of sessions attended across the CBT (67.6 percent), MET (78.8 percent), and TSF (61.4 percent) groups. No significant differences were found as a function of level of cognitive impairment ($F=2.360$, $p=.095$); however, a trend was found for highly impaired clients (65 percent) having lower attendance than those in medium or low impairment groups (71 percent for each). No interaction was found between level of impairment and type of aftercare therapy ($F=0.273$, $p=.896$).

Categorical Attendance Indices. Nearly a quarter (24.2 percent) of the aftercare clients were classified as low therapy attendees (≤2 sessions); 47.8 percent of the aftercare clients (63.2 percent of those attending 3 or more sessions)

were classified as therapy completers. A significant relationship was found between cognitive impairment and aftercare therapy attendance (0–2 sessions versus 3 or more sessions) (X^2= 6.123, p=.047); 28.4 percent of clients in the high impairment category were low therapy attendees compared to 19.6 percent and 22.1 percent for the low and medium impairment groups, respectively. However, there was no relationship between level of impairment and therapy completion status in the aftercare arm. When the type of therapy was factored into multilevel chi-square analyses, no differences were found on either of these two measures as a function of type of therapy or within a given therapy as a function of level of impairment.

Working Alliance. There were no differences as a function of type of therapy, level of impairment, or their interaction in the aftercare arm on the total WAI score or on any of the three WAI subscales rated by either therapists or clients.

CBT Versus TSF Contrast

AA Meeting Attendance and Involvement.

AA Attendance. A repeated-measures ANOVA was conducted with therapy type and level of impairment as the independent variables and AA meeting attendance across the followup period as the repeated measure. No main effects for level of impairment, 2-way interactions of impairment by time, or 3-way interactions involving therapy condition, impairment level, and AA meeting attendance across followup points were found in any of the analyses.

AA Involvement. No relationship was found among AA involvement, measured as either a continuous variable in repeated-measures analyses or as a categorization based on the average level of involvement, level of impairment in chi-square analyses, and type of treatment in the aftercare arm.

The relationship between AA involvement during the therapy delivery period and level of impairment on drinking and abstinence during that same period was examined using the number of abstinent weeks and the number of weeks including a heavy drinking occasion as the

dependent variables. Repeated-measures ANOVAs were conducted for each variable, with the level of AA involvement during months 1 to 3 (trichotomized) and level of cognitive impairment as the independent variables. There were no differences across time in either the number of abstinent weeks or weeks including heavy drinking as a function of the level of AA involvement, cognitive impairment, or their interaction among aftercare clients. Similarly, the trichotomized classification of AA meeting attendance was not related to the number of abstinent weeks or weeks including heavy drinking among aftercare clients.

Summary of Aftercare Findings

The results of analyses in the aftercare arm suggest the following:

- Cognitive impairment does not appear to be prognostic of drinking-related outcomes during the therapy delivery period or across the 1-year posttreatment followup.
- There appeared to be some support for a matching effect between level of cognitive impairment and type of therapy during months 1–3 while treatment was being delivered, with clients higher in cognitive impairment having somewhat better within-treatment drinking outcomes when treated in either CBT or TSF compared to MET, and those in TSF doing somewhat better early in treatment compared to those in CBT.
- These apparent matching effects dissipated over time and had disappeared by the end of the active treatment phase.
- There were no differences across the three aftercare therapies with respect to their levels of therapeutic structure.
- No differences or interactions with type of treatment were found for level of cognitive impairment and the number of therapy sessions attended, the percentage of sessions attended, or therapy completion rates; however, those with high levels of impairment were more likely to be classified as low therapy attendees than those with low levels of impairment.

- There appeared to be no relationship between level of impairment and the level of therapeutic alliance as viewed from either the clients' or therapists' perspectives.
- No relationships were found between the level of cognitive impairment and AA attendance or level of AA involvement.

Discussion

Treatment Outcome

The present findings raise questions concerning the utility of measures of cognitive impairment in matching clients to the three treatments used in Project MATCH. In the outpatient setting, the cognitive impairment index was found to have neither a prognostic main effect nor an interaction with treatments on percentage of days abstinent or drinks per drinking day during the 3 months of active therapy, across the 12-month followup period, or at a followup approximately 3 years after treatment. While there was some suggestive evidence of matching in the aftercare setting during the active treatment phase (months 1–3), these effects occurred in only a brief window of time, dissipated rapidly, and were not observed in months 4–15. Thus, the results fail to support the hypothesized main effects, which predicted that more cognitively impaired clients would have poorer outcomes. This portion of the results are consistent with others that have raised questions about the clinical utility of measures of cognitive function in predicting treatment outcomes among alcoholics (Donovan et al. 1984). The results also fail to support the hypothesized interactions that would have indicated a matching effect between level of impairment and type of therapy.

Causal Chain Analyses and Process Measures

Outpatient Arm

Given the lack of prognostic main effects or matching interaction effects between cognitive impairment and type of therapy, the aim of the causal chain analysis for the outpatient arm of the trial was to determine where the causal

chain broke down. The first causal chain, involving the contrasts between MET and CBT and TSF, seems to have failed in part because MET appeared to have higher levels of therapeutic structure (as rated after Session 2) than either CBT or TSF. This finding is contrary to the hypothesis that CBT and TSF would be more structured. Further, outpatients high in cognitive impairment did not differ from those low in impairment on the degree of structure observed in their therapy sessions nor was there an interaction between level of impairment and therapy with respect to observed structure.

The second causal chain was partially supported in that cognitive impairment was related in the expected direction with therapy dose. High impairment was associated with fewer sessions attended, suggesting that those who were more impaired found therapy less helpful than those who were less impaired. More importantly, cognitive impairment interacted with the type of therapy to influence attendance. Clients with high levels of impairment who received CBT attended fewer sessions than those having low levels of impairment or than their counterparts in the other therapy conditions.

This differential therapeutic dose was also supported by the percentage of sessions attended, classification as low or high therapy attendees, and categorization as therapy completers. Thus, there appears to be cumulative evidence that level of impairment interacts with CBT to reduce various indices of treatment dose. However, it is not clear whether these differences in attendance as a function of type of therapy and impairment level are related to longer term drinking-related outcomes. This relationship should be tested in future analyses.

In a search for process factors that might be a function of the interaction between type of therapy and cognitive impairment, working alliance, AA attendance, and AA involvement were explored. A number of interesting indirect lines of evidence emerged from these analyses, when combined with the results concerning therapy dose, to support the possibility that CBT-oriented outpatient programs may be less acceptable to individuals who are more cognitively impaired. First, high impairment clients in CBT had a lower level of overall working alliance and

a less positive interpersonal bond with their therapists than did clients in the low impairment category.

Second, more highly impaired outpatients treated in CBT, but not those in TSF or MET, were classified as low therapy attendees and were less likely to complete therapy. Thus, it appears that outpatients who were more impaired were more likely to be premature dropouts who thereby received a smaller dose of the active ingredients of the CBT therapy.

Third, more impaired outpatients tended to have higher levels of AA involvement than less impaired clients. Finally, interactions were found suggesting that higher levels of AA involvement during the period when the therapies were being delivered were associated with fewer weeks in which heavy drinking episodes occurred among highly impaired clients relative to less impaired ones. Similarly, higher frequency of AA meeting attendance during months 1 to 3 was associated with more weeks of abstinence among more highly impaired clients than among less impaired ones.

Aftercare Arm

Given the findings suggesting interaction effects between cognitive impairment and type of therapy during the active phase of treatment, although these interactions dissipated over the 3 months and were not observed over the 1-year followup period, the testing of the causal chain had two main goals: (1) to test whether any of the causal chain elements were supportive of these initial matching effects and (2) to identify where and when the causal chain broke down.

The first causal chain (MET versus TSF or CBT) failed to be supported in that the level of observed structure was comparable across therapies, although it was hypothesized that MET would have less structure than the other two therapies. The second causal chain (TSF versus CBT) was not supported either. Session attendance was unrelated to the cognitive impairment by therapy interaction. This was the case whether attendance was measured by the number or percentage of sessions attended.

Nor was session attendance affected by the level of impairment. While use of therapy completion as a criterion supported the expectation that more highly impaired aftercare clients would be less likely to complete therapy than those low in impairment, neither this measure nor the classification as low versus high therapy attendance supported the hypothesized interaction between impairment level and type of therapy. Thus, there was no support overall for the causal chain indicating that therapy dose interacted with level of impairment. The absence of this causal chain might underlie the lack of the hypothesized matching effect.

Again, as in the outpatient arm, working alliance, AA attendance, and AA involvement were explored as process factors that might vary as a function of the interaction between type of therapy and cognitive impairment. However, unlike the outpatient results, the results of analyses with these variables were less informative. Neither the therapist nor the client Working Alliance Inventory total or subscale scores were found to be affected by level of impairment, type of therapy, or their interaction.

Similarly, neither AA meeting attendance nor AA involvement was influenced by level of impairment, type of therapy, or their interaction. When AA involvement was included as a factor in predicting heavy drinking weeks and weeks of abstinence during the active treatment phase, it was found that these drinking-related measures were not affected by the combination of AA involvement and level of impairment.

Implications

A number of issues are raised by the present findings and their failure to support cognitive impairment as either a prognostic or matching variable. First, if one looks carefully at the recommendations in the literature for more structured approaches (such as CBT) with impaired alcoholics (e.g., Donovan et al. 1987; McCrady 1987), there is a strong emphasis on the use of repeated exposure to the same material, behavioral rehearsal, and demonstrated mastery of the targeted skills. Such an approach, if implemented in the manner recommended, may well be the most appropriate strategy for cognitively impaired clients.

However, in examining the implementation of the CBT protocol in Project MATCH, it may have been too fast paced and too cognitively focused, with much less emphasis on the more concrete and repetitive behavioral rehearsal strategies thought to be appropriate for this subgroup. It may be that rather than skills *training*, the CBT protocol provided skills *exposure*. That is, given that only one session focused on a given topic area, clients may have been exposed to the general concepts of CBT but had insufficient time to consolidate these concepts and rehearse them to the point of demonstrated mastery. As such, the more impaired clients may not have gained sufficient behavioral training to accommodate their deficits. However, no tests of behavioral skills acquisition or generalization were included in the trial.

Second, while cognitive impairment was found to be related to a number of process measures, it may be that its role in predicting drinking-related treatment outcome has been overrated. While the level of impairment has been found to predict treatment outcome among alcoholics, the results have been equivocal and, where relationships have been found, the amount of variance accounted for by cognitive function has often been relatively small (Donovan et al. 1984; Eckardt et al. 1988; Wilkinson and Sanchez-Craig 1981). Cognitive function has been found to be most consistently related to outcome in those studies in which extreme groups (e.g., unimpaired versus markedly impaired) have been compared (Donovan et al. 1984; Knight and Longmore 1994). The sample recruited into Project MATCH, while demonstrating considerable range in cognitive function, did not include clients with the marked level of impairment that is often associated with poor drinking-related treatment outcomes.

A number of researchers (e.g., Donovan et al. 1984; Eckardt et al. 1988; Goldman 1995) have suggested that while important in the prediction of outcome, cognitive impairment is only one of a number of variables that contribute to the determination of treatment outcome. Knight and Longmore (1994) have noted that while most research in this area presumes a causal role for cognitive impairment in poor

treatment outcomes, such deficits may simply be correlates of other factors, such as age, chronicity, severity of dependence, or low social stability, that actually determine the response to treatment.

Also, the posttreatment environment may or may not pose a challenge for the individual's cognitive abilities (Goldman 1995). The effects of cognitive impairment are most likely to be observed in novel situations or those that pose a challenge to individuals and their cognitive problem-solving abilities. Also, performance on cognitive measures of problem-solving are not necessarily reflective of the individual's interpersonal problem-solving abilities (Nixon et al. 1992), which may be more important in dealing with posttreatment relapse precipitants.

Glass (1991) has suggested that alcohol-related impairment can affect mood, judgment, and self-esteem, which influence the motivation one needs in order to achieve and maintain abstinence. She argued that neuropsychological function should be viewed as part of the total and more complex picture in which variables such as motivation to change, social stability, personality, and comorbid psychological problems may also influence treatment process and outcome. This view is consistent with the results of Donovan and associates (1986), who found that clinically meaningful client subtypes, defined by level of cognitive impairment, psychopathology, alcohol dependence, and demographic characteristics, provided a better predictor of outcome than did cognitive impairment alone.

A third issue deals with the assessment of cognitive function. In order to minimize client burden from an already lengthy assessment process in Project MATCH (see Connors et al. 1994), only a few measures were used to assess cognitive function. It may be that other tests assessing different areas of function or assessing in greater depth would have been more sensitive to deficits and possibly would have provided more positive results with respect to outcome or treatment matching. Similarly, a number of alternative strategies for combining the measures of cognitive impairment, rather than a factor-analytically derived continuous index of impairment, might be more effective as predictors of

outcome. As an example, Kadden and colleagues (1989) assigned scores of 0 or 1 (unimpaired/impaired) for each of three cognitive tests administered to aftercare clients; individuals were classified as impaired if they scored in the impaired range on two out of the three tests.

The choice of measures raises two related issues. The first is that currently available measures of cognitive function may be inadequate in their ability to assess or predict those skills and abilities involved in the treatment process and those needed to deal with the posttreatment environment. Knight and Longmore (1994) indicated that it is difficult to determine which tests best assess the cognitive skills needed to consolidate and apply treatment-related skills.

The use of "ecologically valid" measures has been raised previously (e.g., Sussman et al. 1986). However, most available measures of cognitive function are lacking in this ecological validity. The use of measures of treatment-relevant information (e.g., Becker and Jaffe 1984; Godding et al. 1992; Roehrich and Goldman 1993) and the acquisition, retention, and application of specific skills such as cognitive-behavioral problem-solving or drink refusal (e.g., Nixon et al. 1992; Sanchez-Craig et al. 1987; Smith and McCrady 1991) seem like important directions to pursue (Knight and Longmore 1994).

A related issue involves determining the best measures of treatment outcome to investigate in relation to cognitive function. Donovan and associates (1984) found that measures of neuropsychological function were better in predicting posttreatment employment status than drinking-related outcomes. Outcomes such as employment may be much more directly related to the skills and abilities assessed by most measures of cognitive function than is drinking behavior. Although there is the hope of finding a causal link between cognitive impairment and relapse, no such link has yet been demonstrated convincingly (Knight and Longmore 1994).

Conclusions

The present results fail to support level of cognitive impairment, as assessed, as either a prognostic indicator of treatment outcome or as a variable useful in matching clients to one of the three treatments presented in Project MATCH. A number of factors may have contributed to these findings, which failed to support the a priori hypotheses. It may be best to view cognitive function as one variable class that contributes to, but does not independently predict treatment outcome. As Knight and Longmore (1994) suggested, the significance of cognitive impairment must be placed in a wider context that integrates findings concerning cognitive function with other psychosocial and treatment variables. Specifying these interactions with greater precision may provide useful clinical information to alcohol counselors and therapists.

Acknowledgments

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Matching Clients to Alcoholism Treatment Based on Psychopathology

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ABSTRACT

The psychopathology-related findings from Project MATCH included examination of an a priori matching hypothesis based on the Addiction Severity Index Psychiatric Composite score and a DSM–III–R diagnostic assessment. Hypothetical causal chain processes were also examined to gain a better understanding of why matching effects were or were not observed. Significant psychopathology matching interactions were found, but they were not consistent across time or outcome measures. The causal chain analyses did not reveal a mechanism of action for the matching interactions, further reducing confidence in the validity of the matching effects. With these limitations in mind, the following results provide a tentative basis for matching clients to treatment. Individuals without psychopathology had better outcomes after treatment when assigned to Twelve Step Facilitation (TSF) rather than Cognitive-Behavioral Coping Skills Therapy (CBT). Individuals with psychopathology did equally well after treatment when assigned to TSF or CBT, but had worse outcomes during treatment when assigned to Motivational Enhancement Therapy. None of the Project MATCH therapies provided treatment with an extensive focus on reducing psychiatric symptoms, so results cannot be generalized to such forms of therapy.

An extensive epidemiological study indicated that more than half of those seeking treatment for an alcohol use disorder in mental health or substance abuse settings have a comorbid nonsubstance use psychiatric disorder (Regier et al. 1990). These comorbid disorders have been shown to adversely affect substance abuse treatment outcome. Some prognostic studies have employed a categorical, diagnostic approach to measuring psychopathology. For example, Rounsaville and associates (1987), using the National Institute of Mental Health (NIMH) Diagnostic Interview Schedule, found that comorbid DSM–III diagnoses generally predicted poorer outcomes among alcoholics.

Other studies have measured psychopathology using a dimensional, continuous approach such as the Addiction Severity Index Psychiatric (ASI Psych) subscale (McLellan et al. 1992). This subscale has been found to be a significant

predictor of substance abuse treatment outcome using the interviewer severity rating (McLellan et al. 1983, 1984) and the composite score (Kadden et al. 1989). Such findings are important because they suggest that substance abusers with psychopathology may require specialized treatment services.

Substance abuse outcome studies have also found significant interactions between ASI Psych scores and type of treatment. Woody and colleagues (1984) compared methadone-maintained opiate addicts assigned to paraprofessional counseling or to professional psychotherapy (cognitive-behavioral or supportive-

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expressive psychotherapy). Clients with low ASI Psych ratings did equally well with either treatment approach. However, clients with mid to high psychiatric severity had better outcomes with professional psychotherapy.

Kadden and Cooney (Kadden et al. 1989; Cooney et al. 1991) compared two approaches to group therapy for alcoholics. Alcoholics without psychopathology had better outcomes with interactional group therapy, while those with psychopathology had better outcomes with cognitive-behavioral group therapy. In addition to these 2-way interaction results, studies by McLellan and his colleagues found higher order interactions involving ASI Psych interviewer ratings and type of substance abuse treatment (McLellan et al. 1983). Clients with low ASI Psych severity did well in all programs studied, and those with high severity did poorly in all programs. The responses of those with intermediate severity scores to different types of programs depended on the degree of associated problems in social functioning.

This chapter describes in detail the psychopathology-related findings from Project MATCH (Project MATCH Research Group 1993). This included examination of an a priori matching hypothesis based on the ASI Psych composite score and a diagnostic assessment. Hypothetical causal chain processes were examined to gain a better understanding of why matching effects were or were not observed.

The Psychopathology Matching Hypothesis

Drinking outcome will be a function of an interaction between psychopathology and treatment type, such that the slope of the regression line of psychopathology on drinking outcome will be more positive for the Motivational Enhancement Therapy (MET; Miller et al. 1992) and Twelve Step Facilitation (TSF; Nowinski et al. 1992) conditions than for the Cognitive-Behavioral Coping Skills Therapy (CBT; Kadden et al. 1992) condition. This interaction is illustrated in figure 1. This hypothesis was tested as two contrasts, one comparing CBT versus MET (excluding TSF) and the other comparing CBT versus TSF (excluding MET).
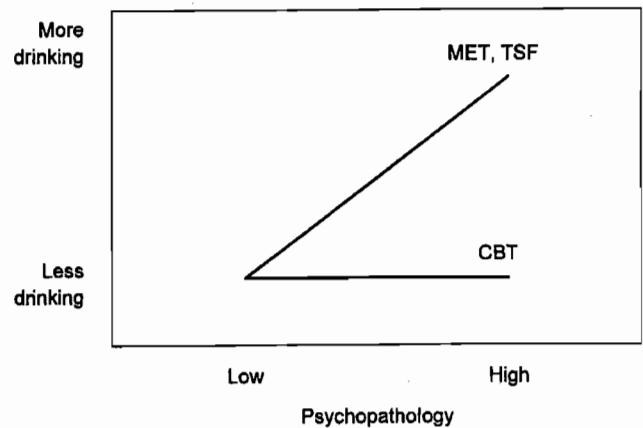

Figure 1. Hypothesized relationships between severity of dependence and drinking outcome for clients treated with TSF, CBT, and MET.

These a priori contrasts specified anticipated directional interaction effects, but they did not specify where on the psychopathology dimension to expect significant differences between treatments. Our theory, however, led us to expect that individuals with high psychopathology would have better outcomes with CBT than with MET or TSF. There was no theoretical reason to expect differences in outcome among CBT, MET, and TSF for individuals with low psychopathology.

