

Matching Alcoholism Treatments to Client Heterogeneity: Project MATCH Three-Year Drinking Outcomes

Project MATCH Research Group

This study reports 3-year outcomes for clients who had been treated in the five outpatient sites of Project MATCH, a multisite clinical trial designed to test a priori client treatment matching hypotheses. The main purpose of this study was to characterize the status of the matching hypotheses at the 3-year follow-up. This entailed investi-

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*In addition to the Project MATCH Research Group, other investigators and institutions have collaborated in the conduct of this study. The names and affiliations of all participating investigators and collaborating institutions are listed in the Appendix to a companion paper published in the *Journal of Studies on Alcohol* 58:25-26, 1997.*

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gating which matching findings were sustained or even strengthened across the 3-year study period, and whether any hypotheses that were not supported earlier eventually emerged at 3 years, or conversely, whether matching findings discerned earlier dissipated at this later time. This research also examines the prognostic effects of the client matching attributes, characterizes the overall outcomes at 37 to 39 months, and explores differential effects of the three treatments at extended follow-up. With regard to the matching effects, client anger demonstrated the most consistent interaction in the trial, with significant matching effects evident at both the 1-year and 3-year follow-ups. As predicted, clients high in anger fared better in Motivational Enhancement Therapy (MET) than in the other two MATCH treatments: Cognitive-Behavioral Therapy (CBT) and Twelve-Step Facilitation (TSF). Among subjects in the highest third of the anger variable, clients treated in MET had on average 76.4% abstinent days, whereas their counterparts in the other two treatments (CBT and TSF) had on average 66% abstinent days. Conversely, clients low in anger performed better after treatment in CBT and TSF than in MET. Significant matching effects for the support for drinking variable emerged in the 3-year outcome analysis, such that clients whose social networks were more supportive of drinking derived greater benefit from TSF treatment than from MET. Among subjects in the highest third of the support for drinking variable, TSF participants were abstinent 16.1% more days than MET participants. At the lower end of this variable, difference in percent days abstinent between MET and TSF was 3%, with MET clients having more abstinent days. A significant matching effect for psychiatric severity that appeared in the first year posttreatment was not observed after 3 years. Of the 21 client attributes used in testing the matching hypotheses, 11 had prognostic value at 3 years. Among these, readiness-to-change and self-efficacy emerged as the strongest predictors of long-term drinking outcome. With regard to the overall outcomes, the reductions in drinking that were observed in the first year after treatment were sustained over the 3-year follow-up period: almost 30% of the subjects were totally abstinent in months 37 to 39, whereas those who did report drinking nevertheless remained abstinent an average of two-thirds of the time. As in the 1-year follow-up, there were few differences among the three treatments, although TSF continued to show a possible slight advantage.

Key Words: Long-Term Outcome, Matching, Alcoholism Treatment, Client Attributes, Project MATCH.

THIS REPORT is part of a large-scale study designed to identify client attributes that would make them more appropriate for referral to one or another type of alcoholism treatment. Data in this study are from a 3-year follow-up of an outpatient sample of subjects whose 1-year outcomes were previously reported.^{1,2} Matching effects that were identified in the earlier papers are revisited, and emerging effects among the other matching hypotheses are sought.

In 1989, the National Institute on Alcohol Abuse and Alcoholism (NIAAA) initiated a multisite study (Project MATCH) of patient treatment matching hypotheses at nine U.S. sites.³ The participating investigators identified 10 primary and 11 secondary client attributes that could potentially serve as the basis for matching clients to three distinctly different treatments.⁴ The three treatments were Cognitive-Behavioral Therapy (CBT), Twelve-Step Facilitation (TSF) therapy, and Motivational Enhancement Therapy (MET); detailed therapist manuals were developed for each of them.⁵ These treatments were provided in two settings: outpatient or aftercare following a more intensive treatment experience.

Among the primary matching hypotheses, those in which the investigators had the most confidence, only one was partially supported at 15-month follow-up: it was found that outpatient clients with low psychiatric severity (no concomitant psychiatric problems) had more abstinent days in the first year following treatment if they had been treated in TSF rather than in CBT. For outpatients high in psychiatric severity, no significant differences in outcomes were found between TSF and CBT.¹ Among the secondary matching hypotheses, those in which the investigators had a lesser degree of confidence, the 1-year follow-up data supported the hypotheses involving client anger and alcohol dependence. Outpatient clients who evidenced more anger had better posttreatment drinking outcomes after MET than after CBT, and outpatients who were low in anger had worse outcomes after MET than after TSF or CBT. Another secondary matching hypothesis that was supported involved alcohol dependence: aftercare clients who scored high on an alcohol dependence scale had better outcomes after TSF, whereas those with less dependence had better outcomes after CBT.²

A description of each of the a priori hypotheses tested in Project MATCH is beyond the scope of this study, but they are all listed in Tables 2 and 3. For researchers interested in reviewing the a priori matching hypotheses in detail, a monograph to be published as part of the NIAAA Project MATCH series will provide the rationale and background for each hypothesis, along with tests of the causal chains that were thought to underlie each matching hypothesis.⁶

The present research reports 3-year outcomes for the clients who had been treated at the five Project MATCH outpatient sites.* The outpatient arm of the study was selected for long-term follow-up for a number of reasons. First, outpatient clients had received no treatment immediately prior to their involvement in Project MATCH, and it was thought that delayed matching effects might be more likely to emerge if there were no influences from a prior treatment experience that might dilute those effects. Second, given the recent emphasis on outpatient services in the treatment community, tests of longer-term outpatient

matching effects would have greater clinical generalizability. Finally, cost savings resulted from a study of only one portion of the original Project MATCH sample.

For purposes of future clinical decision-making, it was important to examine the time course of client-treatment interactions, and to explore the possibility that a matching effect might emerge at a later point in the follow-up. Therefore, all of the primary and secondary hypotheses were tested again at 3 years in the outpatient sample.

Additionally, analyses of follow-up data provided an opportunity to examine the main effects that the client matching attributes might have on extended outcomes. In most long-term outcome studies, drinking during a prolonged follow-up period was not predicted by drinking at intake, or by other client intake variables.⁷⁻¹⁰ The wide range of client matching attributes measured at intake in Project MATCH offered an opportunity to explore an array of variables that might be predictive of long-term success.

Within the first year posttreatment, considerable overall improvement in drinking status had been observed.¹ Therefore, an additional aim of the present study was to assess the degree to which the earlier gains were maintained after a further 2 years. Also, a slight advantage for the TSF intervention had been noted at 1-year follow-up.¹ Consequently, the final aim of the present study was to assess treatment differences, and determine whether the earlier advantage for TSF was maintained at 3-year follow-up.

Summary. The aims of the present set of analyses were to examine the status of the matching effects found in the first year of follow-up, test for emerging effects among the other matching hypotheses, determine whether any of the client matching attributes may serve as predictors of long-term outcome, characterize the overall outcomes of the Project MATCH outpatient sample at 37 to 39 months, and determine whether a slight advantage for the TSF intervention persisted at 3 years posttreatment.

METHODS

Subjects

Eligible subjects were the 952 outpatients recruited into Project MATCH at five clinical sites. Participants had been recruited directly from the community or referred from the intake unit of an outpatient treatment center in lieu of other treatment.

