Changing Network Support for Drinking: Initial Findings From the Network Support Project

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The aim of this study was to determine whether a socially focused treatment can effect change in the patient’s social network from one that reinforces drinking to one that reinforces sobriety. Alcohol dependent men and women (N = 210) recruited from the community were randomly assigned to 1 of 3 outpatient treatment conditions: network support (NS), network support + contingency management (NS + CM), or case management (CaseM; a control condition). Analysis of drinking rates for 186 participants at 15 months indicated a significant interaction effect of Treatment × Time, with both NS conditions yielding better outcomes than the CaseM condition. Analyses of social network variables at posttreatment indicated that the NS conditions did not reduce social support for drinking relative to the CaseM condition but did increase behavioral and attitudinal support for abstinence as well as Alcoholics Anonymous (AA) involvement. Both the NS variables and AA involvement variables were significantly correlated with drinking outcomes. These findings indicate that drinkers’ social networks can be changed by a treatment that is specifically designed to do so, and that these changes contribute to improved drinking outcomes.

Keywords: alcoholism, social support, Alcoholics Anonymous (AA), cognitive–behavioral treatment, network support

It has long been suggested that an effective means to forestall relapse in treated alcoholics is to alter the reinforcers for abstinence and drinking behavior in their home environment (e.g., Bigelow, Brooner, & Silverman, 1998). One way to achieve this is to change the person’s social network. Steinglass and Wolin (1974), among others, noted that the social milieu of an alcoholic serves to support the drinking of those in the network.

Longabaugh and Beattie (Beattie & Longabaugh, 1999; Longabaugh & Beattie, 1986) coined the term “network support for drinking,” referring to the degree to which people in the home environment encourage drinking. Network support for drinking has been found to be predictive of poor outcomes in treatment-seeking patients (Havassy, Hall, & Wasserman, 1991; Longabaugh, Beattie, Noel, Stout, & Malloy, 1993; Project MATCH Research Group, 1997). Efforts to make existing social networks less supportive of substance use have been proposed but have not been widely adopted (e.g., Galanter, 1986, 1999). These efforts include the community reinforcement approach (CRA), first proposed by Hunt and Azrin (1973) and since refined (e.g., Meyers & Miller, 2001; Sisson & Azrin, 1989), and the United Kingdom Alcohol Treatment Trial Social Behaviour and Network Therapy study (UKATT SBNT; Copello et al., 2002; UKATT Research Team, 2005). CRA involves reinforcing the alcoholic’s sobriety and development of activities incompatible with alcohol use, such as participation in recreational and social activities and employment. Although CRA is frequently cited as one of the most efficacious approaches to treatment (e.g., Miller, Wilbourne, & Hettema, 2003), its use is not widespread, possibly because of the time and effort required to implement such a comprehensive intervention. Additionally, the complexity of the intervention makes it difficult to determine what features of CRA make it effective.

SBNT was an effort to identify, expand, and mobilize the social network of drinkers, particularly family, friends, and acquaintances. In the UKATT Research Team’s (2005) study, both SBNT and a comparison motivational enhancement therapy intervention yielded significant decreases in drinking and in drinking-related problems at 12 months, with no differences between treatment conditions (UKATT Research Team, 2005). The authors did not report whether SBNT acted on the social network as planned or if changes in social network were related to outcomes.

The clearest example of an existing social network that supports abstinence is Alcoholics Anonymous (AA). AA is a ready-made sobriety-supporting network and fulfills several of the conditions required of a behavioral choice model of relapse prevention (Tucker, Vuchinich, & Gladso, 1990). AA provides alternative activities to drinking, constrains access to alcohol (at least while...
people are attending meetings), and provides a social group that reinforces sober behavior. Several studies support the efficacy of AA or similar groups in reducing alcohol use. Emrick, Tonigan, and Montgomery (1993) concluded that AA members achieve abstinence at a higher rate than do professionally treated alcoholics and that AA participants who are more active in the fellowship program fare better than less active participants. The findings of AA studies are consistent with the idea that social support for sobriety can enhance treatment outcome. Naturalistic studies by Kaskutas and Bond (Bond, Kaskutas, & Weisner, 2003; Kaskutas, Bond, & Humphreys, 2002) indicate that AA effects are partly mediated by the changes that occur in patients’ social networks, particularly changes in network support for drinking.

A difficulty with such naturalistic studies, however, is that patients who actually attend AA are self-selected. Thus, it is not possible to know what the true effect of AA is. To get an understanding of the true value of AA, researchers would have to manipulate attendance at AA. To some extent, this was done in Project MATCH, in which patients assigned to a case management (CaseM) control condition. The findings of these studies are consistent with the idea that social support for sobriety can enhance treatment outcome. Naturalistic studies by Kaskutas and Bond (Bond, Kaskutas, & Weisner, 2003; Kaskutas, Bond, & Humphreys, 2002) indicate that AA effects are partly mediated by the changes that occur in patients’ social networks, particularly changes in network support for drinking.

Network support for drinking also emerged as one of the more interesting matching variables in Project MATCH. At the 3-year follow-up, it was found that, among patients with high network support for drinking at intake, those who had been assigned to the TSF intervention had better outcomes than those assigned to motivational enhancement therapy (Project MATCH Research Group, 1998). Although network support for drinking per se was not altered by TSF, causal chain analyses indicated that TSF did result in greater involvement in AA, even among those with high network support for drinking at intake. In contrast, for patients whose social network at intake did not support continued drinking, AA involvement had much less impact on outcome (Longabaugh, Wirtz, Zweben, & Stout, 1998). The implication of these findings is that a treatment that encourages a change of social network, from one that is supportive of drinking to one that is supportive of sobriety (e.g., by encouraging AA participation), may be effective, especially for those whose pretreatment environments are initially more supportive of drinking.

In the present article, the network support treatment is described. Unlike SBNT, network support is more reliant on AA and other established social infrastructures to change the social network. AA attendance, as well as involvement in other nondrinking networks, is manipulated by encouragement to attend sober network functions (e.g., AA meetings, nondrinking social events) and by reinforcing attendance in treatment.