Rationale for the Matching Hypothesis

Empirical Evidence

Prior to Project MATCH, there had been no direct test of the specific hypothesis proposed here, although two substance abuse outcome studies found significant 2-way interactions between ASI Psych scores and type of treatment (Cooney et al. 1991; Kadden et al. 1989; Woody et al. 1984). Both studies found that CBT was more effective than alternative treatments for high psychopathology clients, while CBT and alternative treatments were not significantly different for low psychopathology clients.

Severity of psychopathology has also been found in several studies to be a main effect predictor of substance abuse treatment outcome (McLellan 1986). However, data from a study by Rounsaville and associates (1987) suggested

that the relationship between psychopathology and alcohol treatment outcome might be moderated by sex. For men, having an additional diagnosis of major depression, antisocial personality, or drug abuse was associated with poorer outcome. For women, having depression was associated with a better outcome on some measures, while antisocial personality and drug abuse were associated with poorer outcome.

The finding of a differential treatment response for depressed men and women was not consistent. Rounsaville and colleagues reported significant gender by diagnosis interactions for only 4 correlated outcomes, all having to do with impairment due to drinking, out of 13 outcomes tested. Future reports based on Project MATCH data may shed some light on the question of gender by psychopathology interaction effects on treatment outcome.

Theoretical Justification

Negative moods have been shown to elicit alcohol craving (Cooney et al. 1997), and most alcohol relapse situations involve negative moods (Marlatt 1996). It is reasonable to assume that treatments that reduce the frequency or intensity of negative moods will result in reduced drinking among individuals prone to experiencing these moods, that is, individuals with anxiety or affective disorders. TSF and MET were developed uniquely for the treatment of alcoholism, whereas CBT is a more general approach that had been developed for the treatment of anxiety and affective disorders and was subsequently adapted for use with alcoholics.

General strategies used to address psychopathology were incorporated into the Project MATCH version of CBT. The elective sessions include Starting Conversations, Nonverbal Communication, and Assertiveness to help clients cope with *social anxiety*; Receiving Criticism, Awareness of Anger, and Anger Management to help clients cope with *anger*; and Awareness of Negative Thinking, Managing Negative Thinking, Increasing Pleasant Activities, and Managing Negative Moods and Depression to help clients cope with *depression*. On the other hand, TSF and MET offer no direct interventions for clients with psychopathology.

MET's brevity precludes anything but a focus on drinking and is client-structured, which may be too demanding for those with significant psychopathology. The TSF therapist makes the assumption that most psychopathology is a result of the disease process. Mild psychopathology is thought to improve with abstinence, and severe psychopathology is thought to require referral to a mental health professional for adequate treatment.

More intensive treatment is often recommended for alcoholics with high psychopathology, so we predicted a difference in outcome between CBT and MET in high psychopathology clients. Based on this prediction, we tested one a priori contrast dropping the TSF client group and examining the interaction between psychopathology and CBT/MET treatments. The interaction between psychopathology and CBT/TSF treatment was examined as the second a priori contrast. This second contrast tested treatments equated on intensity of treatment, allowing an interpretation of matching effects related to the content of treatment.

Operationalization of the Matching Variable

Psychopathology can be operationalized using either a global, continuous measure or a categorical variable based on a diagnostic assessment. Project MATCH utilized both measurement approaches, and a priori matching hypotheses were developed using the ASI Psych and the Computerized Diagnostic Interview Schedule (C–DIS). The ASI Psych measure consists of 11 items covering the occurrence of psychological problems (e.g., depression, anxiety, and anger) in the past 30 days. The C-DIS is a computer-administered interview based on the Diagnostic Interview Schedule (Blouin et al. 1988; C–DIS Management Group 1991) which can yield psychiatric disorder identification based on the DSM–III–R.

Only the anxiety disorders, affective disorders, and antisocial personality disorders sections on the C–DIS were administered. Participants were considered to meet criteria for a current comorbid Axis I disorder if they met DSM–

III–R criteria for any lifetime anxiety or affective disorder and reported one or more relevant symptoms in the past 6 months. This definition of current diagnosis does not exactly correspond with the DSM–III–R definition of current diagnosis because the C–DIS does not provide sufficient probes to determine whether an individual has enough current symptoms to satisfy criteria for current diagnosis. Thus, the C–DIS may at times classify individuals as having a current disorder when they are actually in partial remission.

The ASI Psych score and the C–DIS diagnostic variable were only moderately correlated (aftercare sample point-biserial $r=0.43$, outpatient sample point-biserial $r=0.27$), so they were examined in separate matching analyses. The ASI Psych measure was selected as a primary matching variable, while the C–DIS was selected as a secondary matching variable. The Steering committee selected ASI Psych as the primary matching variable because it had yielded significant attribute by treatment interactions in three previous substance abuse psychotherapy outcome studies (Kadden et al. 1989; McLellan et al. 1983; Woody et al. 1984).

To our knowledge, no substance abuse outcome study has reported a significant attribute by treatment interaction using an Axis I psychiatric diagnosis-based client variable. There was no a priori basis for determining the point on the psychopathology symptom continuum where CBT would be more effective than TSF or MET. It was hypothesized that the greater overall psychopathology present, the more incrementally effective CBT will be, relative to either TSF or MET.

Sample Characteristics

The Project MATCH sample had a mean pretreatment ASI Psych composite score in the outpatient arm of 0.19 (SD=0.19) with 38 percent of participants having a zero score. The aftercare arm had a mean score of 0.23 (SD=0.21) with 35 percent having a zero score. These scores are slightly lower than normative data from alcohol abusers (mean=0.24) reported by McLellan and associates (1992). Table 1 shows the percentage of participants meeting our operational definition of current comorbid affective and/or anxiety

Table 1. Percentage of participants meeting criteria for current comorbid DSM–III–R diagnoses

	Aftercare arm (N = 748)	Outpatient arm (N = 870)
No current comorbid diagnosis	56.0	67.9
Current comorbid anxiety diagnosis	35.7	25.7
Current comorbid affective diagnosis	20.5	13.8
Current anxiety or affective diagnosis	44.0	32.1

NOTE: Current DSM–III–R diagnoses are defined in the text and may include some cases in partial remission.

disorders based on the pretreatment C–DIS assessment. Among participants with anxiety disorders, there was an approximately even distribution of participants meeting criteria for social phobia, simple phobia, agoraphobia, generalized anxiety disorder, and panic disorder. Among those with affective disorders, most participants met criteria for major depressive disorder, with few meeting criteria for bipolar disorder or manic episode.

Results

Prognostic Effects

The prognostic effects of pretreatment ASI Psych and pretreatment current comorbid Axis I diagnosis on posttreatment alcohol consumption were examined in outpatient and aftercare samples aggregated across all three treatments. Prognostic analyses were conducted using a "latent growth" approach that was utilized in the previously reported analysis of matching effects (Project MATCH Research Group 1997; Longabaugh and Wirtz, this volume, pp. 4–17). The prognostic model included a backward elimination adjustment for the other significant a priori matching attributes and their matching interaction effects.

There were no prognostic main effects of ASI Psych or comorbid Axis I diagnosis on percentage of days abstinent (PDA) or drinks per drinking day (DDD) across the 1-year posttreatment period in either the aftercare or outpatient arm of the study. ASI Psych did interact with time to predict PDA and DDD outcomes (p's<.05) in the aftercare arm. Toward the end of the followup period, clients higher in psychiatric severity had fewer abstinent days compared to those lower in psychiatric severity. However, these time-limited prognostic effects accounted for less than 2 percent in outcome variance.

Interaction Effects

Psychopathology by treatment interaction effects were also modeled as a latent growth process. Tables 2 and 3 show F and nondirectional p values for all possible psychopathology interaction effects using the ASI Psych and C–DIS matching variables. The p values in these tables should be halved to determine the directional p values.

Each matching hypothesis in Project MATCH was tested separately at a family-wise type-1 error rate of 5 percent. A Bonferroni correction was applied to take into account the two outcome variables and the two contrasts proposed for the psychopathology hypothesis, resulting in a corrected alpha level of 0.0125. This strategy does not take into account the number of different hypotheses that were tested, since the matching hypotheses were conceived of as conceptually independent of one another.

The only interaction effect that reached a Bonferroni-corrected level of significance was

Table 2. Interaction effects based on Addiction Severity Index Psychiatric Composite score

Treatment		Within treatment						Posttreatment					
		MV × Tx		MV × Tx × T		MV × Tx × T²		MV × Tx		MV × Tx × T		MV × Tx × T²	
		PDA	DDD	PDA	DDD	PDA	DDD	PDA	DDD	PDA	DDD	PDA	DDD
Outpatient arm													
CBT vs. MET	F	3.20	1.04	1.10	1.06	0.03	1.54	0.96	0.06	0.18	0.52	0.00	0.72
	p	.07	.31	.29	.30	.86	.21	.33	.81	.67	.47	.95	.39
CBT vs. TSF	F	2.43	0.04	2.86	3.92	1.46	0.27	4.88	3.03	2.28	0.42	4.75	2.96
	p	.12	.84	.09	**.05**	.23	.60	**.03**	.08	.13	.51	**.03**	.08
MET vs. TSF	F	0.08	0.66	0.34	0.76	1.77	2.96	1.28	1.96	3.39	1.72	4.49	0.62
	p	.78	.42	.56	.38	.18	.09	.26	.16	.07	.19	**.03**	.43
Overall	F	1.94	0.56	1.47	1.97	1.09	1.55	2.45	1.70	1.92	0.86	3.09	1.49
	p	.14	.57	.23	.14	.34	.21	.09	.18	.15	.42	**.05**	.23
Aftercare arm													
CBT vs. MET	F	0.05	0.52	0.50	1.12	1.66	0.01	0.62	0.09	2.25	0.74	0.17	0.59
	p	.82	.47	.48	.29	.20	.92	.43	.76	.13	.39	.68	.44
CBT vs. TSF	F	0.01	0.03	1.74	1.39	1.02	0.26	0.21	0.46	0.25	2.37	0.14	1.77
	p	.90	.86	.19	.24	.31	.61	.64	.50	.62	.12	.70	.18
MET vs. TSF	F	0.12	0.31	0.13	0.01	0.08	0.17	1.59	0.98	1.04	0.44	0.62	0.30
	p	.72	.58	.55	.92	.77	.68	.21	.32	.31	.51	.43	.58
Overall	F	0.06	0.29	0.87	0.84	0.92	0.15	0.81	0.51	1.18	1.19	0.32	0.90
	p	.94	.75	.42	.43	.40	.86	.45	.60	.31	.30	.73	.41

NOTE: MV = matching variable, Addiction Severity Index Psychiatric Composite score, Tx = treatment, T = time, T² = quadratic time. All p values are nondirectional and should be halved to determine p values for a directional hypothesis test.

Table 3. Interaction effects based on current DSM–III–R diagnosis from the Computerized Diagnostic Interview Schedule

Treatment		Within treatment						Posttreatment					
		MV × Tx		MV × Tx × T		MV × Tx × T²		MV × Tx		MV × Tx × T		MV × Tx × T²	
		PDA	DDD	PDA	DDD	PDA	DDD	PDA	DDD	PDA	DDD	PDA	DDD
Outpatient arm													
CBT vs. MET	F	3.88	3.50	2.59	1.49	0.48	2.34	0.23	1.25	0.00	0.16	0.66	0.07
	p	.05	.06	.11	.19	.49	.13	.63	.26	.97	.69	.42	.80
CBT vs. TSF	F	0.28	2.02	0.42	0.03	0.81	1.37	1.49	2.72	0.00	0.12	3.61	2.37
	p	.60	.16	.52	.86	.37	.24	.22	.10	.99	.73	.06	.12
MET vs. TSF	F	2.23	0.26	5.43	2.40	0.04	0.49	0.50	0.23	0.00	0.56	2.89	1.56
	p	.13	.61	.02	.12	.84	.69	.48	.63	.98	.45	.01	.21
Overall	F	4.45	3.57	8.00	1.93	0.19	1.61	0.57	2.00	0.00	0.07	4.57	1.88
	p	.12	.15	.06	.25	.65	.28	.47	.24	1.00	.75	.03	.25
Aftercare arm													
CBT vs. MET	F	3.76	2.02	0.02	1.12	0.52	0.05	0.86	0.40	1.12	0.21	0.27	0.62
	p	.05	.15	.90	.29	.47	.83	.35	.53	.29	.59	.60	.43
CBT vs. TSF	F	1.02	0.88	0.00	0.01	0.37	1.18	0.00	0.00	0.35	0.61	0.01	0.01
	p	.31	.35	.97	.91	.54	.27	.99	.95	.56	.44	.90	.92
MET vs. TSF	F	0.86	0.23	0.03	1.37	1.77	0.31	0.94	0.02	0.94	0.02	0.48	0.46
	p	.35	.63	.88	.24	.18	.19	.36	.58	.64	.19	.52	.49
Overall	F	3.53	1.10	0.00	0.70	0.77	0.96	0.31	0.06	0.32	0.76	0.05	0.14
	p	.15	.35	.99	.43	.41	.38	.57	.79	.57	.42	.79	.69

NOTE: MV = matching variable, Computerized Diagnostic Interview Schedule Axis I, Tx = treatment, T = time, T^2 = quadratic time. All p values are nondirectional and should be halved to determine p values for a directional hypothesis test.

the psychiatric severity by treatment (CBT versus TSF) effect in the outpatient arm in the posttreatment period with PDA outcome (directional p=.01). The psychiatric severity by treatment by quadratic time effect was also significant for this contrast (p=.03). Figure 2 illustrates this interaction effect in each of the 12 posttreatment months.

Post hoc examination of this contrast by month indicated that there were significant (p< .05) psychiatric severity by treatment interaction effects beginning 1 month after treatment termination and continuing through the eighth month after the end of treatment. Interaction plots revealed that individuals without psychopathology reported approximately 87 percent of days abstinent in TSF treatment compared

with 73 percent of days abstinent reported by those in CBT. The CBT and TSF regression lines crossed at a value of approximately 0.4 on the ASI Psych composite score, more than one standard deviation above the outpatient sample mean. With few clients having ASI Psych scores above this intersection point, it was not possible to determine whether there was a significant advantage for high psychopathology clients treated with CBT rather than TSF.

Several interaction effects in the outpatient arm approached the Bonferroni-corrected level of significance. The psychiatric severity by treatment (CBT versus TSF) contrast approached significance for the DDD outcome in the posttreatment period (directional p=.04) and for the PDA outcome in the within-
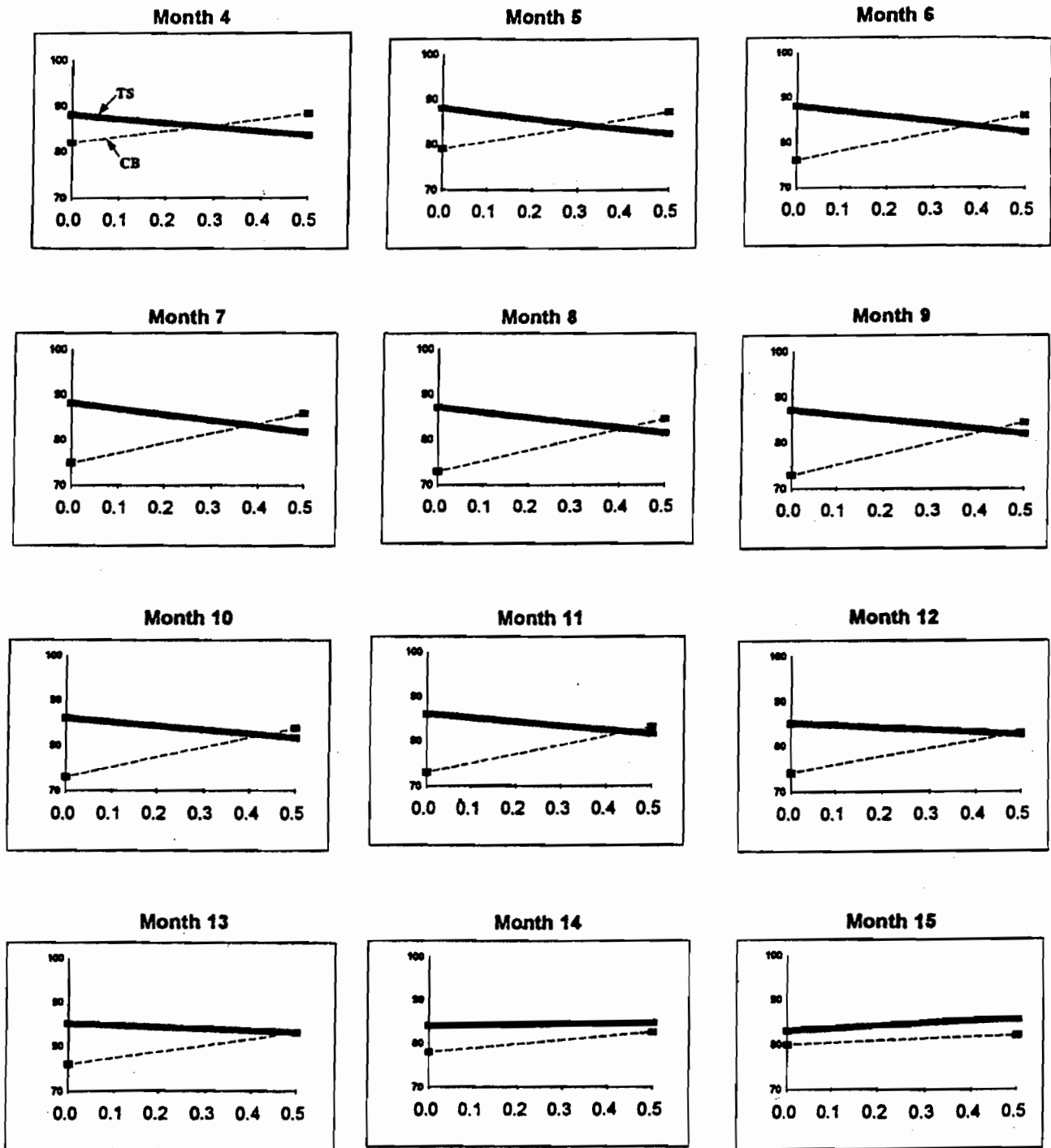
Psychiatric Severity

Figure 2. Posttreatment plot of percentage of days abstinent in the outpatient arm showing the interaction between CBT and TSF treatments and baseline ASI Psych severity. The vertical axes are predicted outcome scores and the horizontal axes represent baseline ASI Psych composite scores, with higher scores indicating higher psychopathology. (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.)

treatment time period (directional p=.06). Also in the outpatient arm, the C–DIS comorbid diagnosis by treatment (CBT versus TSF) interaction approached the Bonferroni-corrected level of significance for the DDD outcome in the posttreatment period (directional p<.05).

Among the CBT versus MET contrasts and the TSF versus MET contrasts, none met Bonferroni-corrected significance levels, and only one (CBT versus MET, within-treatment PDA outcome) approached significance (directional p=.04). Note that no a priori TSF versus MET matching hypotheses were specified in advance. Outcomes for clients without psychopathology assigned to MET were intermediate between the outcomes for clients assigned to CBT and TSF.

Time to Event Outcomes

The primary outcome analyses in Project MATCH were conducted using the latent growth approach described above, with PDA and DDD outcome variables. It was of secondary interest, however, to determine the impact of treatment matching on time to relapse. Survival analysis techniques were used to investigate the time to first incidence of heavy drinking, where heavy drinking was defined differentially according to gender. Heavy drinking was indexed for males as six or more standard drinks in a single day and for females as four or more standard drinks in a day.

Time to event data were analyzed separately for each study arm (aftercare or outpatient), time window (within treatment or posttreatment), and psychopathology indicator (ASI or C–DIS). A nonproportional Cox regression model was used to test for differences in survival rates. The model was nonproportional because it included time itself as a covariate and thus allowed the hazard ratio to vary as a function of time (Cox and Oakes 1984). The model included main effects for site, treatment group, and psychopathology indicator. It also included treatment group by psychopathology indicator, site by treatment group, site by psychopathology indicator, site by treatment group by psychopathology indicator, time by treatment group, time by psychopathology indicator, and time by treatment group by psychopathology

indicator interactions. All categorical variables were coded using an effect encoding technique (Kirk 1982), and in the case of the ASI (i.e., the single quantitative measure), original scores were re-expressed as deviations from the grand mean to reduce multicolinearity. Additionally, the time variable was transformed to increase simultaneously the numerical accuracy and interpretability of the solution. The specific transformation used was T=$ln(t)$-$ln(m)$, where t was the original time point and m was the midpoint of the time window under consideration (i.e., m= 45 days or m=180 days for within treatment and posttreatment analyses, respectively).