Inclusion/Exclusion Criteria. To gain initial entry into the study, clients had to have a current DSM-III-R diagnosis of alcohol dependence or abuse, be at least 18 years old, able to read at a sixth grade level, and willing to accept randomization to any of the three treatments. Exclusion criteria were current dependence on any other substance except marijuana, intravenous drug use in the prior 6 months, acute psychosis, severe organic impairment, danger to self or others, lack of a regular place of residence, or inability to identify a "locator" who could be contacted in case the subject became lost to follow-up. Further details regarding these criteria are provided in a prior paper.¹

Subject Characteristics. Three-year follow-up data were obtained from 806 (84.7%) of the original outpatient sample. The average age of the interviewed sample at intake into the study was 38.6 years (SD = 10.7),

*Participants at two of the aftercare sites were also followed to month 39 as part of a separate substudy, the data from which are not reported herein.

Table 1. Hypothesized Contrasts and Descriptive Statistics for Client Matching Attributes: Continuous Variables

Matching attribute	Assessment instruments	Hypothesized contrasts*	n	Mean	SD	Min.	Max.
Primary hypotheses							
Alcohol Involvement	Alcohol Use Inventory ²⁷	[CBT, TSF] slope > MET slope	754	26.92	11.07	2	61
Cognitive Impairment	Shibley Institute of Living Scale, ²⁸ Trails A, B, ²⁹ Symbol-Digit Modalities ³⁰	TSF slope > CBT slope CBT slope > MET slope TSF slope > MET slope	803	-0.51	2.15	-5.97	10.66
Conceptual Level	Paragraph Completion Method ³¹	MET slope > TSF slope	778	0.01	0.39	-1.35	1.46
Meaning Seeking	Purpose in Life Scale, ³² Seeking of Noetic Goals Test ³³	TSF slope > [MET, CBT] slope	776	-16.24	28.95	-115	73
Motivation	Subset of URICA ²¹	CBT slope > MET slope	800	10.53	1.74	3	14
Psychiatric Severity	Addiction Severity Index: Psychiatric Severity Composite Score ¹³	CBT slope > MET slope CBT slope > TSF slope	802	0.20	0.19	0	0.80
Sociopathy	California Psychological Inventory: Socialization Scale ³⁴	CBT slope > MET slope CBT slope > TSF slope TSF slope > MET slope	806	22.37	5.80	7	37
Support for Drinking	Important People and Activities Instrument ³⁵	CBT slope > MET slope TSF slope > MET slope	790	0.05	0.46	-1.22	1.59
Secondary hypotheses							
Alcohol Dependence	Ethanol Dependence Syndrome Scale ³⁶	TSF slope > CBT slope TSF slope > MET slope	796	33.36	9.76	16	64
Anger	State-Trait Anger Inventory ^{37,38}	MET slope > [CBT, TSF] slope	769	29.47	7.23	15	57
Assertion of Autonomy	Interpersonal Dependency Inventory ³⁹	[CBT, MET] slope > TSF slope	776	41.05	6.92	19	56
Prior Engagement in AA	AA Involvement Scale ¹⁷	TSF slope > [CBT, MET] slope	747	3.36	2.47	0.8	11
Religiosity	Religious Background and Beliefs ⁴⁰	TSF slope > [CBT, MET] slope	764	35.46	10.93	13	67
Self-efficacy	Alcohol Abstinence Self-Efficacy Scale ¹⁸						
Confidence	Confidence in abstinence subscale	MET slope > CBT slope MET slope > TSF slope	785	2.96	0.79	1	5
Temptation minus Confidence	Difference between temptation and confidence subscale scores	TSF slope > MET slope	783	0.05	1.38	-4	4
Readiness to Change	Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES) ⁴¹	[CBT, TSF] slope > MET slope	793	10.97	4.32	-7	16
Social Functioning	Psychosocial Functioning Inventory, ¹⁹ and Drinker Inventory of Consequences, social consequences scale ¹⁶	TSF slope > CBT slope MET slope > CBT slope	793	1.51	0.17	1.03	2

* The hypothesized contrasts predict differences in slopes of the regression lines for each treatment on outcome as a function of client attribute. Contrasts take the form: the difference between the first treatment and the second becomes more positive (or less negative) with increasing values on the client attribute. Hypotheses did not test whether interactions were ordinal or disordinal. In cases where the effects of two treatments were not hypothesized to be different, they were combined into a single value that was contrasted with the third treatment. Where more than one contrast was specified for a client attribute, a Bonferroni correction was applied, dividing the α -level for that attribute by the number of contrasts.

28% were female, 43% were married or cohabiting, 80% were White, and 69% were employed. Also, at intake, 96% of the clients met criteria for alcohol dependence and 4% for alcohol abuse, as assessed by the Structured Clinical Interview for DSM-III-R (SCID);¹¹ 33% had one or more lifetime axis I nonsubstance diagnoses, as assessed by the Computerized Diagnostic Interview Schedule (C-DIS).¹²

Of the 146 missing clients, 45 (4.7%) could not be found, 73 (7.7%) refused to be interviewed, and 28 (2.9%) were known to be dead. Treating all the missing cases as a single group, no differences were found between assessed and missing clients on either of the Project MATCH primary dependent variables [percent days abstinent (PDA) or drinks per drinking day (DDD)] at intake. There also were no differences between assessed and missing clients on any of the primary or secondary matching attribute variables or basic demographic characteristics, nor were there site differences. The only difference found was that missing clients were more likely to have been employed full-time at intake into the study. Testing whether more clients from any one of the treatments were missing, a $3 \times 2 \chi^2$ test (treatment assignment by lost vs. found at 3 years) approached significance ($p \leq 0.054$); 19% of the clients assigned to MET ($n = 61$) were lost at 3 years, compared with 13% ($n = 38$) of CBT clients and 14% ($n = 47$) of TSF clients. Although the number of lost clients did not differ among treatment conditions, an important question for the treatment main effect analyses reported herein is whether lost clients differed in their drinking severity, by treatment assignment. Two one-way ANOVAs were conducted with treatment assignment as the between-subject factor, and with either PDA or DDD at intake into the study as the dependent measure. No differences were found among lost clients, by treatment condition, on either intake measure. The general conclusion from these missing data

analyses is that the 806 participants who completed the months 37 to 39 interview were representative of the original outpatient sample.

Assessments

Intake Assessments. The intake battery was administered in three assessment sessions by research assistants who were trained and certified by the trial Coordinating Center. The battery included selected elements of the SCID, Addiction Severity Index,¹³ and C-DIS. Alcohol consumption over the preceding 90 days was estimated using Form 90,¹⁴ an interview procedure that combines calendar prompts and drinking pattern estimation methods. The instruments used for the intake assessments of the client attributes that had been identified a priori as matching variables are listed in Tables 1 and 2 (see Connors et al.¹⁵ for a full listing of the assessment battery).

