Matching Alcoholism Treatments to Client Heterogeneity: Project MATCH Posttreatment Drinking Outcomes

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ABSTRACT. *Objective:* To assess the benefits of matching alcohol dependent clients to three different treatments with reference to a variety of client attributes. *Method:* Two parallel but independent randomized clinical trials were conducted, one with alcohol dependent clients receiving outpatient therapy ($N = 952$; 72% male) and one with clients receiving aftercare therapy following inpatient or day hospital treatment ($N = 774$; 80% male). Clients were randomly assigned to one of three 12-week, manual-guided, individually delivered treatments: Cognitive Behavioral Coping Skills Therapy, Motivational Enhancement Therapy or Twelve-Step Facilitation Therapy. Clients were then monitored over a 1-year posttreatment period. Individual differences in response to treatment were modeled as a latent growth process and evaluated for 10 primary matching variables and 16 contrasts specified a priori. The primary outcome measures were percent days abstinent and drinks per drinking day during the 1-year posttreatment period. *Results:* Clients attended on average two-thirds of treatment sessions offered, indicating that substantial amounts of treatment were delivered, and research follow-up rates exceeded 90% of living subjects interviewed at the 1-year posttreatment assessment. Significant and sustained improvements in drinking outcomes were achieved from baseline to 1-year posttreatment by the clients assigned to each of these well-defined and individually delivered psychosocial treatments. There was little difference in outcomes by type of treatment. Only one attribute, psychiatric severity, demonstrated a significant attribute by treatment interaction: In the outpatient study, clients low in psychiatric severity had more abstinent days after 12-step facilitation treatment than after cognitive behavioral therapy. Neither treatment was clearly superior for clients with higher levels of psychiatric severity. Two other attributes showed time-dependent matching effects: motivation among outpatients and meaning-seeking among aftercare clients. Client attributes of motivational readiness, network support for drinking, alcohol involvement, gender, psychiatric severity and sociopathy were prognostic of drinking outcomes over time. *Conclusions:* The findings suggest that psychiatric severity should be considered when assigning clients to outpatient therapies. The lack of other robust matching effects suggests that, aside from psychiatric severity, providers need not take these client characteristics into account when triaging clients to one or the other of these three individually delivered treatment approaches, despite their different treatment philosophies. (*J. Stud. Alcohol* **58:** 7-29, 1997)

A FTER AN EXTENSIVE review of alcoholism outcome research, the Institute of Medicine (1990) concluded that it may no longer be appropriate to ask whether alcoholism treatment works or which treatment works best. Reflecting current views in the field, the report instead suggested that the more important question is, "Which kinds of individuals, with what kinds of alcohol problems, are likely to respond to what kinds of treatments by achieving which kinds of goals when delivered by which kinds of practitioners?" (Institute of Medicine, 1990, p. 143). The "matching hypothesis" underlying this question assumes that prescribing specific treatments based on individual characteristics and needs would improve treatment outcomes compared to simply offering the same treatment to all individuals with a similar diagnosis (Donovan and Mattson, 1994). The

potential benefits of treatment matching include enhancement of treatment effectiveness, increases in cost effectiveness, better utilization of resources, and avoidance of therapeutic mismatches that could contribute to lack of response to treatment or dropout from treatment (Finney and Moos, 1986; Institute of Medicine, 1990; Lindstrom, 1992; Mattson and Allen, 1991; Miller, 1989).

The "matching hypothesis," which states that clients who are appropriately matched to treatments will show better outcomes than those who are unmatched or mismatched, is not novel to medicine, behavioral science (Beutler, 1979; Dance and Neufeld, 1988; Keisler, 1966) or alcoholism treatment (Bowman and Jellinek, 1941). The results of more than 30 previous alcoholism treatment matching studies and the potential for more effectively and efficiently applied treatment interventions have made treatment matching an exciting clinical research interest. Empirical research to date (Longabaugh et al., 1994; Mattson et al., 1994), however, indicates only that matching is a promising, but not yet fully realized, strategy for increasing alcoholism treatment effectiveness. In 1989 the National Institute on Alcohol Abuse and Alcoholism (NIAAA) initiated a national, multisite, randomized clinical trial of alcoholism treatment matching entitled Matching Alcoholism Treatments to Client Heterogeneity (Project MATCH). The study was designed to address many of the limitations of prior matching studies, particularly in the

area of statistical power, and to provide a rigorous test of the most promising matching hypotheses.

Project MATCH consisted of two parallel but independent treatment matching studies, one with clients recruited at five outpatient sites, the other at five sites with clients who received aftercare treatment following an episode of inpatient or intensive day hospital treatment. Use of two parallel studies provided a basis for simultaneous replication and allowed an evaluation of the matching hypotheses in two major settings where ambulatory treatment is often delivered: outpatient clinics and as a follow-up to residential care. The overall objective of each study was to determine if various subgroups of alcohol dependent clients would respond differently to three manual-guided, individually delivered treatments: Cognitive Behavioral Coping Skills Therapy (CBT) (Kadden et al., 1992), Motivational Enhancement Therapy (MET) (Miller et al., 1992), and Twelve-Step Facilitation Therapy (TSF) (Nowinski et al., 1992). Since theoretically derived matching hypotheses were considered more likely to be supported than those generated through other strategies (Finney and Moos, 1986, 1989; Longabaugh, 1986), client matching variables and the specific primary hypotheses were based on theoretical considerations and prior empirical findings. An extensive review of matching studies (Mattson et al., 1994) was used to develop the a priori primary matching hypotheses. Ten client characteristics were selected as matching variables: (1) *severity of alcohol involvement* (Edwards and Lader, 1994; Orford et al., 1976); (2) *cognitive impairment* (Cooney et al., 1991; Donovan et al., 1987; Kadden et al., 1989); (3) *client conceptual level* (McLachlan, 1972, 1974); (4) *gender* (Cronkite and Moos, 1984; Lyons et al., 1982); (5) *meaning seeking* (Brown, 1993; Fowler, 1993; Glaser, 1993; Pishkin and Frederick, 1973; Propst, 1980); (6) *motivational readiness to change* (DiClemente and Hughes, 1990; DiClemente et al., 1991; Heather et al., 1993; Marlatt et al., 1988); (7) *psychiatric severity* (Kadden et al., 1989; McLellan et al., 1983a,b); (8) *social support for drinking versus abstinence* (Longabaugh et al., 1993, 1995); (9) *sociopathy* (Cooney et al., 1991; Kadden et al., 1989); and (10) *typology* (Litt et al., 1992).[1]

Specific measures for assessing each of the ten primary matching variables were chosen, and anticipated interactions with each of the three selected treatments were specified in hypothesized contrasts. Table 1 identifies the specific measure used for each of the 10 client characteristics and summarizes the 16 hypothesized contrasts involving the 10 client characteristics. For example, it was predicted that the higher the level of alcohol involvement, the better the outcomes for clients in both CBT and TSF compared with those in MET, since both CBT and TSF were more comprehensive and intensive than the MET intervention. Clients who had greater psychiatric severity were expected to have better outcomes in CBT compared to those in either TSF or MET, since CBT taught skills for coping with social and emotional cues to drink. For the motivation hypothesis, lower levels of readiness to change were predicted to be associated with better outcomes for clients in MET, a motivation enhancement intervention, when contrasted with clients in CBT, a skills-based intervention. Across hypotheses, each treatment was assumed to have matching potential for specific client characteristics. Cognitive behavioral therapy was hypothesized to be especially effective for clients with higher alcohol involvement, cognitive impairment, psychiatric severity, sociopathy and support for drinking, as well as for women and Type B[2] alcoholics. Twelve-step facilitation was hypothesized to be especially effective for clients with greater alcohol involvement, cognitive impairment, meaning seeking, sociopathy and support for drinking, and for Type B alcoholics. Motivational enhancement therapy was hypothesized to be more effective for clients with high conceptual levels and low readiness to change.

Hypothesis teams determined the specific contrasts to be tested, whether to include in the hypothesis only two or all three treatments, and whether to hypothesize more than one contrast per attribute.[3] The selected contrasts were tested with two primary dependent outcome measures: percent days abstinent (PDA) and average number of drinks per drinking day (DDD). This report presents the results of tests of the primary matching hypotheses on these drinking outcomes, along with analyses of main effects for treatment type, client matching attribute and site differences during the year following completion of the 12-week treatment period.

Method

Subjects

Although Project MATCH consisted of two independent arms of investigation, referred to as the "outpatient" and "aftercare" studies, every effort was made to keep them as similar as possible. In the outpatient arm, subjects were recruited directly from the community or from outpatient treatment centers. In the aftercare arm, the treatments were offered to subjects following completion of inpatient or intensive day hospital treatment. The outpatient and aftercare arms of the trial involved identical randomization procedures, assessment instruments, treatment procedures, follow-up evaluations, matching hypotheses and analytic techniques.

Subjects were recruited at nine clinical research units (CRUs) that were affiliated with multiple treatment facilities. The five outpatient CRUs were located in Albuquerque, NM, Buffalo, NY, Farmington, CT, Milwaukee, WI,[4] and West Haven, CT. The aftercare CRUs were located in Charleston, SC, Houston, TX, Milwaukee, WI, Providence, RI, and Seattle, WA. The sites reflect geographic as well as client heterogeneity. Outpatient sites recruited subjects from outpatient clinics and directly from the community through advertisements. Aftercare sites included subjects who had been treated in private, public and Department of Veterans Affairs (VA) facilities.

TABLE 1. Summary of hypothesized contrasts for each primary matching variable

Client attribute	Measured by	Hypothesized effects[a]
Alcohol involvement	Alcohol Use Inventory (Wanberg et al., 1977)	[CBT,TSF] slope > MET slope[b]
Cognitive impairment	Shipley Institute of Living Scale: Trails A and B (Shipley, 1940); Symbol-Digit Modalities (Smith, 1973)	TSF slope > CBT slope[c] CBT slope > MET slope TSF slope > MET slope
Conceptual level	Paragraph Completion Method (Hunt et al., 1978)	MET slope > TSF slope
Gender	Self-report	Female (CBT mean–TSF mean) > male (CBT mean–TSF mean)
Meaning seeking	Purpose in Life Scale (Crumbaugh and Maholik, 1976); Seeking of Noetic Goals test (Crumbaugh, 1977)	TSF slope > [MET,CBT] slope[b]
Motivation	Subset of URICA (DiClemente and Hughes, 1990)	CBT slope > MET slope
Psychiatric severity	Addiction Severity Index: Psych. Severity composite score (McLellan et al., 1980)	CBT slope > MET slope CBT slope > TSF slope
Sociopathy	California Psychological Inventory-Socialization Scale (Gough, 1975)	CBT slope > MET slope[c] CBT slope > TSF slope TSF slope > MET slope
Support for drinking	Important People and Activities Instrument (Clifford and Longabaugh, 1991)	CBT slope > MET slope[c] TSF slope > MET slope
Typology	Composite index[d]	Type B ([CBT,TSF] mean – MET mean) > Type A ([CBT,TSF] mean – MET mean)[b]

[a]The hypothesized contrasts predict differences in slopes of the regression lines for each treatment on outcome as a function of client attribute. With the exception of the gender and typology attributes (which take on only discrete values), all contrasts take the form: The difference between the first treatment and the second becomes more positive (or less negative) with increasing values on the attribute. The gender and typology attributes take the form: The difference in means between the treatments is greater at one level of the attribute than at the other. Hypotheses did not test whether interactions were ordinal or disordinal.

