Published in final edited form as:

Psychol Addict Behav. 2012 December ; 26(4): 859–869. doi:10.1037/a0029674.

Motivational Interviewing: A Pilot Test of Active Ingredients and Mechanisms of Change

Jon Morgenstern,

Columbia University and New York State Psychiatric Institute

Alexis Kuerbis,

Columbia University and Research Foundation for Mental Hygiene, Inc.

Paul Amrhein,

Montclair State University

Lisa Hail,

Research Foundation for Mental Hygiene, Inc.

Kevin Lynch, and

Penn-TRI Center on the Continuum of Care in the Addictions, University of Pennsylvania

James McKay

Penn-TRI Center on the Continuum of Care in the Addictions, University of Pennsylvania

Abstract

Motivational Interviewing (MI) is an effective treatment for substance use disorders (SUD) that focuses on resolving ambivalence and increasing commitment to positive behavior change. While MI has a well developed clinical theory, research findings have been mixed in supporting its view of how change occurs. The primary aim of this pilot study was to test hypothesized MI active ingredients and mechanisms of change in reducing drinking during the initiation of a behavior change episode. Problem drinkers (N=89) seeking treatment were randomly assigned to MI, relational MI without directive elements (Spirit-Only MI, SOMI), or a self-change (SC) control condition. Participants were followed during an eight week treatment period. The first two of four treatment sessions were videotaped and coded for fidelity, discriminability, and change talk. Overall, conditions demonstrated high fidelity. As predicted, change talk significantly increased in MI relative to the SOMI condition. Drinking was significantly reduced at end treatment, but the reduction was equivalent across conditions. Post-hoc analyses found that MI reduced drinking more rapidly than SOMI and SC and that increased change talk mediated the effects of MI relative to SOMI during the week immediately following the first session. Findings are discussed in the context of the pilot nature of the study and the relative absence of experimental tests of mechanisms of behavior change in SUD treatment research.

Keywords

motivational interviewing; mechanisms of action; active ingredients; alcohol; problem drinkers; moderation; alcohol use disorder treatment

Motivational Interviewing (MI) is a brief intervention designed to increase motivation for change. MI was first tested as a treatment for alcohol use disorders (AUD) where it was

demonstrated to be effective both as a stand-alone intervention and when added to more intensive interventions (Miller & Rose, 2009). Subsequent studies have shown MI is effective across a range of other problem behaviors as well as in the promotion of health behaviors (e.g., diet and exercise). Support for the efficacy of MI across a wide spectrum of behaviors where motivation is a critical element has added an additional level of credence to the hypothesis that MI has potent and specific effects on reducing ambivalence and strengthening motivation for positive behavior change (Hettema, Steele, & Miller, 2005). However, despite numerous studies, there is a surprising absence of empirical support for MI's underlying theory of change (Morgenstern & McKay, 2007). Reviews have consistently noted the absence of methodological rigor in prior studies including a reliance on associational study designs, rather than experimental tests (Apodoca & Longabaugh, 2009). The primary aim of this study was to develop an experimental paradigm and conduct a pilot test of MI's hypothesized active ingredients and mechanisms of change in the initiation of drink reduction among treatment seeking problem drinkers.

The Theory of MI's Mechanism of Action

In a recent article, Miller and Rose (2009) summarized knowledge gained over the last 20 years regarding the active ingredients and change mechanisms that explain how MI works. Although the terms active ingredients and mechanisms of change have been used interchangeably, for the purposes of this study we define their usage more precisely following the suggestions of Longabaugh and colleagues (Longabaugh, McGill, Morgenstern, Huebner, In Press). *Active ingredients* refer to the key therapist strategies that facilitate positive change and *mechanisms of change* refer to processes occurring within the client (e.g., skill acquisition, cognitive reappraisal). Both active ingredients and mechanisms of change are the result of treatment and lead to positive change. Stated succinctly, Miller and Rose (2009) note that the combination of relational and technical components represent the active ingredients in MI. Relational elements (often referred to as MI spirit) refer to established elements of non-directive counseling including empathic listening skills, avoiding negative therapeutic interactions, and monitoring and repairing ruptures to the therapeutic relationship. Technical elements refer to directive strategies and techniques that focus on enhancing discrepancy between real and desired behaviors, the resolution of ambivalence, and securing a binding commitment to a behavior change goal.

When delivered in the context of MI spirit, technical elements facilitate the momentum towards action by eliciting statements in support of change. These statements have been labeled client change talk. MI therapists are instructed to elicit and selectively reinforce change talk in a gentle but clearly directive manner. Client change talk is hypothesized to be the mechanism of change in MI. As noted by Moyers and colleagues (Moyers, Martin, Houck, Christopher, & Tonigan, 2009), it is not simply the rote repetition of change talk, but the spontaneous and sincere emergence of the client's own reasons for change via the therapist's active shaping and reinforcement of that speech that leads to behavior change.

Limitations in Empirical Support for MI's Purported Mechanisms of Action

Apodoca and Longabaugh (2009) conducted a comprehensive review of empirical studies on MI's mechanisms of action and found surprisingly limited support for its hypothesized effects. These results are consistent with other prior reviews (Allsop, 2007; Burke, Arkowitz, & Menchola, 2003; Morgenstern & McKay, 2007). A broad reading of the mechanisms literature suggests three primary shortcomings in prior research efforts. First, mechanisms research has largely been a secondary aim conducted in the context of efficacy studies and as such has suffered from flawed designs and limited methods. Second, at best mechanisms studies offer support only for statistical association between active ingredients,

mediators, and outcomes. In order to advance knowledge causal tests of theories are needed. Third, the majority of MI mechanisms studies have been conducted in the contexts that may actually obscure MI's unique effects. In many studies, MI is an add-on intervention to other more intensive treatments. In addition, MI is often delivered in an abstinence goal treatment context. Recent findings suggest that the initiation of change in these populations occurs well before treatment entry (Willenbring, 2007). Attempts to study MI's effects in a noisy context of multiple treatments and clients who have moved well beyond initiation of change may contribute to weak and inconsistent findings of prior research.

Study Aims

The broad aim of the study was to test the causal role of key hypothesized active ingredients and mechanisms of change within MI in reducing drinking. Given the limited prior research and our focus on methodological rigor, we first sought to develop an experimental paradigm that would adequately capture problem drinkers during an episode of initiation of drink reduction; disaggregate MI into its relevant component parts; and reliably assess change talk. Very few studies have examined early patterns of reduction in drinking, choosing instead to focus on reductions following a full assessment and randomization and during longer term outcome periods.

We also sought to create treatment conditions that would disaggregate MI into its theory-relevant components: relational and technical and relational only. Sellman and colleagues (2001) conducted an MI disaggregation study comparing full MI, non-directive listening (NDL), and a feedback and education condition. Although the study was novel, many of the methods now employed to define and measure the fidelity of a treatment were absent, making it unclear whether NDL accurately conveyed MI-spirit or whether patients viewed it as a credible treatment. Accordingly, we developed an MI-spirit condition manual and employed reliable rating scales to assess its fidelity and discriminability from MI. We constructed a control condition that contained other components of MI that have been thought to promote change, but were non-overlapping with relational and technical components and not related specifically to the actions of the therapist, including normative feedback about drinking, messages that self-change was possible, and simple instructions to try out self-change (Miller, 1996). An early study by Harris and Miller (1990) demonstrated that instructing clients to change on their own improved outcomes relative to a wait-list condition. Finally, although change talk has been reliably assessed in abstinence-oriented treatment studies, it has not extensively been examined in problem drinkers seeking moderation (Glynn & Moyers, 2010). Consistent with the Miller and Rose (2009) framework, we hypothesized full MI and MI without its technical elements (Spirit-Only MI; SOMI) would prove superior to a self-change condition and that full MI would prove superior to SOMI.