Three-Year Follow-Up Assessment. This assessment covered months 37 to 39 since participants' enrollment in the study. The follow-up assessments were actually conducted 40.86 months (SD = 2.03), on average, after recruitment. They were conducted by the same research assistants that did the intakes, if they were still available. Many of the assessments that had been used during the first year posttreatment were repeated at 3 years. These included a follow-up version of Form 90 (Form 90F), the Addiction Severity Index, the Drinker Inventory of Consequences,¹⁶ the Alcoholics Anonymous (AA) Involvement Scale,¹⁷ the Alcohol Abstinence Self-Efficacy Scale,¹⁸ the Psychosocial Functioning Inventory,¹⁹ the Social Support Questionnaire,²⁰ and the University of Rhode Island Change Assessment.²¹ A prior paper¹ provided evidence that a high

Table 2. Hypothesized Contrasts and Descriptive Statistics for Client Matching Attributes: Categorical Variables

Matching attribute	Assessment instruments	Hypothesized contrasts*	<i>n</i>	% Valid responses
Primary hypotheses				
Gender of the Subject	Self-report	Female (CBT mean – TSF mean) > male (CBT mean – TSF mean)		
Male			582	72.2
Female			224	27.8
Missing			0	
Type of Alcoholic	Composite index ¹	Type B ((CBT, TSF) mean – MET mean) > Type A ((CBT, TSF) mean – MET mean)		
A			537	67.1
B			263	32.9
Missing			6	
Secondary hypotheses				
Psychopathology	Computerized Diagnostic Interview Schedule ¹²	CBT slope > MET slope CBT slope > TSF slope		
Axis I Diagnosis				
Absent			499	67.4
Present			241	32.6
Missing			66	
Antisocial Personality Disorder	Computerized Diagnostic Interview Schedule ¹²	CBT slope > MET slope TSF slope > MET slope CBT slope > TSF slope		
Absent			665	89.6
Present			77	10.4
Missing			64	

* For the two dichotomous variables, gender and typology, the hypothesized contrasts predict differences in means. For psychopathology and antisocial personality, the hypothesized contrasts predict differences in slopes of the regression lines for each treatment on outcome as a function of client attribute. The Bonferroni corrections for multiple contrasts were applied as specified in Table 1.

degree of confidence can be placed in the accuracy of the self-report data obtained in Project MATCH.

Treatments

Subjects were randomly assigned to treatment at the time of their intake assessment.²² The three treatments were described in detailed manuals,^{23–25} and were delivered as individual therapy over a 12-week period: CBT and TSF for 12 weekly sessions, and MET for four sessions, in weeks 1, 2, 6, and 12. Each of the therapists provided only one of the treatments, in which they had prior relevant experience. All therapists received centralized training and supervision in providing the treatment to which they were assigned. Analyses of session videotapes indicated that the treatments were implemented as intended, were highly discriminable from one another, and were comparable regarding nonspecific dimensions such as therapist skill.²⁶ Outpatient clients attended 68% of their scheduled sessions overall, with MET clients attending a greater proportion (82%) of their 4 scheduled sessions than either CBT (69%) or TSF (63%) clients attended of their 12 scheduled sessions.

Participants in all of the therapies were informed that abstinence was the treatment goal. Nevertheless, it was recognized that each of the three treatments would approach the goal of abstinence in a different way: TSF therapists would take a firm position and confront clients about any drinking that occurred; CBT therapists would try to remediate skill deficiencies that contributed to drinking; and MET therapists would seek to build motivation for accepting an abstinence goal.

Data Analyses

The two primary outcome variables were drinking frequency, operationalized as PDA, and drinking intensity, operationalized as DDD. These data were obtained from the Form 90. Initial analysis of the final three 30-day periods (months 37, 38, and 39) showed no evidence of time trends; therefore, values were aggregated over the full 3 months to create one PDA score and one DDD score for each subject. Analyses of the intake data indicated that an arcsin transformation would improve the distribution of the PDA outcome variable, and a square root transformation would be appropriate for DDD.¹ There were similar skewness and floor/ceiling effects in the present dataset, and therefore the same transformations were used in all tests of the hypothesized matches.

The matching hypotheses were tested using analysis of covariance methodology. To covary for baseline drinking, either baseline PDA or DDD (both transformed) was used as a covariate, depending on which outcome was being analyzed. Other covariates included site, site by treatment interaction, and site by treatment by matching attribute interaction. This is the same covariate set that was used in the prior analyses of the matching hypotheses.¹

Within the context of the analysis strategy, a match was said to have occurred when the slopes of the regression lines predicting an outcome variable from a client matching attribute differed as a function of treatment assignment. Such matches were identified by a statistically significant interaction of the client attribute and the hypothesized treatment contrast. Where significant matches were found, post-hoc analysis of the slopes of the lines predicting the outcome from the attribute were conducted for each of the treatments in the contrast.

In some cases, the client matching attribute was not a continuous variable, but was represented by two categories. Client gender and typology among the primary hypotheses, and diagnoses of psychopathology and antisocial personality among the secondary hypotheses, were two-category variables. A significant interaction for the two dichotomous variables, gender and typology, was based on mean differences and not on differences in slopes of regression lines. In the case of psychopathology and antisocial personality, however, it was presumed that there was an underlying continuum, and matching for these two-category variables was therefore tested in terms of the slopes of regression lines.

The matching hypotheses were tested using one-tail tests, because directional predictions were made in all cases. The same Bonferroni correction was applied as in prior Project MATCH outcome reports: for each client matching attribute the α cut-off level (0.05) was halved to correct for the use of two primary outcome measures (PDA and DDD), and was further reduced for those hypotheses that used more than one contrast among treatments.

RESULTS

Tests of the Matching Hypotheses

Table 1 and Table 2 display descriptive statistics on the present sample of 806, for the client attributes that served

Table 3. Significant Matching Effects at the 37 to 39 Month Follow-up

Matching attribute	Treatment contrast	DV	<i>p</i> *	η^2 (%)	Sample size
Support for Drinking	TSF> MET	PDA	0.0058	0.74	790
		DDD	0.0035	0.90	790
Anger	MET>(CBT&TSF)	PDA	0.0005	1.29	769
		DDD	0.0015	1.14	769

DV, dependent variable.

* *p* values are for one-tailed tests of the a priori hypotheses.

as bases for the primary and secondary matching hypotheses. All attributes were measured at baseline, prior to the start of treatment. Table 1 provides the values for the continuous variables and Table 2 for the categorical variables.

Client Treatment Matching: Primary Hypotheses. Separate tests of each of the primary and secondary hypotheses were conducted for the PDA and DDD outcome variables. The *p* values for the two hypotheses that were supported at 37 to 39 months are shown in Table 3. Also shown are estimated effect sizes, presented as η^2 values (i.e., percent variance computed as the unique sum of squares for the effect divided by the total sum of squares). This is a conservative estimate of the effect size because variance that is shared with other variables is not included in computing η^2 .

The hypothesis of an interaction between support for drinking and treatment was confirmed. This hypothesis predicted that clients whose social network was more supportive of drinking would derive greater benefit from either the CBT or TSF treatments than from MET. The findings support the predicted TSF vs. MET contrast: the regression line slope for clients in the TSF treatment differed from the slope for clients treated in MET. Figure 1 illustrates the regression lines for the two treatments throughout the range of attribute values for raw PDA and DDD scores, estimated without any covariates for illustrative purposes. The top panel of Fig. 1, for the PDA outcome, indicates that the two treatments differed most at the high end of the support for drinking variable, with the TSF treatment providing a better outcome. In the bottom panel, the differences in the DDD variable indicate that, with low support for drinking, the MET treatment resulted in a better outcome (lower DDD); and, at high support for drinking, the TSF treatment again resulted in a better outcome. There was no evidence of nonlinearity, either quadratic or cubic, in the data. Differences in the slopes indicate that, within the MET treatment, social support for drinking at intake is predictive of both drinking outcomes; but, within the TSF condition, social support for drinking is not predictive.

Additional tests were conducted to determine the robustness of this finding. Analytical models were first run with just the attribute by treatment interaction and no covariates, and then with various combinations of covariates: the attribute by treatment interaction, baseline drinking, site, and site by treatment interactions. Because the matching effects were significant under each model, it may be concluded that the match is robust.