[b]The rationale underlying the alcohol involvement, meaning seeking and typology hypotheses assumes that, pertinent to the putative active ingredients involved in the hypothesized matching effect, two treatments are not different in their effect. Therefore, they were combined into a single condition which was then contrasted with the third treatment.

[c]Cognitive impairment and sociopathy each involved three hypothesized treatment contrasts. Therefore, the Bonferroni family wide correction was applied to divide the alpha level by 3 for each of these attributes. Support for drinking and psychiatric severity each involved two hypothesized contrasts; thus each of these contrasts involved dividing the alpha level by 2. All other attributes involved single contrasts.

[d]The composite typology index is derived from several instruments and sources. For the purposes of Project MATCH, a five-variable index was composed of: percent of first degree relatives positive for alcohol dependence taken from the Addiction Severity Index (McLellan et al., 1992); MacAndrew scale from the MMPI (MacAndrew, 1965); the total score from the Ethanol Dependence Syndrome scale (Babor, 1996); Physical effects of drinking score from the DrInC (Miller et al., 1995); and ASP symptoms taken from the Computerized Diagnostic Interview Schedule (CDIS) (Robins et al., 1989). Subjects who scored above the established medians on three of these five scales were classed as Type B alcoholics (high vulnerability, high severity).

Inclusion/exclusion criteria. Inclusion criteria for the outpatient study were: current DSM-III-R diagnosis of alcohol abuse or dependence; alcohol as the principal drug of abuse; active drinking during the 3 months prior to entrance into the study; minimum age of 18; and minimum sixth grade reading level. Exclusion criteria were: a DSM-III-R diagnosis of current dependence on sedative/hypnotic drugs, stimulants, cocaine or opiates; any intravenous drug use in the prior 6 months; currently a danger to self or others; probation/parole requirements that might interfere with protocol participation; lack of clear prospects for residential stability; inability to identify at least one "locator" person to assist in tracking for follow-up assessments; acute psychosis; severe organic impairment;

or involvement (current or planned) in alternative treatment for alcohol-related problems other than that provided by Project MATCH (defined as more than 6 hours of nonstudy treatment, except for self-help groups such as Alcoholics Anonymous [AA], during the 3 months of study treatment).

Criteria for the aftercare arm were identical, with the following modifications: DSM-III-R symptoms of alcohol abuse or dependence and requisite drinking behavior were assessed for the 3 months prior to the inpatient or day hospital admission; completion of a program of at least 7 days of inpatient or intensive day hospital treatment (not simply detoxification); and referral for aftercare treatment by the inpatient or day hospital treatment staff.

Other general admission requirements for all subjects were: willingness to accept randomization to any of the treatment conditions; residence within reasonable commuting distance, with available transportation to sessions; and completion of prior detoxification when medically indicated.

Subject characteristics. Table 2 describes the characteristics of the 952 outpatients (72% male) and 774 aftercare (80% male) clients recruited. Three of the five aftercare sites were VA medical centers, which restricted recruitment of women in that arm of the study. In general, subjects recruited into the two study arms differed in predictable ways: the outpatient sample tended to be significantly younger, more residentially stable and less dependent on alcohol than the aftercare sample (Goodman et al., 1992; Timko et al., 1993). A smaller proportion of outpatients (45%) than aftercare clients (62%) reported prior alcoholism treatment. The overwhelming number of clients in each arm (95% in outpatient, 98% in aftercare) met the criteria for alcohol dependence as opposed to alcohol abuse, as assessed using the Structured Clinical Interview for DSM-III-R (Spitzer and Williams, 1985). Although individuals dependent on other drugs (except for marijuana) were excluded from the trial, there was a sizable minority of subjects who reported some types of illicit drug use in the 90 days prior to recruitment. In the outpatient arm about 44% ($n = 417$) of the clients reported some use of illicit drugs, with men (46%) reporting a higher rate of use than women (39%). In the aftercare arm about 32% ($n = 247$) of the clients reported pretreatment use of an illicit drug, with women (36%) reporting a higher rate than men (31%). However, frequency of use of other drugs was

low. For marijuana, the median days of use of marijuana was low (ranging from 1 day during the 90-day pretreatment period for aftercare women to 4 days for outpatient men).

Sample representativeness. In order to recruit a heterogeneous sample, a broad-based recruitment effort was undertaken in multiple sites at CRUs. An initial screening interview was conducted with 2,193 potential participants for the outpatient study and 2,288 for the aftercare study. Not included in these figures are clients who could be identified (for example, through chart review) as clearly ineligible (e.g., primary dependence on drugs other than alcohol) and not administered the screening interview. During the initial screening, 459 potential participants (49 in outpatient and 410 in aftercare) indicated that they were not interested in participating. The major reasons cited for not taking part were logistical: 45% mentioned the inconvenient location of the study or transportation problems, 21% indicated that too much time was required, 17% reported that they planned to relocate and 16% stated that they preferred some other treatment option not offered in Project MATCH. Of the remaining 2,144 potential outpatient participants and 1,878 potential aftercare participants, 952 (44%) were randomized in the outpatient arm and 774 (41%) were randomized in the aftercare arm. Primary reasons for ineligibility were: failure to complete the assessment battery; residential instability; legal or probation problems that prevented randomization to treatment or protocol compliance; comorbid diagnosis preempting alcoholism treatment; anticipation of concurrent therapy in excess of that permitted in Project MATCH; failure to meet DSM-III-R criteria for alcohol abuse or depen-

TABLE 2. Client personal and demographic information for outpatient and aftercare studies

Variable	Outpatient			Aftercare		
	Men	Women	Total	Men	Women	Total
Gender	688 (72%)	264 (28%)	952	619 (80%)	155 (20%)	774
Age (mean ± SD)	38.7 ± 10.5	39.3 ± 11.2	38.9 ± 10.7	42.0 ± 10.9	41.7 ± 12.1	41.9 ± 11.1
Ethnicity (%)						
White	81	78	80	80	83	80
Black	4	9	6	15	13	15
Hispanic	13	10	12	4	3	3
Other	2	3	2	1	1	1
Years of formal education (mean ± SD)	13.4 ± 2.2	13.6 ± 2.1	13.4 ± 2.2	13.1 ± 2.0	13.1 ± 2.2	13.1 ± 2.1
Relationship status (%)						
Couple	38	29	36	35	29	34
Single	62	71	64	65	71	66
Employment status (%)						
Employed	56	38	51	49	45	48
Not employed	44	62	49	51	55	52
Prior alcohol treatment (%)						
Yes	48	39	45	64	52	62
No	52	61	55	36	48	38
Alcohol dependence symptoms (mean ± SD)[a]	5.8 ± 1.9	5.6 ± 1.9	5.8 ± 1.9	6.9 ± 1.8	6.4 ± 2.0	6.8 ± 1.9
ASI psychiatric severity[b] (mean ± SD)	.18 ± .19	.22 ± .19	.19 ± .19	.21 ± .20	.31 ± .23	.23 ± .21

[a]Measured by the SCID for the 90-day period prior to enrollment; symptom counts range from 1 to 9.
[b]Composite score derived from the Addiction Severity Index; higher scores indicate higher levels of severity.

dence diagnosis; and inability to provide a "locator." A majority (67%) of the nonparticipants had multiple reasons cited for exclusion. All randomized participants are included in the analyses.

Although it is difficult to ascertain the representativeness of any sample of alcoholics seeking treatment, these data indicate that (1) most of the subjects who passed the initial screen but who were later excluded from participation were excluded appropriately because they did not satisfy the inclusion or exclusion criteria; and (2) among those found to be eligible for participation, refusals were attributable to logistical considerations rather than personal factors, such as motivation. It is unlikely that these logistical problems limited our ability to draw inferences about matching effects, nor is there reason to believe that the recruitment procedures failed to provide a broad range of clients typically seen in these types of clinical settings.

Procedure

Subjects were recruited over a 2-year period using a variety of strategies aimed at maximizing sample heterogeneity (Zweben et al., 1994). Following an initial screening interview to evaluate inclusion/exclusion criteria, subjects provided informed consent and participated in three intake sessions comprised of personal interviews, computer-assisted assessment and completion of self-administered questionnaires. As a quality assurance measure, all interviews were audiotaped. Blood and urine samples were also obtained at intake (in hospital settings, patients gave permission to access these data) and, where possible, an interview was conducted with an individual familiar with the subject's drinking (a collateral). For outpatient participants, the baseline assessment included a medical evaluation to determine the need for medically supervised detoxification. If such a need was indicated, clients were detoxified prior to randomization. Randomization to treatment was performed using a computerized urn balancing program designed to minimize differences on critical demographic and matching variables among subjects across the three study treatments in each arm (Project MATCH Research Group, 1993; Stout et al., 1994). In fact, there were no significant differences on dependent measures or matching variables by treatment condition at baseline assessment.

Following randomization, treatment lasted for 12 weeks. Therapy sessions were videotaped to assure quality delivery of treatment and to provide the data needed for a detailed investigation of treatment process (Carroll et al., 1994; DiClemente et al., 1994). Follow-up assessments were scheduled at 3 (end of treatment), 6, 9, 12 and 15 months after the first therapy session. The 3-, 9- and 15-month sessions were major evaluation points, involving the collection of blood and urine specimens, and collateral interviews. A more complete description of the trial protocol has been provided by the Project MATCH Research Group (1993).

Assessment instruments and procedures

Intake assessments. If an individual appeared to meet the inclusion criteria during the initial screening, a diagnostic evaluation interview was scheduled to explore eligibility criteria in greater detail. This session consisted of a brief demographic history; the alcohol, drug and psychotic screen sections of the Structured Clinical Interview for DSM-III-R (Spitzer and Williams, 1985); and the legal, psychiatric and family history sections of the Addiction Severity Index (McLellan et al., 1992). Subjects also completed a 60-minute battery of self-administered questionnaires.

A subsequent pretreatment evaluation session focused on drinking behavior and previous treatment experiences. Estimates of alcohol consumption were obtained by means of the Form 90 (Miller, 1996; Miller and Del Boca, 1994), an interview procedure combining calendar memory cues from time-line follow-back methodology (Sobell and Sobell, 1992) and drinking pattern estimation procedures from the Comprehensive Drinker Profile (Miller and Marlatt, 1984). In addition to estimating alcohol consumption for each of the previous 90 days, the Form 90 elicits information about drug use, treatment experiences, incarceration and involvement with AA. Also administered during this session were several neuropsychological measures of cognitive function and a second packet of self-report questionnaires.

The final assessment session, the psychological evaluation, consisted of social support measures and psychological assessments, including the Computerized Diagnostic Interview Schedule (C-DIS) (Robins et al., 1989), for purposes of identifying anxiety, mood and antisocial personality disorders.

On average the entire assessment battery, including self-report questionnaires, took about 8 hours to complete. A detailed listing of the measures included in the full battery has been provided by Connors et al. (1994). The measures associated with the primary matching variables are identified in Table 1.

