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Active Ingredients of Treatment and Client Mechanisms of Change in Behavioral Treatments for Alcohol Use Disorders: Progress 10 Years Later

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Abstract

Background—The current review revisits the article entitled: *Active Ingredients of Behavioral Treatments for Alcohol Use Disorders (AUDs)* published in *Alcoholism: Clinical and Experimental Research*. This work summarized proceedings from a 2004 Symposium of the same name that was held at the Annual Meeting of the Research Society on Alcoholism (RSA). A decade has passed, which provides occasion for an evaluation of progress. In 2014, an RSA symposium titled *Active Treatment Ingredients and Client Mechanisms of Change in Behavioral Treatments for Alcohol Use Disorders: Progress 10 Years Later* did just that.

Overview—The current review revisits state-of-the-art research on the three treatments examined 10 years ago: Cognitive Behavioral Therapy (CBT), Alcohol Behavior Couples Therapy (ABCT), and Twelve Step Facilitation (TSF). Because of its empirically-validated effectiveness and robust research agenda on the study of process-outcome, Motivational Interviewing (MI) has been selected as the fourth treatment modality to be discussed. For each of these four treatments, the reviewers provide a critical assessment of current theory and research with a special emphasis on key recommendations for the future.

Conclusions—Noteworthy progress has been made in identifying AITs and MOBCs in these four behavioral interventions for alcohol and other drug use disorders. Not only have we established some of the mechanisms through which these evidence-based treatments work, but we have also uncovered some of the limitations in our existing frameworks and methods. Further progress in this area will require a broader view with respect to conceptual frameworks, analytic methods, and measurement instrumentation.

Keywords

Active Treatment Ingredients; Alcohol Use Disorders; Evidence-Based Treatments; Mechanisms of Behavior Change; Process Research

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Introduction

In 2004 the first symposium on the *Active Ingredients of Behavioral Treatments for Alcohol Use Disorders (AUDs)* was presented at the Research Society on Alcoholism (RSA), and the resulting proceedings were published in *Alcoholism: Clinical and Experimental Research* (Longabaugh et al., 2005). This presentation was the result of recognition among many alcohol treatment scholars that research on the efficacy of behavioral AUD treatments had plateaued. Several modalities demonstrated effectiveness, but these approaches were about equally effective, despite being driven by diverse underlying theories of change (see Miller and Willbourne, 2002). To enhance treatment efficacy and efficiency moving forward, a new paradigm was offered: *research should prioritize identifying the causal processes transmitting evidence-based treatment effects* (Longabaugh and Wirtz, 2001).

A decade has passed since the RSA symposium, which provides occasion for evaluation of progress on this research agenda. In 2014, an RSA symposium titled *Active Treatment Ingredients and Client Mechanisms of Change in Behavioral Treatments for Alcohol Use Disorders: Progress 10 Years Later* did just that. It revisited state-of-the-art research on the three treatments examined 10 years ago: Cognitive Behavioral Therapy (CBT), Alcohol Behavior Couples Therapy (ABCT), and Twelve Step Facilitation (TSF). Because of its empirically-validated effectiveness and robust research agenda on process-outcome, Motivational Interviewing (MI) was selected as the fourth treatment modality to be discussed. In the present review, we provide a summary and extension of this 2014 RSA symposium.

For each contribution, a standard conceptual framework will be incorporated (see Figure 1). First, an Active Ingredient of Treatment (AIT) encompasses any therapeutic skill, process, or component with a demonstrated relationship to outcome or mediator of outcome (Longabaugh et al., 2013). The distinction between being an *active* versus *hypothesized* ingredient is this empirical support. AITs may additionally be *common* across behavioral therapies, *distinctive* to only a few, or established as *unique* to a single modality (Longabaugh and Magill, 2011). Second, an MOBC is an event or process occurring within the patient or a behavior enacted by the patient that is associated with a subsequent change in the targeted outcome of interest. Important to our discussion is that an MOBC is not merely a statistical mediator, but will often be supported via mediation analyses and further supported by satisfying additional, established causal criteria (see Kazdin and Nock, 2003; Nock, 2007). Within the noted framework, we are afforded a common terminology from which to delineate a given treatment's causal chain. We will now consider four evidence-based AUD treatments in detail.

