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A Multivariate Meta-Analysis of Motivational Interviewing Process and Outcome

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Abstract

Motivational interviewing (MI) theory proposes a process whereby a set of therapist behaviors has direct effects on client outcomes as well as indirect effects through in-session processes such as client change talk. Despite clear empirical support for the efficacy of MI across settings, the results of studies evaluating proposed links between MI process and outcome have been less clear. In the present study, we used a series of multivariate meta-analyses to test whether there are differential relationships between specific MI-consistent and MI-inconsistent therapist behaviors, MI therapist global ratings, client change language, and clinical outcomes. Among 19 primary studies (N = 2,614) included in the analysis, we found a significant relationship between MI-consistent therapist behaviors and increased client change talk, yet MI-consistent therapist behaviors were also significantly related to increased client sustain talk. Higher therapist global ratings (empathy and MI spirit) were significantly related to increased MI-consistent behaviors, decreased MI-inconsistent behaviors, increased client change talk, yet also to increased client sustain talk. Therapist global ratings were not significantly related to clinical outcomes. Client sustain talk was a significant predictor of worse clinical outcomes, while client change talk was unrelated to outcome. Variability within the correlations indicated that some individual MI therapist behaviors were differentially related to therapist global ratings of empathy and MI spirit. Similar to past research, present findings confirm some hypothesized MI process outcome relationships, while failing to confirm others. Clinical implications and future areas of research are discussed.

Keywords

motivational interviewing; process and outcome; meta-analysis; substance use treatment

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Motivational interviewing (MI) is an empirically supported psychotherapy, originally developed for treating alcohol and substance abuse and now applied to a variety of behavioral health problems (e.g., physical activity for obesity, medication management) and settings (e.g., mental health outpatient clinics, hospitals, and dental offices; see Armstrong et al., 2011; Lundahl et al., 2010; Lundahl, Kunz, Brownell, Tollefson, & Burke, 2013; Miller & Rose, 2009). MI theory proposes a linguistic process wherein specific therapist verbal behaviors (e.g., open questions, reflections, closed questions, confrontations) and general therapist skills (e.g. empathy, MI spirit) lead to client verbal behaviors (e.g., change talk and sustain talk), which in turn influence client outcomes (Figure 1; adapted from Miller & Rose, 2009).

Despite strong evidence that MI is effective in producing behavior change (Lundahl et al., 2010, 2013), and a well-developed theory of how that change is produced, research support for many of the pathways show in Figure 1 is inconclusive. Most MI process studies involve the use of trained human coders who listen to a session and rate the presence of different therapist or client behaviors over time with measures such as the Motivational Interviewing Skills Code (MISC; Miller, Moyers, Ernst, & Amrhein, 2008) and Motivational Interviewing Treatment Integrity (MITI, Moyers, Manuel, & Ernst, 2014). For example, a typical study might count the number of times a therapist reflected the client's experience and estimate the association of that reflection count with the total number of times the client spoke about changing a problematic behavior. Some studies indicate that therapist use of MI specific behaviors or skills are related to treatment outcome (Baer et al., 2008; McCambridge, Day, Thomas, & Strang, 2011), but effects are inconsistent. For example, Tollison et al. (2008) found that complex reflections, (but not simple reflections), correlated with better clinical outcomes. McCambridge et al. (2011) found only therapist MI spirit and percentage of complex reflections correlated with cannabis cessation, but no other MI behavior or skill was associated with outcomes (see also Baer et al., 2008; Gaume, Bertholet, Faouzi, Gmel, & Daeppen, 2010, 2013).

There are several possible explanations for these inconsistent findings noted above. First, behavioral coding is extremely labor intensive; thus, sample sizes in studies of MI process and outcome studies are typically limited (see Vader, Walters, Prabhu, Houck, & Field, 2010, $n = 30$; Baer et al., 2008, $n = 52$). As a result, variability in observed correlations between process measures and clinical outcomes might simply reflect sampling variation associated with small sample sizes rather than real differences in the impact of MI relevant therapist behaviors. In addition, many studies do not report associations between all links in the MI causal chain, reporting only those associations that provided significant associations with clinical outcome (e.g., Hodgins, Ching, & McEwen, 2009; McCambridge et al., 2011). Selective reporting may lead to biased estimates of how MI processes and outcomes are related.