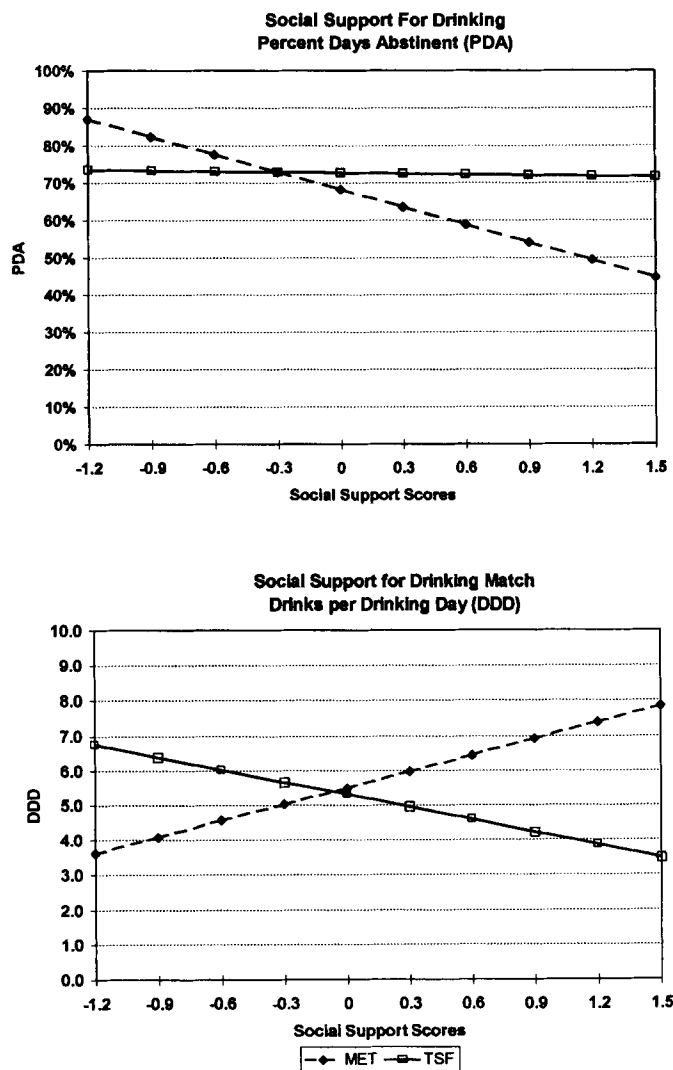


Fig. 1. Interactions of social support for drinking with the MET and TSF treatments. PDA outcomes (top) and DDD outcomes (bottom) as a function of social support for drinking scores.

Finally, the social support for drinking variable was divided into thirds. The values reported herein are adjusted means controlling for the covariate set used in the analyses. Raw score means showed comparable differences. In the upper third of the support for drinking variable, the difference in mean PDA between those in the MET and TSF treatments was 16.3% (PDAs of 60.6 vs. 76.9), with those in TSF having the higher PDA. In the lower third of the support for drinking variable, the treatment difference was 3.8% (75.9 vs. 72.1), with those in MET having more days

abstinent. For the DDD measure, those in the upper third differed by 1.5 DDD (6.0 vs. 4.5), with TSF clients having fewer drinks. In the lower third, the difference was 1.1 DDD favoring MET treatment (5.0 vs. 6.1).

There was only one other significant effect among the primary matching hypotheses. The typology primary hypothesis¹ had a matching effect for DDD outcome ($p \leq 0.0125$), but the direction of the effect did not support the a priori hypothesis that type B alcoholics (those with high vulnerability to alcohol problems and severe current problems) treated in MET would show poorer outcomes than type B clients treated in the other two interventions, and that type A alcoholics (low vulnerability and moderate problem severity) treated in MET would show better outcomes.

In the first year posttreatment, the motivation hypothesis had shown a significant client attribute by treatment by time effect, with a significant matching effect in month 15. However, no matching effect for client motivation was detected at the 3-year outcome point.

Client Treatment Matching: Secondary Hypotheses. The hypothesis of an interaction between client anger and treatment type was supported (Table 3). Tests of the regression line slopes indicate that, within the MET treatment, client anger is predictive of outcomes; but, for the pooled CBT and TSF treatments, anger is not predictive. Figure 2 shows the slopes of regression lines for anger scores predicting PDA and DDD, under the contrast condition of MET vs. the combination of CBT/TSF, as specified in the a priori hypothesis. The figure displays regression lines for raw PDA and DDD scores, estimated without any covariates. The figure shows disordinal interactions, with clients high in anger reporting more abstinent days (top panel) and fewer DDD (bottom panel) after treatment in MET, compared with CBT/TSF data combined, and clients low in anger faring least well if treated in MET.

The preceding analyses were conducted on the contrast of MET vs. the combination of CBT/TSF that had been specified a priori. Further tests were run on MET vs. CBT and TSF separately, to determine if just one of those contrasts was responsible for the significant finding. For PDA, there were matching effects in both the MET by CBT ($F = 7.27, df = 1/738, p \leq 0.007$) and the MET by TSF ($F = 10.11, df = 1/738, p \leq 0.002$) contrasts. Likewise, there were DDD matching effects in both the MET by CBT ($F = 6.26, df = 1/738, p \leq 0.013$) and the MET by TSF ($F = 8.02, df = 1/738, p \leq 0.005$) contrasts. Therefore, the significant matching effects found in the MET by CBT/TSF contrast cannot be ascribed to just one of the constituent contrasts.

To test the robustness of the anger variable, the same strategy of assessing various combinations of covariates that was used for social support was conducted. Here, again, the match appears to be robust in that the effects were significant under each model.

Dividing the anger variable into thirds, the adjusted PDA for MET clients in the highest third of anger was 76.4,

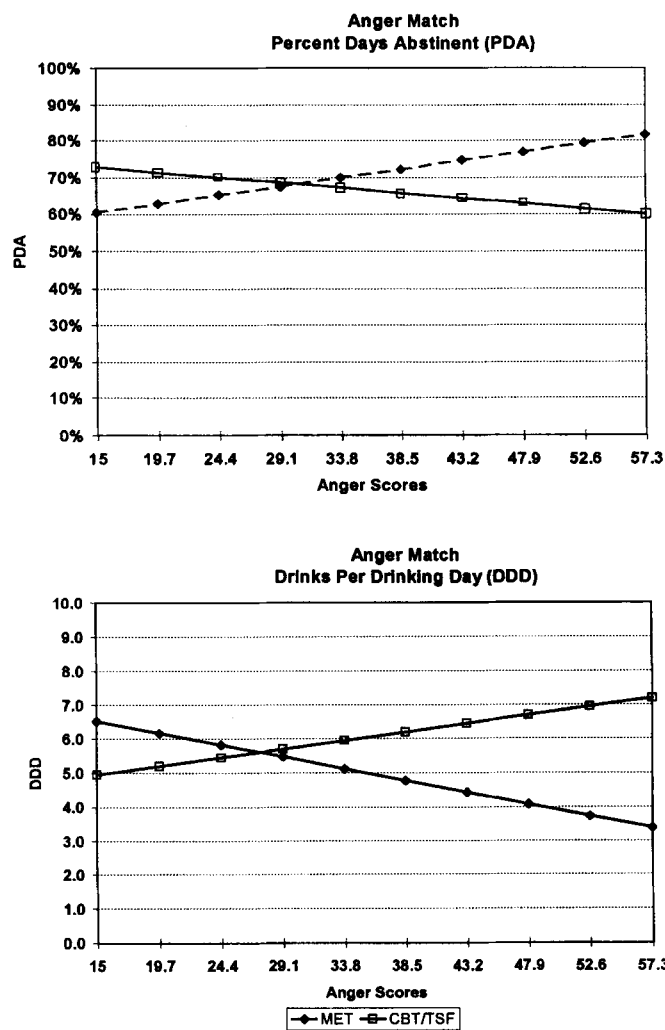


Fig. 2. Interactions of client anger with the MET and combination of CBT and TSF treatments. PDA outcomes (top) and DDD outcomes (bottom) as a function of state-trait anger scores.

whereas the average PDA for the other two treatments (CBT and TSF) was 66.3. In the lower third of the anger variable, CBT and TSF clients reported more abstinence (PDA = 73.2) than MET clients (PDA = 62.4). The same pattern was found for the DDD measure: the DDD for those in the high anger tertile was 4.9 vs. 6.3, with MET clients having fewer DDD. In the low anger tertile, the DDD values were 6.3 vs. 5.1, favoring clients in CBT and TSF.