Alcoholic patients drawn from the community were randomly assigned to one of three treatment conditions: network support (NS), network support + contingency management (NS + CM), or a case management (CaseM) control condition. We hypothesized that a NS intervention would result in more adaptive change in social networks than would CaseM, and that such changes in the social network would predict drinking outcomes.

We also hypothesized that direct reinforcement of network change behaviors using contingency management procedures would lead to greater (and faster) change in the social network, and thereby more complete and lasting reductions in alcohol consumption, than in the other conditions. Finally, we tested whether a NS intervention would be most beneficial to those whose networks were least supportive of abstinence at intake, consistent with the finding in Project MATCH (Project MATCH Research Group, 1998; Zwyik, Longabaugh, & Wirtz, 2002). The present article reports on results out to the 15-month follow-up.

Method

Participants

Recruitment occurred from October 2002 through March 2005. Participants were recruited through newspaper and radio advertisements announcing free alcohol treatment and through other research programs at our site, which is a university medical center. To be eligible, individuals had to be at least 18 years old, meet Diagnostic and Statistical Manual of Mental Disorders (4th ed.; DSM–IV; American Psychiatric Association, 1994) criteria for alcohol dependence or abuse, and be willing to accept random assignment to any of the three treatment conditions. Individuals were excluded from participation if they had acute medical or psychiatric problems requiring inpatient treatment (e.g., acute psychosis or suicide/homicide risk), current dependence on drugs (except nicotine and marijuana), intravenous drug use in the previous 3 months, reading ability below the fifth-grade level, lack of reliable transportation to the treatment site, or excessive commuting distance. Individuals were also excluded if they were already engaged in substance abuse treatment, if they denied any drinking in the previous 60 days, or if they had attended more than three AA meetings in the month prior to intake.

Of the 348 men and women who responded to advertisements and were screened, 297 were eligible according to the criteria described. Most (31) of the 51 excluded were already engaged in some type of treatment. The remainder were excluded because of other drug dependence or lack of transportation and/or stable residence. Of the 297 initially considered eligible, 87 dropped out of the study prior to randomization because of lack of interest or concurrent drug abuse discovered after the baseline assessment but before randomization. The remaining 210 participants were assigned to the three treatment conditions: NS (n = 69), NS + CM (n = 71), and CaseM (n = 70). A sample size of 44 per cell was determined to be sufficient to test all hypotheses (including the interaction of Treatment ˟ Network Support Change) with a power of .83 and alpha set at .05, on the basis of effect sizes derived from previous studies of social network changes (Project MATCH Research Group, 1997) and studies of contingency management procedures on treatment process measures (Petry, Martin, Cooney, & Kranzler, 2000). Given the procedures used in each treatment, participants, therapists, and research assistants could not be blinded as to experimental condition. A diagram showing the flow of participants through the recruitment, treatment, and follow-up stages of the study is shown in Figure 1.

Participants were 58% male, with a mean age of 45 years (SD = 11.4), and they were 86% White, 8% Black, 4% Hispanic, and 2% other. Their mean years of schooling was 13.7 (SD = 2.1), 71%
were employed at least part time, and 51% were living with a spouse or partner. All met criteria for alcohol dependence (99%) or abuse (1%), drank on a mean of 72% of days in the 3 months prior to intake, and averaged 1.3 prior treatments for alcohol dependence (SD = 3.3).

**Measures and Instruments**

**Telephone screening.** Individuals seeking treatment contacted our research center by telephone, at which point they were screened for eligibility with a 20-min Quick Screen.

**Diagnostic interview.** The Structured Clinical Interview for DSM-IV Axis I Disorders, Patient Edition, Version 2.0 (First, Spitzer, Gibbon, & Williams, 1996) was used to determine whether participants met inclusion/exclusion criteria for alcohol abuse or dependence, drug dependence, and psychotic symptoms in the 90 days prior to the interview. Also included in the interview was the Slosson Oral Reading Test (Slosson, 1963).

**Drinking and drug use outcome data.** We collected drinking and drug use data at baseline and at follow-ups using the Form-90 (Miller & DelBoca, 1994). The Form-90 is a structured interview that combines the calendar prompts of the time-line follow-back method (Sobell & Sobell, 1992) with drinking pattern estimation procedures, allowing the recording of drinking for each of the previous 90 days. The Form-90 has good test–retest reliability and validity for verifiable events (Tonigan, Miller, & Brown, 1997).

**Verification of self-reports of drinking.** To provide a gross check on self-reports, we took urine samples at baseline and at posttreatment to screen for drug use. Breathalyzer readings were taken at intake, at every in-person follow-up, and at every treatment session in all intervention conditions. Collateral reports were

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**Figure 1.** Diagram showing flow of participants through each stage of study up to 15-month follow-up. AA mtgs. = Alcoholics Anonymous meetings; Sub. = substance; Tx = treatment; alc. = alcohol; CaseM = case management; mo = months; NS = network support; NS + CM = network support + contingency management.
obtained for one third of participants (randomly selected) and used to verify self-reports substance use. The level of agreement between collaterals and patients regarding drinking at posttreatment was \( \kappa = .62 \) (\( p < .001 \)).

**Psychosocial outcome.** The Drinker Inventory of Consequences (DrInC; Miller, Tonigan, & Longabaugh, 1995) was used to assess problems related to drinking, including health, legal difficulties, and social relations. The DrInC Total score had an internal reliability \( \alpha = .85 \).

**Treatment process variables: Network support.** We measured network support for drinking and for abstinence using the Important People and Activities inventory (IPA; Clifford & Longabaugh, 1991). The IPA consists of a structured interview that asks patients to identify important people in their social network, defined as those people with whom they spent the most time in the previous 12 months. For each person identified, the patient specifies the nature of the relationship (e.g., spouse, brother, friend, coworker), the duration of the relationship, the frequency of contact, the drinking behavior of each person (frequency and quantity), and the person’s behavior with respect to the patient’s drinking (supportive, neutral, nonsupportive of drinking, or supportive of abstinence). Five subscales developed for use in Project MATCH (Project MATCH Research Group, 1993) were used in the present study as the primary social network outcomes: Social Support for Drinking, Behavioral Support for Drinking, Attitudinal Support for Drinking, Behavioral Support for Abstinence, and Attitudinal Support for Abstinence.