In addition, the study conducted a preliminary test of MI's mechanism of change. We examined the hypothesized role of client change talk. We hypothesized that full MI relative to SOMI would significantly increase change talk; that change talk would significantly predict reduced drinking, and that change talk would mediate the relationship between MI and drink reduction. Consistent with the pilot nature of the study we interpreted findings based on significance levels and effect sizes.

Method

Study Overview

We recruited 89 problem drinkers with an AUD diagnosis seeking help to reduce drinking. In order to represent the three theoretically distinct elements of MI, three conditions were

created: MI, MI without directive or technical elements (SOMI), and a self-change control (SC). All participants received feedback (see description below) from a research assistant (RA) following assessment and were then randomly assigned to condition. Because of the pilot nature of the study and because participants had a diagnosed AUD and were seeking treatment, treatment and the outcome period were limited to 8 weeks, after which SC participants were offered MI. In addition to standard assessments and the interventions, participants responded to a daily survey delivered via interactive voice recording (IVR). IVR has not been found to be reactive in prior studies (Shiffman, 2009), but we assessed for potential reactivity as described below. Primary analyses were conducted for the 8 week outcome period. Participants in the therapy conditions were followed for one month after treatment (week 12), and these outcomes are reported.

Participants

Recruitment

General advertising online and in local media was used to recruit 89 participants seeking treatment to reduce but not stop drinking. Advertisements emphasized client choice and a moderation approach. Participants were screened on the phone and then, if eligible, were scheduled for an in-person assessment.

Study eligibility

Participants were considered eligible if they were: (1) between the ages of 18 and 65; (2) had an estimated average weekly consumption of greater than 15 or 24 standard drinks per week for women and men, respectively during the prior 8 weeks and (3) had a current AUD. Participants were excluded if they: (1) had another substance use disorder (for any substance other than alcohol, marijuana, nicotine) or were regular (defined as greater than weekly use) drug users; (2) presented with a serious psychiatric disorder or suicide or violence risk; (3) demonstrated clinically severe alcoholism, as evidenced by physical withdrawal symptoms or a history of serious withdrawal symptoms; (4) were legally mandated to substance abuse treatment; (5) reported social instability (e.g., homeless); (6) expressed a desire to achieve abstinence at baseline; or (7) expressed a desire or intent to obtain additional substance abuse treatment during the 8 week study outcome period.

Procedures

Participants' flow through the study is captured in Figure 1. During their initial in-person assessment, participants provided informed consent and participated in a brief evaluation with an RA. In order to avoid reactivity (Clifford, Maisto, & Davis, 2007) to the commonly used Timeline Followback Interview (TLFB, Sobell et al., 1980), a non-reactive, standard alcohol screen and a standard diagnostic measure were used to determine initial eligibility (described further below). A mental health clinician also assessed for any high risk mental health disorders, such as current major depression. At the end of this evaluation (week 0), participants were trained on the IVR questionnaire system (described below) and asked to return one week later to attend the full baseline assessment (week 1). In order to assess for potential IVR reactivity, participants completed a full week of IVR prior to assessment with the TLFB and assignment to condition.

At week 1, participants completed a full assessment battery, which included the TLFB covering the prior nine weeks. Participants were then (1) provided feedback (see Intervention below) and the NIAAA guidelines (National Institute of Alcohol Abuse and Alcoholism, 2004) for non-hazardous drinking by the RA, and then (2) randomly assigned to one of three conditions: MI, SOMI, or SC only. All participants were followed for a total of

eight weeks using daily IVR and participated in in-person assessments at weeks 0, 1, 4 and 8. Follow up rates for assessments at weeks 1, 4, and 8 were 100%, 96%, and 92.1%, respectively. Participants in the therapy conditions were followed one month post-treatment (week 12) by phone and completed the TLFB. The follow-up rate for the 12-week telephone assessment was 80.0%.

Daily Interactive Voice Recording Survey

All participants were asked to complete a daily telephone survey (e.g., IVR) at the end of each day for eight weeks, one week prior to randomization and then each day during the seven week treatment phase of the study. At the end of their initial screening visit (a week prior to randomization), an RA provided each participant a 10 minute training session on how to use the IVR, a system developed using TELESAGE SmartQ 5.2, a software package specifically designed for the administration of automated surveys (TELESAGE, 2005). Each day, participants responded to a series of questions about potential variables related to drinking behavior such as mood, exposure to high risk situations, in addition to the number and type of drinks they consumed in the last 24 hours. Once familiar with the system, the daily IVR session required approximately five minutes to complete. Each participant was provided a toll-free phone number and an anonymous participant identification number to ensure confidentiality. The IVR system could be accessed between 4:00 pm and 10:00 p.m. This time period was judged to be when participants most likely would be able to reflect on their alcohol use that occurred post the prior day's assessment and before most individuals would be likely to consume large amounts of alcohol. This time window had the advantage of providing consistent report timing and facilitated compliance by creating routines for participants. If participants failed to call into the system by 8:00 p.m., an automated reminder call was made. If participants failed to call for a day, an RA called the next business day to encourage participation.

Study Interventions

All participants received feedback from an RA during their intake appointment immediately prior to randomization. Normative feedback consisted of an estimated average weekly consumption of alcohol and their AUDIT score with a description of AUDIT risk categories which classifies individuals into four levels: low risk, in excess of low risk, harmful/hazardous risk, or may be physically dependent. Treatment was delivered in 4 sessions that lasted between 45 minutes to an hour long at weeks 1, 2, 4, and 8. Thus, participants in MI and SOMI received the equivalent amount of treatment. SC participants received no treatment as described below.

Motivational interviewing (MI)

We adapted the MI condition from MET used in Project MATCH (Miller, Zweben, DiClemente, & Rychtarik, 1992; Project MATCH Research Group, 1993). We revised the structured personalized feedback module to include: percentile rank in terms of quantity and frequency of drinking compared to a normative comparison of adults in the United States; information about risk factors for developing alcohol dependence, including an estimated tolerance for alcohol based on peak blood alcohol concentration, other drug risk, family risk, and the score on the Alcohol Dependence Scale (Skinner & Horn, 1984). The other revisions to the MATCH MET intervention were that there was no "significant other" involvement in any of the sessions and that all in-session discussions regarding goals were geared towards moderation rather than abstinence. A similar moderation-focused adaptation of MET was used previously and demonstrated efficacy among problem drinkers seeking moderation (Morgenstern et al., 2007). Consistent with the approach described in the MET manual, structured feedback, the change plan, and other directive activities were delivered in a

flexible manner with the goal of eliciting self-motivational statements and strengthening commitment to change (Miller et al., 1992, pgs 13–32).

