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## Exploration of Treatment Matching of Problem Drinker Characteristics to Motivational Interviewing and Non-Directive Client-Centered Psychotherapy

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### Abstract

Motivational Interviewing (MI) is a known effective intervention for alcohol use disorder (AUD). MI's mechanisms of action remain inconsistently substantiated, and research in this area has been reliant on identifying relationships through strength of association rather than experimental manipulation of active ingredients. In two previous studies, a pilot and a larger replication study, we disaggregated MI into its hypothesized active ingredients by creating three conditions: MI, Spirit Only MI (SOMI, in which evocation of change talk was proscribed), and a non-therapy condition (NTC). Results from both studies yielded equivalent findings across all three conditions. In the current analyses, data from both studies were combined to test five participant characteristics as moderators of MI's component parts: 1) severity of baseline drinking, 2) severe AUD (met 6 or more criteria), 3) baseline self-efficacy to moderate drinking, 4) mean daily confidence to resist heavy drinking in the week prior to treatment initiation, and 5) depression. There were no significant findings related to baseline drinking, severe AUD, or baseline self-efficacy. Confidence yielded a significant interaction effect. When participants had high baseline confidence, drinking for those in MI *increased* compared to those in SOMI. Depression also yielded a significant moderating effect such that in the context of higher depressive symptoms, receipt of either therapy reduced drinking relative to NTC. Results are discussed in light of existing literature on MOBC with MI and the potential role exploring ambivalence may play for participants with particular characteristics.

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## Keywords

matching hypothesis; motivational interviewing; mechanisms of behavior change; confidence; moderation

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## 1. Introduction

Motivational Interviewing (MI) is a widely used, evidenced based intervention for alcohol use disorders (AUD; Miller & Rollnick, 2013). While its effectiveness and duration of effects for reducing drinking are impressive given its brevity (Lundahl, Kunz, Brownell, Tollefson, & Burke, 2010), MI still yields small to moderate, or in some cases null, effects compared to other bona fide substance abuse treatments (Lundahl & Burke, 2009). One way to potentially hone MI and maximize its effects is by identifying its mechanisms of action and determining for whom and under what circumstances MI works best. In doing so, there is not only the potential to improve MI's effects but also to better disseminate the key components of MI to the clinical community.

### 1.1. Theory of MI's Mechanisms of Action

MI is theorized to enhance motivation for change and support self-efficacy, through two key components: relational factors and directional factors (Miller & Rose, 2009). Relational factors refer to a Rogerian, client-centered approach in which the practitioner conveys accurate empathy and assumes a non-judgmental, non-labeling stance. Such an approach provides the client with acceptance and a holding environment in which the client can engage in authentic self-reflection. Directional factors refer to the specific, focused evocation of client statements for change (change-talk, CT), including desire for, reasons to, ability to, need for and commitment to change (Amrhein, 2004; Amrhein, Miller, Yahne, Palmer, & Fulcher, 2003). Thus, a causal chain is hypothesized, such that MI consistent behaviors lead to increased CT, which in turn leads to reduced substance use (Magill et al., 2014). Many studies have tested this mediational relationship, or segments of it, with mixed results (e.g., Apodaca & Longabaugh, 2009; Gaume, Bertholet, & Daeppen, 2016; Gaume, Longabaugh, et al., 2016; Magill et al., 2014; Moyers, Martin, Houck, Christopher, & Tonigan, 2009; Moyers, Martin, Manuel, Hendrickson, & Miller, 2005; Vader, Walters, Prabhu, Houck, & Field, 2010). A meta-analysis of such studies revealed that MI consistent behaviors significantly increased CT, and MI inconsistent behaviors increased sustain talk (ST; Magill et al., 2014); however, only ST independently predicted drinking outcomes--for the worse. A limitation of research in this area is the general reliance on correlational relationships and an absence of experimental manipulation of Miller and Rose's proposed active ingredients.

### 1.2. Efforts to Identify MI's Mechanisms of Action through Experimental Manipulation

In an effort to address this limitation, we set out to identify the mechanisms of action of MI by disaggregating MI into its relational only and relational plus directional elements. In a pilot, randomized controlled trial (Morgenstern et al., 2012), heavy drinkers interested in moderation rather than abstinence were randomized to one of three conditions: 1) MI, consisting of both the relational and directional elements; 2) Spirit-Only MI (SOMI), a

relational only, nondirective listening condition that proscribed evocation of change talk; and 3) a non-therapy condition (NTC) in which participants were encouraged to change on their own, with no therapist contact. Therapy consisted of four, one hour sessions over eight weeks. Findings revealed MI was differentially effective in increasing change talk but only effective in reducing drinking at a greater rate than the other two conditions in the initial two weeks of treatment. This difference dissipated over time, and condition differences were completely absent by week 8. It was assumed that a small sample size may have hindered discovery of a signal.

Given this assumption, we replicated the study using a larger sample (N=139) (Morgenstern et al., in press; Morgenstern et al., 2016). We again found significant differences in the expected direction related to CT, but all condition differences related to drinking were absent across the treatment period. In both studies, the absence of differences on drinking was unexpected. It was hypothesized that this may be due to participant characteristics that might enhance or hinder the effects of MI or SOMI, in other words, a patient matching hypothesis.