Within the context of survival analysis, the hypothesis corresponding to Contrast 1 predicts longer durations until first day of heavy drinking (i.e., longer survival) for clients with higher psychopathology levels when treated with CBT as opposed to MET. The hypothesis associated with Contrast 2 predicts that clients with higher levels of psychopathology will experience longer survival when given CBT rather than TSF. These two contrasts were tested using a Bonferroni-corrected alpha level (i.e., α=0.05/2=0.025).

Table 4 portrays the sample size and the percentage of individuals who did not engage in any heavy drinking for each of the analyses described above (i.e., the percentage of clients who survived). Differing numbers of clients were administered the ASI and C–DIS instruments, which accounts for the varying sample sizes within each study arm. The percentage of clients surviving within a given arm by time window combination was almost identical across analyses of the ASI and C–DIS samples. Clients in the outpatient arm were significantly less likely to survive than clients in the aftercare arm. This finding held in both within-treatment ($\chi^2(1)$=16.5, p≤.001) and posttreatment ($\chi^2(1)$= 7.05, p≤.008) time windows for the ASI sample.

Analogous differences were found in the C–DIS sample. Clients were also less likely to survive during the longer posttreatment window relative to the shorter within-treatment window. This difference was tested using McNemar's corrected chi square (Edwards 1948) and was significant in both the outpatient ($\chi^2(1)$=112.47, p≤.001) and aftercare ($\chi^2(1)$= 205.52, p≤.001) arms, corresponding to the ASI

Table 4. Sample sizes and percentage of individuals who did not engage in heavy drinking within the specified time period

	Within treatment		Post-treatment	
	ASI	C–DIS	ASI	C–DIS
Outpatient arm				
Sample size	947	870	947	870
Percent surviving	35%	36%	17%	16%
Aftercare arm				
Sample size	767	748	767	748
Percent surviving	58%	59%	27%	28%

NOTE: The percentage of individuals who survived does not include cases censored due to missing data on drinking outcomes.

sample. Again, the same pattern of significant results was found for the C–DIS sample.

Table 5 describes the interaction effects from the Cox regression models that were analyzed. Reliable matching effects were limited to those examined in the C–DIS sample. Specifically, a matching effect for the CBT versus MET contrast was statistically significant in the analysis of outpatients within treatment. In this effect, CBT led to much better survival than did MET when clients exhibited a psychiatric diagnosis; however, the two treatments produced statistically similar outcomes when no diagnosis was present. An analogous finding was observed for the CBT versus TSF contrast, although this contrast only reached trend levels. In this instance, CBT led to better survival than TSF when considering clients with a C–DIS diagnosis. Figure 3 illustrates these two findings with survival curves developed from the Kaplan-Meier (1958) estimates.

Table 5. Survival analysis interaction effects based on models containing current DSM–III–R diagnosis from the Computerized Diagnostic Interview Schedule and the Addiction Severity Index

Treatment		Within treatment				Posttreatment			
		MV × Tx		MV × Tx × T		MV × Tx		MV × Tx × T	
		ASI	C-DIS	ASI	C-DIS	ASI	C-DIS	ASI	C-DIS
Outpatient arm									
CBT vs. MET	χ^2	1.19	6.27	0.09	3.63	1.02	2.13	0.80	1.59
	p	.28	.01	.77	.06	.31	.14	.37	.21
CBT vs. TSF	χ^2	0.11	4.03	2.10	2.27	0.90	0.03	0.01	0.01
	p	.75	.04	.15	.13	.34	.86	.92	.93
Overall	χ^2	1.24	6.80	2.42	3.90	3.60	3.12	0.95	2.33
	p	.54	.03	.30	.14	.17	.21	.62	.31
Aftercare arm									
CBT vs. MET	χ^2	0.70	0.97	0.68	2.34	0.77	0.19	0.23	1.98
	p	.40	.33	.41	.13	.38	.66	.63	.16
CBT vs. TSF	χ^2	0.27	0.00	1.74	4.24	2.43	0.00	2.22	0.27
	p	.60	.99	.19	.04	.12	.98	.14	.60
Overall	χ^2	0.70	1.25	1.75	4.35	5.60	0.23	4.19	2.03
	p	.70	.54	.42	.11	.06	.89	.12	.36

NOTE: MV = matching variable, C–DIS and ASI; Tx = treatment, T=time. All p values are nondirectional and should be halved to determine p values for a directional hypothesis test. All chi-square values are Wald chi squares. Contrasts were 1 degree of freedom tests whereas tests involving the overall attribute by treatment interaction effect possessed 2 degrees of freedom.
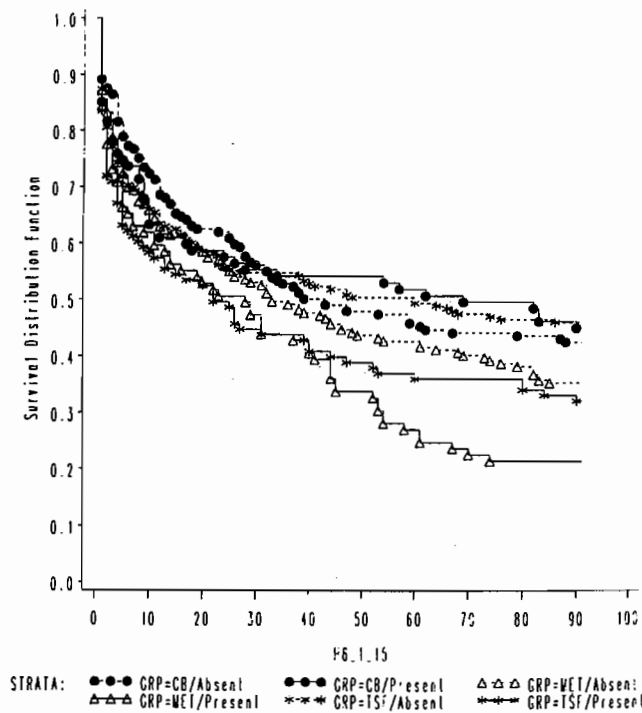
Figure 3. Survival curves for the CBT versus MET matching contrast. Relapse defined as time until first day of heavy drinking.

Matched Versus Mismatched Clients

Another way to determine the magnitude of the observed psychopathology matching effects is to compare outcomes for outpatient clients after dividing all of them into matched or mismatched groups. Descriptive analyses were conducted based on the ASI latent growth results and the C–DIS survival analyses. In the first analysis, high psychopathology clients were considered matched when they were assigned by randomization to CBT and mismatched when assigned by randomization to TSF, while low psychopathology clients were considered matched when assigned to TSF and mismatched when assigned to CBT.

All clients in the outpatient sample were divided into low and high psychopathology groups, with the cut point based on the ASI Psych score at the intersection point in figure 2. Clients with scores less than 0.4 were classified low psychopathology and those with scores greater than or equal to 0.4 were classified high psychopathology. Outcome was examined using a composite outcome variable based on drinking data from the Form 90 (Miller 1996) and alcohol-related negative consequences from the DrInC questionnaire (Miller et al. 1995; see Zweben and Cisler 1996 for a description of the composite outcome variable). Outcome was classified as "success" when a client reported no heavy drinking or alcohol-related negative consequences in the preceding 3 months. Outcome was classified as "failure" when a client reported any heavy drinking and/or consequences in the prior 3 months. Figure 4 suggests that the ASI psychopathology matching effect may actually be a pseudo matching effect because the outcome of the matched group is no better than the outcome of the group of clients all assigned to TSF.

The second descriptive analysis was based on the significant matching effects found in the survival analysis of the C–DIS matching variable. C–DIS positive clients were considered matched when they were assigned by randomization to CBT and mismatched when assigned by randomization to MET, while C–DIS negative clients were considered matched when assigned to MET and mismatched when assigned to CBT. Figure 5 reveals a large matching effect on composite outcome during the treatment phase. Matched clients had more than a 20-percent higher success rate than unmatched or randomly assigned clients.
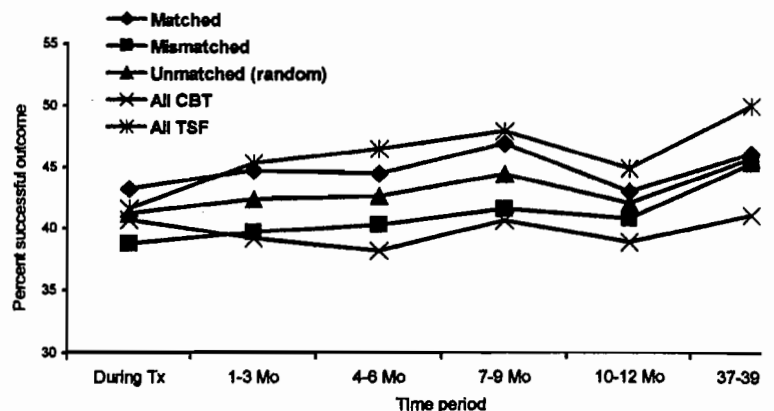

Figure 4. Matching to CBT versus TSF based on intake ASI Psychiatric composite scores in the outpatient arm across treatment and followup. Clients with ASI scores <0.4 were matched to TSF; those with scores ≥0.4 were matched to CBT.
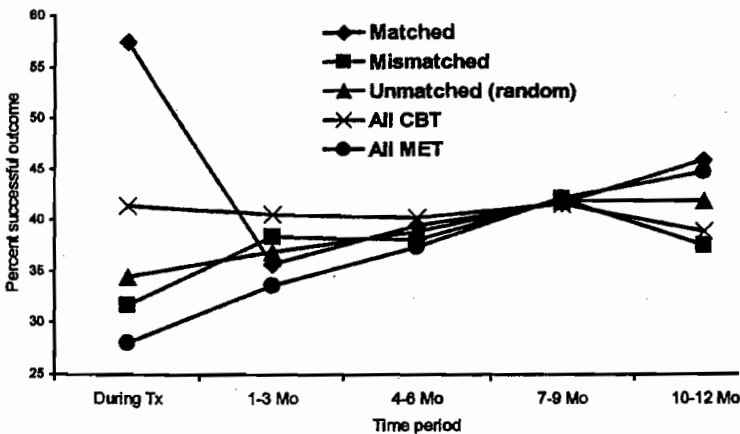
Figure 5. Matching to CBT versus MET based on intake C–DIS Axis I diagnosis in the outpatient arm across treatment and followup. C–DIS positive clients were matched to CBT; C–DIS negative clients were matched to MET.

Testing the Causal Chain

The a priori psychopathology matching hypothesis predicted that greater pretreatment psychopathology scores would be associated with greater differential effectiveness of CBT relative to TSF. A causal chain was hypothesized that CBT treatment contained specific elements that addressed the needs of individuals with higher psychopathology, resulting in a reduction in symptoms in these individuals, which in turn led to reduced drinking after treatment. Results are presented that examine the following links in the causal chain:

- Is there a greater emphasis on addressing psychological symptoms in the CBT treatment sessions than in the TSF sessions?
- Is there a lower level of posttreatment psychological symptoms in the CBT condition than in the TSF condition, controlling for pretreatment psychological symptoms?
- Is the level of posttreatment psychological symptoms predictive of drinking outcomes in the 12 months following treatment?
- Are clients who relapse in the CBT condition less likely to attribute their first drink to a negative mood state than are clients who relapse in the TSF condition?

Is there a greater emphasis on addressing psychological symptoms in the CBT treatment sessions than in the TSF sessions? The

assessment of treatment process in Project MATCH used methodology adapted from the NIMH Collaborative Study on Treatment of Depression (Elkins et al. 1985). Every Project MATCH session was videotaped, and Likert-type items for rating these tapes were generated from treatment manuals. After the MATCH Tape Rating Scale (MTRS) was developed, all Week 2 session tapes and a randomly selected subsample of 150 Week 6 session tapes were rated (see Carroll et al. 1998 for a detailed description of the MTRS).

The MTRS included the following item, "To what extent did the therapist explicitly focus on the client's psychopathology or problems in emotional or behavioral functioning?" The mean rating on this item was examined by treatment for the complete sample as well as on a subsample of clients with high pretreatment psychopathology. Ratings on this item were generally low, with 73 percent of aftercare sessions and 76 percent of outpatient sessions rated "not at all" for Week 2.

Analysis of variance showed no significant difference among CBT, MET, and TSF clients for this item at either Session 2 or Session 6 in the aftercare or outpatient arm. An analysis of the subsample of cases with high pretreatment psychopathology also found no significant differences among treatments for either arm at Session 2. However, it is possible that therapists did not have time to focus on psychopathology early in treatment with clients who were still drinking. Greater focus on psychopathology may have occurred later in treatment, when abstinence permitted clearer assessment of psychopathology.

Another analysis examined the frequency of occurrence of the optional psychopathology-focused CBT sessions in the low and high psychopathology samples. These optional sessions were Awareness of Anger, Anger Management, Awareness of Negative Thinking, Managing Negative Thinking, and Managing Negative Moods and Depression. Although psychopathology sessions were more frequently delivered to high psychopathology clients, these elective sessions made up only 11.2 percent of all sessions in the outpatient arm and 14.8 percent of all

sessions in the aftercare arm. This occurred because the CBT treatment manual specified that eight core sessions dealing with alcohol-related coping skills should be delivered before any elective sessions were delivered.

Is there a lower level of posttreatment psychological symptoms in the CBT condition than in the TSF condition, controlling for pretreatment psychological symptoms? A series of analyses of variance, controlling for site, site by treatment, and pretreatment ASI Psych scores revealed that the mean ASI Psych scores for the CBT, MET, and TSF conditions were not significantly different for the outpatient or aftercare arm at the end of treatment or at 6 and 12 months after treatment (all p's >.1). A parallel analysis was done using pretreatment and posttreatment scores on the Beck Depression inventory, again with no significant differences among treatments. Thus, there was no evidence of greater reduction in psychopathology among participants in the CBT condition.

Is the level of posttreatment psychological symptoms predictive of drinking outcomes in the 12 months following treatment? Four different repeated-measures analyses of covariance were conducted (aftercare and outpatient arms, PDA and DDD outcomes), adjusting for baseline drinking, site, treatment assignment, and site by treatment effects. Posttreatment ASI Psych was a significant predictor of drinking outcome only for DDD outcome in the outpatient arm ($p=$ .013). Although they are significant, the prognostic effects are small, with posttreatment ASI Psych accounting for only 1 percent of variance in DDD outcome. The ASI Psych by time effect was significant for PDA and DDD in the aftercare arm, but post hoc analyses revealed that ASI Psych predicted drinking in only 2 or 3 of the 12 posttreatment months.

Somewhat stronger prognostic effects were found using the posttreatment scores on the Beck Depression Inventory (BDI). Posttreatment BDI predicted PDA and DDD in both the outpatient and aftercare arms (p's <.0001), accounting for approximately 3 percent of variance in outcome.

Are clients who relapse in the CBT condition less likely to attribute their first drink to a negative mood state than are clients who relapse in

the TSF condition? An analysis was conducted to test the hypothesis that psychopathology symptoms are antecedent to relapse less often in the CBT condition than in the MET or TSF conditions. This analysis used only clients who reported a relapse in the followup interviews. The Reasons for Relapse Questionnaire was given at the 3-, 9-, and 15-month followups. This questionnaire contained three items pertaining to negative mood states as reasons for relapse: "feeling angry," "feeling down or blue," and "feeling uptight or anxious."

The means for each of these three items were not significantly different for clients in the CBT condition compared with clients in the TSF condition at any of the three followup interviews, in either the outpatient or aftercare arm of the study. This analysis was also conducted on a subsample of clients with high ASI Psych scores at pretreatment (≥0.4). The results were also nonsignificant, but the sample size for the t-tests ranged from 14 to 28 per cell. This is because only clients with high pretreatment ASI scores who reported relapse in the followup period were entered into the analysis. Based on these analyses, there is no evidence that the CBT condition was associated with fewer relapses triggered by negative mood states compared with the MET or TSF conditions.

Summary

Based on causal chain results from the outpatient arm, there is some evidence to support the link in the causal chain that psychopathology at the end of treatment causes drinking in the following year. However, there is no evidence in either the outpatient or aftercare arm to support the link in the chain that CBT causes more reduction in psychopathology than does MET or TSF. It appears that both CBT and TSF were associated with decreased psychopathology, perhaps secondary to reductions in drinking.

Alcoholics Anonymous Attendance as a Mediator

A new causal chain hypothesis was developed after reviewing results showing that clients without psychopathology had better outcomes when assigned to TSF rather than CBT. This

chain focused on AA attendance as a mediator of psychopathology matching.

We predicted that individuals without psychopathology would have a higher rate of AA attendance than those with psychopathology. If frequency of AA attendance were related to drinking outcome, then the group that went to the most AA meetings (i.e., low psychopathology, TSF clients) would have the best outcome. This would explain our psychopathology matching findings.

Does pretreatment ASI Psych predict AA meeting attendance during and/or after treatment? Pretreatment ASI Psych was not significantly related to AA meeting attendance during or after treatment in either the aftercare or outpatient arm. The pretreatment ASI Psych by treatment interaction effect on AA attendance was also nonsignificant, indicating that ASI Psych did not predict AA attendance differentially across the three treatments.

Pretreatment ASI Psych was also not a significant predictor of scores on the AA Involvement scale (Tonigan 1996) obtained at posttreatment. We found no evidence to support the idea that psychopathology interfered with AA affiliation.

Does AA attendance during outpatient treatment predict followup drinking? Across the three treatments, AA attendance during treatment predicted PDA at every month in the year after outpatient treatment, accounting for a small but statistically significant 1 to 4 percent of the variance.

Conclusions. We found that AA attendance predicted PDA, especially in the third month of treatment. However, we did not find ASI Psych to be predictive of AA attendance at any point in any treatment. Therefore, AA attendance could not function as a mediator of the psychopathology matching effect.

We also failed to find any moderator effects. There were no significant 3-way interaction effects of ASI Psych by AA attendance by Treatment. None was found with either all three treatments or with the CBT/TSF contrast. We also examined ASI Psych by AA attendance within-treatment (month 3) interactions, and none was found to be significant.

Discussion

In the primary outcome analyses, a single psychopathology by treatment interaction effect was found that met criteria for a Bonferroni-corrected level of significance. This was in the outpatient arm, contrasting CBT and TSF treatments using the PDA outcome. Clients without psychopathology on the ASI reported 87 percent abstinent days in the posttreatment period when assigned to TSF compared with 73 percent abstinent days reported by those assigned to CBT. The TSF advantage over CBT disappeared in clients with psychopathology.

The interpretation of this matching finding is clouded by the fact that Bonferroni-corrected significance levels were not achieved with the CBT–TSF contrast for interaction tests involving either posttreatment DDD outcomes, within-treatment PDA or DDD outcomes, or any contrasts with psychopathology defined as presence of a comorbid Axis I disorder on the C–DIS. Also, no psychopathology-related contrast was significant in the aftercare arm, and none of the a priori contrasts involving CBT versus MET was significant in either the outpatient or aftercare arm. When one statistical test out of many is found to be significant, there is the possibility that the significant finding is a type-1 error.

A descriptive analysis comparing matched versus mismatched groups of outpatient clients suggested that the ASI Psych matching effect may be a pseudo effect because the matched clients fared no better than the clients assigned to TSF. There is no reason to bother with assessing psychopathology with the ASI and providing access to alternative treatment approaches if equivalent outcomes can be achieved by assigning all clients to TSF.