Spirit only MI (SOMI)—SOMI consisted of the non-directive elements of MI including therapist stance (warmth, genuineness, egalitarianism), emphasis on client responsibility for change, extensive use of reflective listening skills (e.g., open ended questions, simple reflections), and avoidance of MI-inconsistent behaviors (advise, confront, take expert role, interpretation). Technical or directive elements were proscribed. Proscribed elements included any designed to heighten discrepancy (e.g., ruler exercises, structured feedback) or direct the therapy process towards positive change (e.g., change plan, asking for a commitment). In addition, amplified and double-sided reflections were proscribed as well as other more subtle strategies designed to evoke and selectively reinforce change talk. Instead, reflective listening was focused on experiential or affective content consistent with client-centered experiential treatments (Bohart, 1995). To avoid confusion, we note that the term MI Spirit has been used elsewhere to include therapist elicitation and reinforcement of change talk (Moyers, Martin, Manual, Miller, & Ernst, 2007) as well as MI non-directive elements. We note our use of the term Spirit Only MI is intended only as a useful descriptive label of the SOMI therapy condition employed in this study.

In order to refine the SOMI protocol, a draft SOMI manual was written and four participants meeting study eligibility were treated as pilot cases. All sessions were videotaped, reviewed by the study team, and a final revised version of the manual was then completed.

Self Change (SC)—The SC condition was designed to incorporate elements hypothesized in the MI literature to contribute to change, but not associated with relational or technical active ingredients. These elements included normative feedback, personal responsibility, and efforts to foster self-efficacy. In order to model these elements, after receiving normative feedback, participants were asked to attempt to change on their own during the next eight weeks; told that research had shown that some individuals could reduce their drinking without professional help; and that completion of the IVR as well as research interviews might prove helpful in that effort. Participants were told they would be offered treatment at the end of the eight week period.

Therapists and training—Six master's and doctoral level therapists provided both MI and SOMI. All therapists with the exception of one had five or more years experience providing MI and were highly experienced substance abuse clinicians. All therapists participated in an initial three hour training on the protocol, which was then followed up by once weekly individual and group supervision by two experienced MI therapists who were MINT certified MI trainers. Supervision consisted of ongoing review of session videotapes and focused on ensuring fidelity to each protocol. All therapists were assigned practice cases for training purposes. Performance was reviewed via videotapes of sessions, and therapists were required to meet threshold fidelity criteria prior to treating study participants.

Condition fidelity and discriminability—We assessed fidelity and discriminability from two perspectives: an observer and the client. The Motivational Interviewing Treatment Integrity Code, Version 3.0 (MITI, Moyers, Martin, Manual, Miller, & Ernst, 2007), was used to assess the observer perspective. A total of thirty percent of the 240 sessions were coded by two raters extensively trained in MITI coding and blind to condition. Interclass reliability between the two coders was determined by examining coding for 10% or 24 of the sessions. Reliability was above .73 on all MITI scales.

In order to assess fidelity, it was predicted that MI and SOMI would share the critical spirit or non-directive elements of MI, and that these would be reflected in MITI global ratings,

specifically *empathy*, *collaboration*, and *autonomy and support*. Sessions rating high competency on these scales would constitute fidelity for relational elements. Three main elements were selected for condition discriminability: (1) MITI global rating of *evocation* (therapist “proactively” explores client’s reasons for change, “uses structured therapeutic tasks as a way of reinforcing and eliciting change talk”) (Moyers, Martin, Manual, et al., 2007, p. 5); (2) MITI global rating score of *direction* (clinician exerts influence on session towards targeted behavior); and (3) a non-MITI behavioral count of *Directive Activities* (a summed score of the occurrence of importance and confidence rulers, visualization of behavior change, personalized feedback, and change plan). In addition, we used a modified version of the Therapy Session Report (TSR, Kolden et al., 2006) to assess for fidelity and discriminability from the client perspective (see below for details). The TSR was completed immediately after session 2.

Measures

Sociodemographics—A self-report, demographic questionnaire used in a series of completed studies was used during the initial phone and in-person encounter with the participant. This included data on age, gender, educational and occupational information, race and ethnicity, medical history, family psychiatric and substance abuse history, and the participant’s substance abuse treatment history.

Screening and substance use diagnosis—Two widely used instruments were used to screen participants for eligibility and later identify alcohol and other substance use disorders. In an effort to avoid known assessment reactivity of the TLFB (Clifford et al., 2007), the Alcohol Use Disorders Identification Test-C (AUDIT-C) was used to determine preliminary eligibility for the study. The AUDIT-C is a shortened version of the AUDIT and has demonstrated adequate psychometric properties (Bush, Kivlahan, McDonnell, et al., 1998). The Composite International Diagnostic Instrument, Substance Abuse Module (CIDI-SAM, Cottler, Robins, & Helzer, 1989) was used to evaluate substance dependence exclusion criteria and the number of AUD criteria a participant satisfied. The CIDI-SAM is a well established diagnostic interview that has demonstrated excellent reliability and validity (Wittchen et al., 1991).

Psychiatric and cognitive impairment exclusion criteria—Two screening tools, the Structured Clinical Interview for DSM-IV, Psychotic Screening and Mood Disorders sections (SCID, First, Spitzer, Gibbon, & Williams, 2001), and the Mini-Mental Status Examination (MMSE, Folstein, Folstein, & McHugh, 1975) were used to screen for serious psychiatric symptoms and cognitive impairments, respectively. Both of these instruments are well established as having strong psychometric properties (Folstein, Folstein, McHugh, & Fanjiang, 2001; Tombaugh & McIntyre, 1992; Ventura, Liberman, Green, Shaner, & Mintz, 1998).

Alcohol and drug use problems—The Alcohol Dependence Scale (ADS, Skinner & Allen, 1982) is a 25 item self report measure used to assess severity of alcohol dependence. Items are summed, providing a raw score for interpretation. The ADS has demonstrated high reliability and validity across substance using populations (Kahler, Strong, Hayaki, Ramsey, & Brown, 2003). The Form 90 (Miller & Del Boca, 1994) was used to evaluate lifetime and recent (past 8 weeks) frequency of other drug use. The Form 90 has demonstrated strong reliability and validity (Tonigan, Miller, & Brown, 1997). The Short Inventory of Problems (SIP, Miller, Tonigan, & Longabaugh, 1995) is a 15-item self-report measure of lifetime or past three months’ negative consequences of drinking. The SIP has demonstrated strong psychometric properties (Kenna, et al., 2005) and for this sample yielded strong reliability at all time points ($\alpha=.87$ across all time points).

Alcohol use patterns—The TLFB (Sobell et al., 1980) assessed frequency and intensity of alcohol use during the previous nine weeks at week 1, and it was administered at weeks 4, 8 and 12 covering the time since the last assessment. The TLFB has demonstrated good test-retest reliability (Carey, Carey, Maisto, & Henson, 2004), agreement with collateral reports of alcohol (Dillon, Turner, Robbins, & Szapocznik, 2005), convergent validity, and reliability across mode of administration (i.e., in person or over the phone, Vinson, Reidinger, & Wilcosky, 2003).