Prognostic Effects of Client Matching Attributes

The same analyses that were used to test for matching effects were also used to assess the main effects of the client matching attributes. Significant results of these tests are shown in Table 4. The motivation primary matching attribute and its companion secondary attribute, readiness to change, had main effects on both of the primary outcome variables and accounted for a larger percent of variance

Table 4. Main Effects for Significant Client Matching Attributes at 37 to 39 Months Follow-Up

Matching attribute	DV	p^*	η^2	Direction of effect†	Sample size
Alcohol Involvement	PDA	0.0001	1.88	+	754
	DDD	0.0001	1.37	-	754
Alcohol Dependence	PDA	0.0001	3.73	+	796
Meaning Seeking Religiosity Prior Engagement in AA	PDA	0.0106	0.77	+	776
	DDD	0.0012	1.34	-	764
	PDA	0.0144	0.73	+	747
Motivation	PDA	0.0001	3.82	+	806
	DDD	0.0001	2.51	-	806
Readiness to Change	PDA	0.0001	3.90	+	793
	DDD	0.0092	0.84	-	793
Self-Efficacy: Confidence Self-Efficacy: Temptation minus Confidence	DDD	0.0006	1.47	-	785
	DDD	0.0024	1.15	+	785
Social Functioning	PDA	0.0051	0.90	-	793
Type of Alcoholic	PDA	0.0016	1.13	+	800

Similar constructs are grouped together.

* p values are for two-tailed tests of the attribute main effects.

† A plus sign indicates a positive relationship between the matching attribute and the dependent variable (DV), and a minus indicates a negative relationship.

Table 5. Drinking Outcomes at 39 Months for the Total Sample and the Portion That Was Not Totally Abstinent

Variable	n	Mean	SD	Median	Range	Baseline median
Total sample						
PDA	806	69%	36%	86%	0-100%	28%
DDD	806	5.62	6.29	4.21	0-59.24	11.54
Excluding abstainers						
PDA	569	56%	35%	68%	0-99%	27%
DDD	569	7.96	6.11	6.24	0.36-59.24	10.88

The last column provides the median for each variable at intake into the study.

than any of the other attributes. Alcohol involvement also had a main effect on both outcome variables. Its companion secondary matching attribute, alcohol dependence, had a main effect on just PDA, accounting for a relatively large percent of variance. Seven other of the primary and secondary client matching attributes had main effects on just one of the outcome variables, and accounted for relatively modest amounts of variance. It should be noted that three measures of alcohol problem severity (alcohol involvement, alcohol dependence, and type of alcoholic), and social functioning, had effects such that those with more severe alcohol problems or poorer social functioning at intake had better outcomes at 3 years.

Although not used as a matching variable, the effect of baseline drinking on 3-year outcomes was also examined. With site, treatment assignment, and site by treatment assignment controlled there was a significant prediction of 3-year PDA from baseline PDA ($p \leq 0.0001$, effect size = 7.5%, $n = 806$). For DDD, there was not a statistically significant effect ($p \leq 0.0649$, effect size = 0.4%, $n = 806$). When all client matching attributes, both primary and secondary, were also added as covariates, baseline PDA was still predictive of 3-year PDA ($p \leq 0.0001$, effect size = 7.8%, $n = 542$) and DDD was now significant ($p \leq 0.0225$, effect size = 0.8%, $n = 542$).

Overall Outcomes

Of the 806 participants who were found and assessed, 237 (29.4%) reported complete abstinence during months 37 to 39. Table 5 provides descriptive statistics on PDA and DDD for the total sample and for the portion of the sample that was not totally abstinent. In terms of median PDA values, the *total* sample (including those who were abstinent) did not drink on 86% of the 90 days assessed, compared with 68% abstinent days among the subgroup that continued to drink. By comparison, the total sample at baseline had reported a median PDA of 28% of the 90 days prior to entry into the study. The median DDD for the total sample at 3 years was 4.21, compared with 6.24 for those who were currently drinking and to 11.54 for the total sample at baseline.

Treatment Differences

Identification of treatment differences is a complex matter, depending on which other variables are included in the analytic model. Under the simultaneous solution regression method that was used in all analyses, only the unique contribution of each variable in the set (i.e., treatment) is evaluated, by making all other variables covariates and

Table 6. Summary of Significant Matching Findings in the Outpatient* Sample

Matching attribute	Primary or secondary hypothesis	Significant contrast	Significant drinking outcomes	Follow-up intervals (months) with significant matching effect		
				1-3	4-15	37-39
Psychiatric Severity	Primary	CBT > TSF	PDA	No	Yes	No
Support for Drinking	Primary	TSF > MET	PDA, DDD	No	No	Yes
Anger	Secondary	MET > (CBT, TSF)	PDA, DDD	No	Yes	Yes

* Table includes only outpatient findings, because the aftercare sample was not assessed at 3 years.

asking whether there is a unique effect of treatment on outcome.

We began the search for treatment effects by first testing for differences among them when they were the *only* independent variable in the model. Then, this basic model was extended to include covariates: first, the baseline drinking variables were added, then site, and finally all primary and secondary matching attributes. An analysis was also conducted including the interaction between treatment and site as a covariate, because such an interaction had been found in the 4 to 15 month follow-up data.¹

Using the basic model, with just treatments, only one significant difference was found on the PDA variable ($p \leq 0.034$): TSF clients reported higher PDA than CBT clients. MET fell in the middle and was not different from either of the other two. This TSF-CBT difference was not found when the baseline drinking variables were entered as covariates. However, when site, treatment type, and site-by-treatment type were also included as covariates, significance was found for both outcomes (PDA, $p \leq 0.014$; DDD, $p \leq 0.016$), despite the fact that there were no significant site by treatment interactions in the 37 to 39 month data. Post-hoc tests indicate that TSF outcomes were superior to CBT (PDA, $p \leq 0.007$; DDD, $p \leq 0.004$), but TSF was not better than MET (for both outcomes, $p > 0.05$). In terms of raw data, the TSF-CBT difference amounts to an advantage of about 8% more days abstinent and about 1.2 fewer DDD.

Logistic regression analyses, with a dichotomous abstinence outcome variable that defined abstinence as no drinking at all during months 37 to 39, also indicated a treatment effect: TSF clients attained higher rates of abstinence than those in the other two treatments ($p \leq 0.007$). Among TSF clients, 36% were abstinent during months 37 to 39, compared with 24% of CBT clients and 27% of MET clients.

DISCUSSION

Matching Effects

Of the matching effects that had been observed in the outpatient arm of the trial at 1-year follow-up, one was sustained at 3 years, whereas another was not, and an additional effect emerged for the first time at the 3-year assessment. These findings are summarized in Table 6. The table includes only outpatient findings, because the after-

care sample was not assessed at 3 years. The third and fourth columns indicate which of the hypothesized contrasts between the treatments were supported and for which of the two primary outcome variables. The final columns of Table 6 indicate in which measurement intervals the significant effects were found.