Secondary outcome analyses using survival analysis of time to relapse also yielded only one significant result out of eight tests. This matching effect was also in the outpatient arm, but it involved the period during the active treatment phase rather than the year following treatment. Among clients with comorbid Axis I disorders, MET clients had a significantly higher relapse rate during treatment than CBT. The descriptive analysis of matched and mismatched clients suggests that this was a strong matching

effect, with the matching strategy based on the C–DIS resulting in an improvement of more than 20 percent in the rate of successful outcomes. Unfortunately, this matching approach did not improve outcomes after the termination of treatment. Nevertheless, these findings suggest that MET may not be the treatment of choice for individuals with psychopathology. The CBT advantage over MET with dual disordered clients may be more enduring if CBT treatment were extended beyond 12 weeks.

We were surprised by the lack of evidence for any enduring CBT advantage over the other treatments with high psychopathology individuals. Causal chain analyses shed some light on these results. Although the CBT manual contained many sessions addressing comorbid psychiatric symptoms, few of these sessions were delivered in Project MATCH due to the requirement that CBT therapists deliver the eight core CBT sessions to each participant before delivering any of the elective psychopathology-oriented ones. The mean number of sessions attended by CBT clients was approximately eight, so many clients were not in treatment long enough to receive an adequate dose of psychopathology-oriented treatment.

This interpretation is supported by the finding that videotape ratings revealed no differences among the three treatments in the degree of focus on psychopathology in Week 2. However, there may have been little time for therapists to focus on psychopathology during the highly structured second session. Moreover, most therapists may have waited to focus on psychopathology until later in treatment, when abstinence would have allowed clearer assessment of psychopathology.

Causal chain analyses did not help explain the finding of a TSF advantage over CBT for outpatient clients without psychopathology. Although we hypothesized that psychopathology might interfere with AA affiliation, there was no relationship between pretreatment ASI Psych scores and AA attendance or AA involvement. Clinical lore has it that clients with psychopathology do not affiliate successfully with AA. It is possible that the facilitation offered by the TSF therapists was sufficient to overcome barriers to AA affiliation for clients with psychopathology.

In the aftercare arm of the study, we did not find better outcomes among individuals without psychopathology in TSF treatment. The TSF advantage seen in the outpatient arm may have been diluted in the aftercare arm because most aftercare clients received recommendations to attend AA as a routine part of their inpatient or intensive outpatient treatment prior to entering Project MATCH aftercare treatment.

Another possible reason for the failure to find robust matching effects across study arms is that the psychopathology measures utilized in Project MATCH lacked sufficient reliability and validity. A study of the reliability of the ASI Psych composite score found that test-retest interrater reliability of the scale was lower than expected (Cooney, Carboneri, et al. 1997). The C–DIS has been found to overdiagnose individuals when compared with the Structured Clinical Interview for DSM–III–R and a consensus clinical diagnosis (Ross et al. 1994).

In conclusion, significant psychopathology matching interactions were found, but they were not consistent across outcome measures. The causal chain analyses did not reveal a mechanism of action for the matching interactions, further reducing confidence in the validity of the matching effects. With these limitations in mind, the following matching strategies are only tentatively recommended.

If one has the option of assigning outpatient clients to CBT or TSF, drinking outcomes after treatment may be improved by assessing clients with the ASI Psychiatric scale and assigning those with low scores to treatment utilizing the TSF approach rather than the CBT approach. Clients with higher ASI psychiatric severity may be assigned to either therapy. An equally effective alternative strategy would be simply to assign all clients to TSF rather than CBT.

Individuals with psychopathology treated with MET had significantly worse outcomes during the active treatment phase than those treated with CBT. This effect faded soon after termination of treatment. None of the Project MATCH therapies provided treatment with an extensive focus on reducing psychiatric symptoms, so results cannot be generalized to such forms of therapy.

Acknowledgments

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Sociopathy as a Client-Treatment Matching Variable

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ABSTRACT

Sociopathic personality and the diagnosis of antisocial personality disorder (APD) were evaluated as potential attributes that could differentially influence response to treatment. It was predicted that clients with sociopathy or an APD diagnosis would have better outcomes with Cognitive-Behavioral Coping Skills Therapy (CBT) than with Motivational Enhancement Therapy (MET) because of CBT's presumed lower reliance on the development of a working alliance between client and therapist, the inclusion in CBT of specific skills to manage anger, and the more structured nature of CBT. It was further hypothesized that those with APD or sociopathy would have better outcomes with Twelve Step Facilitation (TSF) than with MET because of the greater structure of TSF. Finally, CBT was hypothesized to be superior to TSF for these clients because it would teach them skills to manage their anger and because it does not require Alcoholics Anonymous (AA) attendance, which would be difficult for these clients to sustain. Only one of these predicted treatment contrasts was supported, and for only a very brief period of time, for just one of the outcome variables, and in only one arm of the trial. Furthermore, the hypothesized causal chains, relating client characteristics to outcome, for the most part did not operate as predicted: working alliance was not differentially effective for MET as opposed to CBT, treatment with CBT was not associated with a decrease in client anger, and MET was not found to be less structured than the other two treatments. However, attendance at AA was related to outcome, as expected, but contrary to expectation, those high in sociopathy or with APD attended AA at rates similar to other clients. The degree of anger reduction during treatment was also related to outcome, as predicted, but this effect was not limited to high sociopathy clients as had been anticipated. The failure to find matching of sociopathy or APD to any of the three treatments is at variance with two prior matching studies that did find matching with these client variables to CBT. Possible explanations for the failure to find matching effects are considered.

Sociopathy is often associated with alcoholism (Lewis et al. 1983; Mandell 1981). Alcoholics who exhibit antisocial personality traits are characterized by an earlier onset of excessive drinking and a more rapid progression to alcoholism than alcoholics who do not exhibit these traits (Hesselbrock et al. 1983). In addition, research suggests that sociopathy is a predictor of poor treatment outcomes among alcoholics. For example, Mandell (1981) documented a disproportionately high rate of dropout from alcoholism treatment by sociopathic clients, and Rounsaville et al. (1987) found that antisocial personality is one of several psychiatric disorders associated with poor treatment outcome among alcoholics.

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Other studies, however, suggest that sociopathy may not always lead to poor treatment outcome. Vaillant's (1983) long-term followup study found abstinence among 48 percent of those classified as both sociopaths and alcoholics, in contrast to only 28 percent of those without antisocial symptoms. Similarly, Longabaugh et al. (1994) found that alcoholics with antisocial personality disorder (APD) had better outcomes than non-APDs, as a main effect of treatment, when measured by percentage of days abstinent.

Rationale for Matching Hypothesis

A number of researchers have noted that sociopaths lack internal motivation and social skills and may be unable to develop good therapeutic relationships (e.g., Cleckley 1941; Gerstley et al. 1989). From these observations, it follows that therapies which rely upon the development of interpersonal relationships are likely to be less effective for sociopaths.

One treatment approach that does not rely heavily upon the quality of the relationship between therapists and clients, Cognitive-Behavioral Coping Skills Therapy (CBT; Kadden et al. 1992), has been found effective with sociopathic alcoholics. Kadden and associates (1989) demonstrated significantly better outcomes among sociopathic clients treated with group CBT than nonsociopathic clients treated with this approach.

In contrast, sociopathic clients did less well than nonsociopathic clients when treated in an interactional group modality that relied heavily on the development of interpersonal relationships within the group. This pattern of results was maintained throughout a 2-year followup (Cooney et al. 1991). The Longabaugh et al. (1994) study is supportive of these findings: alcoholics with APD averaged fewer drinks per drinking day when treated with CBT than APD clients who were given relationally focused treatment. These two studies suggest that matching effects are likely when sociopathic clients are treated with CBT, as compared with alternative treatments that rely on interpersonal relationships as an active ingredient of treatment.

Structure is another attribute of treatment that is thought to be desirable for sociopaths (e.g., Frosch 1983). Among the treatments employed in the current study, CBT is considered to be highly structured. The Twelve Step Facilitation (TSF) approach is also structured, "with each session having a specific agenda and following a prescribed pattern" (Nowinski et al. 1992, p. 4). In this respect, these two treatments appear similar and stand in contrast to Motivational Enhancement Therapy (MET; Miller et al. 1992), which is viewed as being considerably less structured.

An additional similarity between CBT and TSF is that the therapeutic process of Alcoholics Anonymous (AA) has been identified as having, in part, a behavioral and cognitive focus (Brown 1993) that involves clear behavioral prescriptions and simple rules to help ensure abstinence. Miller (1978) has described specific areas of overlap between the approaches of AA and behavior modification.

Thus, there appear to be similarities between the structure and methods of the CBT and TSF approaches. As a result, similar effects of treatment were predicted for clients with sociopathy: they would have fairly good outcomes with either CBT or TSF, compared with MET.

There nevertheless are important differences between CBT and TSF despite the similarity in their degree of structure and in some of their methods. The specific content of CBT addresses skill deficits common among sociopathic alcoholics (e.g., skills for coping with criticism and anger), and improvements in these were expected to lead to reduced drinking. Therefore, sociopathic alcoholics, who were expected to enter treatment with fewer interpersonal skills, were predicted to show greater improvement with CBT than nonsociopathic clients. TSF treatment, on the other hand, was designed to facilitate attendance at AA meetings, which requires adequate interpersonal skills to develop relationships with peers at those meetings. However, since many sociopaths lack the social skills needed to develop positive interpersonal relationships, they were expected not to develop good relationships within AA groups, whereas nonsociopaths should have less difficulty doing so and would therefore benefit more from AA.

Sociopathy and Antisocial Personality

An additional issue in this study relates to identifying the best measure of sociopathy for matching purposes: whether the categorical diagnosis of Antisocial Personality Disorder provided by DSM–III–R would be as effective a matching variable as a continuous measure of sociopathy, such as that provided by the Socialization scale of the California Psychological Inventory (CPI–So; Gough 1987). Matching to the categorical diagnosis would be advantageous because the DSM diagnostic system is in widespread clinical use and is well understood by clinicians.

Although the discrete and continuous methods of assessing sociopathy are conceptually related, the content of the two constructs differs: the DSM–III–R APD diagnosis focuses on overt antisocial behaviors, whereas sociopathy measured with the CPI–So reflects a number of underlying characteristics (Kadden et al. 1996).

As a result, it was recognized from the outset that comparisons between them would reflect differences along two dimensions: (1) continuous measurement versus categorical diagnosis and (2) the differing foci of the two constructs. A comparison between them could provide important information regarding the type of assessment that would be the most useful clinically for matching clients to treatments but would not be able to ascertain whether any differences found were due to differences in scale type or scale content.

The two matching studies cited previously examined the role of the categorical APD diagnosis in client-treatment matching. Longabaugh et al. (1994) found matching based on this diagnosis. On the other hand, Kadden et al. (1989) did not find significant APD by treatment-type interactions but did find matching when they used the CPI–So scale to assess sociopathy.

It should be noted that while the Longabaugh et al. and Kadden et al. studies both included cognitive-behavioral treatments, those treatments nevertheless differed from one another in a number of aspects, and the studies employed different outcome measures.

The Hypothesized Matching Contrasts

The predictions for the two related constructs, sociopathy and antisocial personality diagnosis, were identical and are described below. Differences in treatment outcomes were predicted for three contrasts among the treatments.

CBT Versus MET Contrast

The MET treatment relies heavily on persuasive communications, which require a high degree of rapport between therapist and client, an alliance that is likely to be more difficult for sociopaths to form. In contrast, CBT requires less of clients in terms of rapport and communication skills, relying more on coping skills training and behavioral exercises. Mandell (1981) recommended that behavioral treatment programs should address specific skill deficits common among sociopathic alcoholics (see also Woody et al. 1985; Barley 1986). These elements (e.g., skills for dealing with criticism and anger) are included among the CBT coping skills modules. By comparison, MET does not emphasize the learning of new coping skills, and therefore the sociopath receiving MET is less likely to acquire them.

Statement of the Matching Hypothesis: Drinking outcomes will be a function of an interaction between sociopathy/APD and treatment type, such that the slope of the regression line relating drinking outcome to sociopathy/APD will be greater for the CBT treatment condition than for MET. This interaction is illustrated in Panel A of figure 1. Although this figure shows an intersection of the regression lines, this contrast makes no prediction regarding whether or where the lines might intersect.

TSF Versus MET Contrast

Given the similarities in the degree of structure of the TSF and CBT interventions, as compared with MET, similar predictions were made for the TSF versus MET contrast as were made for the CBT versus MET contrast.

Statement of the Matching Hypothesis: Drinking outcomes will be a function of an
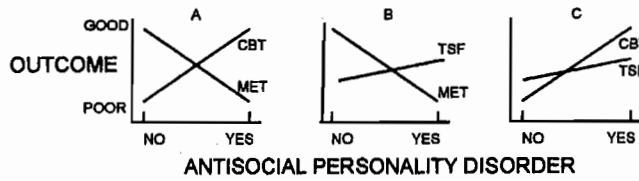
Figure 1. Predicted contrasts for Antisocial Personality Disorder for each of the three treatment pairings. The predicted contrasts for the sociopathy primary hypothesis are the same as those depicted for the APD hypothesis: simply substitute high or low levels of sociopathy for categorical diagnostic status (yes or no) on the abscissa of each panel.

interaction between sociopathy/APD and treatment type, such that the slope of the regression line relating drinking outcome to sociopathy/APD will be more positive for the TSF treatment condition than for MET. This interaction is illustrated in Panel B of figure 1, but here again no prediction was made regarding whether or where the regression lines might intersect.

CBT Versus TSF Contrast

Although it was expected that CBT and TSF would both be structured interventions, TSF differed from CBT in its reliance upon attendance at AA meetings. To benefit from AA, a client must possess adequate interpersonal skills to develop relationships with peers at those meetings, but many sociopaths lack those skills and would thus be unable to develop a positive relationship with an AA group. Assuming that attending and participating in AA meetings fosters sobriety, sociopaths will be less able to avail themselves of this resource and thus will have relatively poorer outcomes with TSF than with CBT.

Statement of the Matching Hypothesis: *Drinking outcomes will be a function of an interaction between sociopathy/APD and treatment type, such that the slope of the regression line relating drinking outcome to sociopathy/APD will be more positive for the CBT treatment condition than for TSF.* This interaction is illustrated in Panel C of figure 1. Again, no prediction was made regarding whether or where the regression lines might intersect.

Operationalization of the Matching Variable

The continuous measure for the sociopathy primary matching hypothesis was the CPI–So, a 46-item true/false inventory (Gough 1987). It was selected based on validity data and practical considerations (Cooney et al. 1990). Scores were inverted for analysis: higher values indicate greater sociopathy.

The categorical measure for the APD secondary hypothesis was the DSM–III–R Antisocial Personality Disorder diagnosis, as determined by the Computerized Diagnostic Interview Schedule (C–DIS; Robins et al. 1989). For analysis, a "1" was coded if the diagnosis was present and "0" if absent. These client variables were assessed at intake into the study.

Secondary Outcome Analyses

In addition to the two standard trialwide outcome variables (percentage of days abstinent and drinks per drinking day), it was also proposed to test two additional dependent variables: time to first drink and time to first heavy drinking day, based on prior matching findings with these variables (Kadden et al. 1989; Cooney et al. 1991).

Causal Chains

CBT Versus MET Contrast

Three causal chain analyses were proposed to account for this contrast.

Quality of the Therapeutic Relationship

The first examined the role of therapeutic alliance as a mediator of the matching effect. It was anticipated that sociopathic/APD clients would form relatively poor working alliances in all the therapies in this study, but the impact of this effect would be greatest in MET, which relies heavily on the establishment of good rapport between client and therapist. Although the poor quality of the working relationship would be present in CBT as well, that modality relies more

on skills training than on the relationship between client and therapist. Stated in the form of a logical syllogism, the causal chain is as follows:

- The more sociopathic the clients, the less their capacity to form a good therapeutic relationship.
- The less the clients' capacity to form a good therapeutic relationship, the less they will benefit from a therapeutic modality that relies on that relationship.
- MET treatment makes greater use of the therapeutic relationship than does CBT.
- The more sociopathic the clients, the less their success in MET, compared to CBT.

Quality of the therapeutic relationship was assessed by the Working Alliance Inventory (Horvath and Greenberg 1986) at the end of the second treatment session.

Anger

The second causal chain was based on improvement in the ability to manage anger as a mediator of the matching effect. It was anticipated that sociopathy/APD would be associated with higher anger ratings at baseline and that CBT, which addresses interpersonal skills in general and anger management specifically, would be associated with more decline in anger scores than MET. Among angry clients, greater reduction of anger from pretreatment to posttreatment would be associated with better treatment outcome. On the other hand, for those low in sociopathy (or without an APD diagnosis), it was expected that anger scores would be lower and therefore neither treatment would result in much change in anger. For these clients, then, there would be no relationship between change in anger and outcome.

The predictions were as follows:

- Sociopaths will have higher levels of anger at intake than nonsociopaths.
- Sociopaths will show more reduction in anger with CBT treatment than with MET.
- Among sociopaths, greater reduction of anger will be associated with better drinking outcome.
- Sociopathic/APD clients treated in CBT will have better outcomes than those treated in MET.

Project MATCH assessed anger at intake using the Spielberger Trait Anger Scale (TAS; Spielberger et al. 1983). Subjects scoring high on the TAS were assumed to have poor anger management skills.

Structure of Treatment

The final hypothesized causal chain for the CBT versus MET contrast examined the role of treatment structure as a mediator of the matching effect. It was expected that for sociopathic/APD clients, the greater the structure of treatment, the better the outcome. For nonsociopathic clients, it was predicted that treatment outcome would be independent of treatment structure. It was anticipated that CBT sessions would receive higher ratings on a treatment structure scale than MET sessions.

In syllogistic form, the causal chain is as follows:

- Sociopathic/APD clients will have a greater likelihood of benefiting from a more structured treatment approach than from a less structured one.
- Ratings of treatment sessions will show CBT to be more structured than MET.
- Sociopathic/APD clients will be more likely to benefit from CBT than from MET.

Treatment structure was measured as one of the subscales of the Project MATCH Tape Rating Scale (Carroll et al. 1998) by independent raters watching videotapes of each participant's second session of treatment.

TSF Versus MET Contrast

It was predicted that treatment structure would mediate the differences between the TSF and MET treatments for sociopathic/APD clients, who would have a greater likelihood of benefiting from a structured treatment. It was anticipated that ratings by independent evaluators would show TSF to be a more structured intervention than MET. Sociopathic/APD clients would therefore be more likely to benefit from TSF and less likely to benefit from MET. The sequence of logical steps for this proposition is the same as that specified for the preceding structure-of-treatment causal chain for the CBT versus MET contrast.

CBT Versus TSF Contrast

Two causal chain analyses were proposed to account for this contrast.

Anger

The first causal chain analysis tested whether change in anger would mediate the matching effect. In similar fashion to the anger causal chain for the CBT versus MET contrast, it was anticipated that sociopathy/APD would be associated with higher anger at intake, that CBT would be associated with greater decline in anger than TSF, and that greater reduction of anger among sociopaths would be associated with better treatment outcome. It was therefore predicted that sociopathic/APD clients would have better drinking outcomes with CBT than with TSF. The logical steps for this proposition are the same as those specified for the anger causal chain of the CBT versus MET contrast.

AA Attendance

The second causal chain for the CBT versus TSF contrast postulated that AA attendance would mediate the matching effect. It was expected that those with high AA attendance would have better treatment outcomes. It was predicted that sociopathic/APD clients would be less likely to engage with AA than nonsociopaths because of their difficulty forming meaningful interpersonal relationships. It was expected that AA attendance would generally be associated with good outcome in the TSF treatment but that sociopaths would be less likely to attend AA. It was therefore anticipated that among sociopathic/APD clients, treatment outcomes would be worse for those treated with TSF, as opposed to CBT, because of the heavy TSF reliance upon AA attendance, whereas the effectiveness of CBT does not depend upon AA.

The predictions were as follows:

- Clients with high AA attendance will have better outcomes.
- AA attendance depends in part upon the formation of interpersonal relationships.
- Because of their difficulty forming relationships, sociopaths will tend not to get involved in AA.

- TSF relies for its effectiveness upon AA attendance.
- Sociopaths will have poorer outcomes with TSF than with CBT because of their poor AA attendance.

Data on AA attendance were obtained at each followup assessment from the Form 90–F (Miller 1996).