Follow-up assessments. Each of the five follow-up assessment sessions included a core set of procedures and instruments. To facilitate data collection from collaterals and follow-up tracking, available information regarding the residences and telephone numbers of the client, collateral informants and potential "locators" was reviewed and updated. The follow-up version of the Form 90 was administered using the date of the last interview as a starting point. There were also telephone interview (Form 90-T) and quick follow-up interview (Form 90-Q) versions for uncooperative clients. If clients missed a follow-up session, they were assisted at the next session in reconstructing their alcohol consumption for the previous period. Continuous daily drinking estimates were produced for the entire 1-year posttreatment follow-up period. The Drinker Inventory of Consequences (DrInC) (Miller et al., 1995) also was administered at each of the five follow-up evaluations to assess problems associated with alcohol use. Other baseline assessment instruments were repeated at three major

assessment points (3, 9 and 15 months following entry into the study).

Collateral and biochemical measures. Collateral informants and laboratory tests were used to monitor changes in subjects' alcohol consumption and to corroborate self-report measures. Blood samples were analyzed to monitor liver enzymes (GGTP, SGOT, SGPT). Carbohydrate-deficient transferrin (CDT), a marker for heavy drinking, was assessed in the 15-month blood sample (Anton and Bean, 1994; Anton and Moak, 1994). Urine samples were screened for recent use of five psychoactive substances: opiates, cannabinoids, amphetamines, benzodiazepines and cocaine. CDT and urine specimens were assayed at a central laboratory (Clinical Neurobiology Laboratory, Medical University of South Carolina, Charleston).

Completeness and accuracy of data. For both arms of the study, data for over 90% of the subjects were collected for all five (at 3, 6, 9, 12 and 15 months) follow-up points. This figure includes subjects for whom data from an earlier time point were reconstructed at a later follow-up (the frequency of such reconstructions for any given assessment period ranged from 4-6% for outpatient participants and from 4-8% for aftercare participants). The Form 90-T (telephone) interview was used infrequently for follow-up data collection (the rates for the follow-ups at 3, 6, 9 and 15 months were, respectively, 3%, 8%, 6% and 7% for the outpatient study and 5%, 19%, 6% and 6% for the aftercare study). The Form 90-Q (quick) for uncooperative clients was also used rarely (<1% of the outpatient participants and <2% of the aftercare participants at any given follow-up point). At the 1-year posttreatment (15-month) evaluation session, 93% of the living aftercare clients and 92% of the living outpatient clients were interviewed. Client deaths during active treatment ($n = 3$) and follow-up ($n = 24$) phases of the trial totaled 1.6% of those randomized. Blood samples were obtained at 1-year posttreatment from 83% of the aftercare and 82% of the outpatient clients. Urine samples were provided by 85% of the clients in each arm of the study. Collateral informants were contacted at baseline and at 3, 9 and 15 months and interviewed using the collateral form of the Form 90. Contact rates for named collaterals at baseline were 87% and 83% in the aftercare and outpatient arms, respectively, and declined to 78% and 75% at the 1-year posttreatment evaluation. Techniques employed to assure data quality are described elsewhere (Project MATCH Research Group, 1993).

Reliability and validity of verbal report measures. Given the extent to which verbal report measures were relied upon for subject eligibility and for assessment of matching variables and treatment outcomes, special attention was given to the evaluation of reliability and validity of interviews and questionnaires employed in the trial. A comprehensive test-retest reliability study showed that measures derived from interviewer assessments were reliable for interviewers paired both across and within sites. In particular, the Form 90 primary outcome measures (PDA and DDD) were found to be consistent across test-retest interviews (Del Boca and Brown, 1996;

Tonigan et al., in press). Cross-site reliabilities, as indexed by the intraclass correlation of ratings of the same client by research assistants from different sites, were high.

Urine drug screens were highly consistent with self-reported drug use at baseline and follow-up. When discrepancies were observed, it was more likely that clients reported drug use when the urine screen was negative. Similarly clients tended to report more use of drugs and alcohol than did their collateral informants. Self-reports of drinking were also examined in relation to gamma glutamyl transpeptidase (GGTP) values at the 15-month assessment point. Clients were partitioned into two groups on the basis of GGTP values being normal or abnormal: 27% (30% of men, 20% of women) of outpatient clients and 32% (33% of men, 25% of women) of aftercare participants had GGTP values in the abnormal range at the 15-month follow-up point. GGTP Status (normal vs abnormal) X Gender ANOVAs were performed for the two primary drinking measures (PDA and DDD) summed over the 30-day period prior to blood draw. Statistically significant GGT main effects ($p < .05$) were obtained for both drinking variables in both arms of the trial, indicating that self-reported alcohol use was consistently higher for clients with abnormal GGT test results.[5] In a separate analysis 40% of the aftercare clients (45% of men and 25% of women) and 35% of the outpatients (42% of men, 18% of women) had abnormally high CDT levels indicative of heavy alcohol consumption. Clients who had CDT levels above the normal cut-off (>17u/l for men and > 25u/l for women) had higher self-reported drinking as indicated by lower PDA and higher DDD (p values < .01 for both dependent measures in both arms of the trial) for the month prior to the 15-month interview. Although gender differences need further exploration, the relationship of CDT to the self-report data confirms, in the aggregate, the validity of the verbally reported drinking. Taken together, the reliability and validity data indicate that a high degree of confidence can be placed in the accuracy of the verbal report data obtained in Project MATCH.

Treatments for matching

Three treatment modalities were chosen as potential matches for client characteristics: Cognitive Behavioral Coping Skills Therapy (CBT), Motivational Enhancement Therapy (MET) and Twelve-Step Facilitation (TSF) (Donovan et al., 1994). Treatments were selected based on potential for matching, evidence of clinical effectiveness, distinctiveness from other Project MATCH treatments, feasibility of implementation, and applicability within existing treatment systems. Although alcoholism treatment is often delivered in group format, design and methodological considerations led the research group to choose individually delivered treatments. All three treatments were delivered over a 12-week period: CBT and TSF both involved weekly treatment sessions, whereas MET consisted of four sessions, occurring during the first, second, sixth and twelfth weeks.

Treatments differed from one another in a number of ways (Donovan et al., 1994). CBT was based on social learning theory and viewed drinking behavior as functionally related to major problems in an individual's life, with emphasis placed on overcoming skills deficits and increasing the ability to cope with situations that commonly precipitate relapse. TSF was grounded in the concept of alcoholism as a spiritual and medical disease with stated objectives of fostering acceptance of the disease of alcoholism, developing a commitment to participate in AA and beginning to work through the 12 steps. It should be noted that the TSF intervention does not represent a test of AA as a treatment intervention, but is instead a treatment designed to promote the client's beginning to work on the 12 steps and foster active participation in traditional fellowship activities of AA. MET was based on principles of motivational psychology and focused on producing internally motivated change. This treatment was not designed to guide the client, step by step, through recovery, but instead employed motivational strategies to mobilize the individual's own resources. The therapy protocol for each modality is described in detailed therapy manuals (Kadden et al., 1992; Miller et al., 1992; Nowinski et al., 1992).

A training protocol and standards for therapist certification and monitoring were developed. Eighty therapists were certified to administer the three treatments in the trial. All sessions were videotaped and supervisors monitored 25% of all Project MATCH therapy sessions (over 2,500) to ensure therapist adherence to treatment manuals and to prevent therapist variation from the protocol (Project MATCH Research Group, 1993).

Treatment integrity. Evaluations of treatment integrity included treatment fidelity and discriminability, treatment dose, exposure to nonstudy treatments and level of therapist skillfulness (DiClemente et al., 1994). In both arms of the study: (1) study treatments were implemented as intended, with high discriminability among treatments based on videotape ratings of independent raters unaware of treatment assignment; (2) clients received substantial exposure to study treatments with high contrast in treatment exposure between subjects in MET versus CBT and TSF; (3) exposure to nonstudy treatments (excluding self-help groups) was minimal and comparable across treatment types; and (4) treatments were largely comparable with respect to nonspecific dimensions of the treatment, such as the working alliance and therapist skillfulness (see Carroll et al., submitted for publication).

Clinical management of subjects. Client progress during treatment was reviewed at therapist supervision meetings held weekly at each CRU. A clinical care review committee provided uniform guidance across the CRUs on decisions concerning clinical "deterioration" and removal of clients from the treatment protocols. Deterioration criteria included suicidal or homicidal risk, onset of significant cognitive impairment, deterioration of physical health and need for long-term hospitalization or other intensive treatment. Clients who deteriorated or were at serious risk despite Project MATCH treatments were referred for additional intervention

outside the Project MATCH protocol. This constituted 3.3% ($n = 57$) of the randomized sample, with no significant differences in the numbers affected across treatment conditions.

Retention and treatment compliance. Clients assigned to the three conditions completed 68% of their scheduled treatment sessions in the outpatient and 66% in the aftercare sites. Direct comparisons between treatments are difficult because the MET intervention consisted of fewer sessions over the 12-week period and TSF clients were encouraged to attend AA meetings in addition to the 12 individual treatment sessions. Analyses comparing the three treatments in terms of weeks in treatment (the number of weeks the client attended treatment) revealed that CBT clients attended therapy significantly longer (9.3 weeks) than their MET (8.4) and TSF (8.3) counterparts. However, this effect was observed only in the outpatient arm and the effect size was small, a difference of 1 week or less. In sum, clients received a substantial amount of the tested treatments and differences in dose or compliance between treatments were small, suggesting that treatments were delivered with sufficient intensity and comparability to test matching hypotheses.

Data analysis plan

Two primary dependent variables were chosen for analysis. Percent days abstinent (PDA) provided a measure of drinking frequency. Drinks per drinking day (DDD) constituted a measure of drinking severity (Babor et al., 1994). Drinking was summarized on a monthly basis; if a person was abstinent during a given month, his or her score for the variable DDD was zero.

Individual differences in response to alcohol treatment were modeled as a "latent growth process" (Bryk and Raudenbush, 1987). The rationale for the selection of this approach for Project MATCH is provided elsewhere (Carbonari et al., 1994). The PROC MIXED procedure of SAS was used for these analyses (SAS Institute, 1992). Each subject's growth curve is a polynomial function of time. Quadratic latent growth curves based on preliminary model fitting analyses were used. Each matching hypothesis was tested separately at a family-wise Type I error rate of 5%. If, for example, there were three hypotheses relating to a single matching variable, then those hypotheses were tested at a Bonferroni-corrected alpha level of .05/3. Because there were two dependent variables, the alpha level was further corrected by a factor of 2. A Bonferroni correction was employed within, but not across, hypothesis families because a correction across families would lead to an excessively conservative test and inflated Type II error rate.

Alcohol outcome variables such as PDA and DDD are prone to substantial departures from normality because of skewness and floor/ceiling effects. Preliminary analyses indicated that an arcsin transformation for PDA and a square root transformation for DDD improved the distribution of these variables. Subjects were excluded from the latent growth analyses if more than 4 of 12 months of their drinking outcome

data were missing. Missing drinking data caused 8.0% of aftercare subjects and 7.1% of outpatients to be dropped. A small number of additional subjects were excluded from some matching tests because of missing data on the matching variable being analyzed. Of the 1,596 subjects who had adequate outcome data to be included in the analyses, 6.8% had at least one missing monthly outcome point. In aggregate, however, there were only 100 missing monthly outcome points out of 8,544, or 1.2%. Ancillary analyses indicated that the primary analysis results were not sensitive to the missing data exclusion rule. This was not surprising since the rate of missing data was low.