Anger. The matching effect for client anger is the most consistent interaction effect confirmed in Project MATCH. This secondary a priori hypothesis predicted that MET would be particularly effective for clients entering treatment with high levels of anger. Motivational interviewing, the therapeutic style on which MET was based, was designed as a nonconfrontational approach for treating alcohol problems and includes specific strategies for defusing client resistance.^{42,43} Therefore, it was predicted that high-anger clients treated in MET would show greater improvement than those treated in the more directive CBT and TSF approaches.

Unlike any other observed matching effect, it was present at both the 1-year follow-up² and at 3 years, and both outcome measures were significant in the outpatient arm of the trial. This suggests that, throughout the 3-year follow-up, angrier outpatients fared better if they had been treated in MET than in the other two studied approaches, as had been predicted. For angry clients, a nonconfrontational focus on motivational issues may be less likely to provoke an angry response, thereby substantially improving outcome for them. The other two treatment approaches, without this element, are less effective for angry clients. Still unexplained is the finding that outpatients lower in anger reported less favorable outcomes in MET than in the other two treatments. For lower anger clients, MET derives no advantage from being nonconfrontational, and these clients may respond better to the more action-oriented CBT and TSF methods.

Social Support for Drinking. The support for drinking primary hypothesis predicted that clients whose social network was supportive of drinking would fare more poorly in MET than in either CBT or TSF. CBT teaches drink refusal and other skills for coping with networks unsupportive of abstinence. TSF attempts to involve clients in AA, which provides a ready-made social system for supporting abstinence. MET includes neither of these mechanisms for reducing vulnerability to a network supportive of drinking and, consequently, clients whose social networks support drinking were expected to fare relatively poorly with MET.

One of the two predicted contrasts involving social support for drinking was confirmed. Clients with greater support for drinking prior to treatment were more likely to have both high PDA and low DDD 3 years after treatment in TSF, as opposed to MET. Unlike TSF clients, however, CBT clients with high social support for drinking did not demonstrate the predicted advantage over MET clients.

Given the late emergence of the social support for drinking matching effect, 3 years after treatment, one might question whether it could plausibly be attributed to treatment. Several pieces of evidence lead us to conclude that the effect can indeed be attributed to treatment. First, the hypothesized matching effect was present for the first month during treatment: TSF clients with high support for drinking had more PDA and fewer DDD than comparable MET clients, although this initial effect faded by the second month of treatment.⁴⁴ Second, whereas the hypothesized matching effect was not significant for either primary dependent variable (PDA or DDD) during the first year following treatment, it was observed on two secondary outcome variables: time to first heavy drinking day and time to sustained (at least 3 days) heavy drinking.⁴⁵ Third, and most important, the causal chain⁶ that had been proposed as a test of the theory underlying this matching hypothesis was empirically supported: treatment in TSF led to higher AA attendance during the initial 15 months of the study than did MET, and AA participation was associated with better PDA and DDD outcomes. When AA attendance was partialled out, the significance level of the matching effect was reduced, indicating that AA participation was a partial mediator of the effect.⁴⁵ Given the combination of early evidence and support for the hypothesized causal chain, it seems fair to say that this matching effect, despite its late appearance, is credible.⁴⁵ What makes the matching effect statistically significant at months 37 to 39, but not earlier, is a greater decline in PDA (and concomitant increase in DDD) for MET clients who had high social support for drinking, than among the comparable TSF clients who maintained their levels of PDA and DDD. This effect is consistent with the rationale underlying the TSF vs. MET contrast of the support for drinking hypothesis, which anticipated that greater involvement in AA by TSF clients would provide a buffer against a social network that supports drinking.

Matching Findings Earlier in the Study That Were Not Supported at Year 3. The psychiatric severity matching hypothesis had a significant effect in the first year posttreatment, but no longer showed a matching effect after 3 years. Even in the first year, the effect was significant for only one (PDA) of the two primary outcome variables.¹ The failure to obtain a robust finding for the psychiatric severity client attribute may have been due to an excessively restricted range on this variable. Project MATCH did not include clients with acute, uncontrolled psychopathology or active suicidal ideation. In clinical practice, severe psychopathology is frequently a criterion for treatment matching among

alcoholics. Given the limitation on the range of this patient dimension in the present study, it would not be accurate to conclude that psychiatric severity does not play an important role in treatment matching.

One other hypothesized matching attribute, motivation (based on URICA scores), was not confirmed at the 4 to 15 month assessment, but a time effect was found, with a significant match in month 15 only.¹ This matching effect did not persist until the 37 to 39 month follow-up. As a result, the status of the motivation matching attribute is relatively weak.

The longevity of the significant matching effect found for alcohol dependence among aftercare clients in the first follow-up year could not be examined at 3 years because long-term outcome was not assessed in the aftercare sample.

Matching Effect in the Opposite Direction from Predictions. The typology client matching attribute had an effect ($p \leq 0.05$) that was not in the direction that had been hypothesized a priori. As such, it is not considered in detail herein, because our directional hypothesis was not confirmed. Nevertheless, it warrants further scrutiny, both in this dataset and in future investigations of matching attributes.

Prognostic Effects of Client Matching Attributes

Eleven of the 21 primary and secondary client matching attributes that were assessed at intake had prognostic significance for at least one of the outcome variables, regardless of the type of treatment received. The most consistent among them, motivation and its related client attribute readiness to change, had main effects on both outcome variables at year 1^{1,2} and again at year 3. To the extent that these two client variables assessed at intake indicate behavior that occurred *prior* to completing the assessments (e.g., the URICA scale item, "I am really working hard to change"), the association with outcome may reflect changes in the client that had already begun prior to entering treatment.

The two self-efficacy variables were predictive only of DDD outcome at year 3, whereas at year 1 they had been predictive of both outcomes. The positive findings for the self-efficacy variables are consistent with other reports,^{46,47} although no previous study has shown that self-efficacy predicted outcome this long after treatment.

Alcohol dependence and religiosity predicted the same outcome variable at 3 years as they had at 1 year: PDA for alcohol dependence and DDD for religiosity.

Participants with more severe alcohol problems (more alcohol involvement, greater dependence, and type B alcoholic) or poorer social functioning at intake had better outcomes at 3 years. It is possible that those with more severe difficulties at intake mobilized themselves more effectively for recovery.

The social support for drinking attribute had been a significant predictor of both outcome variables in year 1,

but did not predict either outcome at year 3. The attenuation of this linkage may be attributed, at least in part, to the success of clients with high network support for drinking who were treated in TSF, and were able to maintain favorable outcomes over the 3-year period.

Finally, it should be noted that most of the successful predictors are “state” variables (e.g., motivation, self-efficacy) that are thought to be changeable, thus holding out the hope that treatment focusing on them can change drinking behavior. Even though the amount of outcome variance accounted for by any one of the client attributes is small, to the extent that alcoholism is viewed as a multidimensional dysfunction, no single variable should be expected to account for a large proportion of the variance.

Overall Outcomes

A high rate of abstinence was noted within the first year posttreatment,¹ and this was sustained after two more years. Almost 30% of the outpatient sample was totally abstinent in months 37 to 39, comparable with abstinence rates reported in other long-term follow-up studies.^{10,48} Subjects who did report drinking were nevertheless abstinent two-thirds of the time, on average, in the 90 days prior to the 3-year interview, an improvement in abstinent days of about 150% over the 90-day baseline period. When drinking, they drank an average of between 6 and 7 drinks per occasion, down from nearly 11 at the time of their intake into the study, representing a considerable improvement over baseline. Although the design of this matching study focused on interactions and therefore did not include a no-treatment control group, it is unlikely that the drinking reductions reported herein, by more than 800 alcoholics, were solely the result of natural progression. If the reasons for these apparently successful outcomes can be identified, they would provide a basis for enhancing treatment effectiveness.