THREE HYPOTHESES OF CAUSAL PROCESS IN MOTIVATIONAL INTERVIEWING: A REVIEW AND RECOMMENDATIONS

Molly Magill

Background—MI has been met with considerable enthusiasm as a brief AUD treatment. To date, MI has established empirical support for efficacy (Lundahl and Burke, 2009), as

well as an emerging body of research on the treatment ingredients and client mechanisms, accounting for this efficacy (see Apodaca and Longabaugh, 2009; Gaume et al., 2014; Magill et al., 2014). At the time of the 2004 symposium, very little was known about MI causal process. In fact, the fledgling construct of Change Talk (i.e., client language about making a behavior change) was the subject of empirical study initially in 2003, where a link from client commitment statements at the end of an MI session and client substance use status 12 months later was established (Amrhein et al., 2003). In the decade that followed, MI researchers studied, to a greater or lesser degree, three hypotheses as to how MI produces its beneficial effects.

Causal Hypotheses about MI Ingredients and Mechanisms—In 2008, Arkowitz and colleagues proposed three MI causal processes: *technical*, *relational*, and *conflict resolution*. These processes were echoed in an early, commonly cited MI definition, which is as follows: “Motivational Interviewing is a client-centered (*relational*), directive (*technical*) method for enhancing intrinsic motivation to change by exploring and resolving ambivalence (*conflict resolution*)” (Miller and Rollnick, 2002, p.24). Under this 2008 framework, a change in motivation would occur via a skilled therapist, a safe environment, and an interpersonal dialogue where ambivalence was thoroughly explored. The three hypotheses proposed by Arkowitz and colleagues (2008) were framed as alternatives, but this work’s greatest contribution might best be conceived as a single, overarching conceptual model.

In the 2013 3rd edition of Miller and Rollnick’s book, another definition of MI was proposed: “Motivational interviewing is a collaborative, goal-oriented style of communication with particular attention to the language of change. It is designed to strengthen personal motivation for and commitment to a specific goal by eliciting and exploring the person’s own reasons for change within an atmosphere of acceptance and compassion” (Miller and Rollnick, 2013, p.29). A noteworthy absence in this new definition is the word *ambivalence* in favor of an emphasis on eliciting client *commitment to* and *reasons for* change. The shift occurred due to nascent research on client change language, and a subsequent empirical emphasis on technical pathways (i.e., MI skills predicting client language) of intervention effectiveness. Specifically, several studies began to support the Technical Hypothesis by demonstrating the role of client Change Talk in positively predicting subsequent outcomes (Gaume et al., 2008a; 2013; Magill et al., 2010; Morgenstern et al., 2012; Moyers et al., 2007; 2009; Vader et al., 2010). Additionally, client language against change, or Counter Change or Sustain Talk, was found to predict poor outcomes in many of these studies (Gaume et al., 2008a; 2013; Moyers et al., 2007; Vader et al., 2010). Although examined to a lesser degree than the Technical Hypothesis, the Relational Hypothesis has also received empirical support. For example, therapist-expressed empathy has been found to positively affect client mechanisms such as engagement in MI sessions (Moyers et al., 2005) as well as follow-up alcohol use outcome (Gaume et al., 2009). At the same time as this emerging research, a revised theoretical model was proposed. The model emphasized *technical* and *relational* predictors of outcome and added an emphasis on the importance of training in these clinical processes (Miller and Rose, 2009).

What happened to the Conflict Resolution Hypothesis of MI? In 2013, Miller and Rose provided a nuanced exposition related to this topic. This review of the Decisional Balance exercise (i.e., weighing the pros and cons of the targeted behavior and/or changing the targeted behavior) proposed motivational conditions under which the intervention should, and should not, be applied. By translation, this work is about how to optimally attend to both sides of client ambivalence, as manifested in an intervention that pulls for client statements of both Change and Sustain Talk. The authors also clarified that a true Decisional Balance exercise is characterized by therapeutic objectivity regarding the client's ultimate choice (Miller and Rose, 2013). This is in contrast with the MI approach, which employs a set of technical skills to direct client verbalizations in the direction of risk behavior change (Amrhein, 2004).