Latent growth analysis incorporating an intent to treat approach that included all randomized clients was used to test each matching variable for an attribute by treatment interaction (ATI) and two time by attribute by treatment effects (linear and quadratic) for each of the two dependent variables (PDA and DDD). These analyses were adjusted using a set of covariates to control for extraneous effects.[6] The covariate adjustment reported here included the baseline level of the criterion drinking measure, terms for site main effects and site by treatment effects, terms for site by matching variable interactions, and interaction terms for both linear and quadratic time for each of these covariates. These covariates adjusted for any initial differences and for differences attributable to site.

There were three indicators of potential matching effects in the latent growth analyses. The attribute by treatment interaction (ATI) indicated whether there was an interaction in the hypothesized direction on average over the entire follow-up period (Months 4 to 15). A significant ATI effect provided evidence of a matching effect. There were also two indicators of whether the ATI changed significantly over the course of the posttreatment period: (1) an ATI by linear time (ATI × T1) effect, and (2) an ATI by quadratic time (ATI × T2) effect. Analyses involving these time effects were centered at the midpoint of the follow-up period and indicated whether the ATI was shifting in a linear (T1) or curvilinear (quadratic) fashion (T2). Since time contrasts were nondirectional, significant interactions related to time were tested on a month by month basis to determine how they were changing over time.

Results

Drinking from baseline to follow-up

There were substantial positive changes in PDA and DDD for both aftercare and outpatient subjects from baseline to each of the follow-up months as shown in Figure 1. These improvements were sustained during the follow-up period with only slight deterioration at 1-year posttreatment. Prior to entry into their inpatient or day hospital treatment, aftercare subjects were abstinent around 20% of the days per month. In the month immediately following Project MATCH

treatments they were abstinent more than 90% of the time and at Month 15 there was only a slight decrement in abstinence. Outpatient subjects averaged slightly more abstinent days per month at baseline, but were abstinent more than 80% of the days at posttreatment, with only a slight decrement at the 15-month follow-up.

Survival analysis was used to examine elapsed time to first drink and to first heavy-drinking period (3 consecutive days of heavy drinking defined as ≥6 drinks per day for men and ≥4 drinks per day for women) for subjects in both arms of the study (Figure 2). In the aftercare arm, approximately 35% of subjects reported continued complete abstinence throughout the 12 follow-up months; 65% slipped or relapsed during that period. Analyzing the time to three consecutive heavy-drinking days, which is a measure of regular drinking as opposed to a slip or lapse, 40% of aftercare clients reached that level of drinking during the follow-up period; 60% never had three consecutive heavy-drinking days. For the outpatient subjects, 19% maintained complete abstinence throughout the follow-up and approximately 46% had a heavy-drinking period of three consecutive days by the end of the follow-up period.

Main effects for type of treatment

Aftercare arm. In an analysis adjusted for only baseline drinking and site differences, no significant main effects of treatment were observed. Estimated means for drinking outcomes are shown in Figure 1. When the same analysis was further adjusted for the ten matching attributes to adjust for all matching effects (not reflected in Figure 1 means), a small but statistically significant treatment by time effect (linear $p < .001$) emerged: TSF clients showed slightly higher PDA outcomes (fewer drinking days) toward the end of follow-up. No difference was observed in drinking intensity (DDD). In light of the presence of CRU by treatment interactions and the unadjusted pattern shown in Figure 1, we conclude that there were no clinically significant outcome differences among these three aftercare treatments.

Outpatient arm. As reflected in Figure 1, an analysis with baseline drinking and site differences as covariates indicated no statistically significant between-treatment difference for PDA and DDD. When adjustments for matching attributes were added, there was a small but statistically significant treatment by linear time effect for both PDA ($p < .001$) and DDD ($p < .05$) outcomes. This reflected a tendency for CBT clients to have had a slightly higher rate of drinking days over time than the other two groups. However, in no single month was there a significant difference among groups. Again, in light of significant site by treatment interactions and the small absolute magnitude and shifting pattern of effects, we conclude that there were no consistent and clinically meaningful differences in efficacy of these three treatments.

Secondary outcome variables. While the a priori hypothesis tests all are based on the two primary dependent variables,
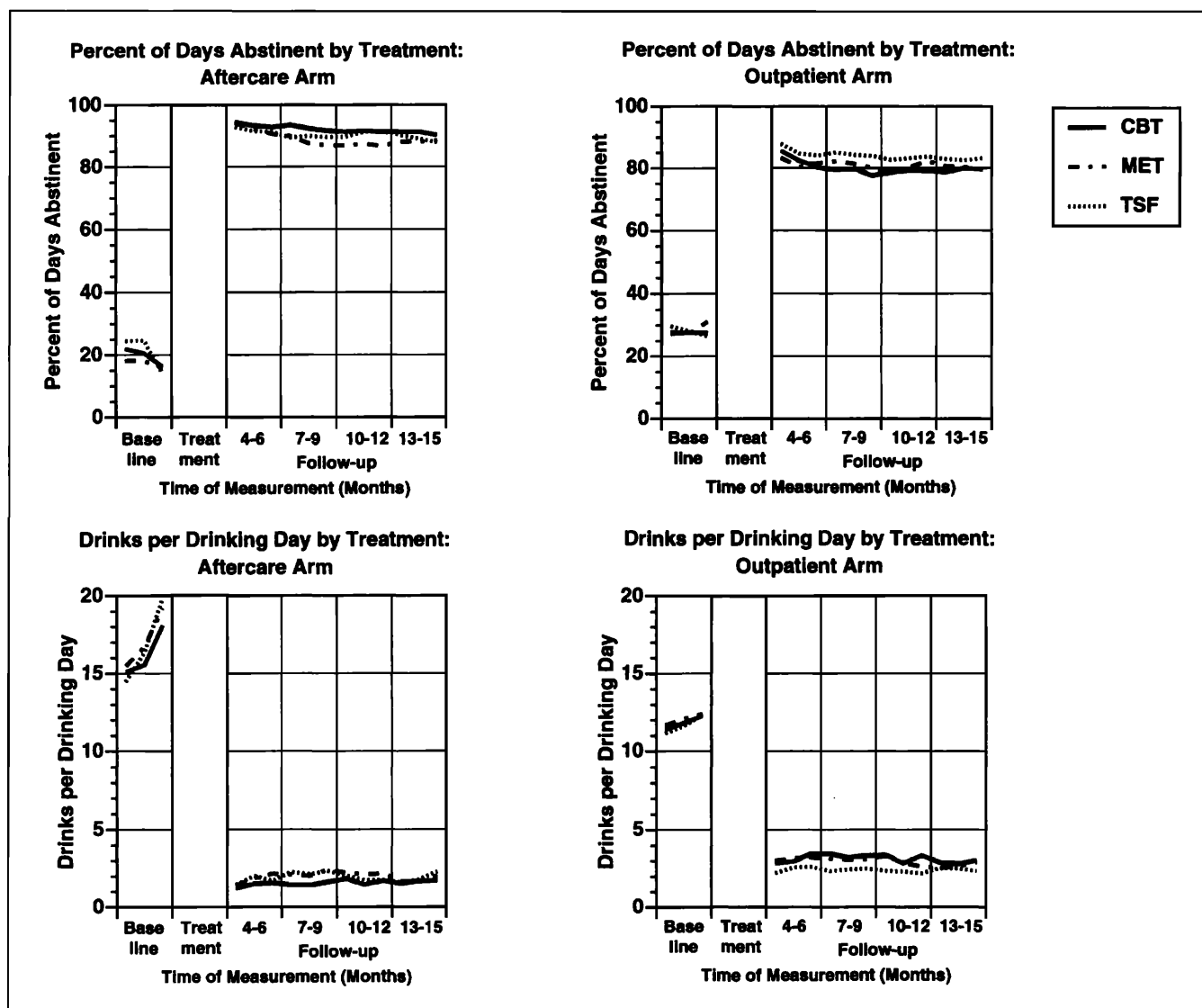
FIGURE 1. Monthly PDA and DDD outcomes for baseline (averaged over 3 months prior to treatment) and for each month of the posttreatment period (months 4-15) for outpatient and aftercare arms. If a person was abstinent during a given month, the DDD score was zero.

PDA and DDD, these measures are not the sole means of assessing outcome. A range of other outcome variables have been assessed, including other drinking-related measures, use of substances other than alcohol and measures of social and psychological functioning. These diverse measures provide a fuller picture of the main effects of the three Project MATCH treatments. Some of these variables will also be used in testing some specific matching hypotheses, but those analyses are beyond the scope of the present article.

Analyses of selected secondary outcome measures involved two 3-month time periods: Months 7-9 and 13-15. These periods were chosen because many of the outcome measures were assessed during the in-person interviews at Months 9 and 15. Continuous outcome variables (see Table 3) were analyzed by repeated-measures analysis of variance. In these analyses of variance, we covaried the baseline value

of the dependent measure being analyzed and also adjusted for the main effects of CRU and for the CRU × Treatment Interaction. We did not attempt to adjust for matching effects because of the complexity of such analyses.

Two discrete outcome variables also were evaluated: composite outcome and other drug use. The composite measure of outcome, described in Zweben and Cisler (in press), has four levels that combine information about drinking and drinking consequences to yield a categorical measure of outcome: 1 = no drinking, 2 = moderate drinking and nonrecurrent problems, 3 = heavy drinking or recurrent problems, and 4 = both heavy drinking and recurrent problems. The composite measure takes into account events happening during the most recent 3 months. It does not take into account duration of drinking episodes. For this measure, we analyzed the treatment main effects using log-linear methods (Bishop
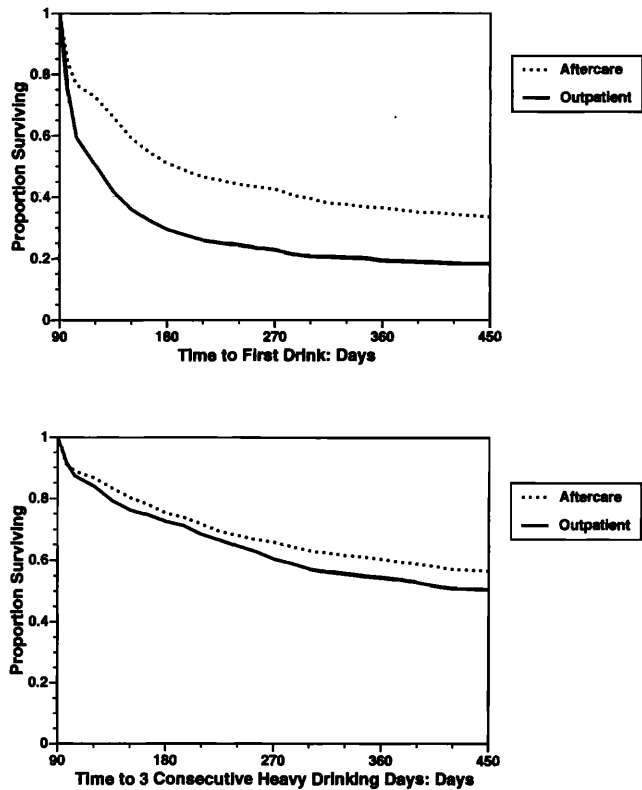
FIGURE 2. Time to event (survival) curves for outpatient and aftercare groups during the 12-month posttreatment period for time to first drink and time to 3 consecutive drinking days

et al., 1975). For the drug use outcome variable, we used logistic regression. Because of the relative sparsity of use of most illegal substances other than marijuana, we collapsed any use of any illegal substance into a binary outcome measure.