Social Support for Drinking was comprised of two summary variables, the mean of the drinking status (from 1 = abstainer to 5 = heavy drinker) of the persons named in the participant’s social network and the mean of those persons’ reactions to the participant’s drinking (from 1 = left the room to 5 = encouraged drinking). Thus, those with networks containing more heavy drinkers, or drinkers who were more encouraging of drinking, were defined as having greater Social Support for Drinking. Internal reliability of the Social Support for Drinking variable at baseline was \( \alpha = .72 \). Behavioral Support for Drinking was the proportion of people in the participant’s social network who were classified as heavy drinkers (i.e., modeled drinking behavior). Attitudinal Support for Drinking was calculated by taking the mean of the reactions to drinking of the top four persons on the participant’s list of important people. Internal reliability of the Attitudinal Support for Drinking variable at baseline was \( \alpha = .70 \).

Behavioral Support for Abstinence was the proportion of people in the participant’s social network who were abstinent. Attitudinal Support for Abstinence was calculated by taking the mean of the reactions to not drinking of the top four persons on the participant’s list of important people (with reactions scaled from 1 = left the room to 5 = encouraged nondrinking). Internal reliability of the Attitudinal Support for Abstinence variable at baseline was \( \alpha = .68 \). The intercorrelations of all five of the network support variables were in the range of .2–.6, indicating that these variables represented related, but not redundant, constructs.

Level of involvement in AA was also considered an important process variable. The AA Involvement Questionnaire (Tonigan, Connors, & Miller, 1996) is a 16-item self-report inventory that measures lifetime and recent attendance and involvement in AA (e.g., acting as a sponsor). The AA Involvement Questionnaire used here had a range from 0 to 5 and a reliability of \( \alpha = .73 \). Self-reports of number of AA meetings attended were also used as process variables.

**Procedure**

**Initial evaluation, informed consent, and identification of collaterals.** Prospective participants were first evaluated through the Quick Screen procedure and were either excluded (and referred elsewhere for treatment appropriate to their needs) or scheduled for an intake interview with a research assistant. The final decision about eligibility was made at the intake interview, after completion of the Structured Clinical Interview for DSM–IV Axis I Disorders (to determine alcohol dependence or the other exclusionary diagnoses). Those who were eligible and agreed to be randomly assigned to treatment reviewed and signed the informed consent form and completed the intake assessment. One third of the participants were asked to give the name of a collateral (usually a spouse or close friend) who would be able to verify the participant’s level of drinking and his/her location.

**Assignment to treatment.** We randomly assigned those who agreed to participate to treatment using a computerized urn randomization procedure (Stout, Wirtz, Carbonari, & Del Boca, 1994) that balanced the three groups for gender, age, ethnicity, alcohol dependence, and lifetime involvement with AA. Participants were informed of their treatment assignment by a research assistant at intake and subsequently were contacted by their therapist to schedule their first treatment appointment.

**Data collection procedures.** Trained bachelor-level research assistants conducted the pretreatment and follow-up research assessments. In-person follow-up interviews were conducted at Months 3 (posttreatment), 9, 15, 21, and 27. Assessments at Months 6, 12, 18, and 24 were conducted by telephone. Participants were compensated $40 for attending the initial intake assessment, $50 for each in-person follow-up assessment, and $20 for the telephone follow-ups. At the 9-month and 15-month follow-ups, 79% and 76% of the interviews were conducted in person, respectively. Results presented in this article cover only through the 15-month time period (1-year posttreatment).

**Treatment Interventions**

Treatment was conducted in 12 weekly 60-min outpatient sessions, employing detailed therapist manuals. Any participant with a breathalyzer reading above .05 was asked to wait until the level declined or to return at a later date. Precautions were taken to prevent those who were legally intoxicated or impaired from driving a car, although this occurrence was rare.

**CaseM.** The CaseM intervention was based on that used in the Marijuana Treatment Project (Steinberg et al., 2002) and was intended to provide an active control condition. During treatment, problems were explored in several domains: psychiatric, interpersonal (family, childcare, and other social issues), medical, employment, educational, financial, housing, legal, and transportation. The therapist and participant used a problem checklist to identify problems that could be barriers to abstinence. Examples of goals included contacting a psychiatrist for depression, finding a job, or finding a new place to live.

After goals were selected, the participant and therapist identified resources to address them, using a comprehensive guide to local...
services. The role of the therapist was to explore the relationship between identified problems and drinking, monitor progress toward goal attainment, and support participants’ efforts to reach their CaseM goals. Efforts were made to minimize overlap with the NS and NS + CM treatments by avoiding explicit recommendations regarding social support or skills development. Attendance at AA was neither encouraged nor discouraged for CaseM participants.

**NS intervention.** The NS intervention consisted of twelve one-hour sessions intended to help the patient change his or her social support network to be more supportive of abstinence and less supportive of drinking. Because AA is a ubiquitous source of social support and one that is already tapped by most treatment services, it was thought that encouraging attendance at AA might be an efficient way to quickly engage patients in a supportive abstinence-oriented social network. Thus, the NS intervention was based on the TSF treatment created for Project MATCH (Nowinski, Baker, & Carroll, 1992). The program consisted of six core sessions, plus six elective sessions that were chosen by the therapist and the patient together. Core topics included Program Introduction; Acceptance (of alcoholism as a problem); Surrender (giving up the idea of managing without help); Getting Active (start changing the social network); People, Places, and Things (stimulus control of drinking); and Termination.

Although the core topics were based on topics presented in Project MATCH TSF, the emphasis was shifted to changing one’s overall social support system. AA-specific philosophy and a focus on a higher power were downplayed, and attendance at AA was presented as a way to avoid drinking, make new acquaintances, and derive enjoyment (reinforcement) from activities other than drinking. If a patient was adamantly opposed to attending AA, the emphasis on AA was dropped. In all cases, other social networks were also explored.