Data Analysis

The primary tests of the matching hypotheses were conducted using hierarchical linear modeling (HLM) analyses. Separate analyses were performed for the period during which treatment took place (from intake to end of treatment, i.e., months 1–3), and for the period from end of treatment to the end of the 1-year followup (months 4–15). The primary dependent variables (DVs) in these analyses were (a) percentage of days abstinent (PDA, transformed to correct for nonnormal distributions) and (b) drinks per drinking day (DDD, also transformed), both of which were derived from Form 90 drinking assessments. Weekly values of these DVs were used in analyses for the 1–3 month period, and monthly values were used for the 4–15 month period.

The covariate set used for these analyses consisted of the pretreatment value of the drinking DV, a dummy variable representing the treatment site, the interaction of site by treatment type, and the interaction of site by treatment by sociopathy. Of the effects estimated, only the following were examined for the present report: main effect for sociopathy, time by sociopathy, quadratic effect of time ($Time^2$) by sociopathy, treatment site by sociopathy, time by treatment site by sociopathy, $Time^2$ by treatment site by sociopathy, sociopathy by treatment, time by sociopathy by treatment, and $Time^2$ by sociopathy by treatment.

A family-wise type-1 error rate of 0.05 was specified beforehand for each matching attribute. This was apportioned to each of the treatment contrasts specified for the hypothesis and was further divided by 2 to account for the two dependent variables. Significance levels for this hypothesis were partitioned among the three contrasts such that analyses involving the best

justified contrast (CBT versus MET) were required to meet an overall significance level of 0.015 (i.e., 0.03/2) and analyses involving the other two contrasts (CBT versus TSF and MET versus TSF) were each required to meet significance levels of 0.005 (i.e., 0.01/2). Main effects for treatment have been reported elsewhere (Project MATCH Research Group 1997*a,b*), and are not repeated here.

Results and Discussion

Results and discussion for the outpatient arm are presented first, followed by a similar presentation for the aftercare arm. Within each arm, matching results are presented in the following order: primary outcomes (PDA and DDD) during treatment, in the 1-year followup, and in the 3-year followup; secondary (time to event) outcomes; and causal chain findings. These are followed by discussion of the findings.

The presentation focuses primarily on the CPI–So client attribute, with additional comments referring to the APD client attribute (assessed by C–DIS), which was evaluated in the same manner as the sociopathy matching variable but in general had fewer findings.

Outpatient Arm—Results

1-3 Month Period

HLM analyses of PDA during the period in which the treatments were provided found no effects attributable to sociopathy nor to any interaction of sociopathy with treatment assignment or with time. However, with DDD as the DV, a main effect for sociopathy emerged, such that clients scoring high in sociopathy reported more drinks per drinking day than did those low in sociopathy $(F(1, 8656)=10.19, p<.01)$.

There were no effects attributable to antisocial personality diagnosis nor any significant interaction of APD with treatment assignment or with time, for either of the dependent variables.

4-15 Month Followup Period

A significant interaction of sociopathy with linear time was found $(F(1, 7857)=10.03; p<.01)$ with the PDA dependent variable. Examination of monthly means indicated that clients high in sociopathy maintained a fairly constant level of PDA throughout the followup period while those low in sociopathy fared progressively worse over the course of the followup year. This effect can be seen across the three panels of figure 2. No significant effects were found for any predicted interaction of sociopathy with treatment assignment. However, there was a finding in the unexpected direction for the CBT versus MET contrast $(F(1, 6298)=3.07, p=.04)$: clients treated in CBT who were *low* on CPI–So sociopathy had higher PDA than clients with high sociopathy or clients treated in MET. With DDD as the dependent variable, no significant effects of any kind were seen.

Furthermore, no effects involving APD, either alone or in interaction with treatment type or with time, reached significance for either the PDA or DDD primary dependent variables.

3-Year Followup

Followup data were collected for outpatient subjects at 3 years posttreatment. Drinking data were averaged across months 37–39 (timed from the date of intake into the study) to provide one value for each of the two primary dependent variables, PDA and DDD (Project MATCH
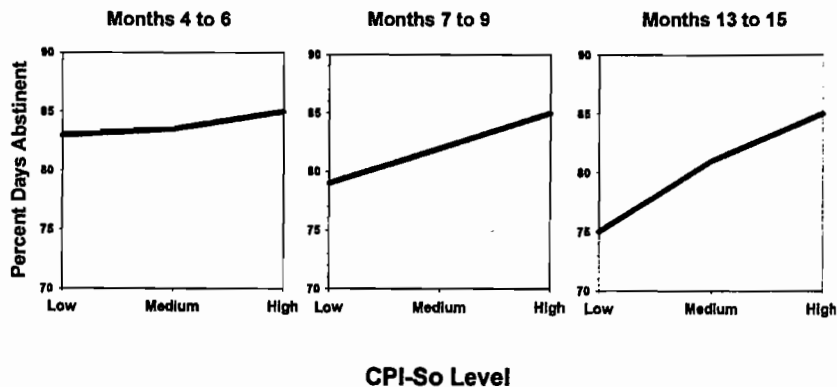

Figure 2. Percentage of days abstinent during three intervals of the followup period as a function of trichotomized sociopathy levels. Data are from the outpatient arm of the trial.

Research Group 1998). An analysis of covariance was performed for each dependent variable, using the same covariates as in earlier analyses. There was no significant effect of sociopathy nor an interaction of sociopathy with treatment assignment for either of the primary dependent variables at 3 years. Furthermore, neither APD nor the interaction of APD with treatment assignment was significant for either of the dependent variables.

Secondary Outcome Variables

In addition to examining data on the quantity (DDD) and frequency (PDA) of drinking, analyses were conducted to determine whether client-treatment matching might also be reflected in time until relapse. Two definitions of "relapse" were used: the most conservative one established the first drink after the beginning of treatment as a relapse, whereas the less conservative definition established the first heavy drinking day after the beginning of treatment as a relapse. Cox model regression analyses were used to determine the effect of CPI sociopathy on time to relapse measured in days since the beginning of treatment. The same was done for the interaction of treatment with sociopathy. In these analyses, the covariates were pretreatment levels of both primary drinking variables as well as terms representing site, treatment, and the interaction of site by treatment.

In the analysis of time to first drink, no significant effects were found for CPI sociopathy, for treatment, or for the interaction of treatment by sociopathy. However, in the analysis of time to first heavy drinking day, a main effect was found for CPI sociopathy (risk ratio=1.015, $p<$ .05), such that those higher in sociopathy reached a heavy drinking day sooner than those lower in sociopathy. No effects on time to first heavy drinking day were found for treatment or for the interaction of treatment with sociopathy.

No significant effects were found for APD, treatment, or the interaction of APD by treatment in analyses of time to first drink or time to first heavy drinking day.

The A Priori Causal Chains

The matching hypotheses were formulated based on certain assumptions regarding

treatment processes and the action of mediating variables; these were specified in terms of causal chains. An example of how these causal chains were operationalized is shown in figure 3 for the differential effects of MET and CBT with respect to the working alliance mediating variable. In this model, sociopathy, measured by the CPI–So, was expected to be inversely related to working alliance; hence the minus sign above and below the arrows (for the outpatient and aftercare arms, respectively) in the left portion of the figure, for both the MET and CBT treatments. Moving to the right in the figure, it was anticipated that working alliance would be conditionally predictive of outcome, depending on the treatment delivered. Because the outcome of MET was expected to be positively related to the development of a working alliance, the proposed relationship between working alliance and outcome was depicted as positive in the upper half of the model by means of four separate terms, one for each of the two dependent variables in both arms of the study.

The terms that appear above the arrow represent the path coefficients for the outpatient arm. Those for the aftercare arm are below the arrow. The first term of each pair indicates the relationship to the PDA outcome; the second term, in parentheses, indicates the relationship to the DDD outcome. The plus sign above the second arrow suggests the anticipated positive relationship between working alliance and the PDA outcome, and the minus sign indicates the anticipated negative relationship between working alliance and the DDD outcome. The same relationship between working alliance and outcomes was predicted for MET clients in the aftercare arm, as indicated by the signs below the arrow. For CBT, however, outcome was expected to be independent of working alliance, and therefore the relationship between working alliance and outcome was expected to be nonsignificant (ns).

The differential impact of sociopathy on treatment outcome during the followup period was analyzed using maximum likelihood structural equations modeling procedures. The two primary outcome variables, PDA and DDD over months 4 through 15, were modeled as latent outcome variables: for each dependent variable, a single latent variable was created, based on
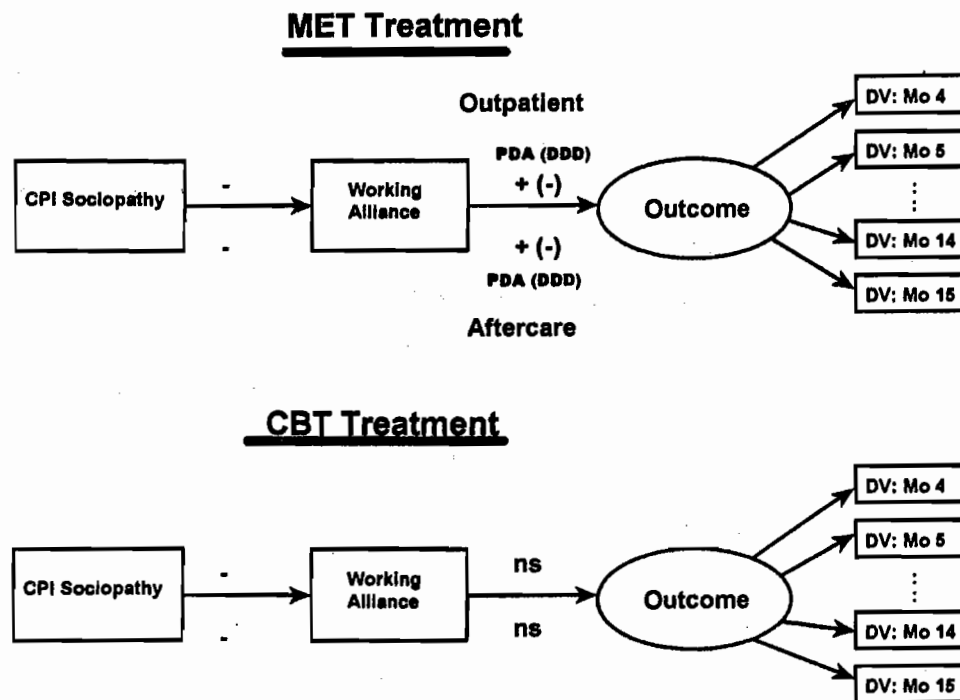
Figure 3. Generic model of a causal chain. This example depicts expected client-treatment matching effects when contrasting the CBT and MET treatments, with working alliance as the mediating variable.

the measures from each of the 12 followup months (indicated by the arrows on the far right in figure 3). The multiple dependent variables that make up the latent outcome variable were each weighted according to their relative contributions to the overall outcome measure. This process was repeated for each of the dependent variables, across all six a priori causal chains that were proposed to account for the hypothesized impact of client sociopathy or APD on the outcomes of the three different treatments.

It should be noted at the outset that these models did not provide a good fit to the data obtained: the goodness-of-fit indexes (GFI), which should be close to 1.00, were at best about 0.85, with no more than 20 percent of the variance in outcome accounted for by any of them.

The results for the APD client attribute paralleled those for CPI-sociopathy as the matching variable, but tended to be weaker. Therefore, we have elected to present causal chain results only for the sociopathy client attribute.

Causal Chain Analyses

CBT Versus MET Contrast. The first causal chain for this contrast involved working

alliance, as illustrated in figure 3. Results of the analyses for this chain are shown in figure 4. Path coefficients are interpreted as betas (standardized regression weights) in these models.

A key assumption underlying the working alliance causal chain is that clients who are high in sociopathy will have poorer social skills than those low in sociopathy. Although Project MATCH included no direct measures of social skills, CPI sociopathy was found to be negatively correlated with the Social Behavior and Overall Social Role Performance subscales of the Psychosocial Functioning Inventory (Feragne et al. 1983) and with length of residence, an indicator of social stability (r's=-0.40, -0.30, and -0.15, respectively). These correlations suggest that clients who are higher in sociopathy do seem to have less social competence and less social stability than clients with low levels of sociopathy.

Nevertheless, despite that relationship, CPI–So scores were only moderately inversely related to working alliance (path coefficients= -0.18 and -0.15). Working alliance, in turn, was not predictive of outcome for MET clients but was significantly predictive of outcome for CBT

Key:
Outpatient
PDA (DDD)
PDA (DDD)
Aftercare

MET Treatment

CPI Sociopathy → -.18* / -.11 → Working Alliance → .05 (-.05) / .10 (-.14*) → Outcome

CBT Treatment

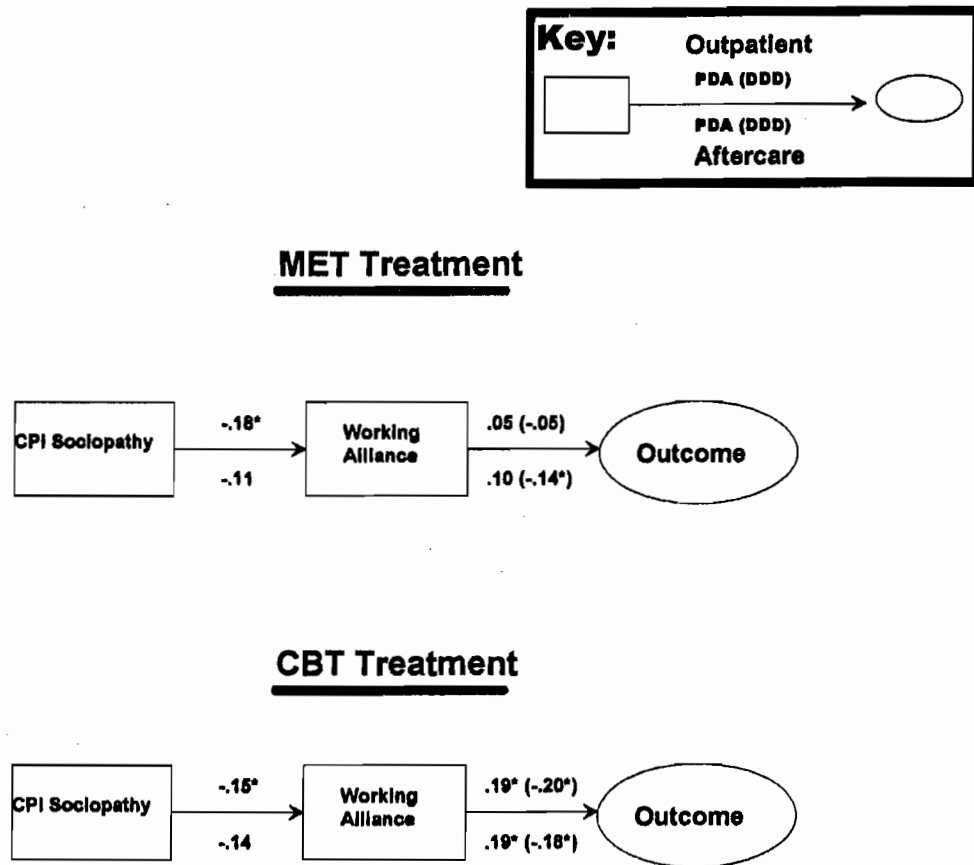CPI Sociopathy → -.15* / -.14 → Working Alliance → .19* (-.20*) / .19* (-.18*) → Outcome

Figure 4. Results of causal chain analysis of CBT versus MET contrast with working alliance as the mediating variable. *$p<.05$

clients. This result, contrary to our expectations, is consistent with the CPI–So by treatment interaction in the unexpected direction noted above in which CBT clients scoring *low* on sociopathy had better outcomes (higher PDA). CBT clients who scored low on sociopathy were more likely to have a better working alliance (path coefficient=-0.15), and higher alliance scores were related to better PDA outcome (path coefficient=0.19).

A second causal chain that was proposed for the CBT versus MET contrast involved the differential effect of treatment on client anger. The underlying assumption was that high-sociopathy clients would be more angry than those low in sociopathy and would therefore be more likely to benefit from a reduction in anger. The initial part of that assumption was borne out: CPI sociopathy was significantly correlated with pretreatment anger ($r=0.38$). Those high in sociopathy had a mean trait anger score of 33.3, whereas

those low in sociopathy had a mean score of 26.7. The causal chain analyses regarding anger change are shown in figure 5. The model tests the proposition that treatment assignment (CBT versus MET) predicts change in anger, which in turn predicts outcome. In this model, low sociopathy clients were those scoring in the lowest third of the distribution of CPI–So scores, and high sociopathy clients were those in the highest third. Anger change in these analyses was calculated as the posttreatment anger score with pretreatment anger partialed out. A positive value for this term represents a *decrease* in anger from pretreatment to posttreatment.

Contrary to our expectations, treatment differences had no effect on change in anger for those high in sociopathy but had a modest paradoxical effect for outpatients low in sociopathy (path coefficient=-0.21): CBT was associated with an *increase* in anger (CBT was coded +1 and MET coded -1 in these analyses). In the
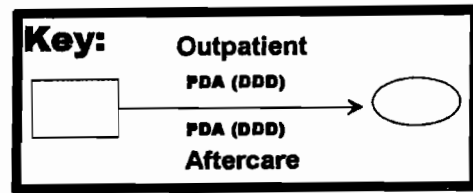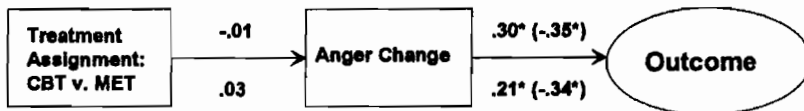
Figure 5. Results of causal chain analysis of CBT versus MET contrast with anger change as the mediating variable, at low levels of sociopathy (bottom third of clients) and high levels of sociopathy (top third of clients). *p<.05

second link of the causal chain, as expected, a decrease in anger was associated with better PDA and DDD outcomes among high sociopathy clients and with better DDD among low sociopathy clients.

A third hypothesized causal chain involved therapy structure, positing that structured therapy would improve outcome for clients high in sociopathy. However, as shown in figure 6, treatment assignment made no difference in raters' judgments of therapy structure: MET sessions were rated as being about as structured as the CBT sessions (the path coefficients for low and high sociopathy clients, -0.22 and 0.04, respectively, were nonsignificant). At both levels of sociopathy, therapy structure was not related to treatment outcome, with one exception: greater structure was associated with fewer DDD, but only for low sociopathy clients, not for high sociopathy clients as had been forecast.

TSF Versus MET Contrast. For the TSF versus MET contrast, treatment assignment did have some impact on ratings of therapy structure (figure 7), with TSF rated as more structured than MET, but only among clients low in sociopathy (path coefficient=0.27). The only relationship between therapy structure and outcome, as in figure 6, was a fairly strong one (path coefficient=-0.73) for the DDD outcome among low sociopathy clients.