Finally, we also conducted tests for treatment main effects using the two time-to-first-event measures reported earlier: time to first drink and time to first episode of three consecutive days of heavy drinking. These tests involved proportional hazards analyses (Cox, 1972).

Analyses of the continuous secondary outcome measures are reported in Table 3, and data for the composite variable are in Table 4. We have applied a Bonferroni correction for testing these nine secondary outcome measures; in the far right column of Table 3, an asterisk indicates treatment effects are significant in a nondirectional test at alpha = .05/9 = .0056. Not shown in the tables are the results for drug use and the time-to-event analyses. We did not detect any statistically significant treatment main effects on drug use outcome in either study arm. In the outpatient arm, the rate of any use of any illegal substance during the preceding 90 days was 30% of clients at Month 9 and 29% at Month 15; the majority of substance use was marijuana. In the aftercare arm, the rates at Months 9 and 15, respectively, were 18% and 19%.

Three of the secondary outcome measures showed treatment effects that achieved Bonferroni-corrected significance levels: drinking consequences, the composite outcome and the time-to-event measures. There was a treatment main effect for drinking consequences (assessed using the DrInC) in the outpatient arm. Using the Duncan multiple range test, TSF clients were shown to have fewer drinking consequences than clients in the other two treatments at Month 9, but at Month 15 the three treatments did not differ significantly.

In the log-linear analysis of the composite measure, the only predictors were treatment group and CRU. In the outpatient arm, treatment main effects on the composite measure at Month 9 achieved a significance level of $p = .0349$, which did not meet the Bonferroni correction for significance. At Month 15, however, treatment main effects did achieve a Bonferroni-corrected significance level of $p = .0024$. As shown in Table 4, there was, for example, a higher percentage of TSF clients in Category 1 (no drinking), relative to the percentages for the CBT and MET clients. There were no statistically significant treatment main effects in the composite outcome data for the aftercare arm clients.

In analyzing the time-to-event outcomes, no treatment main effects were found in the aftercare arm. There were, however, significant effects among the outpatient clients. For outpatients, for time to first drink, the proportional hazards analysis yielded a p value for treatment main effects of .0001; there were also statistically significant CRU main effects $(p = .0007)$ and CRU by treatment interactions $(p = .0065)$. TSF clients had the best outcome on this measure, with 24% avoiding any drinking in Months 4-15, while the corresponding figures for CBT and MET were 15% and 14%, respectively. When we analyzed the more stringent criterion of three successive days of heavy drinking, treatment main effects were significant in the outpatient arm only, $p = .0016$; CRU main effects $(p = .0054)$ and CRU by treatment interactions $(p = .0127)$ also were present. Once again, the TSF condition had the better outcome, with 53% not reaching the criterion, followed by MET with 49% and CBT with 48%.

Matching outcomes: Primary hypotheses

Tests of the primary matching hypotheses over the 4- to 15-month follow-up period demonstrated few matching effects. A summary of the significant results of the 16 contrasts of the primary matching hypotheses appears in Table 5.

Aftercare arm: Percent days abstinent (PDA). Ignoring effects over time, there were no Bonferroni-corrected client attribute by treatment interactions (ATI) for PDA for any of the primary hypotheses in the aftercare arm. When attribute by treatment by time effects were examined, only one significant interaction was found: the *meaning seeking* client attribute by treatment (TSF vs CBT and MET) by linear time $(p = .01)$. During the latter half of the posttreatment period, those clients treated in TSF who had higher meaning seeking were more likely to have proportionately more abstinent

TABLE 3. Treatment main effects on continuous secondary outcome measures

	CBT		MET		TSF		
Variable	Mean (±SD)	N^a	Mean (±SD)	N^a	Mean (±SD)	N^a	Trtmt effects[b]
AFTERCARE STUDY							
Drinking consequences							
Baseline	59.3 ± 23.5		57.4 ± 22.1		60.7 ± 23.3		
Month 9	19.6 ± 27.9	164	20.0 ± 26.8	168	19.4 ± 28.3	161	.9690[c]
Month 15	19.3 ± 29.3		16.9 ± 23.1		21.2 ± 29.0		
GGT							
Baseline	102.4 ± 119.0		72.9 ± 86.9		93.8 ± 116.6		
Month 9	77.7 ± 106.1	103	70.0 ± 100.5	93	74.2 ± 96.8	88	.7194
Month 15	81.0 ± 109.2		58.0 ± 80.6		77.2 ± 101.4		
Percent days paid work							
Baseline	35.9 ± 32.6		40.2 ± 33.1		40.0 ± 33.8		
Month 9	42.6 ± 31.5	166	42.4 ± 30.9	138	39.6 ± 33.2	159	.5427
Month 15	43.7 ± 35.7		46.0 ± 35.8		43.9 ± 38.1		
Social Behavior Scale							
Baseline	3.02 ± 0.62		3.05 ± 0.57		2.95 ± 0.64		
Month 9	3.37 ± 0.53	209	3.36 ± 0.49	209	3.33 ± 0.50	178	.4555
Month 15	3.37 ± 0.52		3.40 ± 0.47		3.31 ± 0.51		
Beck Depression Inventory							
Baseline	10.36 ± 8.56		10.04 ± 8.62		11.41 ± 9.13		
Month 9	7.76 ± 8.16	205	8.45 ± 8.03	197	8.93 ± 8.75	179	.2929
Month 15	7.95 ± 8.93		8.77 ± 8.56		8.75 ± 8.84		
ASI Psych. Severity							
Baseline	0.23 ± 0.21		0.23 ± 0.21		0.23 ± 0.22		
Month 9	0.17 ± 0.20	227	0.14 ± 0.19	221	0.16 ± 0.19	199	.5938
Month 15	0.15 ± 0.20		0.16 ± 0.21		0.15 ± 0.19		
OUTPATIENT STUDY							
Drinking consequences							
Baseline	44.6 ± 21.2		46.2 ± 21.8		45.7 ± 22.6		
Month 9	21.4 ± 24.3	201	23.5 ± 23.2	202	16.7 ± 21.8	245	.0045*
Month 15	19.7 ± 23.1		19.9 ± 23.4		15.9 ± 20.7		
GGT							
Baseline	82.7 ± 93.0		78.4 ± 90.9		72.1 ± 88.6		
Month 9	65.8 ± 74.8	224	66.3 ± 81.6	206	61.1 ± 76.2	240	.7610
Month 15	71.8 ± 87.3		67.8 ± 82.8		61.7 ± 75.3		
Percent days paid work							
Baseline	46.8 ± 31.3		44.4 ± 33.0		49.8 ± 30.7		
Month 9	45.8 ± 31.5	178	49.6 ± 30.9	200	47.1 ± 31.6	183	.2342
Month 15	48.4 ± 32.6		54.1 ± 31.7		52.0 ± 33.0		
Social Behavior Scale							
Baseline	3.23 ± 0.51		3.18 ± 0.50		3.24 ± 0.49		
Month 9	3.40 ± 0.46	253	3.37 ± 0.47	245	3.43 ± 0.45	273	.9041
Month 15	3.44 ± 0.45		3.44 ± 0.46		3.44 ± 0.46		
Beck Depression Inventory							
Baseline	10.30 ± 8.28		9.54 ± 7.37		10.06 ± 8.21		
Month 9	8.11 ± 7.99	233	7.02 ± 7.41	234	6.80 ± 6.96	256	.3020
Month 15	7.32 ± 7.85		6.56 ± 6.78		7.08 ± 7.84		
ASI Psych. Severity							
Baseline	0.21 ± 0.20		0.19 ± 0.19		0.20 ± 0.19		
Month 9	0.13 ± 0.19	253	0.11 ± 0.17	249	0.12 ± 0.16	274	.3202
Month 15	0.12 ± 0.19		0.11 ± 0.16		0.10 ± 0.15		

Note: Months 9 and 15 refer to the preceding 90-day period.

[a]The data in the table are for those subjects who had nonmissing values at all three time points, hence the sample size is the same for all time points within each scale.

[b]The treatment effects column contains p values for a nondirectional 2 df test for main effects of treatment. Those effects whose significance exceeds the Bonferroni-adjusted level of 0.0056 are marked with an asterisk. Treatment by time interactions, if any, are indicated with footnotes.

[c]There is a significant time by treatment effect for drinking consequences (DrInC), $p = .0466$. By the Duncan test, however, the treatment groups do not appear to differ significantly at either time point.

TABLE 4.   Treatment main effects for composite outcome variable

Treatment group	Composite outcome category (%)				N
	1	2	3	4	
AFTERCARE STUDY - MONTH 9					
CBT	44.8	13.2	15.2	26.8	250
MET	42.6	6.6	19.0	31.8	242
TSF	44.8	8.6	16.4	30.2	232
Combined	44.1	9.5	16.9	29.6	724
AFTERCARE STUDY - MONTH 15					
CBT	48.0	7.0	11.1	34.0	244
MET	42.5	8.3	13.8	35.4	240
TSF	47.3	6.6	11.9	34.1	226
Combined	45.9	7.3	12.3	34.5	710
OUTPATIENT STUDY - MONTH 9					
CBT	20.8	17.4	18.1	43.8	288
MET	23.3	14.5	20.6	41.6	296
TSF	31.9	14.4	17.8	35.9	320
Combined	25.6	15.4	18.8	40.3	904
OUTPATIENT STUDY - MONTH 15					
CBT	24.7	14.1	20.1	41.0	283
MET	30.3	14.1	12.3	43.3	284
TSF	35.6	9.3	17.3	37.8	312
Combined	30.4	12.4	16.6	40.6	879

Notes: The composite outcome categories are as follows: 1 = no drinking during the period of assessment; 2 = moderate drinking and nonrecurrent problems; 3 = heavy drinking or recurrent problems; and 4 = both heavy drinking and recurrent problems. The composite measure takes into account events happening during the most recent 3 months. It does not take into account duration of drinking episodes.

days than those treated in CBT or MET. When attribute by treatment by time effects were found, follow-up analyses were performed to examine whether the hypothesized contrast simply changed over time or produced significant differences during any of the follow-up months. The outcomes in terms of p values of month by month tests of the specific

meaning seeking contrasts indicated changes over time in the direction of the specified contrast, although none of the values reached the .05 level of significance.

Aftercare arm: Drinks per drinking day (DDD). Again there were no significant ATI effects for the DDD outcome in the aftercare arm. However, there was a significant interaction effect for *typology* by treatment by time indicating that the contrast between Type B (more severe) subjects treated with CBT and TSF versus Type B subjects treated with MET shifted over time (linear, $p < .05$). However, no single monthly contrast reached the .05 level and p values increased over time.

Thus, in the aftercare condition there was no unequivocal support for any of the matching hypotheses for either PDA or DDD outcomes over the 12-month follow-up period. Although there were two significant client attribute by treatment by time effects during the posttreatment period, neither was statistically significant for any single posttreatment month. However, the meaning seeking contrast did have months where the contrasts were significant ($p < .05$) in an analysis with fewer covariates.

Outpatient arm: Percent days abstinent. There was one significant client attribute by treatment interaction (ATI) for the PDA drinking outcome in the outpatient arm for one of the proposed contrasts of the *psychiatric severity* hypothesis (CBT vs TSF, $p = .01$). It indicated that the less the client's psychiatric severity score, the greater his/her percent days abstinent when treated with TSF, compared to CBT. No other matching hypothesis contrast demonstrated a significant overall ATI.