Sessions 2–11 began with a review of the Adherence Checklist, a record of treatment-relevant activities, including AA meetings and other nondrinking social activities engaged in. If a slip was reported, the therapist worked with the participant to find a way to use his/her social network to help avoid future slips (e.g., calling an AA sponsor or another nondrinking friend, asking the nondrinking spouse to help monitor activities). The session then proceeded to new material, consisting of a core topic or an elective session. Elective topics included the following: Genograms (importance of family drinking); Enabling; Taking Moral Inventories; Sober Living; HALT (dangers of being Hungry, Angry, Lonely, Tired); Assertiveness Training; Increasing Pleasant Activities; and joint sessions with the participant’s spouse or partner.

The end of the session entailed a discussion of Recovery Tasks (homework). These took the form of going to AA meetings and exploring ways to change one’s network of support. These tasks included Education (obtaining information about a course at a community college); Employment (e.g., searching for and applying for a job in a nondrinking environment); Family (e.g., family outings or family therapy); and Social/Recreational (e.g., going to a gym, reestablishing contact with nondrinking friends and relatives).

**NS + CM.** Participants in this condition received the same NS treatment as described above. In addition, reinforcements were provided contingent upon completion of assigned tasks between sessions. Verification of completion of tasks consisted of receipts or signed slips with names and phone numbers listed for confirmation. The form of verification was specified each week on the Adherence Checklist.

The contingency management portion of this condition was adapted from Iguchi, Belding, Morrel, and Lamb (1997) and Petry et al. (2000), and it used a fishbowl-drawing procedure for determining amount of reinforcement. Participants earned drawings from the fish bowl if they offered verification of completed assignments related to developing nondrinking social support networks. Each drawing provided the opportunity to accumulate slips that could be redeemed for services or merchandise.

The drawing fish bowl contained 500 slips of paper. Half of these slips were nonwinning slips that read, “Sorry, try again.” Of the winning slips, 199 were for small prizes (e.g., $1 coupons for local merchants, $1 fast food gift certificates, or bus tokens). Of the winning slips, 50 specified prizes worth approximately $20 in value, such as radios, art and craft supplies, and gift certificates. One of the 500 slips could be redeemed for a prize worth about $100 (e.g., a hand-held television, a portable stereo CD player) or five $20 prizes. Participants were made aware of their chances of picking a winning slip on each trial, and they were encouraged to make suggestions for prizes in all three categories.

Participants earned at least one drawing per verified activity completed. If they accomplished three activities in a given week, the number of drawings earned for each activity escalated by one for each successive week that they accomplished three activities. Participants could thus earn up to two drawings per activity completed in Week 2 (total = six draws for Week 2), up to three in Week 3 (total = nine draws for Week 3), and so on. During the 12 weeks of study participation, they could earn a maximum of 234 drawings.

Failure to attend a scheduled treatment session without giving notice, or failure to provide verification for activity completion, resulted in loss of drawing opportunities for that week, and the number of drawings earned was reset back to one drawing per activity verified. The number of earned drawings was restored to the prior level after verification of three completed activities at three successive sessions. Participants were encouraged to provide honest reports of alcohol use and were assured that drawings would be earned as long as contracted activities were accomplished and verified, regardless of alcohol use.

**Treatment Integrity**

Detailed, step-by-step outlines were provided for each treatment session. Therapists were required to follow the session outline and check off areas covered as the session proceeded. The requirement to adhere to the session outlines and to record progress reduced the likelihood of extraneous or tangential discussions and ensured that required material would be covered. Additionally, each treatment session was audiotaped. The Project Coordinator (PC) listened to all session tapes for the therapist training cases (36 tapes per therapist) and provided weekly supervision. Thereafter, the PC listened to 33% of session tape recordings and independently confirmed that session outlines were followed and that elements of treatment were being delivered. The PC also verified that elements unique to one treatment were not employed in the other treatments. Supervision was provided biweekly and covered both clinical issues and treatment adherence.
Results

Homogeneity Check

Multiple chi-square tests and one-way analyses of variance were used to verify that the three treatment groups were equivalent with respect to the balancing variables: gender, age, ethnicity, alcohol dependence, and current involvement with AA, as well as other relevant sample variables (education level, marital status, employment, and DrInC Total score). There were no significant between-groups differences on any variable.

Of the 210 participants randomized to treatment, 17 (8%) dropped out of the study prior to completion of treatment and provided no posttreatment data. By the 15-month follow-up, another 7 had dropped out, and the remaining participants were distributed among the treatment conditions as follows: CaseM (n = 64), NS (n = 63), and NS + CM (n = 59). Analyses indicated no differences in any patient characteristic by treatment condition among those who completed the 15-month follow-up. These 186 participants provided the data used in the intention-to-treat analyses described below.

Adherence to Treatment

We evaluated session attendance and adherence to treatment assignments using one-way analysis of variance. Over all three conditions, participants attended 8.7 sessions of 12 (SD = 4.2). There were no significant differences in number of sessions attended as a function of treatment condition: CaseM, 9.2 sessions (SD = 3.8); NS, 8.3 sessions (SD = 4.4); and NS + CM, 8.6 sessions (SD = 4.5); F(2, 190) = 0.69, p > .50.

In the two NS conditions, therapists judged whether each assigned activity was completed. Patients in the NS condition completed 83.2% of assignments, and those in NS + CM completed 90.2% (Z = 1.17, p > .25). Patients in the NS + CM condition earned on average 56 draws and redeemed $250.00 worth of prizes. No adherence calculation could be made for the CaseM condition because of the looser behavioral requirements in that condition.

Treatment Effects on Outcome

The primary drinking outcome variables derived from the Form-90 were Proportion of Days Abstinent (PDA) and Continuous Abstinence for the 90-day period prior to each follow-up. The PDA data were arcsine transformed to decrease the inherent skewness of proportion data (Winer, 1971). The DrInC Total score was the primary psychosocial dependent variable examined.