### 1.3. Patient Matching with MI

Research on moderators of MI is relatively scant. While the original Project MATCH study (Project MATCH Research Group, 1997b, 1998) yielded few positive patient matching findings, several secondary analyses using more nuanced or statistically sophisticated approaches have yielded important findings related to participant characteristics determining differential responses to treatment (e.g., Karno & Longabaugh, 2003, 2005a, 2005b, 2007; Witkiewitz, Hartzler, & Donovan, 2010; Wu & Witkiewitz, 2008). These studies revealed that certain circumstances or characteristics (e.g., outpatient vs. aftercare, low motivation, participant reactance (the extent to which someone is likely to be influenced by others), and participant trait anger) are critical in determining the efficacy of interventions, including motivational enhancement therapy (MET; Miller, Zweben, DiClemente, & Rychtarik, 1992), a version of MI.

Given the unique attributes of MI as specifically focused on problem drinking (in the context of this study) and its goal of supporting self-efficacy, two constructs emerge as potentially important moderators of treatment: baseline severity of drinking or AUD and baseline self-efficacy to reduce drinking. Drinking severity has emerged as a moderator of MI efficacy with mixed support. A study using MATCH data revealed that higher baseline severity among men in the aftercare arm did worse in MET than in cognitive behavioral therapy (Witkiewitz et al., 2010). In potential contrast, a recent analysis of moderated mediation of MI (via CT) by alcohol severity among hazardous drinking Swiss male military conscripts revealed a stronger mediational relationship related to reduced drinking when alcohol severity was high (Gaume, Longabaugh, et al., 2016)—suggesting that MI may have more potent effects for those with greater AUD severity. In addition, there is a widely accepted belief that those with greater severity will fare better with more intensive treatment compared to a more minimal treatment (McKay et al., 2005)—in this case, Spirit Only MI.

In regards to self-efficacy, Project MATCH previously tested self-efficacy as a moderator of treatment, comparing MI, CBT, and TSF (Project MATCH Research Group, 1997b), and no significant interaction effects emerged. Given that all of these were active AUD treatments,

it is possible that self-efficacy was supported across conditions, regardless of treatment modality. MET was not compared with a non-directive listening condition—or the relational component of MI. It may be that an overt intervention to support self-efficacy (e.g., MI) would perform well particularly with those who are low in self-efficacy.

#### 1.4. The Current Study

In a previous analysis (Morgenstern et al., in press), we examined the moderating impact of motivation across conditions within the replication study, which yielded null findings. Therefore, based on the limited existing literature, the context of this specific randomized controlled trial, and the theory about MI's mechanisms of action, we identified four additional potential moderators of MI: 1) severity of baseline drinking, 2) severe AUD (met 6 or more criteria), 3) baseline self-efficacy to moderate drinking and 4) mean daily confidence to resist heavy drinking in the week prior to treatment initiation. Given that the MI condition specifically focused on drinking, as a bona fide AUD treatment, it was hypothesized that MI would emerge as a stronger predictor of reduced drinking compared to SOMI when 1) baseline drinking was more severe and 2) AUD was severe. In addition, since MI specifically sets out to support self-efficacy (Miller & Rollnick, 2013), it was hypothesized that both the cross-sectional measure of self-efficacy and daily confidence to reduce drinking would impact the relationship between condition and drinking such that MI would emerge as a stronger predictor of reduced drinking compared to SOMI when self-efficacy was low and mean daily confidence was low. To test these hypotheses, we combined the samples of the two aforementioned studies into a single sample to test the moderating effects of these key participant characteristics. Samples were combined to increase power to detect condition by participant characteristic effects.

Secondary analyses were also performed to test the hypothesis that individuals in either therapy condition (i.e., MI and SOMI) would predict reduced drinking in the presence of greater depressive symptoms compared with those in NTC. Both the MI and SOMI conditions allowed for potential self-reflection and insight—factors negatively associated with depression (Nakajima, Takano, & Tanno, 2017)—through the relational component of MI. It was postulated that depression might interfere with the ability to mobilize the internal resources needed to reduce drinking, and that therapy, relative to the non-therapy condition, might alleviate depressive symptoms and subsequently facilitate drink reduction.

## 2. Method

This study used data collected during two randomized controlled trials, a pilot study (Motion 1, Morgenstern et al., 2012) and a larger, replication study (Motion 2, Morgenstern et al., in press; Morgenstern et al., 2016), both of which sought to test the hypothesized active ingredients and mechanisms of change within MI when used to reduce drinking among problem drinkers. Complete procedures for the parent studies are described elsewhere (Morgenstern et al., 2012; Morgenstern et al., 2016). Because Motion 2 was a replication of Motion 1, procedures were almost identical, and the few minor differences are noted below. Both studies were reviewed and approved by institutional review boards—both at the New York State Psychiatric Institute and Motion 2 also at Northwell Health.

## 2.1. Participants

We recruited 89 and 139 problem drinkers in each study, respectively, for a total sample of 228 problem drinkers with an AUD diagnosis seeking help to reduce drinking. Participants were recruited using digital and print advertising in media, reaching individuals in New York City metropolitan region. Participants were considered eligible if they were: (1) between ages 18 and 75; (2) reported an average weekly consumption of 15 or 24 standard drinks per week for women and men, respectively, during the prior 8 weeks; and (3) endorsed criteria for 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 at baseline to achieve abstinence; or (7) expressed a desire or intent to obtain additional substance abuse treatment during the 8 week treatment period.