TSF Versus CBT Contrast. Sociopathy had been expected to be inversely related to attendance at AA, but as seen in figure 8, it had no association with AA attendance (path coefficients=0.09 and -0.14). Nevertheless, AA attendance was strongly predictive of outcome, even for clients in the CBT treatment condition (absolute value of all path coefficients ≥ 0.33). This was the only model that accounted for significant amounts of outcome variance (average
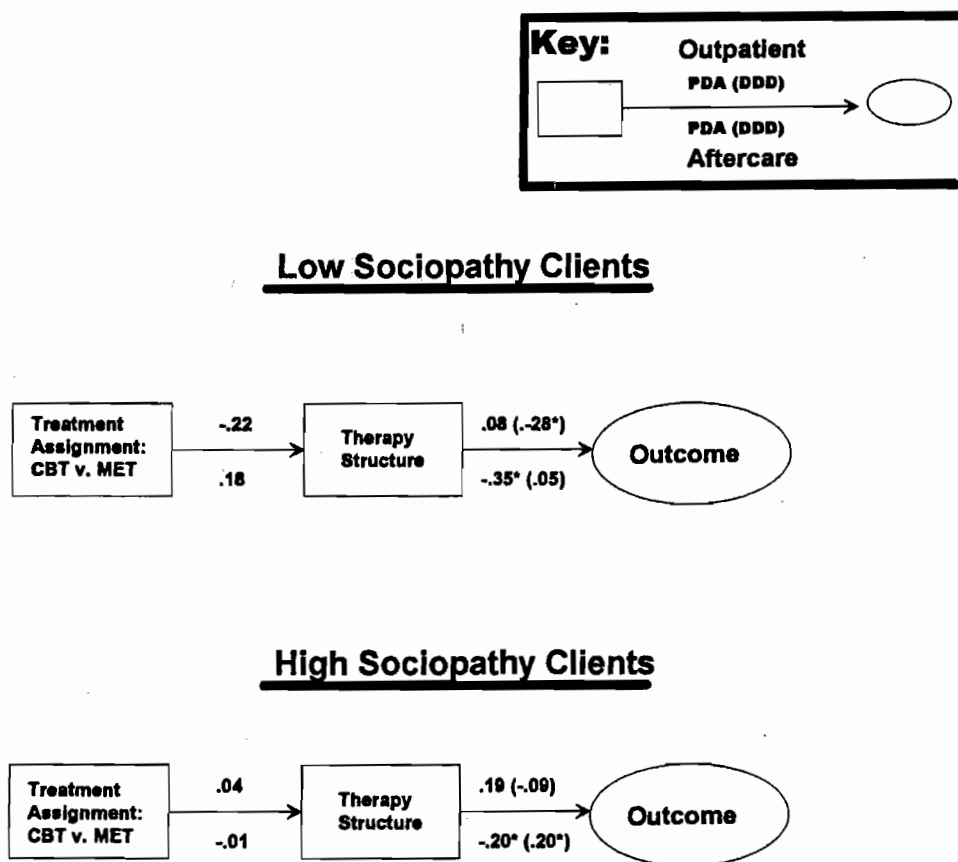
Figure 6. Results of causal chain analysis of CBT versus MET contrast with therapy structure as the mediating variable, at low levels of sociopathy (bottom third of clients) and high levels of sociopathy (top third of clients). *p<.05

multiple R^2=0.45), although as with all the other models, its overall fit to the data was poor for all four analyses (average GFI=0.75).

Finally, change in anger was also hypothesized to be a mediator of treatment effect for the CBT versus TSF contrast, with those higher in sociopathy expected to benefit more from anger reductions, which would be more likely to occur with CBT. In these analyses, however (data not shown), CBT was not superior to TSF in reducing anger (average path coefficient=0.06), and anger change was not related to outcome (average path coefficient=0.15).

Outpatient Arm—Discussion

Prognostic Effects of Sociopathy/APD

A main effect of client sociopathy on the DDD outcome was observed during the 3-month treatment period: as expected, sociopathic clients drank more on each drinking occasion. However, the only effect observed in the year following treatment was a sociopathy by time effect in which PDA became progressively worse among the less sociopathic outpatients, a finding inconsistent with the effect during treatment and with what had been anticipated. Although some weakening of treatment effectiveness over time might be expected, these effects in the primary outcome variables were inconsistent: they were not observed in both outcome variables, and not with APD as the client variable.

However, one of the secondary time-to-event outcome measures (time to first heavy drinking day) was significant in both arms in the expected direction: clients with high levels of sociopathy reached a heavy drinking day more quickly. Combining this with the DDD within-
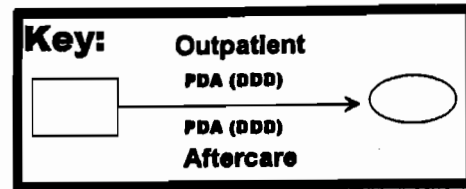
Figure 7. Results of causal chain analysis of TSF versus MET contrast with therapy structure as the mediating variable, at low levels of sociopathy (bottom third of clients) and high levels of sociopathy (top third of clients). *p<.05, **p<.01, ***p<.001

treatment finding suggests that clients who were more sociopathic were more likely to relapse sooner and to drink more when they did.

Inconsistencies in the present findings are reminiscent of those in the literature, where sociopathy is found to be a prognostic variable in some studies but not in others. This variability of findings may indicate that sociopathy is not as reliable an indicator of poor prognosis as has often been suggested, or at least that not all the variables relevant to understanding the impact of sociopathy on outcome have been identified (Longabaugh et al. 1994).

Treatment Matching Effects

In the outpatient arm, no matching effects were observed with any of the treatments and either the sociopathy or the APD client variables. This contrasts with the findings of Longabaugh et al. (1994) in an outpatient

sample in which CBT was particularly effective for clients with an APD diagnosis.

Causal Chain Analyses

The causal chains had been proposed as a means of empirically testing the reasoning behind the matching hypotheses. In the event that a hypothesis was not confirmed, it was hoped that the causal chains might provide useful information as to why the hypothesis failed. In the case of the sociopathy/APD hypotheses, several rationales were offered to account for each of the proposed matching contrasts, which became the basis for a number of different causal chains.

Working Alliance. Among outpatients in both MET and CBT, high sociopathy was associated with poorer working alliance, as anticipated. However, poorer working alliance was predictive of poorer drinking outcomes (both PDA and DDD) in CBT but not in MET, where
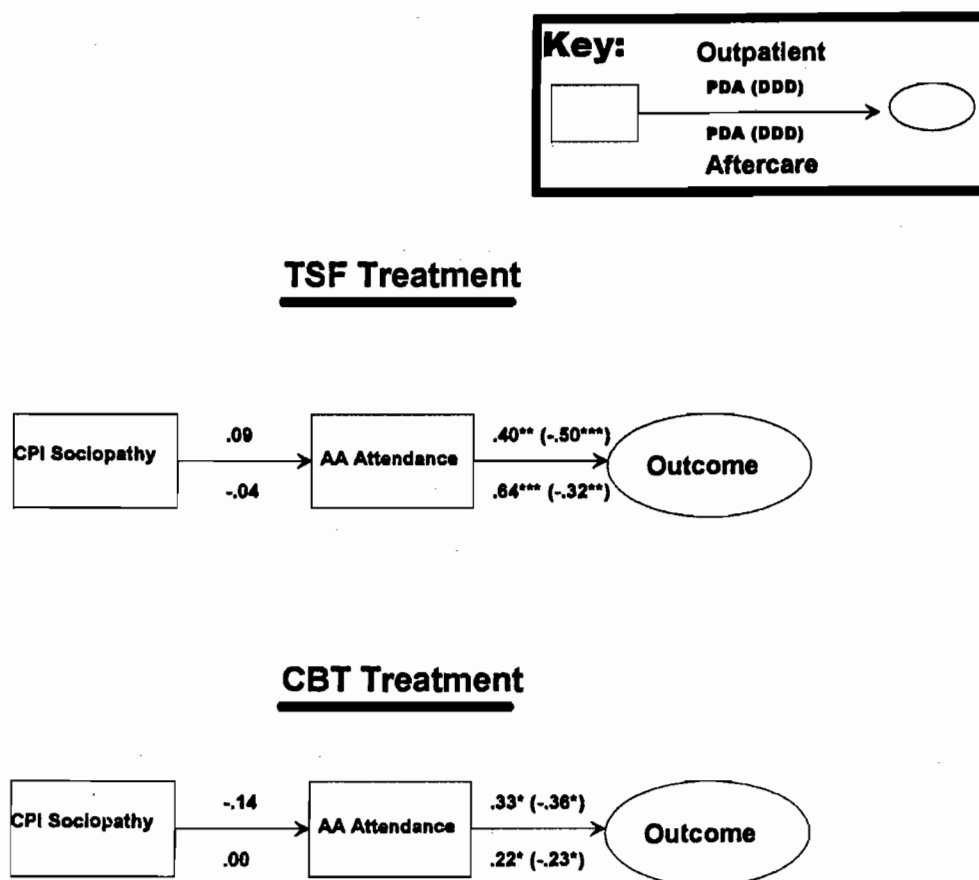
TSF Treatment

CBT Treatment

Figure 8. Results of causal chain analysis of TSF versus CBT contrast with AA attendance as the mediating variable. *p<.05, **p<.01, ***p<.001

this effect on outcomes had been anticipated. Thus, the a priori causal chain broke down because the findings in the second link were opposite to our prediction: CBT outcomes were associated with the strength of the working alliance whereas MET outcomes were not. Although it might be tempting, based on this, to recommend that clients high in sociopathy not be assigned to CBT, such a recommendation would contradict two prior findings in which sociopathic or APD clients had better treatment outcomes with CBT than did nonsociopaths/non-APDs (Kadden et al. 1989; Longabaugh et al. 1994).

Anger. As predicted, greater anger reduction was associated with a greater improvement in both PDA and DDD among high sociopathy clients. However, contrary to our predictions, this was also true among low sociopathy clients (for the DDD outcome), and the improvements in outcome occurred regardless of whether clients

had been treated in CBT or MET. The causal chain failed because the anticipated differential benefit of CBT did not materialize. This may be due in part to anger management training having been an elective session, to be delivered in one of the last four sessions of CBT. However, by that time, many of the CBT clients had already dropped out of treatment: average attendance for outpatients in CBT was 8.27 sessions, and even fewer, 5.73, for those high in sociopathy. As a result, most clients missed the opportunity to receive the anger management session, perhaps explaining, in part, the lack of differential benefit of CBT for angry clients.

Structure. The causal chain based on treatment structure was not supported at any point. The independent raters did not view any of the three treatments as being more structured than the others, for the most part, and the relationship between the structure variable and outcome

was inconsistent. Among outpatient clients with low sociopathy ratings, there was a significant relationship with DDD (in the expected direction—greater structure was associated with lower DDD), but none with PDA. This was true for all three treatments. However, it had been expected that treatment structure would have greater impact on the *more* sociopathic clients rather than on those who were less sociopathic. The reasons for the inconsistency between the outcome measures, and the deviations from expectation, are not at all clear.

AA Attendance. The predicted relationship between sociopathy and AA attendance also did not materialize. Nevertheless, AA attendance was related to both outcome variables across all three treatments, and most strongly for TSF clients. This is consistent with Morgenstern et al.'s (1997) finding that client involvement in AA after formal treatment was associated with better outcomes. These findings speak to the benefit of recommending AA involvement for alcoholics in treatment, regardless of the therapeutic approach. However, it should also be noted that these studies provide no evidence as to whether AA would be sufficient by itself, without any other treatment.

Summary for Outpatient Arm. The data indicate that working alliance was more effective for CBT clients than for MET clients, CBT was not associated with a decrease in anger (but rather with increased anger for clients low in sociopathy), and all three treatments were found to be about equally structured. These findings are at variance with our a priori predictions.

The proposed causal chains failed in their first link, with one exception. Sociopathy was not associated with either the degree of anger reduction or the amount of involvement in AA, and the treatments were not rated as being more or less structured than one another, but sociopathy was associated with poorer working alliance, as anticipated. The causal chains performed a little better in their second link, where at least one of the outcomes was related to each of the mediating variables, although the only consistent relationship was between AA attendance and outcome across all three treatments and both outcome variables.

Aftercare Arm—Results

1–3 Month Period

No significant outcome effects emerged for sociopathy or for the interaction of sociopathy with treatment assignment or with time for either of the DVs during the period in which the treatments were provided. The same was true when the APD client attribute was substituted for sociopathy.

4–15 Month Followup Period

No significant effects of sociopathy or interactions of sociopathy with treatment type or time were found during the posttreatment year when either PDA or DDD was used as the dependent variable.

With respect to the APD analyses, no significant effects were found for any of the terms involving APD when PDA was the dependent variable. However, when DDD was the outcome, a significant interaction of APD by treatment by time was found ($F(2, 8119)=4.91, p<.01$). Examination of the means for DDD in each month of followup showed that early in followup, APD-positive clients who had been treated in CBT had fewer DDD than did APD-positive clients treated in TSF (as predicted), with no treatment differences for APD-negative individuals. This relative advantage for CBT disappeared after 2 months and reversed over time, so that by the end of month 15, APD-positive individuals tended to fare slightly (but not significantly) better if treated in TSF as opposed to CBT.

Secondary Outcome Variables

In the analyses of time to first drink, a main effect was found for CPI–So (risk ratio=1.025, $p<.05$) such that those higher in sociopathy tended to take their first drink earlier than those lower in sociopathy. However, no effects on time to first drink were found for treatment, or for the interaction of treatment by sociopathy. A similar result was found in the analysis of time to first heavy drinking day, with a main effect for sociopathy (risk ratio=1.029, $p<.05$), as also noted above in the outpatient arm. Again, no effects on time to first heavy drinking day were found for treatment or for the interaction of treatment with sociopathy.

With respect to the APD client attribute, no significant effects were found in analyses of time to first drink or time to first heavy drinking day.

Causal Chain Analyses

The reader is reminded that the aftercare coefficients associated with the CPI–So client attribute are the ones below the path arrows in the causal chain figures introduced in the outpatient section.

CBT Versus MET Contrast. In the aftercare arm, working alliance was not related to CPI–So (path coefficients=-0.11 and -0.14, figure 4). Working alliance was related to the DDD outcome for MET clients (path coefficient= -0.14) as expected (greater working alliance associated with fewer DDD). As in the outpatient arm, working alliance was also related to both outcomes for CBT clients, contrary to our expectation that the relationship would only occur for MET clients.

With respect to the anger causal chain (figure 5), treatment differences had no impact on change in anger at either level of sociopathy. However, change in anger did have the expected impact on outcome among high sociopathy clients: decreased anger was associated with improved PDA and DDD outcomes (path coefficients=0.21 and -0.34, respectively). For aftercare clients, this effect occurred only among those with high sociopathy, as anticipated.

There were no differences in ratings of therapy structure (figure 6) between CBT and MET (path coefficients=0.18 and -0.01). The relationships between therapy structure and outcome were opposite to what had been predicted: greater structure was related to lower PDA (path coefficients=-0.35 and -0.20) and to more DDD among high sociopathy clients (path coefficient=0.20).

TSF Versus MET Contrast. The pattern of results for this contrast (figure 7) was largely similar to that for the CBT versus MET contrast, with therapy structure as the mediating variable. There were no differences in ratings of therapy structure between aftercare TSF and MET (path coefficients=0.12 and -0.01). A similar deviation from the predicted relationship between therapy structure and PDA outcome was

observed here as in CBT versus MET: greater structure was related to fewer PDA at both levels of sociopathy (path coefficients=-0.57 and -0.23). However, in this case, greater structure was also related to a decline in DDD among high sociopathy clients (path coefficient=-0.61), a strong finding in the predicted direction despite the opposite-direction finding for the PDA outcome.

TSF Versus CBT Contrast. Client sociopathy was not related to AA attendance (path coefficients=-0.04 and 0.00, figure 8). Nevertheless, AA attendance was strongly related to outcome, more so for TSF clients than for CBT clients, as in the outpatient arm.

Change in anger was not related to type of treatment (TSF or CBT) nor to either of the outcome variables (data not shown).

Aftercare Arm—Discussion

Prognostic Effects of Sociopathy/APD

In the aftercare arm, there were no main effects of sociopathy or APD on either of the primary outcome variables (PDA or DDD). However, the anticipated effect of sociopathy/APD was found among the time-to-event measures: clients with higher ratings of CPI sociopathy relapsed more quickly to both a first drink and to a first day of heavy drinking than did clients with low sociopathy ratings.

Treatment Matching Effects

The lone significant matching effect for either the sociopathy or APD client variables (across both arms of the trial) was an APD by treatment by time effect in which APD-positive aftercare clients who were exposed to the CBT intervention had fewer DDD than clients who had been treated in TSF. This effect was in the predicted direction, but it dissipated over time. The effect was found only for DDD early in the posttreatment period but was not found for the PDA outcome nor with the sociopathy matching variable. Little weight can be given to an isolated finding that was statistically significant for only the first 2 months posttreatment. This stands in contrast to the finding of Cooney et al. (1991), also in an aftercare sample, that sociopathic

clients treated in CBT had superior outcomes for 18 months following treatment.

Causal Chain Analyses

Working Alliance. Sociopathy was unrelated to working alliance in either CBT or MET. Nevertheless, working alliance was positively related to both drinking outcomes among CBT clients (contrary to initial expectations) but only to DDD among MET clients. The working alliance causal chain broke down because of the lack of a differential relationship between sociopathy and working alliance (it had been hypothesized that there would be a negative relationship between sociopathy and working alliance) and because the relationship of working alliance to outcome for CBT clients was more pronounced than for MET clients.

Anger. Change in anger was unrelated to the CBT or MET treatments for either high or low sociopathy clients. Nevertheless, reduction in anger was associated with improvements in both PDA and DDD among high sociopathy clients, as anticipated, and was unrelated to drinking outcomes of low sociopathy clients, also as anticipated. The anger causal chain broke down because CBT was no more effective in reducing anger than MET.

Structure. The causal chain broke down in both links: in the inability of either CBT or TSF to demonstrate greater structure than MET and in the prediction that greater structure would be related to better drinking outcomes, especially for high sociopathy clients. In fact, greater structure of therapy was associated with *worse* PDA outcomes for both high and low sociopathy clients in all three treatments. The lone relationship in the predicted direction was that greater structure was strongly associated with fewer DDD in high sociopathy clients, although the corresponding PDA value was significant in the direction opposite to what had been predicted. The reasons for this inconsistency, or for the opposite-direction effects, are not understood.

AA Attendance. The anticipated relationship between sociopathy and AA attendance did not materialize: sociopaths were no less likely to get involved in AA than nonsociopaths. Thus the causal chain expectation that sociopathy would differentially affect the probability of AA

attendance was not supported. However, degree of client involvement in AA was related to positive drinking outcomes across all three treatments.

Summary for Aftercare Arm. Sociopathy was not associated with hypothesized mediators such as working alliance, change in anger, or AA attendance. Furthermore, none of the treatments was rated as more structured than the others. Thus, the first link was not confirmed for any of the proposed causal chains.

As for the second link, working alliance, anger reduction, and AA involvement were all generally related to better drinking outcomes as hypothesized, but the predicted differential effects for high versus low sociopathy clients did not materialize. Therapy structure, on the other hand, was negatively rather than positively related to drinking outcome (greater structure was associated with worse PDA outcome, regardless of sociopathy level).

Overall Summary

Neither sociopathy nor APD had clear, consistent effects on outcomes, not directly nor in interaction with any of the three treatments. Although a few effects were found, they were isolated findings that were not consistent across the two outcome variables, the two arms of the trial, or characterizations of the client attribute (sociopathy versus APD). Of six hypothesized matching effects (three contrasts each for the sociopathy and APD client attributes), only one attribute by treatment by time effect was found. The only light the causal chains shed on this situation is that the anticipated differential effects of high versus low sociopathy upon the proposed mediating variables did not materialize. Thus, the basic reasoning underlying the a priori matching hypotheses did not receive empirical support. This was the case despite the fact that the hypothesized mediating variables did generally have at least some of the anticipated relationships with outcome: better working alliance, anger reduction, and AA involvement were for the most part associated with better drinking outcomes.

The failure to find support for the first link of the causal chains may to some extent explain the failure to obtain the hypothesized matching

effects. However, it is also possible that the operationalizations of the mediating variables were inadequate or that we failed to identify the proper mediating variables.

One prior study did find treatment matching based on client sociopathy in an aftercare setting (Kadden et al. 1989; Cooney et al. 1991), and another found matching based on diagnosis of APD among outpatients (Longabaugh et al. 1994). The causal chains in the present study provide few clues as to why we failed to replicate the matching effects that were previously reported with the same client variables. Since neither of the earlier studies included tests of causal chains, there is little basis for understanding the substantial differences between the outcomes of those studies and the current one.

Various speculations can be offered as to why the present results do not confirm those prior independent studies. The Kadden et al./Cooney et al. study employed group therapy, with heterogeneous groups of clients. In the CBT groups of that study, it is possible that the therapists may have adjusted the intervention to accommodate the needs of the lowest functioning members of each group, while largely ignoring the higher functioning clients, who as a result may have found the groups boring and unhelpful. A similar process may have also occurred in the "relationship enhanced" therapy employed by Longabaugh et al., in which the focus of treatment may have shifted somewhat from the alcoholic member of the dyad due to the presence of the significant other and therefore may have been less helpful in meeting the needs of APD alcoholics. In the individual therapy of the present study, the therapists could give their full attention to the particular needs of each client, so that the higher functioning clients may have had their needs met better and therefore benefited as much from the CBT intervention as the lower functioning clients and more than the higher functioning clients in the two earlier studies. For similar reasons, the sociopathic and APD clients who were assigned to TSF and MET may have benefited from the individual attention they received in them, thus minimizing the differences between those therapies and CBT.