Linear mixed modeling (Proc MIXED; SAS Institute, 1999) was used to analyze the transformed PDA outcome variable over time as a function of treatment condition. Main effects for Treatment and Time (from baseline to 15 months) were examined, as well as two planned contrasts comparing (a) both NS conditions versus the CaseM condition (i.e., CaseM vs. NS, NS + CM), and (b) NS versus NS + CM (i.e., NS vs. NS + CM). The mixed modeling procedure was used because it employs maximum likelihood estimation to calculate parameter estimates and thus allowed us to take advantage of all data collected. In this analysis, Treatment condition was treated as a fixed effect. Both Time and intercept were included as random effects. An unstructured covariance structure was adopted on the basis of accepted fit criteria (−2 restricted log-likelihood, Akaike Information Criterion; Judge, Griffiths, Hill, Lutkepohl, & Lee, 1985).

The analysis of PDA (transformed) through 15 months indicated no main effect for Treatment, F(2, 931) = 1.60, p > .05; a significant effect for Time, F(5, 931) = 123.66, p < .001; and a significant Treatment × Time interaction, F(10, 934) = 2.13, p < .05. Analysis of planned Time × Treatment contrasts indicated that the two NS conditions yielded significantly greater PDA than did the CaseM control condition at follow-ups, F(contrast, 1, 934) = 3.15, p < .05, but that the two NS conditions did not differ from each other. The treatment effect contrast NS, NS + CM versus CaseM had a moderate effect size (average d = 0.41). Pretreatment, posttreatment, and follow-up levels of PDA (detransformed) by treatment condition are shown in Panel A of Figure 2 to illustrate the magnitude of the treatment effects.

Figure 2, Panel B shows the levels of continuous abstinence reported for the 90 days prior to each follow-up period. As seen in the figure, abstinence rates in the NS condition reached 40% at 15 months. A generalized estimating equations (Proc GENMOD; SAS Institute, 1999) model was used to analyze the effect of treatment condition on continuous abstinence prior to each of the follow-up points. Pretreatment PDA (transformed) served as a covariate. The analysis yielded no significant main effect for Treatment condition, or for Time, and there was no Treatment × Time interaction. An a posteriori contrast comparing the NS conditions versus CaseM, however, was significant, χ²(1, N = 210) = 4.27, p < .05. This contrast had a moderate effect size of h = .31. The two NS conditions did not differ from each other.

Figure 2, Panel C, shows the mean DrInC negative consequences scores by treatment condition for each of the follow-up points in which the measure was administered. As can be seen in the figure, reports of negative consequences declined over time for patients in all treatments. A linear mixed model analysis was used to examine differences in DrInC Total score as a function of treatment condition over the 15 months of follow-up. PDA at baseline (transformed) served as a covariate. Results indicated no main effect for Treatment, F(2, 483) = 1.33, p > .05; a significant effect for Time, F(3, 483) = 102.89, p < .001; and a significant Treatment × Time interaction, F(6, 483) = 1.25, p > .05. Planned Time × Treatment contrasts also failed to show systematic differences in DrInC scores attributable to Treatment condition.

Treatment Effects on Social Network Change

Linear mixed models with planned contrasts were used to determine the effect of treatment over time on the five IPA subscales. As seen in Table 1, no main effects for Treatment emerged in the analyses of any of the social network variables tested. Effects for Time, and/or for Treatment × Time, were found for four of the variables: Social Support for Drinking, Behavioral Support for Drinking, Behavioral Support for Abstinence, and Attitudinal Support for Abstinence. Examination of least-squared means suggested that Social Support for Drinking decreased significantly in all treatment conditions from baseline to posttreatment and remained low at the 15-month follow-up point.

Three variables showed Treatment × Time interactions. Scores on Behavioral Support for Drinking decreased more steeply in the two NS conditions from pre- to posttreatment, whereupon scores in
all treatments tended to increase somewhat by 15 months (see Figure 3, Panel A). The two variables assessing support for abstinence increased from pre- to posttreatment differentially by Treatment and remained elevated through the follow-ups (see Figure 3, Panels B and C). The Treatment Contrasts × Time Analyses (see Table 1) revealed that support for abstinence increased among those in the two NS conditions but not among those treated in CaseM. There was no difference between the NS and NS + CM...
Table 1

Results of Repeated Measures Mixed Model Analyses of Variance on Network Support Variables at Posttreatment and 15-Month Follow-Up

<table>
<thead>
<tr>
<th>Variable</th>
<th>Treatment (dfs = 2, 206)</th>
<th>Time (dfs = 1, 206)</th>
<th>Time × Treatment (dfs = 2, 206)</th>
<th>Time × Treatment Contrast Results (dfs = 1, 206)</th>
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</thead>
<tbody>
<tr>
<td>Social Support for Drinking</td>
<td>0.15</td>
<td>3.13*</td>
<td>1.02</td>
<td>0.21</td>
</tr>
<tr>
<td>Behavioral Support for Drinking</td>
<td>2.21</td>
<td>8.64***</td>
<td>0.57</td>
<td>3.89*</td>
</tr>
<tr>
<td>Attitudinal Support for Drinking</td>
<td>0.05</td>
<td>0.13</td>
<td>0.81</td>
<td>0.02</td>
</tr>
<tr>
<td>Behavioral Support for Abstinence</td>
<td>0.36</td>
<td>3.70*</td>
<td>3.14*</td>
<td>3.15*</td>
</tr>
<tr>
<td>Attitudinal Support for Abstinence</td>
<td>0.18</td>
<td>1.23</td>
<td>4.72*</td>
<td>4.69*</td>
</tr>
</tbody>
</table>

Note. The values shown are F values for each effect. NS = network support; NS + CM = network support + contingency management; CaseM = case management.

*p < .05. *** p < .001.

conditions. For both of the abstinence support variables, the effect size of the NS, NS + CM versus CaseM contrasts was approximately d = 0.70.

Examination of the social networks confirmed the findings regarding increase in support for abstinence in the NS conditions. Networks were examined for number of Heavy Drinking Friends (e.g., those who drank at least everyday) and Nondrinking Friends. Friends were people with whom the patient associated at least once per week. Linear mixed model analyses indicated that the number of Heavy Drinking Friends remained constant (at about 1.3) in all conditions over all time periods. The number of Abstinent Friends, however, showed a Treatment × Time effect, F(4, 207) = 2.39, p < .05, such that number of Abstinent Friends increased over time for those in the NS conditions (from 1.2 at baseline to 1.5 at 15 months) versus the CaseM condition, which showed no increase, F(1, 207) = 2.10, p < .05.