Client change talk—Therapy sessions were videotaped (with only the therapist on camera). Two RAs—unaware of the identity, intake and outcome measures of the clients— independently coded different halves (with 21% overlap for inter-coder reliability assessment purposes, see below) of the tape collection according to the following procedure. Following Amrhein and colleagues (Amrhein, Miller, Yahne, Palmer, & Fulcher, 2003), codable utterances were those in which the client provided a thoughtful reflection either in response to therapist inquiries or comments or in an unsolicited, spontaneous manner. Such utterances could consist of a few words or several phrases or sentences—whichever was used to convey a “thought unit” on a certain topic of discussion. However, simple or brief acquiescent replies by clients were excluded (e.g., the therapist says, “Sounds like you’re ready for a change” to which client responds with the terminal comment “Yeah”). Codable client utterances were categorized as examples of commitment, desire, perceived ability, need, readiness or reasons statements (See Amrhein et al., 2003). Once categorized, a strength value was assigned to each, ranging from –5 to +5, in which a negative value reflected client bias toward continued drinking, and a positive value reflected client bias toward a reduction in drinking. Independent of valence, the stronger the utterance, the larger the strength value assigned to it. Because commitment strength has proved predictive of outcomes in prior studies (Aharonovich, Amrhein, Bisaga, Nunes, & Hasin, 2008; Amrhein et al., 2003) these codes served as the primary dependent measure of change talk.

Change talk codes were divided according to decile of occurrence (using DVD player counter values) for each participant—in this manner, videotapes of varying duration were standardized. Per coder, codes were averaged over in-decile occurrences, with corresponding frequencies noted. Two forms of inter-coder agreement were then computed from these matrices across the utterance codes: assignment and strength. A random sampling of 22 earlier (usually first) and following (usually second) sessions (i.e., 21% of all 106 earlier and following session tapes) were double coded for purposes of assessing inter-coder reliability. Agreement between the coders with regard to assignment of utterances as verbal commitments within each decile across the 22 sampled sessions was quite high, Cohen’s kappa = .79. The overall inter-rater concordance correlation coefficient (a form of intra-class correlation, see Nickerson, 1997) for averaged decile strength for these clients was again quite high at .84. Per client, the data to be analyzed consisted of two decile matrices, one reflecting mean change talk utterance frequencies and the other mean change talk utterance strength values, averaged over coders. For each client’s change talk utterance strength matrix, estimated values were imputed for empty cells using a maximum likelihood algorithm (BMDP AM) that was applied blind to behavioral outcome and other client-non-language variables.

Patient perspective of relational and directive elements in MI and SOMI—We used a modified version of the Therapy Session Report (TSR, Kolden et al., 2006) to assess three constructs: therapeutic bond (TB), perceived helpfulness of therapy, and perceived directiveness of the therapist. The TB subscale of the TSR is comprised of three interpersonal processes that map well onto MI-Spirit: empathic resonance, mutual affirmation, and collaborative role enactment. Perceived helpfulness was assessed using a single item, “How helpful was your therapist” rated on a 6-point Likert scale (0 = *not at all*

helpful and 5 = *completely helpful*). Therapist directiveness was assessed by taking the mean of 2 items, asking how much did your therapist: “offer explicit guidance or advice about drinking” and “suggest changes in your drinking” on a 4-point Likert scale (0 = *not at all* and 3 = *very much*).

Analytic Plan

We examined whether participants significantly reduced their drinking prior to randomization by conducting a repeated measures ANOVA for the nine weeks prior to randomization. Condition equivalence on demographics, drinking, and other problem severity were determined using chi square tests, *t*-tests, and one-way ANOVAs. We found that participants in the MI had somewhat more severe drinking patterns relative to the other conditions. Further analysis indicated this was the result of two participants in the MI condition who were outliers. Accordingly, we conducted all subsequent analyses with and then without the two outlier participants to determine whether their presence affected the results. In all cases, results were equivalent, thus, analyses are presented for the entire sample. Next, we examined treatment condition fidelity and discriminability. MITI and TSR scores were examined across conditions utilizing *t*-tests to compare means.

Next, we tested for hypothesized condition differences using regression analysis. We used the mean sum of standard drinks (SSD) per week, as drawn from the TLFB, as the primary outcome measure of reduced drinking. Pretreatment weekly SSD was represented by aggregating the baseline weeks immediately prior to condition assignment, and the outcome tested was SSD during weeks 5 to 8 or the last month of treatment. We entered the baseline value of drinking as a covariate in the regression equation. The hypothesis of an ordered effect of conditions (MI>SOMI>SC) on outcome was not supported and consistent with the pilot nature of the study we conducted post-hoc analyses to further probe the results. We found that MI performed better than SOMI during the early period (the two weeks after randomization) and then the difference narrowed and was reversed during the last month of treatment.

Because outcome results did not find that MI was superior to SOMI during the end treatment period, we did not conduct the planned test of hypothesized mediation of change talk on the a-priori outcome indicator (the final month of treatment). However, because MI reduced drinking relative to SOMI during the first 2 weeks of treatment, we explored whether outcome differences in the first two weeks of treatment were mediated by change talk. Accordingly, we conducted a formal test of mediation using the Baron and Kenny (1986) four-step approach:

Step 1: We conducted a regression analysis with the mean SSD for the week immediately following the first session as the dependent variable and condition (MI vs. SOMI) and baseline drinking as the independent variables.

Step 2: Next, we examined the effect of condition on the mediator using regression analysis. Consistent with Amrhein et al. (2003), mean commitment strength at the end of session 1 (deciles 9 and 10) was selected as the dependent measure and condition and baseline drinking were the independent variables.

Step 3: Next we examined the effect of the mediator on outcome. Mean SSD for the week following session 1 was the dependent variable and baseline drinking, condition, and commitment strength were the independent variables.

Step 4: We then examined whether the unstandardized regression coefficients for condition were reduced in Step 3 relative to Step 1. Consistent with the exploratory nature of the analyses we considered both effect size and significance level in interpreting the results.

Finally, we conducted a similar mediation analysis for session 2 where the outcome period was the week immediately following session 2. We conducted separate mediation analyses for Session 1 and 2 to provide a discriminating test of the effect of change talk on drink reduction prior to the occurrence of the next therapy session.

Results

Initiation of Drink Reduction and Baseline Condition Equivalence

A repeated measures ANOVA indicated no significant change in drinking across the nine weeks prior to randomization ($p > .39$). Initial descriptive statistics of demographics yielded no significant differences between treatment groups (Table 1). Similarly, the selected markers for drinking severity were equivalent across conditions on all the variables except total number of alcohol dependence criteria ($F(2, 86) = 3.673, p < 0.03$). A Bonferroni post hoc test was performed and MI was found to have a trend mean difference of .95 more alcohol dependence criteria than SOMI ($p = .051$). Neither MI nor SOMI significantly differed from the SC condition. Examination of Table 1 suggests that participants in the MI condition tended to have higher scores on several other drinking severity measures when compared to the other conditions including mean drinks per drinking day, ADS, and the percentage of participants reporting prior treatment, even though these differences were not statistically significant. As noted above, this appeared to be the result of two MI participants who were outliers on severity of drinking measures.