To summarize the extant literature on MI process-outcome associations, Magill et al. (2014) conducted a meta-analysis of 12 studies ($n = 1{,}004$ clients) that assessed the relationship between MI therapist behaviors, client language, and clinical outcomes. For analysis, specific therapist behaviors were aggregated into MI-consistent (e.g. open questions, complex reflections) and MI-inconsistent (e.g. confront, warn) categories. As predicted by

MI theory, there was a significant correlation between MI-consistent behaviors and client language toward behavior change (i.e., "change talk"; $r = .26$, $k = 7$ studies). However, increased MI-consistent behaviors also correlated weakly, but positively, with client language away from behavior change (i.e., "sustain talk"; $r = .10$, $k = 7$). An increase in MI-inconsistent behaviors was related to a significant decrease in client change talk ($r = -.18$, $k = 7$), and a smaller but still significant association, with client sustain talk ($r = .07$, $k = 7$). There was no significant relationship between change talk and client substance use outcomes ($r = .06$, $k = 6$), but increased client sustain talk was associated with worse substance use outcomes ($r = -.24$, $k = 7$). In summary, therapist MI-consistent behaviors are associated with greater change talk, and also related to increased sustain talk. Client sustain talk was directly associated with worse outcomes whereas there was no association between increased client change talk and outcomes. These findings provide only partial support for the standard theoretical model of MI.

There are two primary limitations in the Magill et al. (2014) meta-analysis. First, the study was an examination of the technical hypothesis of MI, focusing on behavioral codes only, and did not assess the relational factors theorized to predict positive change, i.e., therapist empathy and MI spirit (see Figure 1; Miller & Rose, 2009). These skills or relational factors are core theoretical components of MI, but the extent to which they are associated with change processes or outcomes remains unexplored. While early reports provided very strong associations between skills like empathy and treatment outcome (Miller & Baca, 1993), recent work has suggested that these correlations may be less dramatic (Moyers, Houck, Rice, Longabaugh, & Miller, 2016) and more similar to smaller effects observed outside of MI and substance abuse research (Elliott, Bohart, Watson, & Greenberg, 2011). Second, as is typical in many MI process studies, MI therapist behaviors were combined into broad categories of MI-consistent and MI-inconsistent behaviors. While this approach reduces complexity and provides a broad test of MI process, it also limits our ability to understand differences between specific MI behaviors in relation to therapist global ratings, client language, or clinical outcomes. For example, there may be differences in the magnitude of how simple and complex reflections are related to client change language or therapist global ratings.

The present meta-analysis addresses the above limitations. First, to explore relational hypotheses about how MI works, we included therapist global ratings. Second, rather than rely solely on associations between composite MI-consistent and MI-inconsistent scores, we used multivariate meta-analysis methods to examine whether the individual therapist behavior correlations that underlie these composites are differentially associated with client change language, therapist global ratings, and clinical outcomes. This is an attempt to answer a call to MI mechanism research by Miller and Rose (2009) stating a need to "look under the hood" at MI process and outcome to improve clinical training and treatment deliver (p. 527).

We proposed a number of hypotheses based on the MI theoretical framework outlined by Miller and Rose (2009) and a previous meta-analysis (Magill et al., 2014).

- *Hypothesis one*: We predicted that higher therapist global ratings (empathy and MI spirit) would correlate with increased MI-consistent behavior and client change talk and decreased MI-inconsistent behaviors and client sustain talk.
- *Hypothesis two*: We predicted that increased MI-consistent behaviors would correlate with increased client change talk and that increased MI-inconsistent behaviors would correlate with increased client sustain talk.
- *Hypothesis three*: We expected the relationship between client change language and outcomes would replicate the Magill et al. meta-analysis, i.e., client change talk would be unrelated to clinical outcomes, and client sustain talk would be related to worse clinical outcomes.
- *Hypothesis four:* We hypothesized that an overall increase in MI-consistent behaviors would correlate with slightly better clinical outcomes.
- *Hypothesis five:* We expected variability within the MI-consistent and MI-inconsistent correlations would be significant for comparisons with client change language and therapist global ratings. We did not have any specific hypotheses regarding what individual therapist behaviors would be differentially related to client change language or therapist global ratings, as this analysis was exploratory.

Methods

Selection of Studies

We conducted a literature search to identify potential studies of MI adherence and outcome. Primary search terms included: motivational interviewing, MI, and motivational enhancement. Secondary search terms included: outcome, competence, adherence, fidelity, spirit, change talk, MISC, MITI, and Yale Adherence Scale. The search used the following databases: PsycINFO, PsycArticles, ERIC, Academic Search Premier, and PubMed. We also reviewed previously published meta-analysis on MI for studies that met the inclusion criteria.

We included studies that had the following components: 1) an association between some aspect of therapist and client behavior and/or outcome in an MI context, 2) statistical data sufficient to calculate correlational effect sizes, 3) publication in a peer-reviewed journal, 4) examination of adult and/or adolescent populations, 5) group or individual treatment format, and 6) assessment of adherence to MI through trained raters (see Figure 2). For studies that did not report data in a format necessary to calculate correlational effect sizes, or studies that did not report all effects, we contacted primary authors and collected correlation matrices.

Variable Selection

Therapist Behaviors—Analyses included individual adherence variables that comprised MI-consistent (MICO) and MI-inconsistent (MIIN) summary scores. Unlike prior work that relies on these summary scores alone, we estimated correlations of therapist behavior variables using the individual codes that make up the broad categories of MICO and MIIN.