This same contrast (CBT vs TSF) of the *psychiatric severity* matching hypothesis also demonstrated a significant client attribute by treatment by time interaction (quadratic time, $p < .05$). Examination of this contrast by month indicated that there were significant ($p < .05$) effects demonstrated from Months 5 through 11 on PDA. Figure 3 shows

TABLE 5.   Treatment matching analyses: Summary of significant effects for specific treatment contrasts

Matching variable	Treatment contrasts	Type of effect	Outcome variable	Months $p < .05$
OUTPATIENT				
Psychiatric severity	CBT vs TSF	ATI ATI by time	PDA	5-11
Motivation	MET vs CBT	ATI by time	PDA	15
Conceptual level	TSF vs MET	ATI by time	DDD	None
AFTERCARE				
Meaning seeking	TSF vs CBT and MET	ATI by time	PDA	None[a]
Typology	MET vs CBT	ATI by time	DDD	None

Notes: This table summarizes results of latent growth analyses covarying baseline drinking values as well as CRU and CRU by treatment effects over time. Type of effect indicates whether the attribute by treatment interaction (ATI) and/or the ATI over time were significant. The months column summarizes results of monthly contrasts.

[a]Monthly contrasts for months 5 through 14 were $p < .05$ with only baseline drinking covaried, and monthly contrasts for months 11, 12 and 13 were $p < .10$ when adjusted for baseline drinking, CRU and CRU by time effects.
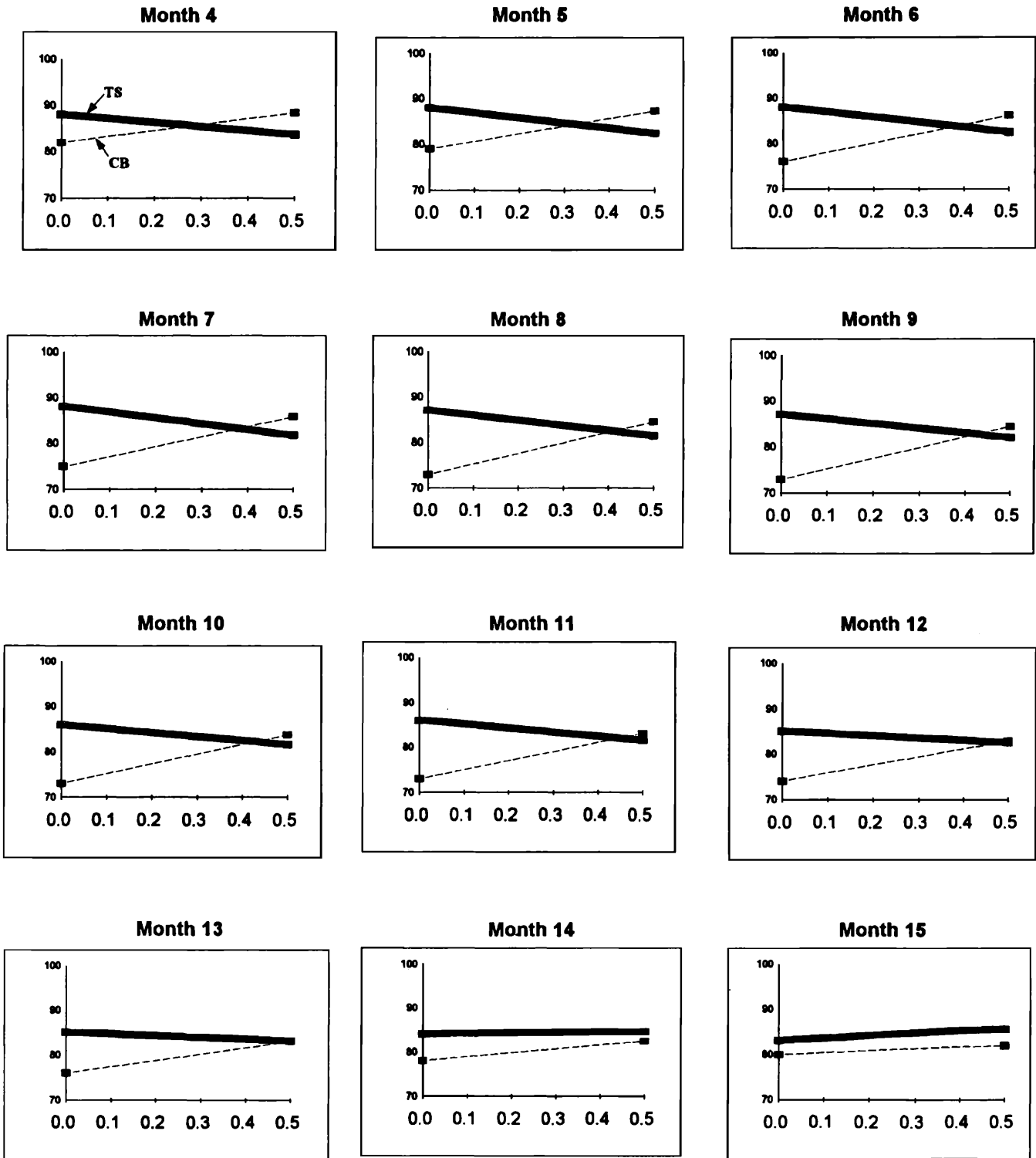
Psychiatric Severity

FIGURE 3.   Monthly posttreatment plots of percent days abstinent for treatment by time by attribute interaction for psychiatric severity contrast between CBT and TSF among outpatients. The interactions at months 5-11 were significant in the predicted direction (p's $< .05$). The vertical axis represents percent days abstinent and the horizontal axis represents psychiatric severity scores.

the interaction effects for each month of the follow-up. In Months 5 through 11, the regression lines intersect at a value of approximately 0.4 on the Addiction Severity Index (ASI) psychiatric composite score. A post hoc analysis of covariance conducted on a subsample of participants with an ASI psychiatric score of zero revealed significantly better PDA outcomes in the TSF condition than in the CBT condition. Similar analyses were unable to demonstrate a significant advantage of CBT over TSF in high psychiatric severity participants, regardless of the use of different subsamples based on progressively higher ASI psychiatric severity cutoff scores. Although slope lines indicated that CBT-treated participants were exceeding TSF participants at higher levels of the ASI scale, a clear conclusion cannot be drawn regarding whether there are better outcomes for high psychopathology participants treated with CBT. It is thus concluded that clients without psychopathology had more abstinent days if treated with TSF rather than CBT, but this TSF advantage disappeared as psychopathology increased.

Also in the outpatient arm, the *motivation* hypothesis, which stated that subjects lower in motivation would do better in MET than in CBT, demonstrated a significant ATI by time interaction (linear, $p < .01$). However, the contrast was significant ($p < .05$) at only 1 month (Month 15) for the PDA outcome. As shown in Figure 4, the relationship between CBT and MET treatments for the less motivated subjects began with the less motivated subjects initially doing better in CBT compared to MET, but this effect reversed over time so that by the end of follow-up, the less motivated subjects treated in MET had a greater percentage of abstinent days compared with the CBT clients. There was little difference between treatments over the follow-up period for subjects with high motivation to change.

Outpatient arm: Drinks per drinking day. There were no significant ATI effects for any of the primary hypotheses in DDD. There was a significant client attribute by treatment by time effect for the *conceptual level* hypothesis (quadratic, $p < .01$) for DDD which indicated that the relationship of conceptual level and the MET vs TSF contrast shifted over time. However, none of the monthly tests of the hypothesized contrast approached a .05 level of significance. In fact, in the last month of follow-up the p value indicated a significant contrast opposite to that hypothesized.

In summary, in the outpatient arm of the trial there was a matching effect for one specified contrast of the *psychiatric severity* hypothesis. Although the original conceptualization of this hypothesis was that individuals high in psychopathology would have better drinking outcomes with CBT rather than TSF, results indicated that there was no reliable difference in the outcomes of high psychopathology subjects. On the other hand, subjects without psychopathology had significantly more abstinence in 7 of the 12 follow-up months when treated with TSF rather than CBT. The TSF advantage over CBT was on average approximately 4 more abstinent days per month.

In addition to the latent growth analyses of treatment matching effects, traditional repeated measures MANOVA analyses were also conducted for each of the primary matching hypotheses. Although there are some differences in these two analytic approaches, the results of these more traditional analyses were consistent with the major findings of the latent growth analyses, but generally with p values greater and thus less significant than those found with the latent growth analyses.

Treatment site differences analysis

Main effects for treatment site were present in both arms for PDA outcomes, but only in the outpatient arm for the DDD outcomes. By design, treatment sites represented differential client heterogeneity with their unique contributions to the pool of subjects. Treatment site effects may be due to these differences in the client populations or environmental factors not measured by covariates. Such differences should have little effect on tests for client-treatment matching, however, since the covariate set used in our analyses included terms for both site and site by time interactions.

There were several site by treatment interactions that could potentially have been due to variations in the implementation of treatment across sites and, as such, could represent a potential threat to the validity of the tests for client-treatment matching. However, treatment process data indicated that treatment implementation was relatively uniform across sites. That is, there were no substantial, clinically meaningful differences with respect to treatment implementation, perceived therapeutic alliance, session type (emergency, collateral), and several other variables across sites that might be expected to affect drinking outcomes. Site by site tests of the matching hypotheses indicated that the overall matching results are generalizable across sites.

Drinking outcome effects for client attributes

Since the client attributes chosen for the matching hypotheses can affect outcomes independent of treatment condition, a separate analysis was conducted to examine client attribute effects on both PDA and DDD outcomes. Since attributes constituted a relatively large pool of variables and were correlated with one another to varying degrees ranging from a Pearson first order correlation of .00 to ±.50, a backward elimination approach was used in order first to eliminate nonsignificant effects and then to examine effects of the retained variables. Table 6 reports the significant main and time dependent interaction effects.