What remains unresolved in Miller and Rose's work is the optimal role for the therapist in eliciting client Sustain Talk in a motivational interview. Recent meta-analytic research on 12 studies of the MI Technical Hypothesis underscores the importance of pursuing this question. Here, MI consistent technical skills (e.g., questions and reflections) were found to decrease Sustain Talk in some studies (Moyers et al., 2009) and increase Sustain Talk in others (Gaume et al., 2008b; Vader et al., 2010), resulting in an overall non-significant path effect size. This is in contrast with the Technical Hypothesis, which proposes that MI consistency will increase Change Talk (supported in Magill et al., 2014) and decrease Sustain Talk (unsupported in Magill et al., 2014), and these changes will predict positive outcome (supported in Magill et al., 2014 for combined Change and Sustain Talk). Sustain Talk was supported as an independent predictor of negative outcome (i.e., a small-moderate effect size). As a causal chain, this latter meta-analytic result suggests that MI consistent skills that explore the negative side of client ambivalence should be contraindicated.

To demonstrate consistent, unqualified, empirical support for any theoretical model is difficult. Advances in statistical modeling, however, allow for tests of under what conditions or for whom causal models will hold. Addressing the question of how to work with ambivalence in MI may be a matter of *conditional indirect effects* (also known as moderated mediation; Preacher, 2015) rather than a more simplified conclusion that Sustain Talk should be avoided. A theorized model may hold for some contexts, client states, or other model specifying factors but not others. The task for MI research is then to identify the specific conditions where internal conflicts *can* be effectively resolved, and Miller and Rose (2013) suggest client motivation is a promising specifying variable in this regard. What should not occur is a departure from the Relational Hypothesis (i.e., the MI Spirit) in favor of eliciting Change Talk only. Recognition of the negative side of the ambivalence is perhaps MI's most humane contribution to the addictions field. Further, and as noted, meta-analytic research demonstrates predictive validity for Change Talk when measured in combination with Sustain Talk (i.e., small effect size; Magill et al., 2014); this could be the indicator of *conflict resolution*.

Recommendations—What is the most flexible, yet parsimonious, causal model of MI efficacy? This is a pragmatic question for clinicians and researchers alike, and one that is particularly important given the large spectrum of MI-based interventions that fall under the term: Brief Alcohol Intervention (BAI; also often referred to Brief Intervention [BI] or as

Brief Motivational Intervention [BMI]). In fact, the BAI definition alone has been the subject of debate (see e.g., McCambridge and Cunningham, 2013). Heather (2014) identifies two broad BAI categories: Brief Advice and Brief Motivational Counseling. The challenge is thus not only to specify the most valid and reliable conditional process model for MI, but also to identify where this model fits across its breadth of applications and extensions. So what do we recommend? First, the three causal hypotheses of MI efficacy should be conceptualized as a single model, which will likely be best specified by client motivational state. Specifically, technical skills are likely most effective only under certain relational conditions (i.e., high empathy and MI spirit; see e.g., Miller and Rose, 2009) and Conflict resolution only needs to occur when the client's motivational stage warrants it (i.e., pre-action; see e.g., Miller and Rose, 2013). Second, the term BAI represents a range of interventions, informed by MI theory (Heather, 2014). This means that the conditional process model must be identified for standard MI delivery, but this achievement will only set the foundation for research identifying where the model does, and does not, apply across the spectrum of BAI intervention types. The result will be clearer guidelines for MI dissemination, training, and client referral.

CBT INGREDIENTS AND MECHANISMS IN AUD/SUD: WHAT WE'VE LEARNED IN THE PAST 10 YEARS AND WHAT'S STILL MISSING

Brian D. Kiluk

Background—CBT has considerable empirical support for its efficacy at reducing alcohol use (Magill and Ray, 2009; Miller et al., 1995; Miller and Wilbourne, 2002; Project MATCH Research Group, 1998; Roth and Fonagy, 2005). With a foundation in social cognitive theory and the principle that alcohol use is a learned coping behavior (Kadden et al., 1992; Abrams and Niaura, 1987), CBT is designed to teach effective skills to increase the ability to cope with high-risk situations that precipitate drinking, thereby increasing self-efficacy to avoid alcohol use. At the time of the 2004 symposium, there was a striking lack of support for coping skills and self-efficacy as CBT's primary MOBC. There were several potential explanations offered, such as insufficient measures, an insufficient number of sessions for skill development and acquisition, and the contribution of common therapeutic factors (Longabaugh et al., 2005). Although the number of studies evaluating the MOBC of CBT for alcohol use over the past decade has dwindled, some promising results in a range of CBT treatment targets have emerged.