## 2.2. Procedures

Potential participants who contacted the study underwent a brief, initial telephone screening. Those who were preliminarily eligible were scheduled for a baseline assessment and trained to complete the ecological momentary assessment, specifically daily diaries, via: interactive voice recording (IVR) in Motion 1 and online surveys (OS) in Motion 2, described further below. One week later, during the baseline assessment, eligible participants completed a full assessment battery, which included the Timeline Followback Interview (TLFB; L. C. Sobell, Sobell, Leo, & Cancilla, 1988; M. B. Sobell et al., 1980) covering the prior nine weeks. All participants were provided with normative feedback about their drinking from study staff prior to randomization. Feedback included an estimated average weekly consumption of alcohol based on screening reports and their score from the Alcohol Use Disorder Identification Test (AUDIT; Babor, Higgins-Biddle, Saunders, & Monteiro, 2001) with a description of AUDIT risk categories. Participants were then randomly assigned at baseline to one of three conditions: MI, SOMI, or NTC. Participants assigned to either MI or SOMI received four sessions of psychotherapy over the next 7 weeks (weeks 1, 2, 4 or 5, and 8). Those randomized to NTC were encouraged to change on their own, and, if still drinking at problematic levels at the end of the 7-week period, they were offered four sessions of MI. Participants completed two assessments following baseline (at week 4 or 5 in Motion 1 and 2 respectively, and week 8).

**2.2.1. Study Interventions—**The MI protocol was adapted from the motivational enhancement therapy used in Project MATCH (Miller, Zweben, DiClemente, & Rychtarik, 1999; Project MATCH Research Group, 1993) and included structured, personalized feedback. The SOMI protocol consisted only of the relational elements of MI, specifically including therapist stance (warmth, genuineness), extensive use of reflective listening skills, and avoidance of MI-inconsistent behaviors (advise, confront). Directional elements (e.g., amplified or double-sided reflections, decisional balance, etc.) were proscribed in SOMI to specifically avoid the selective reinforcement of change talk. Instead, therapists focused their open-ended questions and reflections on affect and self-reflection. The NTC protocol

emphasized personal responsibility for change by asking participants to change on their own. Participants were also informed that research demonstrated that some individuals could reduce drinking without professional help. Importantly, fidelity to and discriminability of the conditions were high in both studies and not significantly different from one another. See Morgenstern et al. (2012; in press) for detailed descriptions of the interventions, therapist training, and condition fidelity and discriminability. Attrition rates for the conditions were statistically equivalent (4.2% for MI, 4.3% for SOMI, and 6.5% for NTC).

**2.2.2. Ecological Momentary Assessment: Daily Surveys**—In both studies, participants received training on the daily surveys at the end of their initial screening visit (week prior to randomization), and research assistants (RAs) provided ongoing technical support.

**2.2.2.1. IVR:** Participants in Motion 1 were asked to complete a daily telephone survey via 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. Participants called a toll-free phone number to complete the survey between 4:00 pm and 10:00 p.m. each day. If participants failed to call into the system by 8:00 p.m., an automated reminder call was made. The daily surveys took about 2 to 5 minutes to complete. The compliance rate of the IVR was 66.1% across the eight weeks.

**2.2.2.2. OS:** Participants in Motion 2 were asked to complete twice daily, once in the morning and once in the evening, online surveys (OS) using a smartphone. To avoid assessment fatigue, participants were only asked to complete the surveys for four weeks during the treatment period: one week prior to and one week following randomization and one week prior to the week 5 and 8 in-person assessments. Text messages were used to prompt participants to complete the OS, which took between two and six minutes to complete. Compliance rates for OS in Motion 2 were higher for the morning surveys (78.4% versus 66.3% for the evening surveys), and therefore only morning survey responses were used in the present analyses.

### 2.3. Measures

**2.3.1. Sociodemographics**—A self-report, demographic questionnaire was utilized to collect information about age, gender, educational, occupational information, race and ethnicity.

**2.3.2. Depression**—Baseline depression was assessed using the Beck Depression Inventory (BDI-II; Beck, Steer, & Brown, 1996), a 21-item self-report measure, administered one week prior to randomization in each study. Scores were summed for a composite score of depressive symptoms, with a score of over 14 indicating mild depressive symptoms, and a score of 20 and over indicating clinical depression. Cronbach's alpha was .90.

**2.3.3. Severity of AUD**—The Composite International Diagnostic Instrument, Substance Abuse Module (CIDI-SAM; Cottler, Robins, & Helzer, 1989) was used to evaluate the

number of DSM-IV (American Psychiatric Association, 2000) AUD criteria, whether abuse or dependence, a participant endorsed. A proxy of DSM-5 (American Psychiatric Association, 2013) criteria was used by eliminating the legal criterion from abuse and pooling all criteria together. Participants were classified as “severe” if they met six or more criteria.