Condition Fidelity and Discrimination

As predicted, scores on the three MITI scales were 4.0 and above across the treatment conditions. There were no significant differences in Empathy ($t(10) = -1.387, ns$) or Autonomy/Support ($t(10) = -1.536, ns$), but MI sessions scored significantly higher on Collaboration ($t(10) = -5.0, p < .01$) than SOMI. Examination of coding suggested that Collaboration in MI was higher because therapists were given additional credit for MI directive activities (e.g., completing a change plan) that were proscribed in SOMI. As hypothesized, highly significant differences were found between conditions on Evocation, Direction, and Activities. Among the global rating scales Evocation and Direction, MI demonstrated a mean well above 4.0 (Evocation: $M = 4.47, SD = .58$; Direction: $M = 4.56, SD = .59$), indicating MI competency, whereas SOMI was significantly lower at $p < .001$ (Evocation: $M = 1.97, SD = .56$; Direction: $M = 2.08, SD = .75$). As expected, MI demonstrated a significantly higher mean score per session on Activities (MI: $M = 2.3, SD = 1.3$, SOMI: $M = .05, SD = .235$; $t(17.98) = -6.79, p < .001$).

There were no significant differences across conditions on the therapeutic bond (MI: $M = 2.7, SD = .32$; SOMI: $M = 2.6, SD = .31$) with ratings in both conditions approaching the maximum anchor (3 = *very much*). Conditions differed significantly on ratings of directiveness regarding drinking ($t(53) = 5.4, p < .001$). MI participants rated the amount of therapist guidance around drinking between “*some*” and “*pretty much*” ($M = 1.8, SD = .76$), whereas guidance was rated in SOMI between “*not at all*” and “*some*” ($M = .66, SD = .76$). SOMI participants rated Session 2 on average between “*pretty helpful*” and “*very helpful*” ($M = 4.8, SD = .83$) and MI participants rated it as very helpful ($M = 5.0, SD = .93$).

Condition Effects on Drinking Outcome at End Treatment and One Month Follow-up

There was a significant reduction in drinking from baseline to the last month of the treatment period, but there were no significant differences in outcomes across conditions. Condition effects were in the opposite of the predicted direction with SOMI reducing drinking the most, followed by MI, and then SC. However, condition differences accounted for less than 1% of the variance. Baseline drinking significantly predicted ($\beta = .53, SE = .$

064, $p < .001$) drinking during the outcome period. Most of the reduction occurred within the first two weeks after randomization, and was then maintained for the remainder of the follow-up period.

We conducted several post-hoc analyses in order further elucidate the findings. First, we considered outcome measures including drinks per drinking day and number of negative consequences. None of the condition analyses of the secondary outcome measures were significant (all $ps > .40$ and none were in the expected direction). Next we examined whether there might be a problem severity by treatment condition interaction such that MI was more effective for those with higher severity. This interaction was not significant ($p > .6$). Follow-up analysis indicated that participants in MI and SOMI continued to significantly reduce their drinking from end treatment ($M = 21.3$, $SD = 13.7$) to posttreatment ($M = 16.2$, $SD = 11.9$), but there were no significant differences in posttreatment drinking across MI ($M = 16.9$, $SD = 13.9$) or SOMI ($M = 15.2$, $SD = 9.2$).

Post-hoc Analyses of Condition Differences on Early Drinking Outcomes

While hypotheses were not supported at end or post-treatment, regression analyses indicated condition differences were in the expected direction during the two weeks following randomization, although differences were not statistically significant ($p > .5$). For example, during the first week after randomization, participants in the MI condition reduced their drinking ($M = 2.6$, $SD = 10.9$), while participants in SOMI and SC showed no change. While participants across conditions significantly reduced their drinking in the two weeks after randomization, participants in the MI condition reduced drinking more than those in SOMI and SC. We computed effect sizes for the difference in reduction of drinking across conditions for early change and found $d = .27$ for MI relative to SOMI and $d = .41$ for MI relative to SC.

Formal Mediation Analysis

Table 2 presents mediation analysis results for Session 1 and 2. As noted above, condition did not significantly predict outcome for the week following session 1, but the observed condition effect was in the predicted direction (Step 1). MI relative to SOMI predicted significantly greater change talk (Step 2). Greater change talk predicted reduced drinking at a trend level ($p < .06$) (Step 3). There was a reduction in the unstandardized regression coefficient (Step 4) for condition from Step 1 ($B = 1.59$) to Step 3 ($B = -0.98$) indicating that change talk mediates the relationship between condition differences and outcome in session 1. Results for session 2 indicate change talk was significantly greater in MI relative to SOMI (Step 2). However, change talk did not significantly predict week 2 outcome ($p > .3$). Thus, Step 3 was not supported.

Discussion

Results support the feasibility and utility of the study design to conduct a rigorous test of MI's active ingredients and mechanisms of change among problem drinkers. Despite the requirement that clients agree to potential placement in a non-treatment condition (self-change), we were able to recruit a sample of problem drinkers who were actively drinking heavily, were mildly to moderately dependent on alcohol, had relatively limited drug use or co-occurring mental health problems, and were seeking alcohol treatment for the first time. On average, participants did not significantly reduce their drinking prior to the intervention. MI and SOMI demonstrated the expected pattern of fidelity and discriminability both from observer and participant perspectives. In addition, MI significantly increased change talk relative to SOMI. Overall, these results support the use of this experimental paradigm in future research.

Support for MI's Active Ingredients and Mechanisms of Change

Findings did not support the ordered effect of MI active ingredients on outcome. At end treatment, the three interventions yielded equivalent outcomes. One month post-treatment follow-up of MI and SOMI yielded similar equivalent outcomes. Examination of effect size estimates indicated that differences in outcome across conditions were small and SOMI had slightly better outcome at end treatment than MI. Thus, the small sample size does not explain the failure to find statistically significant condition differences.

Post-hoc analyses of outcomes immediately after the first two sessions provided support to study hypotheses. MI relative to the other conditions resulted in a more rapid reduction of drinking in the first two weeks. The effect size differences between MI and SOMI ($d=.27$) and MI and SC ($d=.41$) during the two weeks after randomization were similar in direction and size to what the hypothesis predicted should occur at end treatment. However, contrary to expectation, there was a more gradual reduction in drinking in the other conditions that eventually led to equivalent outcomes across conditions in later weeks. In addition, in the week after session 1, MI's superior effects relative to SOMI were mediated by an increase in change talk. Although these findings should be interpreted cautiously given the nature of the evidence, they do support the full hypothesized MI causal chain. Specifically, experimental manipulation therapist directive interventions led to client increases in change talk which, in turn, mediated MI's effects on drink reduction. It is not clear why mediation was not supported in session 2, but it might be because participants in SOMI did not reduce their drinking during week one making the MI mediation effects easier to detect.

Findings in Context

One prior study used a dismantling design to test the efficacy of MI relative to a person-centered approach non-directive listening (NDL) condition (Sellman et al., 2001). The study found MI significantly reduced heavy drinking relative to NDL. However, the study had a number of methodological weaknesses. Notably, MI was significantly different on only one of six outcome indicators tested relative to NDL. Overall, findings from both studies indicate that more and better quality research is needed to test whether MI's directive strategies explain its effects or whether relational elements alone might be equally effective. One plausible explanation of the current study results is that MI is uniquely effective in mobilizing rapid change in the context of a one or two session intervention. However, well delivered Rogerian therapy can achieve equivalent effects in the context of a longer treatment at least for problem drinkers.