For MICO, the variables included: *advise with permission, affirm, complex reflections, simple reflections, emphasize control, open questions, raise concern with permission, reframe, and support*. MIIN variables included: *advise without permission, confront, direct, raise concern without permission, warn, and closed questions.* Retaining the raw correlation allowed for the examination of variability within the aggregate category. The raw therapist behaviors that comprised these correlations are listed in Table 1.

Global Ratings—We included two primary therapist global ratings: therapist empathy and MI spirit. Empathy ratings measure how well the clinician attempted to understand and take the perspective of the client. MI spirit is a gestalt rating of the clinician with three facets: collaboration (avoiding an authoritative stance), evocation (drawing out the client's perspective rather than giving advice), and autonomy (accepting that clients have the choice of whether to change).

Client Change Language—We coded two client change language variables. Client change talk is client utterances indicating movement towards the target behavior change, for instance, reducing substance use. Client sustain talk indicated movement away from the target behavior change.

Clinical Outcomes—We selected client outcomes that evaluated the primary target of behavior change. These mostly consisted of substance use outcomes, plus one HIV medication adherence study and one gambling study. When multiple outcomes were reported (e.g. drinking days per week and a consequences of drinking measure) these outcomes were aggregated across comparison variables. We recorded the most recent time point after the intervention.

Meta-Analytic Approach

We conducted two series of six multivariate meta-analytic models to quantify and test the relationship and variability between and among different MI therapist and client behaviors, therapist global ratings, and client outcomes. The six models tested associations of: (a) MI therapist behaviors (consistent/inconsistent) and client change language (change talk/sustain talk), (b) MI therapist behaviors and clinical outcomes, (c) MI therapist behaviors and MI therapist global ratings (empathy/MI spirit), (d) client change language and clinical outcomes, (e) therapist global ratings and client change language, and (f) therapist global ratings and clinical outcomes.

The first series of models (Models 1a-f) served as baseline models with a fixed effect for the type of correlation and a random effect for study. For example, in the first meta-analysis (Model 1a) of MI therapist behaviors and client change language, the fixed effects provided four correlation estimates, including the relationship between 1) therapist MI-consistent behaviors with client change talk, 2) therapist MI-consistent behaviors with client sustain talk, 3) therapist MI-inconsistent behaviors with client change talk, and 4) therapist MI-inconsistent behaviors with client sustain talk. Thus, this model provides both a fixed effect estimate of these four correlations and between study variability in the one overall aggregate correlation (i.e., MI-behavior and change language). Thus across the six meta-analyses, the

fixed effects yielded 18 unique correlation types, including associations between MI-consistent and -inconsistent behaviors, clinical outcomes, as well as change talk, sustain talk, and therapist empathy and MI spirit global ratings (see Figure 2).

The second series of six meta-analytic models (Models 2a-f) included a stratified random effect for the correlation type. This random effect allowed the fixed effect for correlation type to vary across studies, and provides separate variability estimates by type of correlation. Accordingly, this model tests whether the estimates of a specific correlation varied across studies, but also indexed the amount of variability within a particular correlation type. For example, with model 2a, there are now separate estimates of variability of the correlation between 1) MI-consistent behavior and change talk, 2) MI-consistent behavior and sustain talk, 3) MI-inconsistent behavior and change talk, and 4) MI-inconsistent behavior and sustain talk. These variance estimates capture the associations of individual codes within a type (e.g., the complex reflects and sustain talk).

To determine if including random effects improved the fit of the models (Models 2a-f), we conducted model comparisons using a likelihood ratio test. A significant likelihood ratio test would indicate that there is significant variability in raw correlations within correlation types. For example, a significant likelihood test for the comparison between MI therapist behaviors and therapist global ratings (Model 2c) would indicate that some individual correlations that comprised the correlation were larger than others. When this was true, we examined these specific correlations (via the fixed effects) included in the aggregate correlation to determine which correlations may be larger than others (e.g. the relationship between complex reflections, a variable within the MICO composite, and therapist empathy).

We aggregated duplicate effect sizes (i.e., estimates of the same raw correlation in the same study) within-study using the *MAc* package (Del Re & Hoyt, 2010), using Hunter and Schmidt's (2004) aggregation approach (see chapter 10, pp. 435–8) and assuming a .50 within-study correlation (Wampold et al., 1997). We fit all models using the *metafor* package with the R statistical software (R Development Core Team, 2010). For the fixed effects, conventional effect size cutoffs for the correlation coefficient are .10 for small effects, .30 for medium effects, and .50 for large effects (Cohen, 1992).

Results

Reports from 19 primary studies (N = 2,614, M = 137.6, range = 30–372) met the inclusion criteria and examined at least one link in the MI causal chain (Figure 1). The total number of effects (n = 604) included 81 different raw correlation types. Sample sizes for each meta-analysis were: (a) MI behavior and client language (n = 214 correlations, k = 9 studies), (b) MI behavior and outcome (n = 94, k = 13), (c) MI behavior and global ratings (n = 229, k = 14), (d) client language and outcome (n = 15, k =8), (e) global ratings and client language (n = 30, k = 8), and (f) global ratings and outcome (n = 22, k = 11).