CBT Ingredients and Mechanisms—The acquisition of and improvement in coping skills and self-efficacy have support as mediators (and potential MOBCs) of CBT's effect on a range of treatment outcomes. For instance, increased coping skills were identified as a mediator of outcomes in studies evaluating CBT for gambling (Petry et al., 2007) and chronic pain (Litt et al., 2009b) and although increased self-efficacy has been considered a byproduct of improved coping skills (Kadden and Litt, 2011), it was found to mediate the relationship between drink refusal training (a *specific ingredient* of CBT) and drinking outcomes (Witkiewitz et al., 2012). Of note, support for coping skills as a mediator of CBT for drug use appeared in one of the first studies to satisfy all four criteria in the causal chain (Kiluk et al., 2010); a finding that had been absent in the previous review (Morgenstern and

Longabaugh, 2000). Although this statistical support for coping skills as a mediator originated from a trial for drug use disorders, several unique aspects of this study may have enhanced the ability to detect mediation effects and may have implications for AUD research moving forward (Kiluk et al., 2010; Longabaugh, 2010).

First, a situational role-play assessment (Carroll et al., 1999) was utilized as the primary measure of coping skill acquisition, with independent observers rating the *quality* of an individual's coping response in addition to the quantity. Although situational role-play assessments are not new, they do provide opportunity for a more in-depth evaluation of skill acquisition compared to self-report questionnaires, and as such, increases in the *quality* of coping responses may be a more precise indicator of CBT's effects than the mere frequency of coping. Second, the study included a more robust statistical test of mediation (e.g. product of coefficients; MacKinnon et al., 2007) as opposed to the less powerful, but more common, causal steps approach. Third, a computer-based CBT (Carroll et al., 2008) was used as the experimental intervention, thereby standardizing the delivery of AITs in CBT. We will now discuss these in further detail as they relate to recommendations for future research.

Recommendations—Three study characteristics - measurement, statistical approach, and intervention delivery - should be the primary focus that informs the next decade of AIT/MOBC research in CBT. In doing so, we can come closer to what's still missing: a reliable and comprehensive explanation for how CBT works. Inadequate measurement of coping skills has been cited as one explanation for the lack of support for coping skills as a mediator in CBT effectiveness (Longabaugh et al., 2005; Longabaugh and Morgenstern 1999). While observer ratings of role-play assessments may be informative, they are burdensome and might not be conducive to the frequent assessment schedule required for establishing temporal relationships between AIT/MOBC and treatment outcomes. Experience sampling through ecological momentary assessment (EMA; Shiffman, 2009) may provide a better method for measuring change by assessing them often, in real time, and in individuals' daily lives. For instance, EMA was utilized by Litt and colleagues (2009b) to support coping skills as a mediator of CBT's effect on reducing chronic pain, and has demonstrated some utility for elucidating mechanisms of pharmacotherapies for alcohol use through frequent measurement of craving (see Miranda et al., 2014). We recognize, however, that EMA still contains many of the limitations of reliability and validity associated with traditional self-report assessment.

MOBC research on CBT should also include multiple levels of measurement by incorporating translational approaches. One such approach is functional magnetic resonance imaging (fMRI), which may provide important insights into the neural and cognitive processes underlying behavior change and how specific therapies exert their effects (Feldstein Ewing and Chung, 2013; Feldstein Ewing et al., 2011; Morgenstern et al., 2013). Integrating repeated fMRI measures into randomized clinical trials evaluating CBT may help identify changes at the level of brain structure and function that are associated with treatment process and outcomes, which could improve our understanding of mechanisms and shed light on new targets to enhance and individualize CBT treatments for AUDs. For instance, changes in levels of neural activation in brain regions associated with 'cognitive control' from pre- to post-treatment have been found for those who received CBT for

substance use disorders compared to healthy controls (DeVito et al., 2012). Future work in this area may help reveal the neural correlates of an AIT, if such activation changes are found to be associated with a specific CBT component and better treatment outcomes (e.g., reduced drinking), providing a more complete understanding of how CBT works. CBT may be particularly well-suited for integration with fMRI, as its focus on teaching, remembering and implementing new cognitive, behavioral, and affective regulation strategies is likely to have neural correlates. Inclusion of the noted approaches may address some of the previously cited limitations in evaluations of CBT mechanisms (Morgenstern and McKay, 2007; Morgenstern et al., 2013).