Given the emphasis on AA in the NS interventions, a linear mixed model like that just described was performed on the baseline, posttreatment, and 15-month follow-up AA Involvement scores. Examination of pretreatment and follow-up least squared means indicated that AA Involvement actually decreased among the CaseM participants (from 2.2 to 1.0), whereas AA Involvement increased in the two NS conditions (from about 2.0 to 2.5). The analysis showed a significant main effect for Treatment, F(2, 328) = 5.28, p < .01; no Time effect; and a significant Treatment × Time interaction, F(4, 328) = 5.80, p < .001. Time × Treatment contrasts indicated that the two NS conditions yielded significantly greater AA Involvement scores at posttreatment than did the CaseM condition, F(1, 328) = 6.75, p < .01, but the two NS conditions did not differ from one another. The effect size for the NS, NS + CM versus CaseM contrast was moderate to large, d = 0.68.

We analyzed AA attendance using a linear mixed model, like those described above. Results indicated a main effect for Treatment, F(2, 330) = 3.37, p < .05; a main effect for Time, F(2, 330) = 24.96, p < .001; and a significant Treatment × Time interaction, F(4, 330) = 2.35, p < .05. AA attendance in the NS conditions averaged over 25 meetings in the prior 90 days at the 15-month point, versus just over 8 for CaseM participants, resulting in a significant contrast of NS, NS + CM versus CaseM × Time, F(1, 330) = 8.61, p < .01. The effect size of this contrast was d = 0.80. The two NS conditions did not differ from each other.

An additional analysis examined whether patients attended AA at all during the treatment period as a function of treatment condition. Of the CaseM participants, 18% attended at least one meeting during the treatment period, as compared with 67% of NS patients and 56% of NS + CM patients. A logistic regression analysis that used attendance (yes–no) as the outcome, and that controlled for lifetime AA attendance, indicated that those in either of the NS conditions were over 7 times more likely to attend AA than those in CaseM (B = 2.04, SE = 0.39, Wald χ² = 26.80, p < .001, odds ratio = 7.71). There were no differences between the two NS conditions.

As noted above, not all patients attended AA, even though AA attendance was encouraged at every NS session. Of the more than 3,100 network support activities completed by patients, 26% were accounted for either by AA attendance or AA-related activity (e.g., arranging a sponsor). The rest of the activities completed consisted of Family Activities (e.g., family outings, church, activities with children; 27%), Other Social (e.g., going to gym, walks or lunches with nondrinking friends, activities with church groups; 30%), or Individual-Nondrinking (completing job applications or going on job interviews, attending classes; 17%).

Network Change and Treatment Outcome

A series of partial correlations was performed to evaluate the influence of change in each of the network support variables on outcome at posttreatment through 15 months (see Table 2). For each partial correlation, the baseline value of both the support variable and the outcome variable was controlled for. As the correlations indicate, change in network support for drinking tended to be only weakly associated with treatment outcome. However, changes in support for abstinence, and involvement with AA, were significantly related to improvements in abstinence at
posttreatment and follow-up. Of the network change variables examined, only increase in AA attendance was consistently associated with decreases in DrInC scores.

To determine whether network change was mediating the relationship between treatment and outcome, we examined a series of hierarchical linear models, with PDA (transformed) through 15 months as the dependent variable. As before, time and intercept were added as random effects, and an unstructured covariance structure was adopted.

In the first model, baseline values of all IPA network support variables that showed change from pre- to posttreatment were entered (i.e., Behavioral Support for Drinking, Behavioral Support

Figure 3. Effects of treatment on selected measures of social network change (measured with the Important People and Activities instrument [IPA]). Case Mgmt = case management; Net Support = network support; NS + ContM = network support + contingency management; Tx = treatment; Mo = months.
for Abstinence, and Attitudinal Support for Abstinence). In addition, AA attendance at baseline was also entered. In the second model, all variables from Model 1 were entered, plus a term representing the treatment contrast (CaseM vs. NS, NS + CM) was entered. In the third model, all variables from Model 2 were entered, as well as posttreatment values of the network support variables and AA attendance at posttreatment. (Because levels of network support did not generally increase substantially after the posttreatment period, the increases from pre- to posttreatment were used to represent the effects of changes in network support.) If the addition of the network support variables resulted in the loss of predictive power of the Treatment condition variable, it would indicate that network support was a mediator of the relationship between treatment and outcome (Baron & Kenny, 1986). Results of these analyses are seen in Table 3.

Examination of Table 3 indicates that of the variables entered in Model 1, only Time was a significant predictor of PDA outcome. In Model 2, the Treatment Contrast × Time interaction was significant. However, when posttreatment values of the network support variables were added in Model 3, the Treatment Contrast × Time interaction term was no longer significant, though the support-for-abstinence variables were significant. This result suggests that changes in Behavioral Support for Abstinence and in AA attendance from pre- to posttreatment were true mediators of the NS, NS + CM versus CaseM treatment effect.

Finally, we also examined the change in the nature of the social network and its relationship to outcomes. Patients (37 of 186 total available patients) were classed as very successful if they reported abstinence on at least 90% of days at all follow-ups. Of the very successful patients, the number of nondrinking close friends in the

Table 3
Results of Multiple Hierarchical Linear Regression Analyses Showing Influence of Network Support and Treatment Condition Variables on PDA Outcome Over 15 Months Posttreatment