**2.3.4. Self-efficacy for moderating drinking**—Baseline self-efficacy was measured in Motion 1 using the Situational Confidence Questionnaire-39 (SCQ; Annis & Davis, 1988) and in Motion 2 with the 8-item Brief Situational Confidence Questionnaire (BSCQ; Breslin, Sobel, Sobel, & Agrawal, 2000). While structurally different, both scales measure self-efficacy related to the ability to resist the urge to drink heavily. Breslin et al. (2000) demonstrated that the reliability and validity of the original, 100-item SCQ (Annis, 1986) and the 8-item BSCQ provided similar measures of self-efficacy. In this study, a total composite score was utilized by summing the scores of each of the items for the SCQ and BSCQ, independently. Cronbach's alpha for the SCQ was .95, and .89 for the BSCQ. Scores from each measure were then transformed into *z* scores before the datasets were combined. Using standardized *z* scores allows for comparison across variables with different means and standard deviations by helping to determine the relative position to the mean each value holds (Hatcher, 2003, p. 263).

**2.3.5. Daily confidence to resist heavy drinking**—One item on both the IVR and OS measured baseline *confidence*. In Motion 1, participants were asked “How confident are you that you can resist drinking heavily (that is, resist drinking more than 5 drinks) over the next 24 hours?” For Motion 2, the question was tailored to gender by adding the phrase “...that is, drink 4 or more drinks for women, 5 or more drinks for men.” For Motion 1, the response set ranged from 0 (not at all) to 4 (completely). In Motion 2, the response set ranged from 0 (not at all) to 8 (extremely). Due to response scale differences between the two studies, a 7-day mean for this item was calculated for the pre-treatment period for each person within each study. These scores were then transformed to *z* scores before the datasets were combined.

**2.3.6. Daily commitment to resist heavy drinking**—Similar to the confidence question, baseline *commitment* to resist heavy drinking was assessed in both studies with one item: “How committed are you to not to drink heavily (that is, not to drink more than 5 drinks) over the next 24 hours?” In Motion 2, this question was tailored to gender by adding the phrase “...(that is, drink 4 or more drinks for women, 5 or more drinks for men)...”. In Motion 1, the response set ranged from 0 (not at all) to 4 (completely), and in Motion 2, the response set ranged from 0 (not at all) to 8 (extremely). Due to response scale differences, a 7-day mean for the item was calculated for the pre-treatment period to yield a baseline *commitment* score for each person within each study. Scores were then transformed to *z* scores before the datasets were combined.

**2.3.7. Drinking outcomes**—The TLFB (M. B. Sobell et al., 1980) assessed frequency and intensity of alcohol use during the previous nine weeks at week 1, and it was re-administered at weeks 4 or 5 and 8, each assessment covering the period of time since the

last assessment. The TLFB has demonstrated strong psychometric properties (Carey, Carey, Maisto, & Henson, 2004; Dillon, Turner, Robbins, & Szapocznik, 2005; Vinson, Reidinger, & Wilcosky, 2003). Data for the entire pre-baseline period was aggregated into a summary variable for mean sum of standard drinks per week at baseline (BL SSD). Outcome data was aggregated into the mean sum of standard drinks per week for the end of treatment (SSD), defined as the last four weeks of treatment.

## 2.4. Analytic Plan

To test primary and secondary hypotheses, generalized linear models were specified for the non-normal data for the dependent variable, SSD. For these models, given the distribution of the data, a negative binomial distribution with logit link function was specified, providing good model fit (Atkins, Baldwin, Zheng, Gallop, & Neighbors, 2013). All analyses were conducted using SAS statistical software program, version 9.4 (SAS Institute Inc., 2002–2012).

Moderation models were built in a hierarchical fashion. First, for all models covariates (BL SSD and demographics) were entered first to evaluate any initial significant main effects. For all models, BL SSD was retained as a covariate, while all demographics were non-significant and removed from the final models. Orthogonal contrast coding was used for condition, and all continuous variables were centered at the grand mean. The main effect of treatment condition with each of the proposed moderators was tested first, and then higher order interaction terms were added next. Each moderator was tested independently. For primary moderation hypotheses, we tested BL SSD, severe AUD diagnosis, baseline self-efficacy, and mean daily confidence to resist heavy drinking the week prior to randomization.

Secondary hypotheses were explored in a similar way, but with a new variable for condition, denoting treatment (MI *and* SOMI) versus no-treatment (Assessment only), orthogonally coded. Again, only BL SSD was retained as a covariate in the model, and all continuous variables were centered at the grand mean. Condition and depression were entered into the model first to determine main effects, and then the higher order interaction term was entered into the model.

## 3. Results

### 3.1. Comparison of Study Demographics

Table 1 shows baseline characteristics of the two samples. There were few significant differences between the samples from Motion 1 and 2, suggesting overall equivalent samples. Motion 2 recruited a slightly older sample, with the mean age about 4 years older than Motion 1. While both samples had a majority of Caucasian participants, Motion 2 had a smaller proportion of Whites and a larger proportion of non-White and Hispanic participants than the Motion 1 sample. Drinks per drinking day were significantly heavier for individuals in Motion 1 (by about one standard drink), and the mean number of criteria met for alcohol dependence was greater by about one for individuals in Motion 2 than in Motion 1.