In accordance with multilevel measurement of AIT and putative MOBCs of CBT, advanced statistical approaches for identifying and evaluating MOBC should become the standard moving forward. Just as the mechanisms by which CBT achieves its effects are likely complex, so too should be the statistical models for exploration and confirmation. For instance, positive findings regarding self-efficacy as a mediator in the Witkiewitz (2012) study described above were produced within the context of a piecewise parallel process growth model. There are several established and emerging methods for evaluating longitudinal mediation (see Preacher, 2015) that should be more frequently applied to MOBC research in CBT for AUDs. Person-centered approaches (i.e., estimating individual-level change) and non-linear dynamic models may be more effective at detecting associations and evaluating change than general linear models based on aggregate change (Maisto et al., 2014; Witkiewitz et al., 2010). Also, analyses should consider the effect of moderating variables that may impact coping skill acquisition or self-efficacy (i.e., *conditional indirect effects*). For instance, there is considerable evidence that chronic, heavy alcohol use affects cognitive abilities associated with controlled and effortful processing of novel information (e.g. Oscar-Berman and Marinkovic, 2007; Pitel et al., 2007). These deficits have been shown to affect treatment processes (e.g. Bates et al., 2006) and could affect the delivery of a cognitively-demanding therapy such as CBT. Future work might include cognitive function as a moderator of treatment process and/or outcome (e.g. Kiluk et al., 2011) as well as investigate the role of specific genotypes as moderators of mediated effects (*conditional process model*, e.g. Kranzler et al., 2014).

Lastly, intervention delivery should be an important consideration moving forward as advances in technology-based interventions may provide promising avenues for the evaluation of AITs and MOBC of CBT. In addition to more easily experimentally manipulating the hypothesized AITs (e.g. Litt et al., 2009a), one of the primary advantages of technology-based delivery of CBT is standardized intervention delivery, thereby reducing differences due to therapist effects. Therapist-delivered interventions include variability in fidelity (Perepletchikova and Kazdin, 2005) as well as dose and quality of delivery (Carroll et al., 2000) that may directly impact the ingredients hypothesized to contribute to change. Furthermore, distinguishing *common* from *specific* AITs has proven difficult in trials examining mediators across therapist-delivered treatments (Kazdin, 2005; McKay, 2007), as the *specific/distinctive* effects are often inseparable from relational effects (e.g., therapeutic alliance) when treatments are delivered in an interpersonal context (Miller and Moyers,

2014). Thus, future studies including both technology-delivered and therapist-delivered versions of CBT might help illuminate *distinctive* and *common* AITs.

In summary, despite continued effort during the past decade toward identification of CBT's AITs and MOBC, consistent support remained elusive. Moving forward, integrating multilevel assessment (e.g., cognitive, behavioral, neurobiological, and genetic measures) of the potential mediators and moderators, incorporating complex statistical models, and utilizing advances in technology-based intervention delivery to isolate and manipulate hypothesized AITs may greatly enhance progress.

ALCOHOL BEHAVIORAL COUPLE THERAPY: ACTIVE INGREDIENTS AND MECHANISMS OF BEHAVIOR CHANGE

Barbara McCrady

Background—Considerable research suggests that ABCT leads to positive drinking outcomes and improvements in relationship satisfaction (McCrady et al., 2009; McCrady et al., 1991; Powers et al., 2008; Shumm et al., 2014). However, little research has addressed the MOBCs in ABCT. In a 2004 RSA symposium (Longabaugh et al., 2005), McCrady presented a conceptual model of ABCT MOBC and summarized the literature relevant to that model. At that time, research suggested that reinforcement of abstinence by the significant other (SO), use of relationship skills taught during treatment, and improved relationship functioning were positive predictors of drinking outcomes. The 2004 model did not consider therapist AITs in relation to MOBC in ABCT.