Neither Project MATCH nor the other studies cited included measures of coping skills acquisition. Possibly some of the anomalous findings with respect to client-treatment matching with CBT might have been explained if the target of the CBT intervention, enhancement of coping skills, had been directly assessed. Similarly for the other treatments, relevant target behaviors or mediating variables may not have been identified or adequately measured.

A final issue to consider is the comparison between sociopathy and APD as alternative ways of characterizing clients for matching purposes. Kadden et al. (1989) found treatment matching based on sociopathy (CPI–So scores) but not based on the presence/absence of an APD diagnosis. Longabaugh et al. (1994), however, did find matching to APD diagnostic status. No conclusion can be drawn from the present data regarding the relative effectiveness of these two means of characterizing clients due to the lack of significant matching findings with either one of them.

As a result of this study, the status of sociopathy and APD as client matching variables is uncertain. They received support in prior studies but not in the present one. A number of differences between the earlier studies and the present one have been discussed, but it will remain for future research to settle the matter.

Acknowledgments

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Alcoholic Typology as an Attribute for Matching Clients to Treatment

Mark D. Litt, Ph.D., and Thomas F. Babor, Ph.D.

ABSTRACT

The typology of alcoholic clients developed by Babor and associates (1992) that defines the Type A/Type B distinction was evaluated as a basis for matching clients to treatment in Project MATCH. It was hypothesized that the more severe Type B alcoholics would have better outcomes if treated in Cognitive-Behavioral Coping Skills Therapy or Twelve Step Facilitation as opposed to Motivational Enhancement Therapy (MET), and that the less severe Type A alcoholics would fare better with MET. Hierarchical linear model analyses using monthly percentage of days abstinent and drinks per drinking day for the 12 months following treatment as the dependent variables revealed that Type B clients had fewer abstinent days over the followup period, as predicted. However, the analyses failed to show any other effects on outcome attributable to client type, or to any interaction of client type with treatment, in either arm of the study. Furthermore, client type was not predictive of outcome in the outpatient arm at the 3-year posttreatment followup point, nor was type predictive of time to first slip or time to resumption of heavy drinking. Results are discussed in the context of general outcomes found in Project MATCH, and the utility of the alcoholic typology is evaluated.

Alcoholism appears to be a multiply determined entity, with biological, psychological, and social factors all interacting to produce a drinking problem (e.g., Tarter 1983). Recognition of the diverse nature of the alcoholic population has led to a search for homogeneous subtypes or groups of alcoholics that share similar characteristics. If such groups could be identified, it might be possible to devise treatments that would accommodate their specific needs and thereby maximize treatment effectiveness. This is the logic behind the creation of alcoholic typologies.

A number of typologies have been proposed to discriminate different subgroups of alcoholics (e.g., Cloninger 1987; Jellinek 1960; Morey and Skinner 1986). Few of these, however, have been replicated in new samples, and fewer still have demonstrated external validity by showing that different subtypes have better outcomes with different types of treatments (Brown et al. 1994).

In view of the multidimensional nature of alcoholic drinking, it has been suggested that a clinically meaningful and predictive typology would encompass multiple domains, including clinical course, genetic predisposition, drinking behavior, psychosocial functioning, and comorbid psychopathology. One such typology was developed by Babor and colleagues (1992), who used k-means cluster analysis with a heterogeneous sample of 321 alcoholics. The clustering solution identified two "types" of alcoholics who differed consistently across 17 defining characteristics in both the male and female samples. The first, termed "Type B alcoholics," is characterized by a family history of alcoholism,

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premorbid childhood conduct problems, early onset of problem drinking, rapid progression of drinking problems, more psychiatric disturbance, greater alcoholism symptom severity, and poor prognosis. The second group, called "Type A alcoholics", is characterized by later onset of drinking, fewer indicators of vulnerability, less psychiatric disturbance, a more benign alcohol-related problem profile, and better prognosis.

The results of the clustering analyses were consistent with historical and contemporary typological theories that have postulated similar subgroups of alcoholics, such as those described in Cloninger's neurobiological learning model (1987). Other findings from the Babor et al. (1992) study and elsewhere suggested that an empirically derived multidimensional typology of alcoholism could have theoretical implications for explaining the heterogeneity among alcoholics and might provide a useful basis for treatment matching.

Prognostic Significance

There is evidence that Type A alcoholics differ from Type B alcoholics both in their overall prognosis and in their responses to different treatments. In their initial study of 321 male and female treated alcoholics, Babor et al. (1992) found that Type B alcoholics had significantly worse treatment outcomes than those classified as Type A at 12- and 36-month followups, as measured by total number of drinking days during followup and drinks per drinking day. Additionally, in a 3-year outcome study by Yoshino and Kato (1996), 259 Japanese alcoholics were classified as Type A or Type B in a similar manner. Type A alcoholics had lower mortality and higher abstinence rates than did the Type B alcoholics by the end of the followup period.

Prior Matching Effects

A study by Litt and associates (1992) indicated that client type was not only prognostic of outcome but might also be useful in matching clients to treatment. In this study, the two-group typology was replicated on a sample in which alcoholic clients had been randomly assigned to one of two different kinds of group aftercare treatment. The data used in this study

were originally collected by Kadden and colleagues (1989) to evaluate the treatment-matching implications of three theoretically based client dimensions: sociopathy, psychopathology, and neuropsychological status. Because the Kadden et al. (1989) study was designed to measure client characteristics in a way similar to the Babor et al. (1992) study of alcoholic subtypes, it provided an ideal opportunity to replicate the Type A–Type B distinction and to test the treatment-matching hypothesis with the cluster-derived typology.

Analyses of proportion of heavy drinking days immediately following aftercare treatment and at several subsequent followup points indicated that, consistent with the Babor et al. (1992) findings, Type A alcoholics fared better overall than Type B clients at the followup points (main effect for type: $F(1, 43)=4.96$, $p<.05$). Additionally, however, a significant client type by treatment interaction was found ($F(1, 41)=4.10$, $p<.05$). Type A clients fared best in interactional treatment and more poorly with coping skills training, whereas those clients classified as Type B alcoholics by the clustering procedure had better outcomes with the coping skills treatment and worse outcomes with interactional therapy. Differences in treatment response were maintained for 2 years from the beginning of aftercare treatment.

The results suggested treatment-matching effects wherein Type A clients were best matched to interactional group therapy and Type B clients were best matched to coping skills therapy. Effects sizes for matches versus mismatches were substantial: at the end of the 2-year followup, for example, 45 percent of matched clients were still abstinent compared with only 15 percent of mismatched clients. The authors speculated that the structured cognitive-behavioral treatment was well-suited to Type B clients, who may have benefited from the clear goals and procedures. The relationship-focused interactional therapy, on the other hand, was thought better suited to the Type A clients, who were less in need of basic skills than in receiving the motivation from others to use the skills they already had. The coping skills treatment was thus thought to be less relevant for the Type A clients in this study.

The Litt et al. (1992) study provided a convincing demonstration of the potential for using client type as a matching variable. Although the MATCH treatments were all delivered on an individual basis, there were significant similarities with the group treatments described in Litt et al. (1992) and Kadden et al. (1989). Motivational Enhancement Therapy (MET; Miller et al. 1992) in Project MATCH, for example, like the interactional group therapy in Kadden et al. (1989), was not considered to be a highly structured, intense treatment, but was expected to be more interpersonally centered, relying for its effectiveness on the ability of the therapist to quickly establish trust and rapport.

The MATCH Cognitive-Behavioral Coping Skills Therapy (CBT; Kadden et al. 1992) condition, on the other hand, was very much like the coping skills treatment in Kadden et al. (1989), with its emphasis on skills and problem-solving and its highly structured approach. Given the outward similarities in treatments, it was expected that Project MATCH clients would respond like the clients described in the Litt et al. (1992) study.

Based on our previous typological research and the results of the Litt et al. (1992) matching study, we proposed the following hypotheses (figure 1):

- *There would be an overall main effect for client types, with high severity (Type B) clients relapsing sooner, drinking more frequently, and experiencing more drinking-related problems than low severity (Type A) alcoholics in all treatment conditions.*
- *Type B alcoholics would fare best in the CBT and Twelve Step Facilitation (TSF; Nowinski et al. 1992) treatments, and poorly in MET. Type A alcoholics would respond well to MET and relatively less well in TSF and CBT.*

Rationale for the Matching Hypothesis

The matching findings of the Litt et al. (1992) study suggested that several important "active ingredients" of the treatments have differential importance for Type A and Type B alcoholics. We
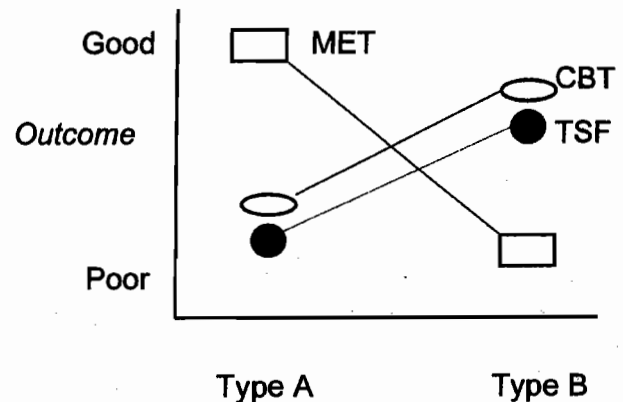

Figure 1. Hypothesized outcomes in Project MATCH as a function of treatment assignment and alcoholic type.

speculated that these active ingredients included structure of treatment and change in cognitions, change in psychopathology, and various therapist relationship factors.

Structure

We believed that Type B clients would be more likely to benefit from the highly structured, programmatic CBT and TSF treatments, in which performance and role expectations are clearly defined, than from the less structured, more open-ended form that MET takes. This prediction was based on evidence indicating that clients who are more severely impaired in terms of general psychopathology do poorly in traditional psychotherapy (Sloane et al. 1975), possibly because of a reduced ability to learn in unstructured treatment sessions (Truax and Carkhuff 1967).

Additionally, a similar differential success prediction would result from considering the client's sociopathy. The Type A/Type B typology is influenced by the level of sociopathy as well as other vulnerability factors that affect both alcohol dependence and ability to control impulsiveness or regulate behavior. Type B clients show higher levels of sociopathy and other indicators of poor impulse control (e.g., conduct disorders) that may inhibit learning and skill acquisition in therapy situations that are not highly structured. Walker (1992), for instance, writes that substance abusers with antisocial personality have little awareness of their own thoughts and

feelings and how they influence their behavior. Treatment for these individuals should be kept simple, with a firm structure and the clinician clearly directing the process of therapy. The CBT approach in Project MATCH should have been ideally suited to these clients.

Nace (1989), in his discussion of substance abuse treatment for those with antisocial personality, also stresses the importance of firm structure in therapy, with the setting of clear limits and a constant focus on abstinence. In their lack of impulse control and need for abstinence the Type B clients resemble the classic gamma alcoholic (Jellinek 1960). These attributes make Type B clients good candidates for a 12-step approach (an approach designed originally for just such a population; Nowinski et al. 1992) as well as the CBT treatment. Conversely, it was felt that Type A clients would feel unduly constrained by the highly structured CBT and TSF treatments and would prefer the more open-ended, less predictable MET approach.

Cognitive Change

It was expected that the structure and demands for behavior change inherent in the CBT and TSF treatments would be differentially useful for the Type B individuals and that treatment gains would be mediated by cognitive changes resulting from treatment. The treatment demands were expected to lead to behavior change that would result in increases in self-efficacy and motivation. Bandura (1977) has stated that the most influential source of self-efficacy is actual performance. By attending regular and frequent treatment sessions and stopping drinking, self-efficacy should be increased. It was believed further that the CBT and TSF treatments, by virtue of their clear demands for change, would increase motivation for change, leading the person to movement from a precontemplation or contemplation stage of change to an action stage.

Type A individuals, on the other hand, were not expected to benefit from the directiveness of CBT and TSF. It was believed that these persons would already be sufficiently motivated and that their self-efficacy would be enhanced by following through with their own plans for change.

Change in Psychopathology

In addition to other signs of impairment, Type B clients are more likely to score higher on indices of psychopathology such as depression and anxiety. Work by Rounsaville and others (e.g., Rounsaville et al. 1987) has indicated that those higher in psychopathology are likely to have poorer outcomes in treatment. Because of the explicit focus on psychopathology in CBT, it was expected that Type B clients would experience relief of psychiatric symptoms and thus have better outcomes in this therapy. Additionally, because the MET treatment was so brief and had little content related to psychopathology, it was believed that Type B clients would derive less benefit in this treatment. Although TSF had no specific content focus on psychopathology, the frequent visits and support from AA were expected to help relieve psychopathology symptoms and thus predict better treatment outcomes for Type B clients.

Relationship Factors

It was thought that Type B clients, who are more likely to show sociopathic characteristics, would have more difficulty relating to the therapist and making use of the therapy process (Garfield 1978) than would Type A clients. Type A clients, on the other hand, being relatively unimpaired, would be able to make appropriate use of the therapist relationship in MET and might be put off by the lack of such a relationship in CBT, which was considered to be a less relationship-oriented therapy.

A variety of relationship issues having to do with the nature of the CBT and MET therapists could play a role in the outcomes of the various treatments. The MET therapists were trained to be persuasive as well as accepting and empathic in order to quickly establish the rapport required to help motivate clients. CBT and TSF therapists, on the other hand, were trained to be active, challenging, and confrontational. Type B clients, it was thought, would benefit from the clear directions for lifestyle change and the unwillingness of the CBT and TSF therapists to allow the Type B client to avoid making behavioral changes. Minimally impaired Type A clients, however, might feel cornered or attacked

by a confrontational therapist and would prefer an approach that allowed them greater autonomy.

Causal Chain

To summarize, the factors presented above were expected to give rise to changes in certain measurable constructs that would have a bearing on outcome. The causal chain was as follows:

For Type B clients, CBT and TSF treatments, with their greater intensity and structure and their emphases on straightforward behavior change, would be well-suited to Type B clients' learning style.

The skills focus in both treatments, presented in a highly structured and easily coherent manner by a therapist who makes performance expectations clear, would lead to increased cognitive shifts for change, reflected in greater motivation (stage of change), and greater self-efficacy.

Furthermore, practice of these skills in homework assignments (in CBT) should help increase clients' self-efficacy, making it more likely they would practice the skills they learned and thus lead to better outcomes.

Finally, as Type B clients learned and practiced more skills and showed greater motivation to change, support relationships would improve and psychopathology would decrease (e.g., clients would become less depressed and anxious about relationships, work, etc.).

MET, by contrast, with its relatively unstructured focus on motivation would not deliver specific instruction in skills to stop drinking and would be less useful to Type B clients.

For Type A clients in MET, adaptive changes in cognitions were expected to occur, but in a different way from Type B individuals. Because Type A clients were relatively high functioning, it was expected that they would benefit from the low intensity of the therapy by receiving confirmation of their own plans to change (reflected in slight movement in stage of change, as from *contemplation* to *action*). Self-efficacy for change would also increase as a result. Social supports should also improve as treatment efforts at change were made. No changes would be expected in measures of psychopathology.

Hypothesized Matching Contrasts

Consistent with the theoretical rationale, it was concluded that the most obvious treatment contrasts would be those between CBT and MET, and TSF and MET. Given the similarities between CBT and TSF in terms of intensity, structure of therapy, and relationship factors, it was determined that, for Type A and Type B clients, the CBT and 12-step treatments would be almost equivalent. Because of this, these two treatments were combined in analyses such that the contrast of interest was that between MET clients and those in *either* CBT or TSF.

Operationalization of the Matching Variable

Assigning Clients

The original typology formulation was based on 17 defining characteristics that tapped 4 conceptual domains: vulnerability factors, alcohol involvement, chronicity of alcohol problems, and comorbid psychopathology. In the MATCH data set, we identified 14 variables that measured each of the different domains of the typology, and first sought to replicate the two-group typology using k-means cluster analysis. Results of the cluster analyses replicated those of the Babor et al. (1992) and Litt et al. (1992) studies. The most coherent solution was a two-cluster solution that classed individuals as Type A or Type B.

Although the two-group Type A/Type B classification was clearly replicated with the Project MATCH variables using cluster analysis, it was thought that a more practical test of the typology-matching hypothesis would entail classifying people by means of simple a priori classification rules rather than by means of algorithms derived from a cluster analysis of the entire study sample. We therefore developed a quick classification decision-rule using a smaller number of variables with data obtained from a segregated sample of the first 40 clients enrolled at each Clinical Research Unit.

Based on previous work with three different alcoholic samples (Babor et al. 1992; Brown et

al. 1994; and Litt et al. 1992), evidence suggested that a reasonably good classification could be made on the basis of five variables, each measuring one of the following domains: familial risk, personality vulnerability, dependence severity, consequences of drinking, and psychopathology. These variables were considered to be the best representatives of the domains in the typology, and they could be measured reliably:

- Family history of alcoholism (tapping risk; median number of first-degree relatives positive for alcohol abuse = 0.33)
- MacAndrew Alcoholism scale score (MacAndrew 1965), as a measure of vulnerability (median score = 27.0)
- Ethanol Dependence Syndrome Scale score (Babor 1996; median score = 35.0)
- Physical consequences of drinking index (Babor et al. 1992; median score = 17)
- Antisocial personality symptom count from the Computerized Diagnostic Interview Schedule for DSM–III–R (Robins et al. 1981; median count = 3.0 symptoms).

The typology assignment (the type variable) was made according to a criterion rule, namely, that a person should be high on some minimum number of variables to be considered Type B (severe). Anyone who scored above the median on three of the five variables was classed as Type B.

Characteristics of the Variable

Once chosen, the 5 variables were tested against the complete 14-variable typology using data from the segregated sample. The 5-variable typology assignment corresponded very well with the cluster analysis-derived 14-variable typology assignment, with a sensitivity of 0.93, a specificity of 0.79, and overall efficiency of 0.84.

The distribution of the type variable was examined in the complete data set (N=1726). The ratio of 54 percent Type A to 46 percent Type B was exactly what we expected for the complete data set. When the sample was divided by arm of study, Type As outnumbered Type Bs in the outpatient arm by 586 to 360 (62 to 38 percent), but in the aftercare arm, the Type Bs outnumbered Type As 435 to 332 (57 to 43 percent). As for distribution by sex, men were nearly evenly distributed between Types A and B, but Type A women outnumbered Type B women by almost 3 to 2 (63 to 37 percent). These distributions were consistent with previous research (Brown et al. 1994).

Finally, the correlations of the type variable with the other primary matching variables was assessed in the complete data set. The strongest association was with Alcohol Involvement (r= 0.51), followed by sociopathy (r=0.41). Correlations with the other variables were relatively modest. These analyses indicated that the two-group typology is a robust classification scheme, replicated in several samples, and that the five-variable classification algorithm provides a good approximation of the more complex clustering of Type A and Type B individuals.

Results

The primary tests of the matching hypotheses for each arm of the study were conducted using hierarchical linear modeling (HLM) analyses. Separate analyses were performed for the period during which treatment was taking place (from intake to end of treatment, months 1–3), and for the period from end of treatment to the end of the 1-year followup (months 4–15). The primary dependent variables (DVs) in these analyses were (a) percentage of days abstinent (PDA; arcsin transformed to correct for nonnormal distributions) and (b) drinks per drinking day (DDD; square-root transformed). These DVs were measured weekly during the 1–3 month period, and monthly during the 4–15 month period. Details regarding these analyses can be found in Longabaugh and Wirtz's chapter (pp. 4–17) of this monograph.

The covariate set used for these analyses included the pretreatment value of the drinking DV. Although controlling for pretreatment drinking could partially nullify differences between client types, this covarying was done to make sure that any differences in outcome would be attributable to the longstanding, dispositional aspects of client type and not to recent drinking history.

A family-wise type-1 error rate of 0.05, specified beforehand for each matching attribute, was further divided by 2 to account for the two

dependent variables. Because only one contrast of interest (CBT and TSF versus MET) was specified for the client type attribute, effects had to reach a Bonferroni-corrected significance level of $p<.025$ (i.e., 0.05/2) to be considered meaningful.