### 3.2. Main Condition Effects on Drinking during Last Four Weeks of Treatment

When controlling for baseline drinking, there was no significant effect of condition on SSD (Contrast 1 (MI & SOMI vs. NTC):  $B = .03$ ,  $SE = .08$ ,  $p = .66$ ; Contrast 2 (MI vs. SOMI):  $B = .02$ ,  $SE = .08$ ,  $p = .77$ ).

### 3.3 Effect of Moderators on Condition's Impact on Drinking

**3.3.1. Baseline drinking severity (BL SSD)**—The main effect of BL SSD was significant ( $B = .02$ ,  $SE = .00$ ,  $p < .01$ ). The BL SSD by condition interaction terms did not yield a significant effect (Contrast 1 (MI & SOMI vs. NTC)  $\times$  baseline SSD:  $B = -.01$ ,  $SE = .01$ ,  $p = .05$ ; Contrast 2 (MI vs. SOMI)  $\times$  baseline SSD:  $B = .01$ ,  $SE = .01$ ,  $p = .13$ ). The trend level effect of treatment interacting with BL SSD indicated that those in therapy with high BL SSD reduced their drinking to a greater degree than those in NTC with high BL SSD. At low BL SSD, there were no differences across conditions.

**3.3.2. Severe AUD diagnosis**—The main effect of severe AUD on SSD, when controlling for condition and BL SSD, was not significant ( $B = -.05$ ,  $SE = .06$ ,  $p = .46$ ). When the interaction terms with condition were entered into the model, neither yielded a significant effect (Contrast 1 (MI & SOMI vs. NTC)  $\times$  AUD:  $B = -.15$ ,  $SE = .16$ ,  $p = .36$ ; Contrast 2 (MI vs. SOMI)  $\times$  AUD:  $B = .08$ ,  $SE = .15$ ,  $p = .57$ ).

**3.3.3. Self-efficacy**—The main effect of self-efficacy on SSD, when controlling for condition and BL SSD, was not significant ( $B = -.02$ ,  $SE = .03$ ,  $p = .55$ ). There were also no significant effects of the self-efficacy by condition interactions (Contrast 1 (MI & SOMI vs. NTC)  $\times$  self-efficacy:  $B = .13$ ,  $SE = .08$ ,  $p = .12$ ; Contrast 2 (MI vs. SOMI)  $\times$  self-efficacy:  $B = -.11$ ,  $SE = .08$ ,  $p = .14$ ).

**3.3.4. Confidence**—When controlling for BL SSD and condition effect, the main effect of *confidence* was significant ( $B = -.13$ ,  $SE = .03$ ,  $p < .05$ ), such that for every unit increase in *confidence* there was a 13% decrease in drinking. There was no significantly different effect of the average of MI and SOMI compared to NTC on *confidence* (Contrast 1 (MI & SOMI vs. NTC)  $\times$  *confidence*:  $B = -.11$ ,  $SE = .07$ ,  $p = .12$ ); however, there was a significant effect comparing MI to SOMI (Contrast 2 (MI vs. SOMI)  $\times$  *confidence*:  $B = .22$ ,  $SE = 0.07$ ,  $p < .05$ ), such that for those assigned to MI, each standard deviation increase in *confidence* yielded an *increase* of about a quarter of a standard drink, compared to those in SOMI. The simple slopes of this effect are shown in Figure 1.

### 3.4. Moderating Impact of Depression on Receipt of Therapy's Effect on Drinking

The main effect of BDI on SSD, when controlling for condition and BL SSD, was not significant ( $B = -.00$ ,  $SE = .00$ ,  $p = .73$ ). The BDI  $\times$  condition interaction term was significant ( $B = -.02$ ,  $SE = .01$ ,  $p < .05$ ), such that for participants at the same BDI level, those who received either therapy had a 2% decrease in drinking compared to NTC.

### 3.5. Post Hoc Analyses

To further probe the conditional effect of depression on condition, we examined whether these effects might be mediated by daily commitment or confidence to resist heavy drinking

in an exploratory analysis. We hypothesized that commitment or confidence, which are found to predict drinking (Kuerbis, Armeli, Muench, & Morgenstern, 2013, 2014; Morgenstern et al., 2016), might be impacted by depression. For example, it might be for those with higher levels of depressive symptoms, receiving therapy differentially increases commitment not to drink heavily compared to the non-therapy condition, whereas at low levels of depression, there is no differential effect of receipt of therapy on commitment. Accordingly, two moderated mediation models were built using PROCESS (Hayes, 2013) in SPSS 24 (IBM Corp, 2016). In the first model, depression was examined as a moderator of the *a* path of a mediated relationship between condition and SSD by *commitment* (to resist drinking heavily) at mid-treatment (week 4 for both studies). Baseline *commitment* was used as a covariate. Results yielded no conditional mediation effects for depression related to *commitment*.

In the second model, depression was examined as a moderator of the *a* path of a mediated relationship between condition and SSD by *confidence* to reduce drinking at mid-treatment (week 4). Baseline *confidence* was used as a covariate. Results revealed a significant conditional effect of depression on the mediated relationship (index of moderated mediation was  $-.12$ ,  $SE = .06$  [95% CI:  $-.28, -.03$ ], Hayes 2013, Supplemental Materials). To probe these relationships further, we ran separate mediation models for individuals with a BDI score less than or equal to 17 and 18 and above. This threshold was chosen by looking at the significance of the indirect effect at different values of BDI that is given in the output for this model within PROCESS—at around 17, the indirect effect began to be significant. No significant mediational relationships were revealed for those in the lower BDI group. For individuals in the higher BDI group, there was a significant indirect effect,  $ab = -2.28$ ,  $SE = 1.48$ , [95% CI:  $-6.2, -.09$ ] of condition on drinking via *confidence*, such that therapy increased *confidence*, which in turn decreased SSD. Total and direct effects of condition were not significant.