More recently, McCrady and Epstein (in press) have suggested four classes of AITs: (1) motivational enhancement; (2) drinker skills training; (3) partner skills training; and (4) relationship enhancement. To achieve these, McCrady and Epstein suggested several key therapist behaviors, e.g., expression of empathy, active listening, instillation of hope, forming a therapeutic alliance with both partners, reinforcing positive behavior change, providing feedback and coaching, and the use of *compassionate confrontation*. O'Farrell and Fals-Stewart (2006) also suggested the importance of providing structure to the therapy session, managing partners' anger, and maintaining a focus on alcohol or drug use. These ABCT ingredients are hypothesized to affect four types of MOBCs: (1) drinker motivation; (2) drinker coping skills; (3) partner support; and (4) improved couple interactions (McCrady and Epstein, in press; O'Farrell and Fals-Stewart, 2006).

In our current research, we are testing hypothesized AITs and MOBCs using audiotapes of heterosexual dyads from four ABCT trials. To test the ABCT MOBC model, we are analyzing time-lagged relationships between (a) therapist behaviors in session 1 and changes in drinker and partner behaviors from session 1 to mid-treatment; (b) therapist, drinker, and partner behavior change from session 1 to mid-treatment and drinking during the first 6 months post treatment. This will be the first major study of MOBC in ABCT. In contrast, there is a small but burgeoning literature in the couple therapy field. Examination of this literature suggests several potential avenues for future AIT/MOBC research on ABCT.

Active Ingredients in Behavioral Couple Therapy—Outside the AUD field, behavioral couple therapy (BCT) has been researched in two different forms: Traditional Behavioral Couple Therapy (TBCT) (Epstein and Baucom, 2002) and Integrative Behavioral Couple Therapy (IBCT) (Christensen and Jacobson, 2000). The two approaches have many similarities, but TBCT uses traditional behavioral training methods, which were also the basis for ABCT. IBCT integrates concepts related to acceptance, focuses on both behavior change and acceptance, and uses natural shaping of behavior rather structured behavioral rehearsal. Both approaches consider the therapeutic alliance to be a central AIT. Primary therapist behaviors in TBCT include: psychoeducation, modeling and coaching new behaviors, behavioral rehearsal, and reinforcing successive approximations of desired outcomes (Fischer and Fink, 2014). IBCT therapist behaviors include several of these elements, but also focus on the therapist identifying common themes that underlie the couple's dysfunctional interactions, and using his or her own emotional reactions to partner behaviors in the session to help guide interventions in the session (Gurman 2013). There is no published research relating these hypothesized ingredients to MOBCs or treatment outcomes.

In contrast to the paucity of research on specific therapist behaviors, there is a fairly robust literature on the therapeutic alliance between the therapist and the two members of the couple in couple therapy. There is disagreement, however, about whether therapeutic alliance is better viewed as an AIT or MOBC and it is difficult to tease out time-sequenced relations between alliance and outcome (e.g., Kazdin, 2007). In general, however, research suggests that a positive alliance early in couple therapy predicts better relationship satisfaction (e.g., Anker et al., 2010; Owen et al., 2014), although effects on partner well-being are less clear (e.g., Knobloch-Fedders et al., 2007).

Mechanisms of Behavior Change in Behavioral Couple Therapy—Research on BCT for distressed couples without AUDs has focused on several putative MOBC, including increases in positive behaviors (Doss et al., 2005), communication and problem solving, and decreases in negative communication (Baucom et al., 2011; Doss et al., 2005; Halford et al., 1993; Iverson and Baucom, 1990; Sayers et al., 1991; Sevier et al., 2008), increased positive cognitions about the partner (Halford et al., 1993), increased positive affect (Doss et al., 2005; Doss et al., 2014; Halford et al., 1993), and greater emotional acceptance (Doss et al., 2005; South et al., 2010). Research has examined change in these putative mechanisms from baseline to post treatment, as well as associations between pre-post changes in these mechanisms and post-treatment relationship satisfaction. Some studies have looked at marital stability or separation. In general, results suggest that couple therapy affects putative mechanisms in the ways hypothesized by the treatment (e.g., increasing positive and decreasing negative behaviors, improving communication and problem-solving), but have provided limited support for the hypothesized association between changes in putative mechanisms and changes in marital outcomes.