<table>
<thead>
<tr>
<th>Model</th>
<th>Variables in model</th>
<th>dfs</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IPA Behavioral Support for Drinking—Baseline</td>
<td>1, 908</td>
<td>0.63</td>
</tr>
<tr>
<td></td>
<td>IPA Behavioral Support for Abstinence—Baseline</td>
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<td>1.46</td>
</tr>
<tr>
<td></td>
<td>IPA Attitudinal Support for Abstinence—Baseline</td>
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</tr>
<tr>
<td></td>
<td>AA attendance lifetime</td>
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<td>0.02</td>
</tr>
<tr>
<td></td>
<td>Time</td>
<td>5, 908</td>
<td>107.72***</td>
</tr>
<tr>
<td>2</td>
<td>All baseline variables entered</td>
<td>1, 902</td>
<td>1.17</td>
</tr>
<tr>
<td></td>
<td>Treatment contrast (NS, NS + CM vs. CaseM)</td>
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<td>99.21***</td>
</tr>
<tr>
<td></td>
<td>Time</td>
<td>5, 902</td>
<td>4.45</td>
</tr>
<tr>
<td>3</td>
<td>All baseline variables entered</td>
<td>1, 828</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Treatment Contrast (NS, NS + CM vs. CaseM)</td>
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<td>79.94***</td>
</tr>
<tr>
<td></td>
<td>Time</td>
<td>5, 828</td>
<td>1.93</td>
</tr>
<tr>
<td></td>
<td>Behavioral Support for Drinking—Posttreatment</td>
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<td>1.72</td>
</tr>
<tr>
<td></td>
<td>Behavioral Support for Abstinence—Posttreatment</td>
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<td>3.12</td>
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<td></td>
<td>Attitudinal Support for Abstinence—Posttreatment</td>
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<td>4.84</td>
</tr>
<tr>
<td></td>
<td>AA attendance past 90 days—Posttreatment</td>
<td>1, 828</td>
<td>5.46</td>
</tr>
</tbody>
</table>

Note. PDA = Proportion of Days Abstinent; IPA = Important People and Activities instrument; AA = Alcoholics Anonymous; NS = network support; NS + CM = network support + case management; CaseM = case management. * p < .05. ** p < .01. *** p < .001.
social network increased from a mean of 1.3 (SD = 1.1) at baseline to a mean of 1.9 at 15 months (SD = 1.0). The number of heavy drinking close friends among these patients remained steady (M = approximately 1.7, SD = 1.1). We used logistic regression analyses to predict success status using baseline and posttreatment numbers of heavy drinking and nondrinking friends in the social network. Change in number of heavy drinkers in the social network was not predictive of success status. However, change in the number of nondrinkers in the social network from baseline to posttreatment was a significant predictor of success status (B = 0.22, SE = 0.18, Wald $\chi^2 = 2.02, p < .05$), such that an increase of one nondrinking friend in the social network translated into a 27% increase in the probability of being very successful by our definition.

Tests of Differential Efficacy of Network Support Treatment

To determine whether network support treatment was differentially effective for those who were higher in baseline Support for Drinking (or lower in Support for Abstinence) at intake, we examined linear mixed model analyses of PDA (transformed) over time. In each of these analyses, the following variables were included in the model: the Social Support variable (Social Support for Drinking or Behavioral Support for Abstinence); a term representing the primary Treatment contrast (CaseM vs. NS, NS + CM); the Time variable; and the interaction terms of Support × Treatment, and Support × Treatment × Time. In each of the analyses, the interaction terms involving the Support Variable × Treatment Contrast failed to reach significance ($p$ values ranged from .16 to .94). These results suggest that the NS intervention was not differentially effective for those higher in initial social support for drinking.

Network Support Treatment and Gender Effects

Women were well-represented in our patient sample. We were therefore able to analyze treatment effects on outcome by gender. A linear mixed model regression analysis was conducted in which PDA (transformed) from baseline to the 15 month follow-up point constituted the repeated dependent variable. Terms entered were patient gender, Treatment condition, Time in months, and the interactions of each of these. Subject and Time were treated as random effects. Gender was treated as a fixed effect. An autoregressive covariance matrix was used to model the repeated data.

In this analysis, the main effect for Treatment remained significant, $F(2, 919) = 3.31, p < .05$, as did the Time effect, $F(5, 919) = 108.67, p < .001$. However, a main effect for Gender also emerged, $F(1, 919) = 5.29, p < .05$, such that, overall, men were seen to have better outcomes than women. A Gender × Treatment interaction, $F(2, 919) = 5.70, p < .01$, indicated that women fared better than men did in CaseM but less well than men in the NS conditions, by a margin of about 10%. We obtained similar results with an analysis of repeated abstinence outcomes using a generalized estimating equations model. Significant Time and Treatment effects emerged, as did a main effect for Gender, $\chi^2(1, N = 210) = 10.39, p < .001$, and an interaction of Gender × Treatment, $\chi^2(2, N = 210) = 6.29, p < .05$.

One possibility for the relatively poorer performance of women in the NS conditions was that women might have already had sufficiently supportive networks and that an intervention seeking to change that might have been disruptive. A multivariate analysis of variance was therefore performed in which the network support variables measured at baseline were examined as a function of gender. Results indicated no overall significant differences in social network supportiveness between men and women at this baseline point (Wilks’ $\lambda = .96, p > .17$). Examination of network support variables from baseline through 15-month follow-up, however, did show a systematic difference in mixed model regression analyses. Throughout the trial, women reported significantly higher Social Support for Drinking than did men, regardless of treatment condition, $F_{gender}(1, 203) = 5.25, p < .05$.

Discussion

The results of this study indicate that a treatment specifically designed to change the social network can effect beneficial changes. Although behavioral support for drinking decreased in all conditions from pre- to posttreatment, only the NS treatment conditions appeared to result in increased support for abstinence. Contrary to expectations, the NS conditions did not yield decreases in Social Support for Drinking relative to the CaseM condition. Social Support for Drinking was a composite variable made up of the number of drinking friends and their reaction to drinking (ranging from nonsupportive to supportive). Examination of the number of people in each patient’s network indicated that the number of drinking friends remained constant, but that the number of abstinent people in the network increased from pretreatment through the follow-ups in the NS Conditions. In retrospect this result might have been expected; the NS treatments were focused on expanding abstinence-oriented relationships but did not specifically discourage established relationships with drinking friends. This result is somewhat at odds with those of Humphreys and Noke (1997), who noted that social network size tends to remain constant but that composition changes. In the present study, however, the abstinence-based network had to increase by only one person to make a significant difference.