Treatment Differences

With respect to differences among the three treatment modalities, the slight advantage for TSF at the 1-year follow-up¹ was also identified 3 years after treatment; and, as noted in the earlier study, this advantage was strongest using the measure of total abstinence.

During the 3-month period assessed at 3-years follow-up, clients treated in TSF were more likely to attend at least one AA meeting, but there were no differences among the treatment groups in the total number of meetings attended. To the extent that there may have been an advantage for the TSF intervention at 3 years, it cannot be attributed to attending more AA meetings in the last 3 months. However, perhaps even infrequent AA attendance is helpful, and those who attended only a few meetings, or even one, during the last 3 months obtained some benefit. Alternatively, perhaps the TSF advantage was due to an experience prior to months 37 to 39, such as greater AA attendance

earlier in the follow-up period, or to the TSF treatment itself 3 years earlier.

A number of the a priori hypotheses had predicted an advantage for CBT with clients having certain characteristics, but none of them was supported. Several factors may have contributed to this. In the first place, most clients did not complete the 12 sessions offered in CBT. The average number of CBT sessions completed was eight. In the CBT manual, client dysfunctions such as interpersonal, family, and employment problems were addressed in “elective” sessions (8 through 12) and, as a result, certain important issues may never have been addressed with many CBT clients. Second, to maintain the distinctiveness of the three treatments, little emphasis was placed on motivational issues in CBT. Finally, for the same reason, involvement in AA was not encouraged among CBT clients, even among those whose social environments were not supportive of abstinence. In “real-world” clinical settings, CBT therapists usually encourage AA involvement. Thus, in Project MATCH, these limitations might conceivably have reduced the effectiveness of CBT.

Limitations of the Current Study

Project MATCH was designed to maximize internal validity without unduly sacrificing generalizability of the results. A great deal of effort was devoted to facilitating client compliance with the study protocol to obtain accurate and complete data on all subjects. This required that clients be assessed thoroughly, contacted if any treatment sessions were missed, and seen relatively frequently for intensive follow-ups.

At the same time, much emphasis was placed on facilitating therapist adherence to the study protocol to ensure that the active therapeutic ingredients of each treatment (CBT, TSF, or MET) were delivered in accordance with its manual. Consequently, therapists were intensively monitored and supervised throughout the treatment phase of the study.

Although not intentional, the above research-related activities might have inflated treatment outcomes. They may have inadvertently reduced the negative effects of mismatches, thereby contributing to the relatively weak matching findings.

Directions for Future Research

The present findings do not rule out the possibility of discovering other client treatment matching effects that may be clinically meaningful. Such matching studies might involve therapies not used in Project MATCH, such as family therapy, group therapy, or a combination of elements from the MATCH therapies, such as support for AA involvement (TSF) and enhancing self-efficacy (MET). Other studies might entail combining elements of psychotherapies, such as coping skills therapy or motivational counseling, with medications found to be effective with

alcohol clients, such as naltrexone or acamprosate. Consideration should also be given to designing matching studies for client populations excluded from Project MATCH, such as those with comorbid drug dependence (other than cannabis), many of whom are currently seen in typical substance abuse treatment settings.

Future work may also consider examining higher order matching hypotheses, to move the alcoholism field further along in understanding client treatment matching. At the present time, matching theory may be too "simplistic" or "underspecified."² A more complete theory of matching may entail specifying the circumstances and conditions under which matching effects might be expected to appear. For example, the matching findings on support for drinking might have been more robust if variables such as motivational readiness and self-efficacy had been included in the a priori hypothesis. It is conceivable that clients with a profile of high self-efficacy, high motivational readiness for change, and high social support for drinking would benefit most from CBT, whereas those clients with low self-efficacy, low motivational readiness for change, and high social support for drinking would benefit most from TSF. Although beyond the scope of this study, additional analyses of the Project MATCH dataset will explore some of these possibilities, and future research may be needed to test interactions between a variety of client profiles and different treatments to help improve services for alcohol clients.

Summary

The matching effect involving client anger that had been observed during the 4 to 15 month period was found again at the 37 to 39 month follow-up and, as such, is the most consistent matching finding in this trial. In addition, a social support for drinking matching effect emerged for the first time at 3 years. However, given the number of matching hypotheses tested in this trial, the number of successful matches that were found was small, and those that were supported will require replication and further study before they can be recommended for general clinical application.

Of the 21 client attributes used in testing the matching hypotheses, 11 had prognostic value at 3 years. Readiness-to-change and self-efficacy emerged as the strongest predictors of long-term drinking outcome.

Overall, the benefits of the three Project MATCH treatments that had been observed at year 1 posttreatment were sustained at 3 years. TSF continued to show a possible slight advantage, especially when total abstinence was the outcome measure.

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REFERENCES

1. Project MATCH Research Group: Matching alcoholism treatments to client heterogeneity: Project MATCH posttreatment drinking outcomes. *J Stud Alcohol* 58:7-29, 1997
2. Project MATCH Research Group: Project MATCH secondary a priori hypotheses. *Addiction* 92:1671-1698, 1997
3. Project Match Research Group: Project MATCH: Rationale and methods for a multisite clinical trial matching patients to alcoholism treatment. *Alcohol Clin Exp Res* 17:1130-1145, 1993
4. Donovan DM, Kadden RM, DiClemente CC, Carroll KM, Longabaugh R, Zweben A, Rychtarik R: Issues in the selection and development of therapies in alcoholism treatment matching research, in Donovan DM, Mattson ME (eds): *Alcoholism Treatment Matching Research: Methodological and Clinical Approaches*. *J Stud Alcohol Monogr* 12(Suppl.):138-148, 1994
5. Carroll KM, Kadden RM, Donovan DM, Zweben A, Rounsaville BJ: Implementing treatment and protecting the validity of the independent variable in treatment matching studies. *J Stud Alcohol* 12(Suppl.): 149-155, 1994
6. Longabaugh R, Wirtz PW: Project MATCH: A Priori Matching Hypotheses, Results and Mediating Mechanisms, vol 8. Project MATCH Monograph Series. Rockville, MD, National Institute on Alcohol Abuse and Alcoholism (in press)
7. Edwards G, Brown D, Oppenheimer E, Sheehan M, Taylor C, Duckitt A: Long-term outcome for patients with drinking problems: The search for predictors. *Br J Addict* 83:917-927, 1988
8. Finney JW, Moos RH: The long-term course of treated alcoholism. II. Predictors and correlates of 10-year functioning and mortality. *J Stud Alcohol* 53:142-153, 1992
9. Öjehagen A, Skjaeris A, Berglund M: Prediction of posttreatment drinking outcome in a 2-year outpatient alcoholic treatment program. A follow-up study. *Alcohol Clin Exp Res* 12:46-51, 1988
10. Polich JM, Armor DJ, Braiker HB: Patterns of alcoholism over four years. *J Stud Alcohol* 41:397-416, 1980
11. Spitzer RL, Williams JBW: Structured Clinical Interview for DSM-III-R, Patient Version. New York, Biometric Research Department, New York State Psychiatric Institute, 1985
12. Blouin AG, Perez ELL, Blouin JH: Computerized administration of the Diagnostic Interview Schedule. *J Psychiatr Res* 23:335-344, 1988
13. McLellan AT, Luborsky L, Woody GE, O'Brien CP: An improved diagnostic evaluation instrument for substance abuse patients: The Addiction Severity Index. *J Nerv Ment Dis* 168:26-33, 1980
14. Tonigan JS, Miller WR, Brown JM: The reliability of Form 90: An instrument for assessing alcohol treatment outcome. *J Stud Alcohol* 58: 358-364, 1997
15. Connors GJ, Allen JP, Cooney NL, DiClemente CC, Tonigan JS, Anton RF: Assessment issues and strategies in alcoholism treatment matching research, in Donovan DM, Mattson ME (eds): *Alcoholism Treatment Matching Research: Methodological and Clinical Approaches*. *J Stud Alcohol Monogr* 12(Suppl.):92-100, 1994
16. Miller WR, Tonigan JS, Longabaugh R: The Drinker Inventory of Consequences (DrInC). An Instrument for Assessing Adverse Consequences of Alcohol Abuse, vol 4. Project MATCH Monograph Series. Rockville, MD, National Institute on Alcohol Abuse and Alcoholism, 1995
17. Tonigan JS, Connors GJ, Miller WR: The Alcoholics Anonymous Involvement (AAI) scale: Reliability and norms. *Psychol Addict Behav* 10:75-80, 1996