For aftercare subjects, only gender predicted the percent days abstinent over the entire follow-up period, with male subjects having fewer abstinent days. Although there was no main effect of psychiatric severity on outcome, this attribute did interact with time to predict PDA outcome. Toward the end of the follow-up period subjects higher in psychiatric
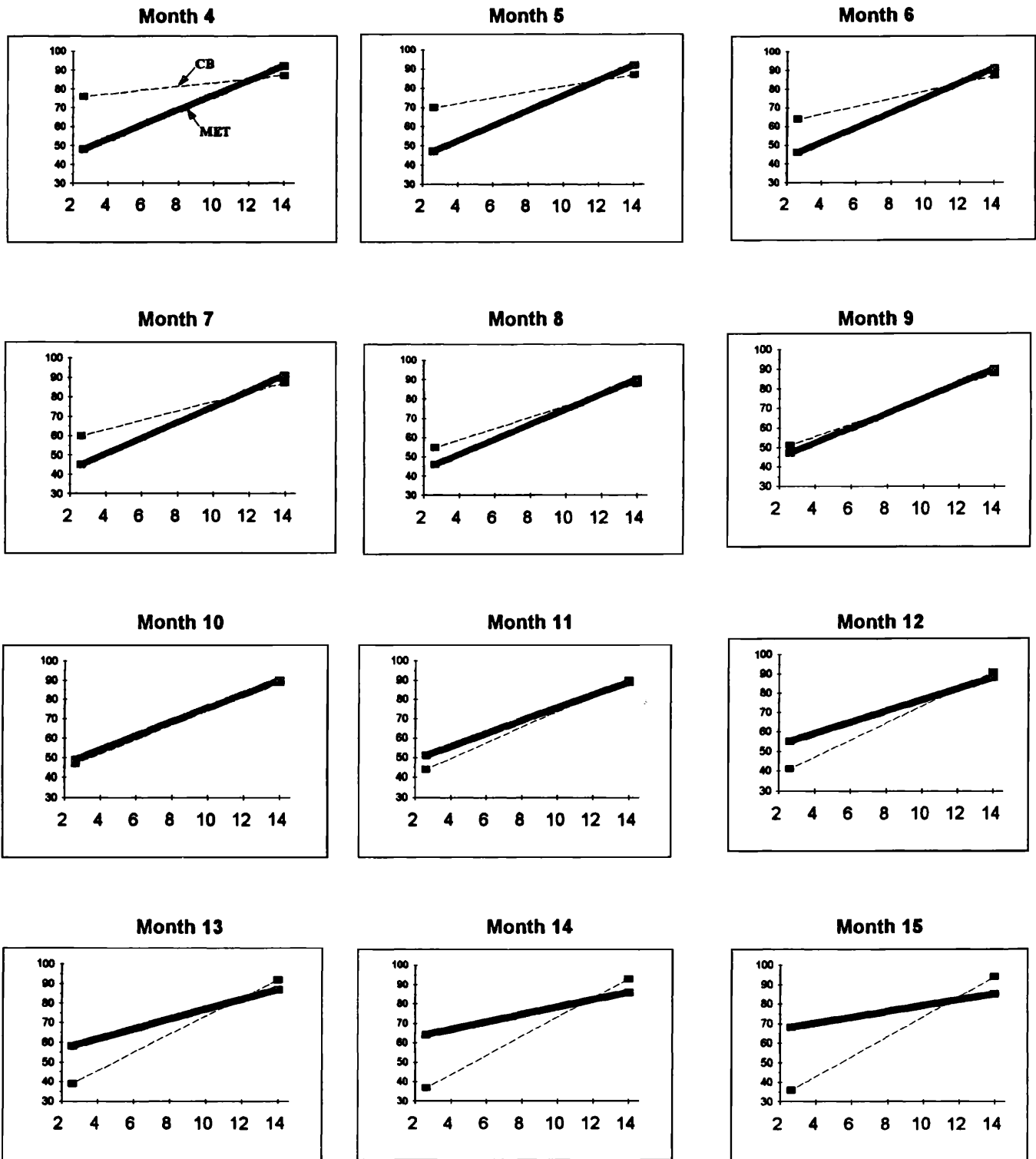
Motivation

FIGURE 4.   Monthly posttreatment plots of percent days abstinent for treatment by time by attribute interaction for motivation contrast between CBT and MET among outpatients. The interaction at month 15 was significant in the predicted direction ($p < .05$). The vertical axis represents percent days abstinent and the horizontal axis represents motivation scores.

TABLE 6. Significant main effects and time effects on PDA and DDD outcomes for client attributes

	Aftercare p values		Outpatient p values	
Attributes	PDA	DDD	PDA	DDD
Alcohol involvement				
Main		.002		
Gender				
Main	.004	.035		
Linear time		.017		
Motivation				
Main			<.001	<.001
Psychiatric severity				
Linear time	.012	.022		
Quadratic time	.015	.010		
Support for drinking				
Main		.024	.005	.026
Sociopathy				
Linear time			<.001	.029
Typology				
Quadratic time		.024		

Note: p values represent the results of a stepwise procedure done across all CRUs with CRU and CRU by treatment interaction terms in the model in which initially all the matching variables were included. These results represent the significant main and time effects of the variables retained after the last step of backwards elimination.

severity had fewer days abstinent compared to those lower in psychiatric severity.

Client attributes demonstrated greater influence on the number of drinks per drinking day (DDD) once a subject began drinking. Higher alcohol involvement, being male and having more social support for drinking were each associated with more DDD during follow-up. In addition, the prognostic effects of gender (male) and psychiatric severity (greater) on DDD were more pronounced as time increased in the follow-up period.

For the outpatient subjects, fewer client attribute predictors were significant. The more motivated the subject was at intake and the less the social support for drinking, the better were the drinking outcomes in terms of both PDA and DDD. Level of sociopathy interacted with time as a predictor of outcome: greater sociopathy was associated with worse outcomes early in the follow-up period but not later.

Project MATCH was designed as a prospective study, with ten primary matching hypotheses (containing 16 contrasts) tested with two dependent variables chosen a priori to represent treatment outcome. Within these constraints, we found very limited evidence for either main or matching effects for the three treatments studied. It is plausible, however, that informative effects may be found as other outcome variables are examined and as secondary matching hypotheses are tested. This report has focused on the measures and primary hypotheses chosen a priori by the Project MATCH Research Group to constitute the main trial. Similar care will now be devoted to conducting and subsequently reporting analyses for a priori secondary matching hypotheses and for secondary outcome variables with all hypotheses.

Discussion

Tests of the specific matching hypotheses evaluated in Project MATCH provided limited support for the generic hypothesis that client attributes would interact with treatment modality to differentially affect drinking outcomes. Only one client attribute examined had an overall matching effect that was not time dependent. Outpatients without psychopathology had significantly more abstinence when treated in Twelve-Step Facilitation (TSF) than those treated in Cognitive Behavioral Coping Skills Therapy (CBT), but as psychiatric severity increased, the TSF advantage over CBT disappeared. Since the outpatient sample had fewer participants at the high end of psychiatric severity, it was not possible to evaluate completely whether CBT led to significantly more abstinent days than TSF at the high end of severity. Overall, the outpatient sample was slightly lower on the ASI psychiatric composite score (mean [±SD] = .19 ± .19) than other alcoholism treatment samples (e.g., McLellan et al., 1992; mean = .24 ± .22). Individuals with current suicide risk, homicide risk or acute psychosis were excluded from the present trial.

These psychiatric severity matching results suggest that there is some advantage to assigning outpatient clients without psychopathology to TSF treatment. The largest difference occurred at Month 9, when matched (TSF) participants had approximately 87% days abstinent versus 73% days abstinent for mismatched (CBT) participants. Definitive client-treatment matching recommendations for outpatient clients with moderate to high psychiatric severity cannot be made based on Project MATCH results. Since no psychiatric severity matching effects were found in the aftercare study, no client-treatment matching recommendations can be made for the aftercare setting.

One other client attribute among outpatients, motivation, interacted with treatment modalities as hypothesized, but this interaction effect changed over time and demonstrated a significant difference during only the last month of the follow-up period. Other client attributes, meaning seeking, conceptual level and typology, were also observed to have matching contrast effects that changed over time, but at no time point did the hypothesized contrast reach significance. Evidence for each of these effects occurred in only one arm of the study.

Aside from psychiatric severity, the most notable matching findings involved meaning seeking and motivation. In aftercare, clients higher in meaning seeking (i.e., those who at intake evidenced less purpose in life and aspired to experience greater meaning) were somewhat more responsive (in terms of PDA) to TSF than to other treatments. This pattern, which was modest and consistent in direction across sites, had been predicted because the strong twelve-step emphasis on spirituality was hypothesized to appeal particularly to clients seeking greater meaning in life. Evidence for this interaction was lacking during the first 6 months after treatment, emerging only in the latter half of the follow-up year.

Outpatient clients low in motivation ultimately did better in Motivational Enhancement Therapy (MET). At the beginning of the posttreatment period, however, CBT appeared to be superior to MET in PDA for clients less motivated to change. Over the course of the follow-up, the outcomes for the two treatments reversed, with MET becoming superior to CBT, indicating a possible delayed effect. DDD outcomes are consistent with this finding but not statistically significant.

An ongoing 3-year follow-up study of outpatient subjects should yield additional data that will shed new light on effects that shift or emerge over time. Furthermore, the planned examination of the causal chains that were proposed for each hypothesis should reveal whether hypothesized mediating mechanisms operated as assumed, and may offer explanations for the presence or absence of hypothesized interactions.

In summary, this large-scale, randomized, clinical trial has detected simple (i.e., non-time-dependent) matching effects in the directions predicted for only one of the ten client attributes hypothesized to interact with the chosen treatment modalities. Except for psychiatric severity, there is not convincing evidence of major treatment matching effects. Observed effects are sufficiently small and circumscribed that, again with the exception of psychiatric severity, we can conclude that they are clinically insignificant when making triaging decisions to individual therapy employing these three treatments. Matching clients with the identified attributes to these treatment modalities did not appreciably enhance treatment effectiveness on our primary drinking outcome measures.

Psychiatric severity as a matching attribute deserves more intensive examination because, in the outpatient study, it alone interacted with treatment to affect drinking across most of the 1-year follow-up period. A number of other alcoholism treatment studies have also found significant psychiatric severity matching effects (Cooney et al., 1991; Kadden et al., 1989; McLellan et al., submitted for publication, 1983a). Project MATCH, however, is the first study to examine psychopathology by treatment interactions with a 12-step approach among the treatments examined. The finding of a TSF advantage over CBT in individuals without psychopathology, but not in individuals with moderate to high psychopathology, suggests that process analyses should look for some ingredients in the TSF condition that are disrupted by psychopathology.

The ASI psychiatric composite score is a global measure that combines symptoms of anxiety, affective, psychotic and personality disorders. Further analyses will examine how well more specific, diagnostic-based measures of psychopathology perform as matching variables.

Although it is never possible to prove the null hypothesis, the power of the present study to detect matching effects, and its careful, rigorous implementation, make the lack of substantial findings particularly notable. Our data provide little evidence to support widely held views regarding the potential value of matching clients, at least on the basis of nine of the client at-

tributes tested, to any of the treatments offered as individual therapy in this study. These results support wider latitude in the triaging process with less need to match basic client characteristics to any of these three treatments, if they are implemented carefully as individual therapy by well-trained therapists.

It should be underscored, however, that the lack of support for matching hypotheses involving these three particular treatments does not address potential matching effects that possibly could appear if more diverse treatment delivery systems were contrasted (e.g., inpatient vs outpatient treatments, group vs individual therapies, social system therapies [such as the community reinforcement approach or behavioral marital therapy] vs individual therapies, or pharmacological therapies vs psychosocial therapies). Nor do these findings hold for all types of substance abusers with varying or multiple substances of abuse, or the homeless. Although the sample gathered for this study was large and heterogeneous, it does not fully represent the entire population of alcohol dependent individuals or other substance abusers. Finally, there may be other client attributes or treatment contrasts that could yield important matching information. Project MATCH researchers plan to examine the dataset for potential matching interactions in terms of additional client characteristics, different contrasts, secondary outcome variables, and more complex types of matching involving combinations of variables.

Although the efficacy of the three treatments cannot be demonstrated directly since the trial did not include a no-treatment control group, the striking differences in drinking by clients from pretreatment levels to all follow-up points suggest that participation in any of these treatments will be associated with substantial and sustained changes in drinking. This is particularly true for the outpatient arm, where the Project MATCH treatments were the only treatments provided. One important conclusion of this trial is that individually delivered psychosocial treatments embodying very different treatment philosophies appear to produce comparably good outcomes (Hester and Miller, 1995; Lambert and Bergin, 1994), a finding generally supported by evaluation of a variety of secondary outcome measures as well. In fact, the sustained, positive improvement for clients in all three treatment conditions may have left little room for matching effects to emerge. Implications are, of course, unknown for treatments that are not manual guided, not structured to produce and utilize a good therapeutic relationship, or are poorly done.