Outpatient Arm

1–3 Month Period

HLM analyses performed for the period during treatment revealed no significant effects attributable to client type, either alone or in interaction with treatment assignment or time. These results were the same for both dependent variables.

4–15 Month Period

With PDA as the dependent variable, a significant main effect for typology was found ($F(1, 952)=5.93; p<.025$), with Type B clients having a greater percentage of drinking days during this posttreatment period than did Type A clients. No effects significant at the Bonferroni-corrected level were seen for any interaction of type with treatment site, with time, or with treatment assignment. With DDD as the dependent variable, no significant effects were seen.

3-Year Followup

For outpatient clients only, followup data were collected at the 3-year posttreatment point and covered study months 37, 38, and 39. Drinking data from these 3 months were averaged to provide one value for each of the dependent variables, PDA and DDD, at 3 years. For neither of the dependent variables was client type, or the interaction of client type with treatment assignment, significant at the Bonferroni-corrected level of 0.025.

Aftercare Arm

1–3 Month Period

When PDA was used as the DV, no significant effects were seen for any of the terms involving client type. The same results were seen when DDD was the DV.

4–15 Month Period

In the aftercare arm, with PDA as the dependent variable, no significant effects were seen for client type or for any interaction of client type with treatment or with time. The same absence of effects was seen when the dependent variable was DDD. In brief, client type was found to be neither a prognostic variable nor an attribute that could be used for matching purposes when outcome was measured out to 15 months.

Secondary Outcome Variables: Time to Event Measures

In addition to the primary outcome measures (PDA and DDD), three time to event measures were used in the evaluation of typology as a matching variable. The three measures were time to first drink, time to first heavy drinking day, and time to first period of three consecutive heavy drinking days. All times to events were measured from the beginning of treatment. Time was measured in days, and the data were obtained from the Form 90 (Miller 1996) timeline followback measure. A heavy drinking day was a day in which six or more drinks were consumed for men, or four or more drinks were consumed for women. Analyses were conducted using Cox proportional hazards modeling, with baseline drinking (both baseline PDA and baseline DDD), treatment site, treatment type, and site by treatment, as covariates and the interaction of treatment (CBT clients plus TSF clients combined versus MET clients) with client type entered as the last term in the model.

Results of the analyses indicated that client type was not predictive of any time to event outcome, either alone or in interaction with treatment type. This was true in both study arms.

Testing the Causal Chains

The matching hypotheses discussed above postulated more or less complex mediating steps, or causal chains, that would account for differential treatment outcomes for the two types of client. By examining these causal chains, we attempted to discover where our hypotheses failed and thus find out why client type

appeared to have so little influence on the outcome of clients in project MATCH.

The A Priori Causal Chain

Causal chains were analyzed using structural equation modeling. The two primary outcome variables, PDA and DDD, which were measured at 12 time points (i.e., study months 4 through 15), were modeled as latent growth curves as suggested by McArdle (McArdle 1986; McArdle and Epstein 1987). That is, for each of the two dependent variables, a single latent variable was created, made up of the measures taken at each of the 12 followup points. Since the model uses repeated-measures data, the latent factors are interpreted as chronometric (time-based) factors representing individual differences over time (McArdle 1986). In these factors, the dependent variable at each time point makes an independent weighted contribution to the latent outcome variable. Thus, the latent variable takes into account the changes for each individual at each time point.

Results

Three primary causal chain hypotheses were tested. The first hypothesis was that both CBT and TSF treatments would be more structured than MET but that only the Type B clients would benefit from this additional structure in terms of cognitive changes from pretreatment to posttreatment that would lead to improved outcomes. Thus, only Type B clients were expected to show a positive relationship between therapy structure and cognitive change. For Type A, we predicted a nonsignificant or even negative relationship between perceived therapy structure and cognitive change. This is the hypothesis represented in simplified form in figure 2.

The results of this first analysis are shown in figure 3. Therapy structure was determined by rating videotapes of therapy sessions, using a rating scheme developed by Carroll et al. (1998). Cognitive change, in the figure, is a latent variable made up of the pre-to-post change scores on the Alcohol Abstinence Self-Efficacy Scale (DiClemente et al. 1994) and the University of Rhode Island Change Assessment (DiClemente
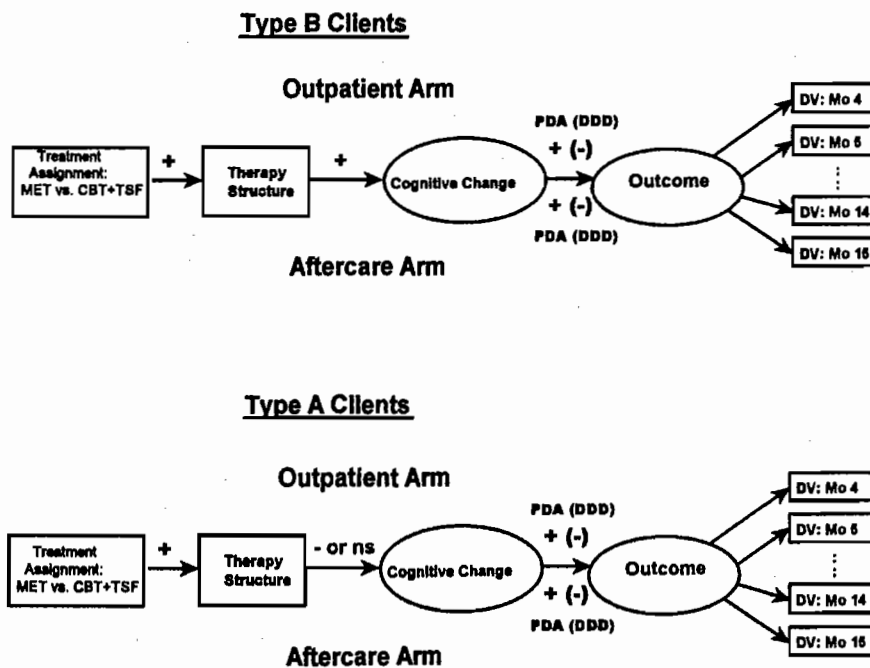

Figure 2. Hypothesized causal chain explaining expected client-treatment matching effect. In figures to follow, results for the outpatient arm are represented above the arrows and results for the aftercare arm are represented below the arrows. Outcome in these analyses is modeled as latent growth curves comprising the repeated DVs (month 4 DV through month 15 DV).

and Hughes 1990), a measure of motivation. In the figure, both dependent variables and both arms of the study are represented. The path coefficients that appear over the arrows in the diagram show the results for the outpatient arm. Coefficients for the aftercare arm are shown below the arrows. The coefficients to the left indicate results when PDA was the outcome; coefficients in parentheses indicate results when the outcome was DDD. The coefficients are interpreted as beta weights. Asterisks indicate that the coefficients are significant at the $p<.05$ level. Coefficients above 0.25 are considered to indicate strong prediction.

Positive cognitive change (i.e., increase in self-efficacy and motivation for change) was strongly related to outcome (positively related to PDA and negatively related to DDD), except for Type B clients in the outpatient arm. Ratings of therapy structure, however, were only weakly related to treatment received, and rated structure was virtually unrelated to cognitive change. The weak relationships explain the poor fit of the models to the data; model chi squares were highly significant, and the goodness-of-fit indices averaged about 0.75.

The second hypothesis was that Type B clients would score higher on measures of psychopathology and that they would experience significant decreases in psychopathology (decreases in Addiction Severity Index (ASI) Psychiatric subscale scores) in the CBT and 12-step treatments versus MET, but that Type A clients would not. Analysis of variance confirmed that Type B clients did in fact have higher baseline ASI Psychiatric scores than did Type A clients ($F(1, 1699)=25.84$, $p<.001$). The decrease in psychopathology was expected to be related to improved outcome. Results of these analyses are depicted in figure 4. (Change in psychopathology was calculated such that positive change indicated a decrease in severity and thus should be positively related to PDA and negatively related to DDD).

In this case, none of the hypothesized relationships held. Change (decrease) in psychopathology was virtually unrelated to outcome, regardless of dependent variable used or arm of
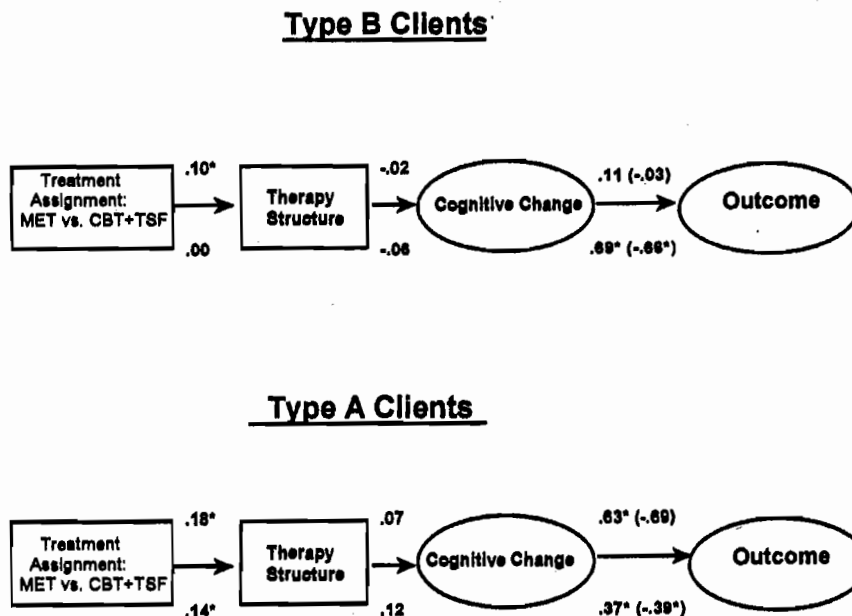
Type B Clients

Type A Clients

Figure 3. Results of structural equations analyses of expected causal chains. Coefficients above the arrows are those for outpatient clients; the coefficients below the arrows refer to aftercare clients. Coefficients to the left refer to outcome expressed in PDA; coefficients in parentheses to the right refer to outcome expressed as DDD. Under Treatment Assignment, MET was coded as 0 and CBT+TSF was coded as 1. Asterisks indicate that the magnitude of the coefficient was significantly different from 0 (by t-test) at the $p<.05$ level.

study, except for a small effect for Type A clients in the outpatient arm. Additionally, treatment assignment apparently made no difference with respect to change in psychopathology. Again, the models shown were poor fits to the data, with highly significant model chi-square values and goodness-of-fit values averaging 0.75.

The last hypothesis was that in Type A clients there would be a positive relationship between treatment and working alliance, as measured by the Working Alliance Inventory (WAI; Horvath and Greenberg 1986), in that Type A individuals in MET would show greater WAI scores than in CBT+TSF. Working alliance was at best only weakly related to outcome, regardless of client type, study arm, or dependent variable (figure 5). Additionally, the hypothesized differential effects of client type and treatment assignment on clients' evaluations of working alliance failed to appear. Model chi-square values were once again highly significant, and goodness-of-fit statistics averaged only 0.80, indicating relatively poor fit of the models to the data.

Discussion

Client type is intended to describe more than just a client attribute. It is a multidimensional construct that encompasses biological and psychological vulnerability, drinking history, and likely prognosis. As such, it should have been an ideal matching variable—one would be hard pressed to think of two kinds of people who are more different or who should respond more differentially to treatment. Yet not only did client type not prove to be a useful matching variable in the present study, with the exception of predicting PDA in the 4–15 month period in the outpatient arm, it did not even turn out to be prognostic. These results are contrary to our own previous results indicating that client type can be a matching variable (Litt et al. 1992) as well as a number of studies showing that client type can be highly prognostic (e.g., Gibbs and Hollister 1993; Shanks et al. 1995; Yates et al. 1993). The purpose of the present study was to explore which of our assumptions may have been in error.
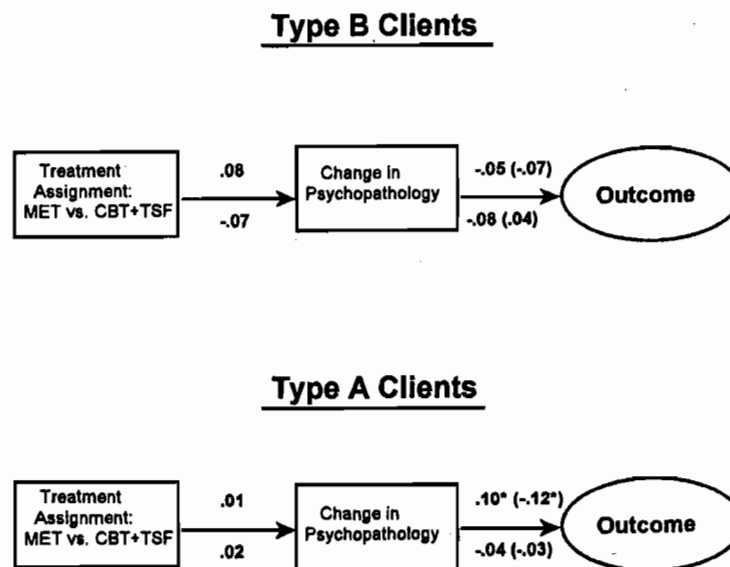
Type B Clients

Type A Clients

Figure 4. Results of structural equations analyses of causal chain examining psychopathology change as a mediating variable. Coefficients above the arrows are those for outpatient clients; the coefficients below the arrows refer to aftercare clients. Coefficients to the left refer to outcome expressed in PDA; coefficients in parentheses to the right refer to outcome expressed as DDD. Under Treatment Assignment, MET was coded as 0 and CBT+TSF was coded as 1. Asterisks indicate that the magnitude of the coefficient was significantly different from 0 (by t-test) at the $p < .05$ level.

Our hypotheses in this study were based upon results found in previous work. Type B clients, whose drinking history, consequences, and psychopathology were so much worse than those of Type A clients, were expected to fare more poorly than Type A individuals regardless of treatment. This occurred in only one arm (outpatient) on one dependent variable (PDA), and the effect vanished when other matching variables were included in the analyses (see Project MATCH Research Group 1997a). The fact that Type B clients did not do more poorly may be a clue as to what occurred in Project MATCH.

One possible reason that client type accounted for so little variance in outcome is that there was relatively little variance in outcome to start with, at least in terms of the two primary dependent measures, PDA and DDD. As has been described elsewhere (Project MATCH Research Group 1997a), drinking in all treatment conditions dropped dramatically from pretreatment to posttreatment. It is possible that a floor effect in outcome may have made the discovery of main effects for most client attributes almost impossible. If this were true, then no attribute by treatment interactions would be likely to be found either. This was largely the case in Project MATCH; only three attributes, psychiatric severity, trait anger, and alcohol dependence, showed attribute by treatment interactions that were not time-dependent (Project MATCH Research Group 1997a,b).

If lack of variance were responsible for the lack of effect attributable to client type, then most other variables and constructs would also fail to predict outcome. This, too, was the case in Project MATCH and showed up in both primary outcome measures and in time to event measures. In the structural equation models in the present chapter, only cognitive change, defined as increases in self-efficacy and motivation, predicted drinking outcomes.

Another possible reason why client type failed to account for treatment outcome, or play a role as a matching variable, is that our
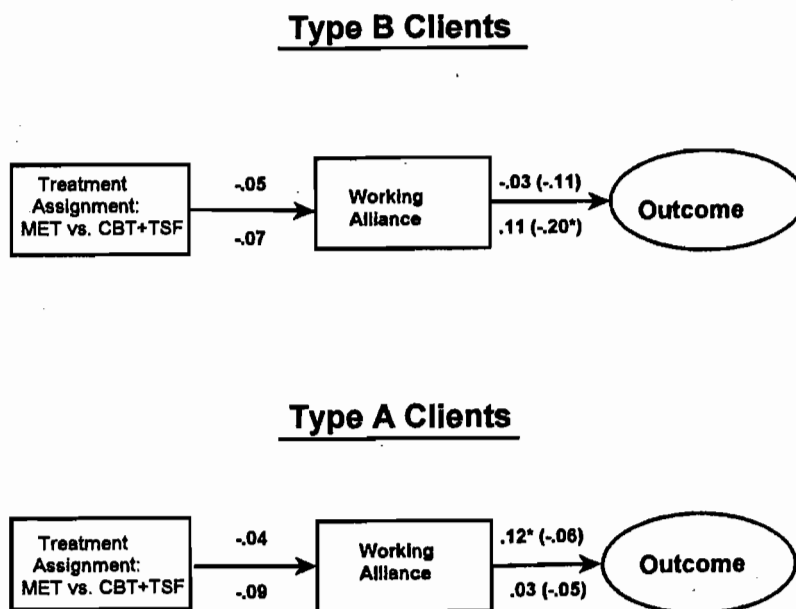
Type B Clients

Type A Clients

Figure 5. Results of structural equations analyses of causal chain examining working alliance as a mediating variable. Coefficients above the arrows are those for outpatient clients; the coefficients below the arrows refer to aftercare clients. Coefficients to the left refer to outcome expressed in PDA; coefficients in parentheses to the right refer to outcome expressed as DDD. Under Treatment Assignment, MET was coded as 0 and CBT+TSF was coded as 1. Asterisks indicate that the magnitude of the coefficient was significantly different from 0 (by t-test) at the $p < .05$ level.

assumptions were wrong about what occurs in therapy, or even about the importance of specific aspects of therapy. The structural equations models suggest that clients did not respond to treatment in the ways we expected. Despite distinct differences in how the treatments were designed and implemented (Carroll et al. 1998), these differences apparently were not reflected in client perceptions. MET, for example, was not perceived by clients as entailing increased working alliance relative to CBT and TSF, and CBT and TSF did not result in improvements in psychopathology relative to MET. Independent raters did, for the most part, perceive TSF and CBT as being more structured than MET, but this effect was neither strong nor ultimately very important to outcome. In summary, the findings suggest that whatever occurred in Project MATCH served generally to increase clients' motivation and self-efficacy and that these changes were not associated with specific characteristics of the treatments.

An additional explanation for the failure of client type to predict outcome or to interact with treatment may be because the two types, although different on numerous dimensions, were nevertheless equivalent on some other attributes that may have been more important. An examination of the means on a variety of variables indicated that, as intended, the two types were substantially differentiated from one another on indicators of vulnerability, severity of dependence, and sociopathy and psychopathology. Differences on means between the two client types on these variables ranged from one to two standard deviations. But on two other variables, the results were quite different. On baseline readiness for change, an important prognostic variable in Project MATCH, Type B clients actually scored higher than Type A clients. And the two types were equivalent on another predictive variable, social support for drinking. Thus, the two types of clients may have been indistinguishable on some of the most significant attributes of the trial. Because neither readiness nor social support for drinking were measured in the earlier studies of client typology, it is not clear whether the Type B clients in those studies were fundamentally different from those in Project MATCH.

A final explanation for the differences between results found in Project MATCH and those found in earlier studies may have to do with an interaction between the Project MATCH clients and the way that treatment was delivered. In the Litt et al. (1992) report, for example, clients were treated in group therapies, and no concessions could be made for the special needs of individual group members. In Project MATCH, the clients were treated individually. Motivated clients, even if they were Type B clients, may have been able to extract from their therapists whatever it was they needed to change, regardless of therapy type, possibly including straightforward recommendations for change from MET therapists. (This might help explain why there were no apparent differences in rated structure between treatments for Type B clients.)

Given the results of Project MATCH, one question that now presents itself is whether alcoholic typology is worthwhile as an explanatory or clinical construct. The answer to that question should be considered in the context of Project MATCH itself. To the extent that Project MATCH represented an artificial treatment situation, with closely supervised individual treatment, frequent paid followups, and the participation and cooperation of significant others, then the validity of all potential client attributes was compromised. It might be argued that studies that have found prognostic, and even matching, effects for client type were somewhat better representatives of the actual state of substance abuse treatment than was Project MATCH. Bearing in mind the results from other studies, and the possible lack of generalizability of results from Project MATCH, the alcoholic typology remains an appealing construct. What Project MATCH does indicate, however, is that regardless of drinking severity and vulnerability, significant improvements in outcome are possible under the right circumstances. Even the most severe alcoholics can go far toward recovery.

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