Correlations of MI Processes and Outcome

Figure 3 provides estimates of each of the 18 correlation types within the six multivariate fixed effect models. For MI behavior and client change language correlations, there was a significant relationship between therapist MI-consistent behaviors and client change talk (Model A; r = .17, 95% CI = [.11, .23]), but not between MI-inconsistent behaviors and client change talk (r = .02, 95% CI = [−.04, .08]). There was a small and significant correlation between MI-consistent and increased sustain talk (r = .10, 95% CI = [.04, .16]), and a non-significant correlation between MI-inconsistent therapist behaviors and sustain talk (r = .06, 95% CI = [−.001, .12]). MI-consistent therapist behaviors correlated with worse clinical outcomes (r −.04, 95% CI = [−.07, −.005]) and MI-inconsistent was unrelated to clinical outcomes (r −.01, 95% CI = [−.05, .02]). In regards to change language, client sustain talk significantly, negatively correlated with clinical outcome (r = −.23, 95% CI = [−.35, −.12]), indicating that an increase in sustain talk was associated with worse clinical outcomes. The relationship between change talk and clinical outcomes was near zero and not significant (r = −.05, 95% CI = [−.16, .06]).

Both therapist global ratings, empathy and MI spirit, correlated with increased MI-consistent behaviors (empathy, r = .16, 95% CI = [.10, .22]; MI spirit, r = .15, 95% CI = [.08, .20]), decreased MI-inconsistent behaviors (empathy, r = −.13, 95% CI = [−.20, .−.06]; MI spirit, r = −.19, 95% CI = [−.28, −.11]), increased client change talk (empathy, r = .25, 95% CI = [.11, .38]; MI spirit, r = .25, 95% CI = [.11, .39]), but also with increased sustain talk (empathy, r = .18, 95% CI = [.05, .31]; MI spirit, r = .13, 95% CI = [−.005, .27]). However, the association between MI spirit and sustain talk was not significant (p = .06). The relationship of therapist global ratings and clinical outcomes was small and not significant (empathy, r = .03, 95% CI = [−.05, .10]; MI spirit, r = .04, 95% CI = [−.04, .12]).

Consistency of Correlations within MI categories

A particular strength of the multivariate mixed effects models is the ability to assess the consistency of correlations within the 18 correlation types, addressing the extent to which all specific therapist variables that comprise MI behaviors correlate similarly with the comparison variable (e.g., therapist empathy or MI spirit ratings). As noted above, we tested this by including random effects for the correlation type in the model, which provided tests of variability between the levels of each type of correlations.

In only one set of models was there evidence of variability within correlation types. As indicated by a significant improvement in fit between Model 1c and 2c, there was significant variability within correlation types for MI behavior and therapist global ratings (Model C; $\chi^2(10) = 89.3$, p = <.001). This was the largest sample size of any sub-model and thus had the largest power relative to the five other comparisons to detect differences. For the other models, none of the other likelihood estimates were significant, indicating a lack of significant variability within the correlation types.

MI therapist behaviors and therapist global ratings—To explore variability within the significant correlation types, we reran model 2c with the fixed effect at the level of the raw correlation type to examine differences at the individual therapist behavior level. We

compared individual therapist behaviors among both MI-consistent and MI-inconsistent categories across two therapist global ratings: empathy and MI spirit (Figure 4). MI-consistent behaviors generally trended in the hypothesized direction wherein increased counts of these behaviors correlated with higher empathy and MI spirit ratings. The complex reflection variable had the largest effects with empathy and MI spirit (r =.38 and r = .35, respectively). In contrast, correlations between support (empathy r = .20 and MI spirit r = .13) and simple reflections (empathy r = .17 and MI spirit r = .16) were smaller.

We found a similar pattern regarding MI-inconsistent behaviors but in the opposite direction. All MI-inconsistent behaviors correlated with lower empathy and MI spirit scores (range = −.34 to −.02). The variables confront (empathy r = −33, MI spirit r = −.34) and advise without permission (empathy r = −.20, MI spirit r = −.33) had the largest predictive weight of lower therapist global ratings. These data suggest that MI-inconsistent behaviors, particularly confronting a client during session or giving advice without their permission, are related to lower empathy and MI spirit global ratings.

Discussion

The present study was the first aggregate examination of MI process and outcome with both the technical elements of MI (MI-consistent to client change language), including the dismantling of MI-consistent and MI-inconsistent therapist behaviors, as well as the relational factors or skills of therapist global ratings. Our analysis of 19 primary studies (N = 2,614) found support for some parts of the MI model but not for others. Given that MI is a behavioral approach with strong empirical support across disorders (Lundahl et al., 2013), a detailed assessment of the ingredients is useful in better understanding the overall efficacy of MI.