#### 4. Discussion

This study attempted to identify potential participant characteristics that may enhance or hinder the effects of MI's relational and directional component parts. There was no moderating effect of baseline drinking or AUD severity on MI, which is surprising and inconsistent with some of the existing literature on matching (e.g., Witkiewitz et al., 2010), especially since the MI condition specifically focused on drinking, whereas the SOMI condition was less likely to do so. This finding is also inconsistent with the only other study to compare MI with non-directive listening, which found a greater effect for MI (Sellman, Sullivan, Dore, Adamson, & MacEwan, 2001). Findings indicate that a non-therapy condition works equally well as MI across a variety of characteristics, including severity, which deserves increased attention and exploration within future research.

The most curious finding, contrary to Project MATCH (Project MATCH Research Group, 1997a) which found no impact of self-efficacy on treatment type, was the moderating relationship of baseline confidence to resist heavy drinking on MI, which led to *increased* rather than decreased drinking compared to SOMI. This interactive effect was not large, and when combined with the strong main effect of confidence to reduce drinking, one can

conclude that MI slightly weakens the effect of baseline confidence on reducing drinking. Still, this finding raises interesting questions about how directional elements within MI may unintentionally entrench individuals in the status quo when they are already confident of their ability to resist heavy drinking. Individuals who are already confident may simply require support limited to just the relational components, rather than the directional elements.

This finding is similar to other studies that have found that individuals who are already committed may not respond well to evocation of CT (Magill, Stout, & Apodaca, 2013; Miller & Rose, 2015). MI was designed to help individuals who are not fully committed to or confident about change to engage in a collaborative decision-making process to become more motivated and self-efficacious. Problem drinkers voluntarily seeking treatment and expressing a strong commitment and confidence not to drink heavily, as both of these samples did, may have already engaged in this decision making process, making MI and specifically evocation of change talk irrelevant. It should be noted that within MI, especially in the beginning of working with the client, attention was paid to what the client gained from or liked about drinking, which inherently evoked ST. Such a conversation was then used to later help to evoke CT. The result was a sling shot effect of CT. While there were more statements of ST in MI than SOMI, there was also much greater strength and frequency of CT. Given their incoming confidence and commitment, this process of exploring ambivalence may have entrenched clients in the status quo, reminding them of reasons they enjoy drinking, such as suggested in the study by Carey, Carey, Maisto, and Henson (2006).

It is also important to note the difference in findings between self-efficacy measured cross-sectionally versus daily confidence measured via ecological momentary assessment, when the cross-sectional measure did not yield a significant finding. In a previous analysis using only data from Motion 1, the cross-sectional measure of self-efficacy was both correlated with confidence and predictive of drinking (Kuerbis et al., 2013); however, confidence was a stronger predictor of drinking outcomes. With the larger sample, self-efficacy measured cross-sectionally was not related to drinking, while daily confidence was. It is possible that the daily evaluation of confidence in context (real world) increases the validity and or measures a slightly more nuanced aspect of self-efficacy that may be particularly important for behavior change.

Finally, only the secondary hypothesis was supported in the expected direction. Presence of a greater level of depressive symptoms interacted with therapy to facilitate a greater reduction in drinking. In addition, depression yielded a significant moderated mediational effect with confidence. The literature on depressive symptoms moderation of psychosocial interventions are limited (e.g., Kuerbis, Neighbors, & Morgenstern, 2011), but yield findings consistent with this study that there is a potentially synergistic interaction of psychosocial interventions with depression for improved outcomes. In this case, MI's relational component or simply therapist contact may be particularly important for increasing self-efficacy, providing an opportunity for needed self-reflection and reducing drinking for individuals with more than mild depressive symptoms.

#### 4.1. Limitations

Findings should be interpreted in the context of the study's limitations. These two samples were from distinct studies, and as a result, there were minor differences in procedures (e.g., timing of mid-treatment assessment, timing of the ecological momentary assessment). We evaluated these differences to be negligible, but it is possible that these differences asserted undue influence in the analyses. Generalizability of these findings is limited, particularly to problem drinkers who choose a goal of moderation. Having a goal of moderation may have impacted these findings in a different way than a goal of abstinence. Moderation goals often change throughout treatment—sometimes related to success in achieving or failing to achieve an initial goal (Zilberman, 2014)—inherently altering confidence and commitment related to that goal. This potentially dynamic goal may have important yet invisible impact on participants' trajectories through treatment. Methodological limitations of the parent studies also influence our current analysis, such as using an outcome variable that is concurrent with the treatment period and the possibility of assessment reactivity with the TLFB and EMA. Furthermore, we have not included all the possible moderated mediation analyses nor the impact of these moderated relationships on CT directly. These will be next steps in our efforts to unpack the dynamic processes that may be occurring. Finally, it may be that the null findings related to moderators may be due to a lack of statistical power (McClelland & Judd, 1993), which is sometimes problematic for finding moderator effects. While the two samples were combined to increase to maximum power, we cannot rule it out as a possible explanation for the null findings of this study.