No prior study has compared a SC condition to therapist led interventions among treatment seeking problem drinkers. Walters, Vader, Harris, Field, and Jouriles (2009) conducted an MI dismantling study among college drinkers that among other conditions compared feedback to MI. They found that MI was more effective than feedback and feedback was no more effective than assessment control. However, feedback occurred via the web, whereas MI was delivered in-person. Current study limitations make it difficult to offer a clear interpretation of the SC condition findings. SC was less effective in reducing drinking compared to SOMI and MI, although differences were not statistically significant. The assessment paradigm included daily IVR, a high level of staff contact, and a short follow-up timeframe of 8 weeks. Thus, participants in the SC condition might have benefitted in the short run from a context that provided support and monitoring. More research is needed before drawing conclusions about the therapeutic effects of SC relative to MI.

One prior study experimentally manipulated therapist behavior to test its relationship to change talk. Glynn and Moyers (2010) used a context that resembled a psychotherapeutic encounter and instructed therapists to use change talk evocation (CT) or functional analysis

(FA) in an ABAB design. Study findings demonstrated that CT resulted in significantly greater levels of change talk relative to FA. Thus, the Glynn and Moyers and the current study findings support the hypothesis that specific therapist behaviors can increase change talk, helping to establish one causal link in the chain that connects therapist behavior to client language to drinking outcomes.

There is a small, but growing literature examining the association between therapist behavior, client change talk within session, and outcome. Generally, studies have found that MI consistent therapist behavior (MICO) leads to greater change talk (CT), whereas MI inconsistent behavior (MIIN) leads to sustain talk (ST) or talk that favors the status quo (Catley et al., 2006). Studies have also found that CT predicted improved client drinking, whereas ST predicted worse drinking outcomes (Moyers et al., 2007). Finally, two studies have examined the links across therapist, clients, and outcomes and found therapist MICO, led to greater client CT, which in turn led to better drinking outcomes (Moyers et al., 2009; Vader, Walters, Prabhu, Houck, & Field, 2010). It is important to note that the questions addressed and methodology employed regarding MI mechanisms differ from those of the current study. The above cited research examines the effect of MI consistent versus MI inconsistent therapist behaviors on CT, whereas the current study compares the effects of different types of MI consistent interventions on CT. In addition, the current study used a dismantling design to experimentally manipulate therapist behaviors and then examine the link to CT and outcome, whereas the above cited research examined these connections using an associational design.

Study Limitations

The primary limitations of this study are its relatively small sample size and short-term follow-up. It may be that MI's effects relative to SOMI emerge only at later post treatment follow-ups. Similarly, it is difficult to fully assess the effects of SC without a larger sample and longer-term follow-up. In addition, findings of equivalent effects for MI and SOMI may be limited to problem drinkers seeking moderation who voluntarily attend treatment with minimal coercion for outside sources. This study excluded individuals who were legally mandated to treatment and most of the participants reported minimal social consequences of drinking such that pressure from employers and partners did not appear to be an important factor in seeking help. Participants with more severe AUD including those experiencing coercion to seek treatment might respond quite differently to Rogerian counseling relative to MI. While the study did find that change talk mediated MI's effects of drinking in the week immediately following the first session, these findings are limited by the post-hoc nature of the analyses and small sample. Finally, our coding of change talk was limited to one method (Amrhein et al., 2003). An alternative method to code change talk has been developed as part of the Motivational Interviewing Skills Coding measure (MISC; Glynn & Moyers, 2009). Results of the post-hoc analyses may have differed if the MISC approach was used.

Implications and Future Directions

Overall, findings support the value of study designs that experimentally manipulate hypothesized active ingredients of treatments and test their link to change mechanisms and outcomes. Despite study limitations, it is surprising that SOMI and SC did not yield clearly inferior outcomes relative to MI. Findings highlight the need to better understand initiation of drink reduction and the role of common therapy factors and even non-therapy elements play in the change process. Common therapy factors and self-change have been identified in prior studies as potential active ingredients in fostering resolution of alcohol dependence (Imel, Wampold, Miller, & Fleming, 2008), but there has been a notable absence of well designed research to understand whether, for whom, and how these elements might work. Similarly, empirical studies have tended to focus on testing the hypothesized unique or specific effects

of effective interventions like MI or cognitive behavioral treatment (CBT) to the exclusion of other factors. Findings that self-change may be as effective as MI highlight the need to expand conceptual formulations beyond a narrow consideration of hypothesized specific therapy effects and reinforce the value of incorporating the emerging cognitive science literature on mechanisms of behavior change (Webb, Sniehotta, & Michie, 2010) as a way to strengthen conceptual models that drive empirical research.

Conclusion

We were able to develop a research paradigm to experimentally test hypothesized active ingredients and mechanisms of change of MI in problem drinkers seeking treatment. Findings did not support the hypothesis that full MI would be more effective than a treatment that contained MI relational elements only (SOMI) nor a condition that provided feedback and encouraged participants to change on their own (SC). The pilot nature of the study make it difficult to draw firm conclusions, but suggest the importance of further research on how MI works including a greater focus on common and self-change factors.

Acknowledgments

This study was supported with funding from the National Institute on Alcohol Abuse and Alcoholism (grants R21 AA 017135-01 & R01-AA 020077-01A1).

References

- Aharonovich E, Amrhein PC, Bisaga A, Nunes EV, Hasin DS. Cognition, commitment language, and behavioral change among cocaine-dependent patients. *Psychology of Addictive Behaviors*. 2008; 22(4):557–562. [PubMed: 19071981]
- Allsop S. What's this thing called motivational interviewing? *Addiction*. 2007; 102(3):343–345. [PubMed: 17298637]
- Amrhein PC, Miller WR, Yahne CE, Palmer M, Fulcher L. Client commitment language during motivational interviewing predicts drug use outcomes. *Journal of Consulting and Clinical Psychology*. 2003; 71(5):862–878. [PubMed: 14516235]
- Apodaca TR, Longabaugh R. Mechanisms of change in motivational interviewing: A review and preliminary evaluation of the evidence. *Addiction*. 2009; 104(5):705–715. [PubMed: 19413785]
- Baron RM, Kenny DA. The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*. 1986; 51:1173–1182. [PubMed: 3806354]
- Bohart, A. The person-centered therapies. In: Gurman, A.; Messer, S., editors. *Essential psychotherapies*. New York: Guilford; 1995. p. 85-127.
- Burke RL, Arkowitz H, Menchola M. The efficacy of motivational interviewing: A meta-analysis of controlled clinical trials. *Journal of Consulting and Clinical Psychology*. 2003; 71:843–861. [PubMed: 14516234]
- Bush K, Kivlahan DR, McDonell MB, Fihn SD, Bradley KA. The AUDIT alcohol consumption questions (AUDIT-C): an effective brief screening test for problem drinking. Ambulatory Care Quality Improvement Project (ACQUIP). Alcohol Use Disorders Identification Test. *Archives of Internal Medicine*. 1998; 158(16):1789–1795. [PubMed: 9738608]
- Carey KB, Carey MP, Maisto SA, Henson JM. Temporal stability of the Timeline Followback Interview for alcohol and drug use with psychiatric outpatients. *Journal of Studies on Alcohol*. 2004; 65:774–781. [PubMed: 15700516]
- Catley D, Harris KJ, Mayo MS, Hall S, Okuyemi KS, Boardman T, Ahluwalia JS. Adherence to principles of motivational interviewing and client within-session behavior. *Behavioural and Cognitive Psychotherapy*. 2006; 34:1–14.
- Clifford PR, Maisto SA, Davis CM. Alcohol treatment research assessment exposure subject reactivity effects: Part I. Alcohol use and related consequences. *Journal of Studies on Alcohol and Drugs*. 2007; 68(4):519–528. [PubMed: 17568955]