Therapist Global Ratings Correlations

MI-consistent and MI-inconsistent—Therapist global ratings of empathy and MI spirit generally correlated with MI-consistent and MI-inconsistent behaviors in the hypothesized directions: higher global ratings for higher consistent behaviors and lower global ratings for the higher inconsistent behaviors. Of the 14 studies that examined MI-consistent behaviors in relation to empathy, 13 of the 14 were positive correlations with one small negative correlation (r = −.06; Gaume et al., 2013). We found a similar trend for the 13 studies that examined MI-consistent behaviors in relation to MI spirit, with nearly all positive correlations except for one small negative correlation (Gaume et al., 2013). The reverse was true for MI-inconsistent behaviors, a majority of which correlated negatively with empathy and MI spirit except a few small positive correlations (Catley et al., 2006; Tollison et al., 2008). These finding strongly support the notion that an empathic therapist engaged in the MI process, or MI spirit, tends to use more MI-consistent behaviors (e.g. complex reflections and affirmative statements) and fewer MI-inconsistent behaviors (e.g. confrontations and warning statements).

Client change language—Therapist global ratings also correlated with increased change talk, yet also with sustain talk (albeit only significantly in the case of empathy). Of the eight studies that examined both change and sustain talk, all studies found positive correlations

between increased therapist empathy and MI spirit with client change and sustain talk except one small negative correlation between empathy and sustain talk (Apodaca et al., 2016). After a sensitivity analysis, no study, when removed, significantly altered the results. The correlations between global ratings and sustain talk tended to be smaller than those with change talk. This partially supports the hypothesized relationship that increased empathy and MI spirit will lead to greater client change talk and less sustain talk. Thus, an empathic therapist seems to be a critical element in eliciting client change talk.

Clinical outcomes—The correlations between therapist global ratings and clinical outcomes were positive, yet near zero and non-significant. This finding did not support our hypothesis that increased therapist empathy and MI-spirit ratings would correlate with better clinical outcomes. This result failed to replicate previous findings regarding the relationship between empathy and clinical outcomes (see Elliott et al., 2011). One possible explanation for this null finding is that variability across providers is minimized due to selection of previously competent therapists who are highly motivated and supervised weekly. Thus, provider effects may be null and variability is more attributable to client characteristics (e.g. McCambridge, 2011). Another possible explanation is that some studies were preventative (rather than intervention) studies that sought to reduce problematic behaviors in a future event (e.g. drinking on one's 21st birthday, Neighbors et al., 2012). Thus, there was a restriction on the range of outcome and limited power in detecting an effect. Also some primary intervention studies, from which the secondary study examined MI process and outcome and were included in the present meta-analysis, had a null MI effect (e.g., Baer et al., 2008; Apodoca 2015), thus reducing the ability to detect any relationship between therapist empathy or MI spirit and clinical outcomes.

MI Therapist Behaviors Correlations

Client change language—We found small and significant aggregate correlations between MI-consistent behaviors and client change and sustain language. Of the nine studies that examined this link in the MI model, all but one showed positive correlation between MI-consistent behaviors and change and sustain talk (Gaume et al., 2014). These correlations ranged from small to moderate and the single negative correlation between MI-consistent and sustain talk was near zero. These results support MI's hypothesized relationship between increased MI-consistent behaviors and increased client change talk. This is an important component in MI theory, as therapists who more often engage in MI-consistent behaviors are expected to elicit greater amounts of change talk. However, these results suggest that similar behaviors are also likely to elicit increased client sustain talk statements. It is likely that more open-ended probing will elicit more substance use talk in general. Given that we know therapists differ in their ability to deliver MI (Miller & Rose, 2009), it would seem up to the therapist to work to continually reinforce the change talk and avoid reinforcing the sustain talk during these sessions.

Clinical outcomes—The aggregate correlations between MI-consistent and MI-inconsistent behaviors and clinical outcomes were near zero, yet surprisingly, increased MI-consistent behaviors significantly correlated with worse clinical outcomes ($r = -.04$). There were two studies with moderate positive correlations between MI-consistent behaviors and

outcome (Thrasher et al., 2006 and McCambridge et al., 2011), however, four studies with sample sizes more than four times larger showed small and negative results (Gaume et al., 2014, Krupski et al., 2012; Lee et al., 2014; Neighbors et al., 2012). Again, one possible explanation is range restriction and reduced power in outcome assessment in preventative studies (versus intervention) and studies that had an overall null MI effect. This finding fails to support the link in the MI causal model that increased MI-consistent behaviors in session is related with better clinical outcomes.