The treatment compliance of the individuals in this trial was high. Subjects received substantial amounts of the specified treatments. Compliance enhancement procedures (i.e., calling clients between sessions, sending reminder notes and having collateral contacts) and the greater attention of individual treatment may have produced a level of overall compliance that made it difficult for differences between treatments to emerge. It is possible that previous matching studies may have reflected variations in treatment compliance.

Finally, research follow-up compliance also was remarkable, reflecting an intensive effort on the part of research staff and payment of clients as an incentive to return for follow-up. The overall effect of being a part of Project MATCH, with its extensive assessment, attractive treatments and aggressive follow-up, may have minimized naturally occurring variability among treatment modalities and may, in part, account for the favorable treatment outcomes. These outcomes suggest the importance of examining the potential impact of system and treatment delivery attributes in addition to treatment philosophy and clinically effective ingredients.

Whereas participation in any of these three treatments was generally associated with a sustained, good outcome, some small but significant differences among the treatments on the primary outcome measures were detected in both the outpatient and aftercare arms. However, these effects were not robust and represented small absolute differences in percentage of days abstinent or drinks per drinking day. In terms of other outcome variables, outpatient (but not aftercare) clients in the TSF treatment showed better outcomes on three measures strongly influenced by continuous abstinence (time to first drink, time to first run of 3 heavy-drinking days and composite outcome), perhaps due to a greater emphasis on abstinence in TSF relative to CBT and MET. With the exception of an advantage to TSF in drinking consequences at Month 9, no other treatment differences emerged on the remaining outcome measures at either Month 9 or 15 for outpatient or aftercare clients. Thus, an overall implication for the field is that each of these three treatments can be used with confidence, when implemented as they were in the Project MATCH trial.

There are several other interesting and important treatment-related implications. Of particular importance is the performance of an individually delivered 12-step-based treatment (TSF) and the performance of the four-session, 12-week motivational-based treatment (MET). Although TSF must be clearly distinguished from Alcoholics Anonymous and its practices and traditions, TSF is a 12-step-based approach that encourages AA attendance and the working of the 12 steps. In particular, Project MATCH represents the first demonstration in a randomized clinical trial, controlling for other treatment factors, of comparable outcomes from a 12-step-based approach and other treatment methods. One potential limitation in the use of TSF compared to CBT may be that it is perhaps not as effective for aftercare clients with low meaning seeking. However, there are few signs of the other mismatches that we had hypothesized for TSF (e.g., females and those with higher conceptual levels having poorer outcomes in TSF). It should be noted that AA attendance was not controlled in this trial. Clients in TSF did attend significantly more AA meetings than did those in the other two treatments, but clients in CBT and MET, particularly in the aftercare study, were often exposed (outside the context of our treatment) to AA and a 12-step approach. While AA attendance during treatment did not appear to be an important mediating variable in this study,

such AA participation is nevertheless an important topic that will be addressed more fully in a future report.

The performance of MET relative to CBT and TSF suggested that this four-session, 12-week treatment modality can be used in lieu of these more intensive ambulatory treatments, at least in the context in which it was delivered in this trial. The fact that no other hypothesized client attribute moderated the effectiveness of this treatment with the range of clients treated in this study suggests that four sessions of MET may have more widespread applicability than previously thought. In fact, the reason some of the matching hypothesis contrasts did not receive support is that many of them assumed a mismatching effect with the less intensive MET that did not materialize. An ongoing study of cost-effectiveness will examine whether MET may be a more cost-effective treatment than either CBT or TSF. However, we again caution that there was no untreated control group in this trial and that many steps were taken to ensure quality of treatment. In addition, the impact of intense and frequent follow-up efforts and corroborative checking of drinking behavior every 3 months may also have affected outcomes. Finally, MET subjects also attended some AA meetings. Process data and analysis of session videotapes will enable us to examine in greater detail the mechanisms of action for MET, as well as for CBT and TSF.

CBT has had an established, research-based credibility as an effective treatment for the broad spectrum of alcoholics (Monti et al., 1989). In the current study, however, CBT appeared to produce fewer abstinent days than TSF for clients without psychopathology. The comparative advantage of TSF disappeared as the level of client psychopathology increased. Because there were few participants with very high levels of psychopathology in the outpatient study, further research is needed on the effectiveness of CBT and TSF in these types of individuals. Results, however, did not support the hypothesized superiority of CBT for clients with higher alcohol involvement, cognitive impairment, sociopathy and support for drinking, nor for women and Type B alcoholics as suggested in the literature.

Although client variables did not demonstrate strong matching effects, several client attributes were predictive of drinking outcomes. For the aftercare subjects, gender (male) and, to a lesser extent, greater alcohol involvement and support for drinking were associated with less successful outcomes. For the outpatients, higher motivation for change was strongly associated with better outcomes, and higher levels of support for drinking was associated with poorer drinking outcomes. Characteristics that emerged as important for the aftercare arm may relate more to the relapse process since aftercare clients were generally abstinent at the beginning of the Project MATCH treatments, whereas in the outpatient arm predictor variables may be more related to the process of moving toward and stabilizing abstinence which was the initial task of the outpatient treatments. These effects for both aftercare and outpatient subjects are consistent with prior research (Skinner, 1981; Timko et al., 1993). Of clinical relevance is the fact that both motiva-

tion and social support for drinking are modifiable characteristics and suggest the need for treatment strategies that target them (DiClemente et al., 1992; Longabaugh et al., 1995).

Combining the results of attribute, treatment main effect and treatment matching analyses offers an interesting view for alcoholism treatment research. Some client attributes appear to impact drinking outcomes irrespective of type of treatment and deserve further research. With respect to treatment effects, there appear to be few differences in outcome among these individually delivered psychosocial treatments regardless of differing philosophies and strategies, consonant with many prior studies in psychotherapy research (Beutler, 1991; Hester and Miller, 1995; Smith and Glass, 1977). In fact, it is precisely results like these that have been used in the past to argue for efforts to identify a set of common active ingredients of treatment, or for investigating client attribute by treatment matches that could bring treatment differences to light (Hester and Miller, 1995; Institute of Medicine, 1990; Miller and Hester, 1986).

Although prior research has indicated the potential for matching effects in alcoholism treatment (Mattson et al., 1994), Project MATCH found little evidence for hypothesized matches even with characteristics that had previously produced positive matching results (sociopathy, conceptual level, severity of alcohol involvement). There are several potential explanations for this discrepancy. One explanation is that a large-scale, multiple-site study with a large number of subjects eliminated effects that may have been idiosyncratic or site-dependent. Prior research, generally, had fewer subjects, more drop out, less-controlled treatments, less-controlled randomization procedures, and were more likely to be conducted at a single treatment site. Other explanations include differences in the treatments or treatment modalities. Most prior research used a group treatment modality, few studies used the exact treatments evaluated in this trial, and none compared these particular treatments with one another for matching effects. Although there are other possible types of matches, particularly client by therapist interaction effects (Beutler, 1991), that were not studied systematically in Project MATCH, our inability to find robust attribute by treatment interactions is consistent with the results of prior attribute by treatment interactions research in education and psychotherapy (Dance and Neufeld, 1988; Smith and Sechrest, 1991; Snow, 1991).

Prior alcoholism treatment matching studies have been criticized for lack of methodological rigor (Lindstrom, 1992). Project MATCH carefully addressed a number of critical methodological and design issues that often threaten the internal and external validity of clinical trials: clearly articulated a priori hypotheses, successful random assignment, use of manuals for all conditions, monitoring treatment delivery, assessment of treatment fidelity, delivery of an adequate amount of treatment, limiting attrition, and reliable outcome assessment. Project MATCH is the largest, statistically most powerful, psychotherapy trial ever conducted. The limited matching findings may disappoint many who have believed

in the efficacy of matching treatments to subject characteristics and they certainly challenge the existing view that attribute by treatment matching is a key to improved treatment effectiveness. However, the matching findings must be interpreted cautiously since there are additional areas of matching and levels of complexity of matching that require further investigation. Moreover, the evidence of matching with the psychiatric severity attribute offers an important and interesting area for future research.

In addition to testing for matching effects, this trial offers the treatment field a wealth of new information for alcoholism treatment and for psychotherapy in general. Analyses of the therapy videotapes, therapist characteristics, treatment compliance and assessment measures used in this trial will offer new information to guide future treatment studies. Another area that requires further exploration is the apparent benefit gained from prior inpatient or day hospital treatment by clients recruited in the aftercare arm. Although outcomes appeared better for aftercare clients in comparison with outpatient clients (see Figures 1 and 2), causal inferences are difficult because of the lack of random assignment to study arms. Possible explanations for these differences are: the attrition of unmotivated clients before recruitment into the aftercare arm (since subjects had to complete prior treatment before inclusion); the respite from alcohol exposure and consumption gained from a period of protected abstinence; and the greater intensity of treatment received by aftercare clients just prior to participation in Project MATCH.

The Project MATCH Research Group will continue conducting planned a priori and exploratory analyses with this unique dataset through an extensive analysis and publication plan. In January of 1998 this database will be made available through NIAAA for analyses by other qualified investigators.

Appendix: Project MATCH Research Group, Collaborating Investigators, Collaborating Facilities and Data Monitoring Board

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Notes

1. Although these ten variables were selected as the most promising for generating and testing matching hypotheses, a number of other variables have been included in secondary hypotheses that will not be the focus of the current report. These secondary hypotheses include measures of DSM-III-R Axis I diagnostic categories, client self-efficacy, alcohol dependence, anger, deviance, social functioning, antisocial personality dis-

order, religiosity, assertion of autonomy, another motivation measure and several higher order and global matching hypotheses, all of which have potential as matching variables.

2. This variable was defined by a cluster of interrelated indicators of premorbid vulnerability (e.g., a family history of alcohol dependence) and current problem severity (e.g., alcohol dependence syndrome) that permitted classification of clients as either Type A alcoholics (low vulnerability and moderate problem severity) or Type B alcoholics (high vulnerability and severe problems).

3. The process of formulating a priori matching hypotheses involved initial literature reviews to identify promising client attributes and treatments that would likely provide a basis for client-treatment interactions (Longabaugh et al., 1994). Written proposals were critiqued by the steering committee and the most promising ones were selected for testing in the trial as primary hypotheses. These went through several iterations of refining their rationale, specifying predictions, and developing assumed "causal chains" that described probable mechanisms of action for each of the proposed client-treatment interactions. At each stage of development these proposals were reviewed and critiqued by a hypothesis review committee (R. Longabaugh and P. Wirtz) and the steering committee, prior to final acceptance by the steering committee.

4. The Milwaukee clinical research unit was primarily an outpatient site but developed an aftercare capacity and contributed subjects to both the outpatient and aftercare arms of the study.

5. Supplementary analyses indicated that there were no significant GGTP differences among treatment conditions at any of the three (3-, 9- and 15-month) follow-up time points for either arm.

6. Two sets of covariates were examined. The first set included the baseline value of the criterion drinking measure and its interaction with time. The second added the CRU effect terms as described in the text. Both sets of covariates yielded similar results. Only the results of the analyses using the second set of covariates are reported since these covariates were judged to be the most appropriate to adjust for both site and baseline measurement effects.

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