- Cottler LB, Robins LN, Helzer JE. The reliability of the Composite International Diagnostic Interview Substance Abuse Module-(CIDI-SAM): A comprehensive substance abuse interview. *British Journal of Addiction*. 1989; 84:801–814. [PubMed: 2758153]
- Dillon FR, Turner CW, Robbins MS, Szapocznik J. Concordance among biological, interview, and self-report measures of drug use among African American and Hispanic adolescents referred for drug abuse treatment. *Psychology of Addictive Behaviors*. 2005; 19(4):404–413. [PubMed: 16366812]
- First, MB.; Spitzer, RL.; Gibbon, M.; Williams, JBW. Structured Clinical Interview for DSM-IV-TR Axis I Disorders, Research Version, Patient Edition With Psychotic Screen (SCID-I/P W/ PSY SCREEN). New York: Biometrics Research, New York State Psychiatric Institute; 2001.
- Folstein MF, Folstein SE, McHugh PR. Mini-mental state: A practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research*. 1975; 12(3):189–198. [PubMed: 1202204]
- Folstein, MF.; Folstein, SE.; McHugh, PR.; Fanjiang, G. Mini-Mental State Examination user's guide. Odessa, FL: Psychological Assessment Resources; 2001.
- Francis N, Rollnick S, McCambridge J, Butler C, Lane C, Hood K. When smokers are resistant to change: Experimental analysis of the effect of patient resistance on practitioner behaviour. *Addiction*. 2005; 100:1175–1182. [PubMed: 16042648]
- Glynn, LH.; Moyers, TB. [Retrieved September 2, 2009] Manual for the Motivational Interviewing Skill Code (MISC), Version 1.1: Addendum to MISC 1.0. Unpublished manuscript, Center on Alcoholism, Substance Abuse, and Addictions, University of New Mexico. 2009. from Center on Alcoholism, Substance Abuse, and Addictions Web site: http://casaa.unm.edu/download/MISC_1.1_Manual.pdf.
- Glynn LH, Moyers TB. Chasing change talk: The clinician's role in evoking client language about change. *Journal of Substance Abuse Treatment*. 2010; 30:65–70. [PubMed: 20418049]
- Harris KB, Miller WR. Behavioral self-control training for problem drinkers: Components of efficacy. *Psychology of Addictive Behaviors*. 1990; 4(2):82–89.
- Hettema J, Steele J, Miller WR. Motivational interviewing. *Annual Review of Clinical Psychology*. 2005; 1:91–111.
- Imel ZE, Wampold BE, Miller SD, Fleming RR. Distinctions without a difference: Direct comparisons of psychotherapies for alcohol use disorders. *Psychology of Addictive Behaviors*. 2008; 22(4):533–543. [PubMed: 19071978]
- Kahler CW, Strong DR, Hayaki J, Ramsey SE, Brown RA. An item response analysis of the Alcohol Dependence Scale in treatment-seeking alcoholics. *Journal of Studies on Alcohol*. 2003; 64:127–136. [PubMed: 12608493]
- Kenna GA, Longabaugh R, Gogineni A, Woolard RF, Nirenberg TD, Becker B, et al. Can the Short Index of Problems (SIP) be improved? Validity and reliability of the 3-Month SIP in an emergency department sample. *Journal of Studies on Alcohol*. 2005; 66(3):433–437. [PubMed: 16047535]
- Kolden G, Chisholm-Stockard SM, Strauman TJ, Tierney SC, Mullen EA, Schneider K. Universal session-level change processes in an early session of psychotherapy: Path models. *Journal of Consulting & Clinical Psychology*. 2006; 74(2):327–336. [PubMed: 16649877]
- Longabaugh, R.; Magill, M.; Morgenstern, J.; Huebner, R. Mechanisms of change in behavioral treatments for addictions. In: McCrady, BS.; Epstein, EE., editors. *Addictions: A comprehensive guidebook*. 2nd ed.. New York: Oxford University Press; (in press).
- Miller WR. Motivational Interviewing: Research, practice, and puzzles. *Addictive Behaviors*. 1996; 21(6):835–842. [PubMed: 8904947]
- Miller WR, Del Boca FK. Measurement of drinking behavior using the Form 90 family of instruments. *Journal of Studies on Alcohol, Suppl*. 1994; 12:112–118.
- Miller, WR.; Rollnick, S. *Motivational interviewing: Preparing people for change*. 2nd ed.. New York: The Guilford Press; 2002.
- Miller WR, Rose GS. Toward a theory of Motivational Interviewing. *American Psychologist*. 2009; 64(6):527–537. [PubMed: 19739882]