Client Change Language and Outcome

An important component to the MI model is the relationship between client change language and clinical outcomes, yet research has been mixed (Magill et al., 2014; Miller & Rose, 2009) It is hypothesized that clients who engage in more change talk will likely make positive behavior changes. Furthermore, theorists expect that clients who engage in a greater amount of sustain talk will likely continue engaging in problematic behaviors. Our results provided evidence for increased sustain talk leading to worse outcomes, yet showed no evidence of change talk correlating with increased clinical outcomes. Both of these results are congruent with the findings in a previously published meta-analysis (Magill et al., 2014). All of the 8 studies assessing the relationship of change talk to outcome showed correlations that were near zero, except one outlier with a moderate negative correlation (Vader et al., 2010). In contrast, there seems to be consistent evidence of sustain talk leading to worse outcomes, as all 7 studies showed negative correlations. Thus, there is growing research support for the assertion that clients actively engaging in sustain talk statements are more likely to have worse clinical outcomes. It may be that increased client sustain talk can also be viewed as measure of lack of client readiness to change. Across the present study and the previous meta-analysis however, there is little evidence support for change talk leading to improved clinical outcomes.

Assessing Variability Across Comparisons

A particular strength of the present study was assessing variability within the correlation types, i.e., looking “under the hood” at specific MI behaviors (Miller & Rose, 2009). It is common for researchers to aggregate MI therapist behaviors into broad “consistent” and “inconsistent” behaviors. Thus, counts of each individual behavior are summed into these two categories and analyzed. However, there has not been an aggregate test of these composite correlations into their parts, and given the selective reporting of behaviors across studies, this is a vital test to understand possible differential effects of individual therapist behaviors. We hypothesized that there would be significant variability within the MI-consistent and MI-inconsistent composite correlations in relation to client change language and therapist global ratings. Our results showed significant variability in the latter.

We observed a significant amount of variability between separate MI therapist behaviors in relation to empathy and MI spirit. We found that complex reflections had relatively larger correlations with increased empathy and MI spirit versus other MI-consistent behaviors. Thus, when a therapist provided reflective statements above and beyond what the client stated, they were more likely to be rated as empathic and engaging in MI spirit. In contrast, a number of therapist behaviors had negative correlations with therapist global ratings,

including confront, advise without permission, raise concern without permission, and warn statements. Independent raters found therapists engaging in these behaviors to be less empathic and less engaged in MI spirit approach.

The lack of variability within the other composite MI-consistent and MI-inconsistent correlations in relation to client change language is indicative of a pattern as well. The aggregate correlations (shown in Figure 3) revealed a lack of differentiation between MI-consistent and client change and sustain talk. Correlations between both were small and near zero, yet significant, but they provide evidence that MI-consistent therapist behaviors are not differentially related to the amount of change or sustain talk they predict. Correlations between MI-inconsistent and both change and sustain talk were near zero and non-significant. Thus, there does not seem to be evidence of the overall differential relationship between MI-consistent and change or sustain talk as well as individual therapist behaviors that create the composite variables.

What Does it all Mean? Conclusions, Limitations, and Future irections

Our results provide the MI causal model presented by Miller and Rose (2009) with sustained support for some links, yet not for others. This meta-analysis replicated some previous findings by Magill et al. (2014); specifically that MI-consistent behaviors correlated with increased client change language and to a lesser extent with increased client sustain talk, and that while client sustain talk correlated with worse clinical outcomes, change talk did not correlate with improved outcomes. In an extension from the Magill et al. meta-analysis, the present study also examined therapist global ratings in relation to client change language and clinical outcomes. We found that increased empathy and MI spirit were associated with increased MI-consistent behaviors, decreased MI-inconsistent behaviors, and increased client change and sustain talk. We observed no relationship between therapist empathy or MI spirit ratings and clinical outcomes.

A particular strength of the present study was an attempt to examine individual MI therapist behaviors that create the composite MI-consistent and MI-inconsistent variables. We utilized a multivariate meta-analytic method versus a univariate approach to look “under the hood” of MI process and outcome (Miller & Rose, 2009). This method provided the ability to examine variability within the composite correlations. When there was significant variability, we examined the associations between the individual MI therapist behavior correlations and the comparison variable. We found significant variability in only one model, Model C, MI therapist behaviors in relation to MI therapist global ratings. The individual MI therapist behaviors trended in the hypothesized direction, wherein MI-consistent variables more positively related to increased empathy and MI spirit ratings and in contrast all MI-inconsistent behaviors negatively correlated with empathy and MI spirit. Among MI-consistent therapist behaviors, complex reflections had the largest correlation with empathy and MI spirit and support, simple reflections, and open questions were also positive and significant. Among MI-inconsistent therapist behaviors, confront was large and negatively correlated with empathy and MI spirit. These results provide empirical support to training and clinical supervision surrounding adherence to MI.

This study was not without its limitations. The first limitation was the lack of data across all comparisons. As studies tended to selectively report, or report effects that are not translatable to a correlation coefficient, it was difficult to assess effects equally across the six broad comparisons. Typical MI coding manuals include a large number of available behavioral and global codes, for both the client and the therapist, thus it is difficult to report all coded data. A second limitation is that all behavioral correlations are based on sums of behaviors over entire sessions. This fails to assess the sequential process of at the talk-turn level, i.e., examining whether specific therapist behaviors are more or less likely to elicit client change or sustain talk. A third limitation is that this study did not assess additional client global ratings, e.g., self-exploration, as defined in MISC coding manuals (Miller et al., 2008).