As expected, attendance at, and involvement with, AA played a large role in support for abstinence. Posttreatment AA variables correlated with posttreatment Support for Abstinence variables in the range of .23–.33 ($p < .001$). This would suggest that, in many instances, AA was indeed being used as an additional social network. (That is, numbers of abstinent people in the social network increased as AA involvement increased.) However, it should also be noted that, despite our urgings and incentives to attend AA, 39% of NS patients never attended an AA meeting during the treatment period. For those patients who reported increases in Support for Abstinence and did not attend AA, the NS treatments may have operated by effecting changes in other areas (new friendships, new activities). Indeed, the NS participants who never attended AA tended to fare slightly less well than AA attendees in the later follow-ups but not significantly so. For example, at 15 months AA attendees in the NS conditions were reporting 70% days abstinent versus 62% for nonattendees.

As hypothesized, the NS conditions resulted in better posttreatment outcomes than did the CaseM condition. The CaseM condition was intended to control for many of the aspects of treatment
that have been termed “nonspecific” but are perhaps better termed “unspecified.” These factors include therapist attention and support, the addition of structure to one’s weekly schedule, and the effect of simply being in a clinical trial. The CaseM condition resulted in roughly a 25% increase in PDA, a 5%–10% increase in continuous abstinence, and a 10-point drop in DrInC scores. The NS conditions resulted in more than a doubling of those effects. Much of that improvement can be attributed to improvements in Social Network variables.

AA involvement (including attendance) was a large part of the improvement in social networks, and it was also a large contributor to outcomes. As can be seen in Table 2, increases in AA involvement variables were the strongest predictors of outcomes, and the only significant predictors of improvement in drinking consequences. As has been frequently noted (e.g., Moos & Moos, 2005), AA attendance is associated with improved outcomes in virtually all cases. Those who choose to attend AA, however, remain a self-selected subgroup of patients. The 61% overall attendance rate in the NS conditions versus the 18% in CaseM suggests that participants can be “encouraged to self-select.” In any case, AA in this study seems to have acted as described by Humphreys, Mankowski, Moos, and Finney (1999), who reported that AA operated by expanding social networks.

The hypothesis that those who had social networks most supportive of drinking would most benefit from NS treatment, as found in Project MATCH (Project MATCH Research Group, 1998), failed to be supported. One possibility for this is that the Project MATCH sample may have been more severe or more socially isolated than the current sample. However, an examination of the characteristics of the current sample indicates that it is quite comparable with the Project MATCH outpatient sample in terms of demographics and treatment history. Similarly, in terms of Social Support for Drinking, the Project MATCH sample reported a mean score of 6.2 (SD = 1.08) at intake versus a mean of 5.8 (SD = 1.06) for the current sample. Thus, it seems unlikely that sample differences account for the differences in findings.

Another possibility seems more likely. The Project MATCH findings (Project MATCH Research Group, 1998) were not discovered until 3 years after treatment. It may take a considerable amount of time for alcohol dependent patients to adopt a different view of what their social network should look like. The Network Support Project will continue to follow the current sample for another year, during which further social network changes may take place.

A notable, and consistent, finding in the current study was the failure of contingency management to yield either more therapy-related behavior change or improved outcomes. This failure to find an effect may be related to the target for reinforcement. In most studies of contingency management for drug use, for example, the target for reinforcement is the delivery of a negative urine sample (Petry, 2000), thus directly reinforcing abstinence. Reinforcing abstinence directly may engender better substance use outcomes than reinforcing alternate behavior patterns, a finding that was also noted in a recently completed study of contingency management for illicit substance abusers (Petry et al., 2006).

The lack of beneficial effects of the contingency management procedure in the present study may also relate to characteristics of the population being treated or to the treatment itself. In this study, patients completed over 83% of their weekly assignments even when no reinforcement was provided (i.e., in the NS alone condition). This high level of adherence may have resulted in a ceiling effect, leaving little room for improvement for contingency management. Indeed, the NS + CM condition in this study did not significantly improve compliance with weekly activities. In contrast, among illicit substance dependent patients, compliance levels with activities tend to be substantially lower, with only about 66% of activities completed even when reinforcement for completion is provided (Petry et al., 2006; Petry, Tedford, & Martin, 2001).

The present study has some limitations. Most notably, there was no active coping skills-based treatment against which to compare the NS treatments. Consequently, there is no way to determine whether NS is superior to other treatments, such as cognitive-behavioral treatment. It should be noted, however, that the CaseM condition in this study was manualized and provided the same degree of attention and task involvement as the other active treatments. Given the levels of attendance and satisfaction seen in this study (the mean satisfaction ratings ranged from 4.5 to 4.7 of 5 for all treatments), it appears that CaseM was seen as an active and viable treatment, and as such was a useful control condition.

We do not yet know what aspects of “support for abstinence” are truly responsible for improvements in outcomes. One possibility is that simply spending time with abstinent persons takes time away from drinking. However, the fact that associations with persons supporting abstinence and AA attendance remained elevated throughout the follow-up period indicates that patients may find contact with abstinence-oriented individuals reinforcing.

Although we were able to achieve an impressive level of at least minimal AA involvement, over one third of our patients refused to attend AA. Thus, the self-selection problem in the interpretation of AA outcomes is still with us to some extent. Additional exploration of the differences between those who attend AA and those who do not, and the strategies they each use to control drinking, will be needed.

Finally, the analysis of outcomes by gender actually showed that women fared less well in the NS conditions than did the men. To say that this was unexpected is an understatement. The result is certainly at odds with findings like those by Davis and Jason (2005), who found that, among those in a recovery community, women, and not men, used their social networks to increase their sense of self-efficacy for abstinence, and that social support for abstinence mediated the relationship between treatment and outcome. The finding that baseline support variables were equivalent between men and women suggests that it was not the case that the NS treatments were disruptive of adaptive support networks already in place for women. To the contrary, women tended to have less adaptive networks over time than did the men. It may be that the NS conditions encouraged these women to rely more on these less adaptive networks.

In summary, the present study indicates that a manualized treatment focused specifically on changing the social environment can indeed alter the social network of alcohol dependent patients, and that adaptive social network changes are predictive of drinking outcome, at least in the short term. It remains to be seen whether this particular treatment approach will in the long run be better suited to those with impoverished social networks, as would be predicted from previous research.
References


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