#### 4.2. Conclusion

After decades of research into MOBC of AUD treatment, it is clear that its dynamics are extremely complex and a full understanding them remains out of reach. Still, important progress has been made, and there appear to be clear ways forward to improving our understanding. As suggested by Magill (Magill et al., 2013), the role of ambivalence, including identifying the precise balance between CT and ST that yields optimal outcomes, needs to be more overtly explored as a means to better understand the MOBC of MI. In addition, this study reveals that it is indeed important to include confidence as a contributing moderating factor, separate from commitment, in leading to positive outcomes as we examine MOBC. Common factors and other patient states and traits that are non-treatment specific, such as depression, should be explored, across studies both as independent moderators and together with typical constructs of interest, such as motivation and self-efficacy. Additionally, recent research has revealed that outcome expectancies may shape self-efficacy (Beauchamp, 2016; Williams & Rhodes, 2016). Outcome expectancies and goal choice should also be considered in a causal model of change.

This study adds to the existing literature on MOBC in MI in important ways. It contributes more information towards honing the technical hypothesis, for which, under certain circumstances, there is either more or less support. In the context of disaggregation of MI, this study provides new information about moderation of the hypothesized active ingredients of MI, suggesting that the relational and directional elements may interact with different patient characteristics to yield distinct outcomes. As personalized medicine is increasingly the goal for optimal health care, knowing which factors work synergistically with each

component will be crucial for the most effective intervention and dissemination within the community.

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These findings have not been presented elsewhere.

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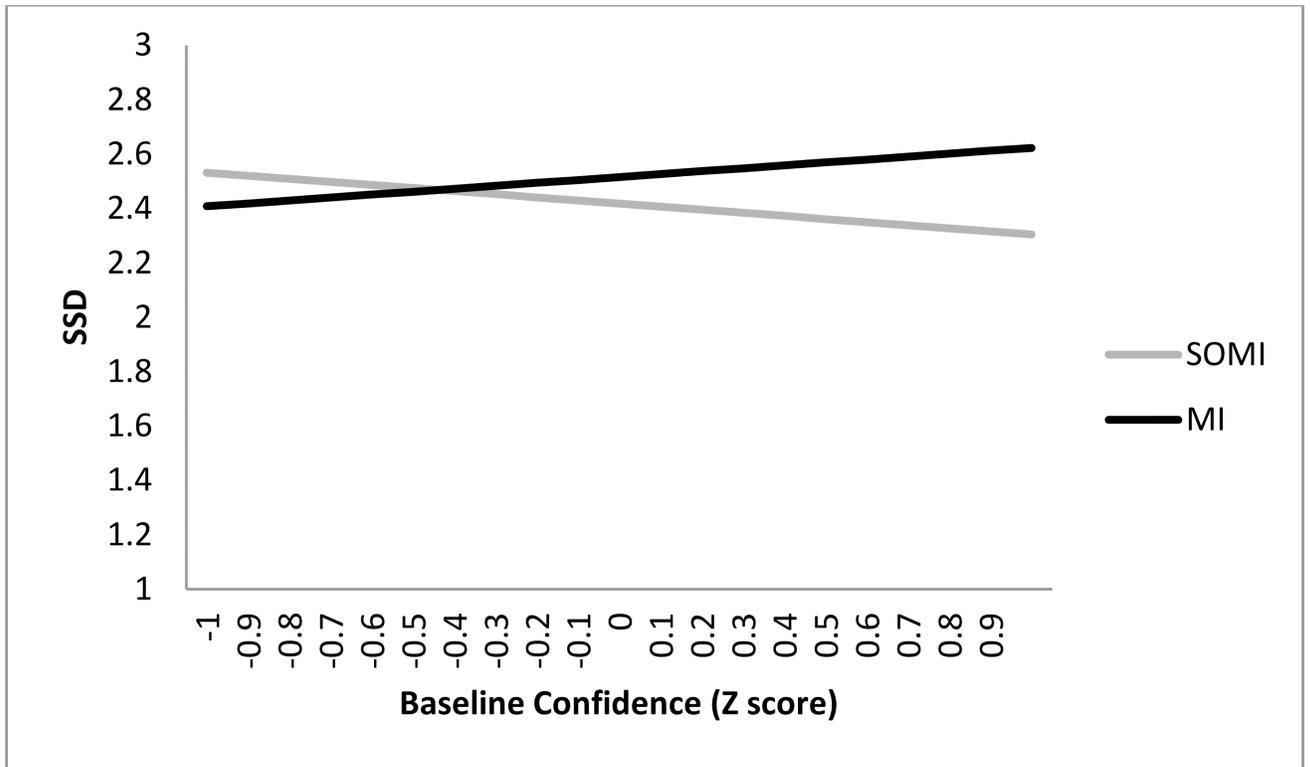
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### Highlights

- Participant characteristics may moderate effects of Motivational Interviewing (MI).
- Severity of drinking, AUD criteria, and self-efficacy were not significant moderators of MI.
- Confidence moderated MI--higher confidence led to increased drinking compared to non-directive listening.
- Depression moderated receipt of therapy--those in therapy reduced their drinking.
- Matching some participant characteristics to type of therapy can have important impact on outcomes.