So where do we go from here? Our efforts to assess MI process outcome research are limited by the inherent constraints of labor-intensive behavioral coding, resulting in small sample sizes. Despite the increased sample size in the present meta-analysis, we are still only examining a fraction of data from MI outcome trials. The present study included a total of 2,614 coded sessions across 19 primary studies. This figure may seem large in comparison the Magill et al. (2015) meta-analysis of 1,004 coded sessions across 12 studies, but pales in comparison to MI efficacy study research. A meta-analysis by Lundahl and colleagues (2010) included 204,415 sessions across 119 MI clinical trials. Thus, the present study includes only 1.4% the amount of that MI efficacy trial data. One way for researchers in our field to address this limitation is by attempting to scale up efforts to assess MI process and outcomes. Recent work has evidenced promising results via implementing technological advances in assessing MI adherence using automated speech recognition and natural language processing (for a review see Pace et al., 2016), which may increase our ability to collect and analyze data on MI process and outcome. Researchers have demonstrated the ability to use machine learning procedures to analyze large unstructured text corpora to identify semantic content (Steyvers & Griffiths, 2007), discriminate between different psychotherapies (Imel, Steyvers, & Atkins, 2014), automatically assign MI behavioral codes (Tanana, Hallgren, Imel, Atkins, & Srikumar, 2016), and assess MI empathy ratings on par with observer ratings (Xiao, Imel, Georgiou, Atkins, & Narayanan, 2015). These advances will allow us to scale up our ability to collect data, and improve our ability to understand MI process and outcome and answer key questions about how MI works.

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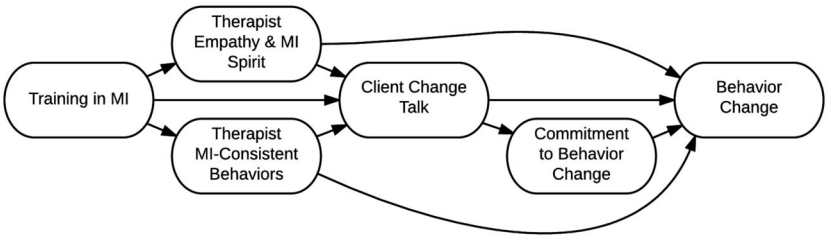

Figure 1.

Hypothesized pathways that facilitate behavior change in MI. Figure adapted from Miller, W. R., & Rose, G. S. (2009). Toward a theory of motivational interviewing. *American Psychologist*, *64*(6), 527–537.

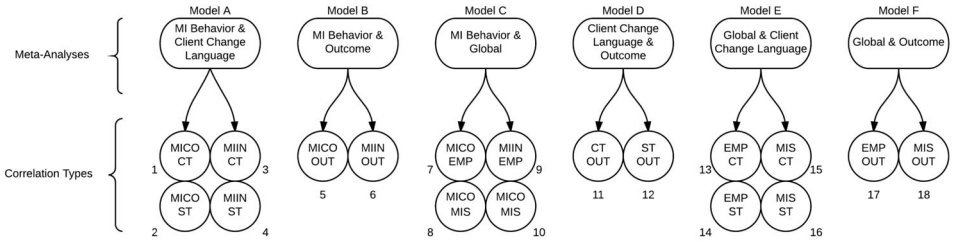

Figure 2.

Structure of the six separate MI comparisons and the 18 correlation types. Models 1a-f including a fixed effect at the correlation type level and a random effect at the study level. Models 2a-f including an additional random effect at the correlation type level. MICO = MI-consistent behavior; MIIN = MI-inconsistent behavior; CT = client change language; ST = client sustain language; OUT = outcome; EMP = therapist empathy; MIS = therapist MI spirit.

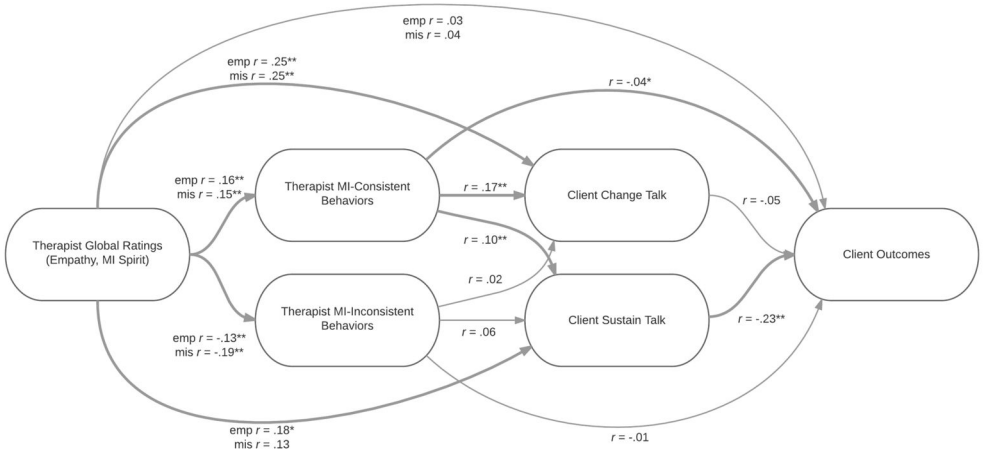

Figure 3.