- Miller, WR.; Tonigan, JS.; Longabaugh, R. NIAAA Project MATCH Monograph Series Volume 4. Rockville, MD: NIAAA Project MATCH Monograph Series Volume 4; 1995. The Drinker Inventory of Consequences (DrInC): An instrument for assessing adverse consequences of alcohol abuse. Test manual.
- Morgenstern J, Irwin TW, Wainberg ML, Parsons JT, Muench F, Bux DA, . . Schulz-Heik J. A randomized controlled trial of goal choice interventions for alcohol use disorders among men-who-have-sex-with-men. *Journal of Consulting and Clinical Psychology*. 2007; 75(1):72–84. [PubMed: 17295566]
- Morgenstern J, McKay J. Rethinking the paradigms that inform behavioral treatment research for substance use disorders. *Addiction*. 2007; 102:1377–1389. [PubMed: 17610541]
- Moyers TB, Martin T, Christopher PJ, Houck JM, Tonigan JS, Amrhein PC. Client language as a mediator of motivational interviewing efficacy: Where is the evidence? *Alcoholism: Clinical and Experimental Research*. 2007; 31(Suppl. 3):40S–47S.
- Moyers TB, Martin T, Houck JM, Christopher PJ, Tonigan JS. From in-session behaviors to drinking outcomes: A causal chain for Motivational Interviewing. *Journal of Consulting and Clinical Psychology*. 2009; 77(6):1113–1124. [PubMed: 19968387]
- Moyers, TB.; Martin, T.; Manual, JK.; Miller, WR.; Ernst, D. The motivational interviewing treatment integrity (MITI) code: Version 3.0. Albuquerque: Unpublished report at the University of New Mexico; 2007.
- National Institute of Alcohol Abuse and Alcoholism. NIAAA council approves definition of binge drinking. *NIAAA Newsletter*. 2004; 3:3.
- Nickerson CAE. A concordance correlation coefficient to evaluate reproducibility. *Biometrics*. 1997; 53:1503–1507.
- Project MATCH Research Group. Project MATCH: Rationale and methods for a multisite clinical trial matching patients to alcoholism treatment. *Alcoholism: Clinical and Experimental Research*. 1993; 17:1130–1145.
- Sellman JD, Sullivan PF, Dore GM, Adamson SJ, MacEwan I. A randomized controlled trial of motivational enhancement therapy (MET) for mild to moderate alcohol dependence. *Journal of Studies on Alcohol*. 2001; 62:389–396. [PubMed: 11414349]
- Shiffman S. Ecological momentary assessment (EMA) in studies of substance use. *Psychological Assessment*. 2009; 21(4):486–497. [PubMed: 19947783]
- Skinner HA, Allen BA. Alcohol dependence syndrome: Measurement and validation. *Journal of Abnormal Psychology*. 1982:199–209. [PubMed: 7096790]
- Sobell, MB.; Maisto, SA.; Sobell, LC.; Cooper, AM.; Cooper, T.; Saunders, B. Developing a prototype for evaluating alcohol treatment effectiveness. In: Sobell, LC.; Ward, E., editors. *Evaluating alcohol and drug abuse treatment effectiveness: Recent advances*. New York: Pergamon; 1980. p. 129–150.
- TELESAGE, I. SmartQ 5.2 automated telephone survey software. Chapel Hill, NC: Author; 2005.
- Tombaugh TN, McIntyre NJ. The Mini-Mental State Examination: A comprehensive review. *Journal of the American Geriatrics Society*. 1992; 40(9):922–935. [PubMed: 1512391]
- Tonigan JS, Miller WR, Brown JM. The reliability of Form 90: An instrument for assessing alcohol treatment outcome. *Journal of Studies on Alcohol*. 1997; 58:358–364. [PubMed: 9203116]
- Vader AM, Walters ST, Prabhu GC, Houck JM, Field CA. The language of Motivational Interviewing and feedback: Counselor language, client language, and client drinking outcomes. *Psychology of Addictive Behaviors*. 2010; 24(2):190–197. [PubMed: 20565145]
- Ventura J, Liberman RP, Green MF, Shaner A, Mintz J. Training and quality assurance with the Structured Clinical Interview for DSM-IV (SCID-I/P). *Psychiatric Research*. 1998; 79:163–173.
- Vinson DC, Reidinger C, Wilcosky T. Factors affecting the validity of a Timeline Followback Interview. *Journal of Studies on Alcohol*. 2003; 64:733–740. [PubMed: 14572197]
- Walters ST, Vader AM, Harris TR, Field C, Jouriles EN. Dismantling Motivational Interviewing and feedback for college drinkers: A randomized clinical trial. *Journal of Consulting and Clinical Psychology*. 2009; 77:64–77. [PubMed: 19170454]
- Webb TL, Sniehotta FF, Michie S. Using theories of behaviour change to inform interventions for addictive behaviours. *Addiction*. 2010; 105:1879–1892. [PubMed: 20670346]

- Willenbring ML. A broader view of change in drinking behavior. *Alcoholism: Clinical and Experimental Research*. 2007; 31(S3):84s–86s.
- Wittchen HU, Robins LN, Cottler LB, Sartorius N, Burke JD, Regier D, et al. Cross-cultural feasibility, reliability and sources of variance of the Composite International Diagnostic Interview (CIDI). *British Journal of Psychiatry*. 1991; 159:645–653. [PubMed: 1756340]

\$watermark-text

\$watermark-text

\$watermark-text

Figure 1. Participant flow chart. MI = Motivational Interviewing. SOMI = Spirit Only Motivational Interviewing. SC = Self change.

Table 1

Baseline Characteristics of Study Sample (N = 89)

Variable	MI (N = 29)		SOMI (N = 30)		SC (N = 30)		Overall Sample (N = 89)	
	M or %	SD	M or %	SD	M or %	SD	M or %	SD
Demographics								
Age (years)	40.8	11.9	39.8	11.8	37.4	11.4	39.2	11.7
Male	41.4		50.0		60.0		50.6	
Race/Ethnicity								
Non-Hispanic, White/Caucasian	79.3		86.7		80.0		82.0	
Hispanic/Latino, any race	6.8		10.0		10.0		9.0	
Other	13.7		3.3		10.0		9.0	
Education								
High school diploma/GED and under	3.4		6.7		6.6		4.5	
Some college/Associates	27.6		23.4		16.7		22.5	
Bachelor's degree	31.0		36.7		43.3		37.1	
Some graduate school or higher	37.9		33.3		33.3		34.8	
Employment								
Employed	89.6		90.0		76.7		85.2	
Unemployed/Looking for work	6.9		3.3		13.3		7.9	
Not in labor force/not looking for work	3.4		6.7		10.0		6.7	
Drinking Severity								
Mean sum of standard drinks per week	33.9	20.4	31.2	19.0	29.2	12.9	31.4	17.6
Mean drinks per drinking day	6.9	3.0	5.7	2.6	5.8	2.8	5.9	2.8
Short Inventory of Problems (SIP)	16.5	8.9	15.0	7.1	13.2	5.2	14.9	7.2
Alcohol Dependence Scale (ADS)	13.6	4.6	11.8	5.3	12.1	5.3	12.5	5.1
Number of alcohol dependence criteria met ^a	4.6	1.5	3.6	1.6	3.7	1.4	4.0	1.6
Any drug use	34.5		43.3		43.3		40.4	
Beck's Depression Inventory-II Score (BDI-II)	15.2	9.8	12.2	8.2	11.0	7.2	12.8	8.5
Ever received formal treatment for substance use problem	24.1		10.0		6.7		13.5	

^a $F(2, 86) = 3.67, p < .05$

Table 2

Baron and Kenny analysis of mediation

		Session 1			Session 2		
		B	β	Sig	b	β	Sig
Step 1	Treatment condition ^a predicting SSD ^b	-1.598	-0.049	ns	-2.082	-0.061	ns
Step 2	Treatment condition ^a predicting Mediator ^c	1.291	0.488	<.001	1.145	0.400	<.01
Step 3	Mediator ^c predicting SSD ^b	-1.818	-0.149	<.06	-1.430	-0.131	ns
Step 4 {	Treatment condition ^a predicting SSD ^b	0.977	0.030	ns	-0.537	-0.016	ns
	Mediator ^c predicting SSD ^b together	-1.995	-0.163	<.07	-1.366	-0.125	ns

^aTreatment conditions were Motivational Interviewing (MI) and Spirit Only Motivational Interviewing (SOMI). In this analysis, SOMI was the reference group.^bSSD = mean sum of standard drinks after session 1 or after session 2 respectively. SSD was the primary outcome measure.^cMediator = maximum commitment strength expressed by participant during the last 2 deciles of the respective session.

Note: Above are the results of a formal test of mediation using the Baron and Kenny (1986) four-step approach. Step 1: Results of regression analysis where the dependent variable is mean SSD for the week immediately following the first treatment session, and condition (MI vs. SOMI) and baseline drinking are independent variables. Step 2: Examined effect of condition on the mediator using regression analysis. Maximum commitment strength at the end of session 1 (deciles 9 and 10) was the dependent measure and condition and baseline drinking were the independent variables. Step 3: Examined the effect of the mediator on outcome without condition. Mean SSD for the week following session 1 was the dependent variable and baseline drinking and commitment strength were the independent variables. Step 4: Examined the effect of the mediator and condition on outcome. Mean SSD for the week following session 1 was the dependent variable and baseline drinking, condition, and commitment strength were the independent variables. This process was repeated for Session 2.