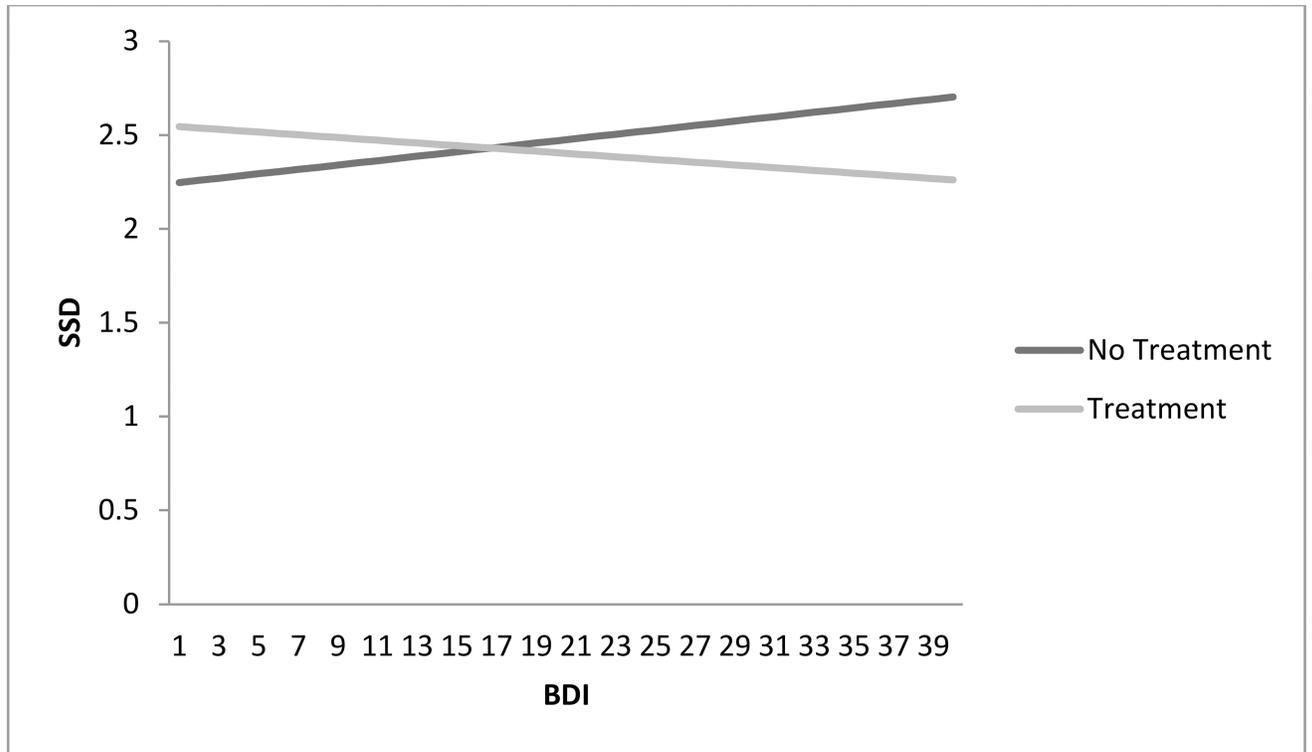
**Figure 1.**  
Simple slopes of baseline confidence (z score) by condition.

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**Figure 2.**  
Simple slopes of depression (BDI) by condition.

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**Table 1**

Baseline Characteristics of Motion 1 and Motion 2

Variable	Motion 1 (N=89)		Motion 2 (N=139)		p-value
	M or %	SD	M or %	SD	
Demographics					
Age (years)	39.3	11.7	43.4	12.6	.01
Male	50.6		43.2		.28
Race/Ethnicity					
Non-Hispanic, White/Caucasian	82.0		69.0		.00
Hispanic/Latino, any race	9.0		17.3		
Other race, non-Hispanic	9.0		13.7		
Education					
High school diploma/GED and under	5.6		7.2		.42
Some college/Associates	22.5		23.0		
Bachelor's degree	37.1		36.7		
Some graduate school or higher	34.8		33.1		
Employment					
Employed	85.4		77.7		.82
Unemployed/Looking for work	7.9		9.4		
Not in labor force/not looking for work	6.7		12.9		
Drinking Severity					
Mean sum of standard drinks per week	31.3	17.5	31.1	14.2	.62
Mean drinks per drinking day	5.9	2.8	4.4	2.0	.00
Alcohol Dependence Scale (ADS)	13.0	5.2	13.9	5.8	.23
Number of alcohol dependence criteria met	4.0	1.5	5.1	1.7	.00
Mean Situational Confidence Questionnaire 39 <sup>a</sup>	2.9	.8	--	--	--
Mean Brief Situational Confidence Questionnaire <sup>b</sup>	--	--	2.7	1.1	--
Becks Depression Inventory-II	12.8	8.5	13.7	9.1	.45

<sup>a</sup>Possible range of the mean was 0 to 5.

<sup>b</sup>Possible range of the mean was 0 to 5.