18. DiClemente CC, Carbonari J, Montgomery R, Hughes S: The Alcohol Abstinence Self-Efficacy Scale. *J Stud Alcohol* 55:141-148, 1994
19. Feragne MA, Longabaugh R, Stevenson JF: The Psychosocial Functioning Inventory. *Eval Health Prof* 6:25-48, 1983
20. Rice C, Longabaugh R: Measuring general social support in alcoholic patients: Short forms for perceived social support. *Psychol Addict Behav* 10:104-114, 1996
21. DiClemente CC, Hughes SO: Stages of change profiles in outpatient alcoholism treatment. *J Subst Abuse* 2:217-235, 1990
22. Stout RL, Wirtz PW, Carbonari JP, Del Boca FK: Ensuring balanced distribution of prognostic factors in treatment outcome research, in Donovan DM, Mattson ME (eds): *Alcoholism Treatment Matching Research: Methodological and Clinical Approaches*. *J Stud Alcohol Monogr* 12(Suppl.):70-75, 1994
23. Kadden RM, Carroll K, Donovan D, Cooney N, Monti P, Abrams D, Litt M, Hester R: *Cognitive-Behavioral Coping Skills Therapy Manual: A Clinical Research Guide for Therapists Treating Individuals with Alcohol Abuse and Dependence*, vol 3. Project MATCH Monograph Series. Rockville, MD, National Institute on Alcohol Abuse and Alcoholism, 1992
24. Miller WR, Zweben A, DiClemente CC, Rychtarik RG: *Motivational Enhancement Therapy Manual: A Clinical Research Guide for Therapists Treating Individuals with Alcohol Abuse and Dependence*, vol 2. Project MATCH Monograph Series. Rockville, MD, National Institute on Alcohol Abuse and Alcoholism, 1992
25. Nowinski J, Baker S, Carroll K: *Twelve Step Facilitation Therapy Manual: A Clinical Research Guide for Therapists Treating Individuals with Alcohol Abuse and Dependence*, vol 1. Project MATCH Monograph Series. Rockville, MD, National Institute on Alcohol Abuse and Alcoholism, 1992
26. Carroll K, Connors G, Cooney N, DiClemente C, Donovan D, Kadden R, Longabaugh R, Rounsaville B, Wirtz P, Zweben A: Internal validity of Project MATCH treatments: Discriminability and integrity. *J Consult Clin Psychol* 66:290-303, 1998
27. Wanberg KW, Horn JL, Foster FM: A differential assessment model for alcoholism: The scales of the alcohol use inventory. *J Stud Alcohol* 38:512-543, 1977
28. Shipley WC: A self-administering scale for measuring intellectual impairment and deterioration. *J Psychol* 9:371-377, 1940
29. Reitan RM: Validity of the Trail Making Test as an indicator of organic brain damage. *Percept Mot Skills* 8:271-276, 1958
30. Smith A: *Symbol Digit Modalities Test*. Los Angeles, Western Psychological Services, 1973
31. Hunt DE, Butler LF, Noy JE, Rosser ME: Assessing conceptual level by the paragraph completion method. Toronto, Ontario Institute For Studies In Education, 1978
32. Crumbaugh JC, Maholik LT: *Purpose in Life Scale*. Murfreesboro, TN, Psychometric Affiliates, 1976
33. Crumbaugh JC: The Seeking of Noetic Goals Test (SONG): A complementary scale to the Purpose of Life Test (PLT). *J Clin Psychol* 33:900-907, 1977
34. Gough HG: *California Psychological Inventory Manual*. Palo Alto, CA, Consulting Psychologists Press, 1975
35. Clifford PR, Longabaugh R: *Manual for the Administration of the Important People and Activities Instrument* (available from Richard Longabaugh, Brown University, Center for Alcohol and Addictions Studies, 800 Butler Drive, Providence, RI 02906). Providence, Center for Alcohol and Addictions Studies, 1991
36. Babor TF: Reliability of the Ethanol Dependence Syndrome Scale. *Psychol Addict Behav* 10:97-103, 1996
37. Spielberger CD: *Manual for the State-Trait Anger Expression Scale (STAX)*. Odessa, FL, Psychological Assessment Resources, Inc., 1988
38. Spielberger CD, Jacobs G, Russel S, Crane RS: Assessment of anger: The State-Trait Anger Scale, in Butcher JN, Spielberger CD (eds): *Advances in Personality Assessment*, vol 2. Hillsdale, NJ, Lawrence Erlbaum Associates, 1983, pp 161-189
39. Hirschfeld RM, Klerman GL, Gough HG, Barrett J, Korchin SJ, Chodoff P: A measure of interpersonal dependency. *J Pers Assess* 41:610-618, 1977
40. Connors GJ, Tonigan JS, Miller WR: A measure of religious background and behavior for use in behavior change research. *Psychol Addict Behav* 10:90-96, 1996
41. Miller WR, Tonigan JS: Assessing drinkers' motivation for change: The stages of change readiness and treatment eagerness scale (SOCRATES). *Psychol Addict Behav* 10:81-89, 1996
42. Miller WR: Motivational interviewing with problem drinkers. *Behav Psychother* 11:147-172, 1983
43. Miller WR, Rollnick S: *Motivational Interviewing: Preparing People to Change Addictive Behavior*. New York, Guilford Press, 1991
44. Project MATCH Research Group: Matching alcoholism treatments to client heterogeneity: Treatment main effects and matching effects on drinking during treatment. *J Stud Alcohol* (in press), 1998
45. Longabaugh R, Wirtz PW, Zweben A, Stout RL: Network support for drinking, Alcoholics Anonymous and long-term matching effects. *Addiction* (in press)
46. Brown SA, Vik PW, Patterson TL, Grant I, Schuckit MA: Stress, vulnerability, and adult alcohol relapse. *J Stud Alcohol* 56:538-545, 1995
47. Miller WR, Westerberg VS, Harris RJ, Tonigan JS: What predicts relapse? Prospective testing of antecedent models. *Addiction* 91(Suppl.): S155-S172, 1996
48. Taylor C, Brown D, Duckitt A, Edwards G, Oppenheimer E, Sheehan M: Patterns of outcome: Drinking histories over ten years among a group of alcoholics. *Br J Addict* 80:45-50, 1985