Effect sizes in the MI causal model. Note: emp = therapist empathy and mis = MI spirit. * $p < .05$. ** $p < .001$.

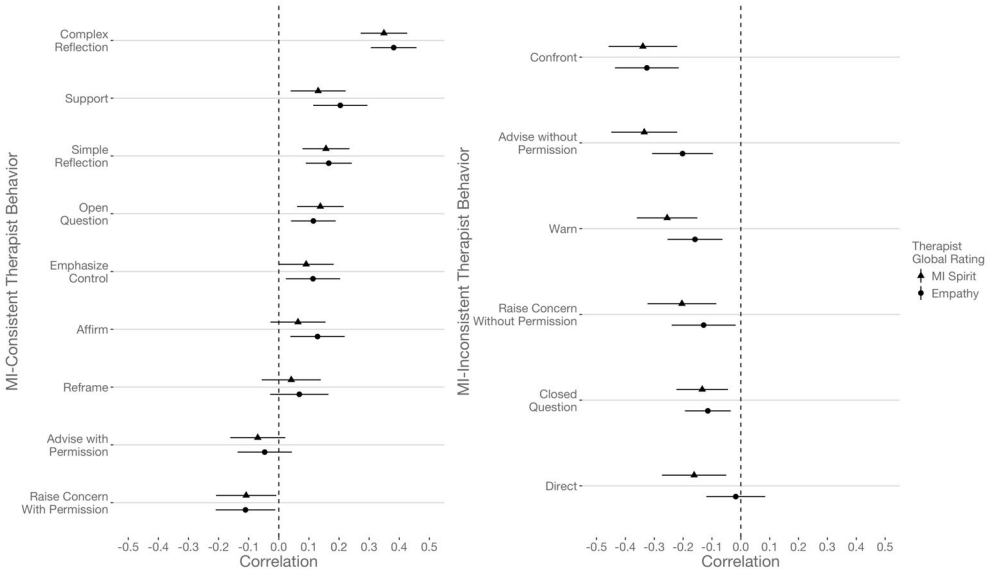

Figure 4.

Correlations between individual MI therapist behaviors and empathy and MI spirit ratings. The point estimated shows the aggregated correlation and error bars represent 95% confidence intervals. The plots depict MI-consistent (left) and MI-inconsistent (right) therapist behaviors.

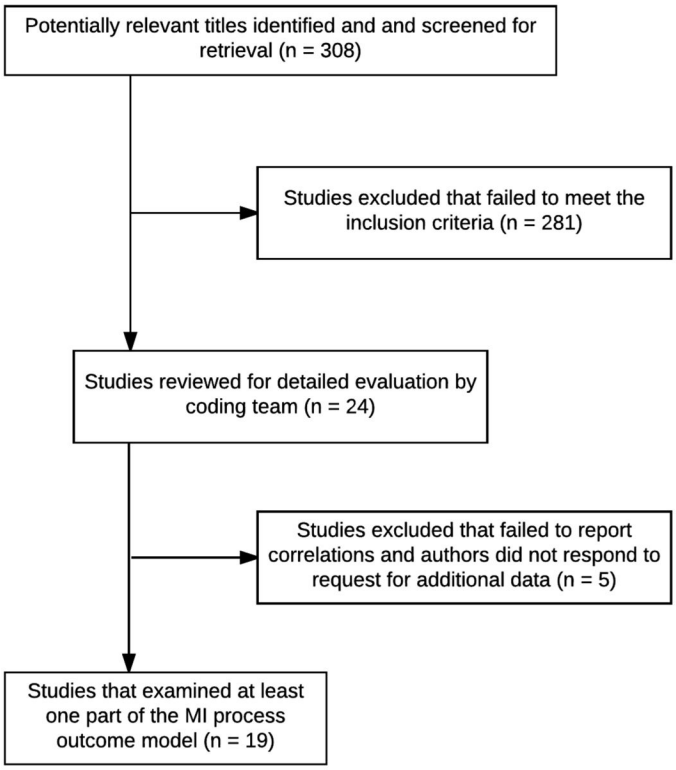

Figure 2.
A primary study inclusion flowchart.

Table 1

MI-Consistent (MICO) and MI-Inconsistent (MIIN) Variable Composition

MICO	MIIN
Advise with Permission	Advise without Permission
Affirm	Confront
Complex Reflections	Closed Questions
Emphasize Control	Direct
Open Questions	Raise Concern without Permission
Raise Concern with Permission	Warn
Reframe	
Simple Reflections	
Support	

Note: The variable selection was based on examination of MISC and MITI manuals.