Limitations of the Evidence on AITs and MOBC—There has been an impressive lack of research on MOBC for ABCT in the past decade. There is no research on AITs, although, as noted above, researchers have described therapist behaviors that could be operationalized

for research purposes. One of the challenges is the complexity of the treatment. There are several classes of target behaviors and several potential outcomes of importance. Further, the limited research on MOBCs has used pre-post methodologies, making temporal relationships difficult to ascertain, and has not shown convincing associations between postulated MOBCs and drinking or other outcomes. Research also has relied on self-report measures without direct behavioral observation of either the therapist or the partners.

Research on AITs in couple therapy has focused exclusively on reports of therapeutic alliance, even though, as with ABCT, there is a rich literature describing AITs. No couple therapy research has reported direct observation and coding of therapist behaviors. MOBC research also suffers from this limitation. Generally, researchers have used a subjective dependent variable, relationship satisfaction, rather than more objective measures of outcome. As with the limited body of research on ABCT, MOBC research on couple therapy typically has measured change during the full course of treatment, rather than testing for a temporal relationship between changes in postulated mechanisms and changes in outcome variables.

Recommendations—Given the paucity of research on AITs and MOBCs in ABCT or couple therapy more generally, the opportunity is present to develop a systematic research agenda. First, several therapist behaviors appear to have particular potential as AITs and future research should focus on types of therapist behaviors such as psychoeducation, coaching and behavioral rehearsal, reinforcement of targeted interactional behaviors, and discussion of emotions in the therapy session.

Second, any MOBC research is challenged by the multitude of hypothesized mechanisms, so the use of dismantling and analog studies of one hypothesized pathway at a time might enable researchers to focus on different classes of mechanisms in different studies. In our current research we have developed a system to code the behaviors of both partners during ABCT treatment sessions (Owens et al., 2014) that could be used in simplified form in dismantling studies. A third potential future direction would be to develop measures to assess the enactment of specific couple behaviors outside of the therapy session.

Another challenge is determining the appropriate timeframe to measure change. Because little is known about what AITs, delivered at what points during treatment, are most likely to impact MOBCs, multiple points of observation during treatment are necessary. Therefore, a fourth future direction would be to use behavioral coding of small segments of multiple therapy sessions or the coding of behavior during short, standardized interactional tasks at multiple points during therapy to assess changes over time. Additionally, there is an implicit assumption in AIT/MOBC research that relationships are time-sequenced where the therapist delivers specific interventions, which then impact client behaviors, leading to changes in MOBCs that result in specific outcomes. The correctness of this assumption for any treatment is untested, and a dynamic interplay is more likely. A fifth future direction for ABCT MOBC research would be to use designs that incorporate assessment of both therapist and couple behaviors at multiple points during the course of treatment to allow for time-ordered analyses of the relations among therapist, identified patient, and significant

other behaviors over time. Clearly, opportunities are rich for future research on AITs and MOBC for couple therapy approaches to AUDs.

IMPROVING 12-STEP TREATMENT BY UNDERSTANDING AA BETTER

J. Scott Tonigan

Background—Twelve-step (TS) therapy is the prevailing alcohol treatment model in the United States and a majority of persons receiving formal treatment (TS and non-TS) will attend Alcoholics Anonymous (AA), even if only for a limited time (Timko et al., 2000). Reported in our 2004 RSA symposium, active facilitation into AA was a defining feature of 12-step treatment and there was strong evidence that the achievement of this therapeutic objective accounted for the superiority of 12-step treatment when *complete* abstinence was desired (Project MATCH Research Group, 1997). Understandably, then, over the past decade a substantial amount of research has sought to identify the AITs and change processes in community-based AA. To underscore this point, between 2004 and 2012 about 290 peer-reviewed articles were published investigating the AA *experience*, and at least 38 of these papers specifically focused on prospective testing of the hypothesized mechanisms accounting for the salutary effects of AA.

The rapid accumulation of high quality 12-step process research offers a unique opportunity for understanding what is currently known about change mechanisms in AA. As such, this paper seeks to abstract and elaborate upon the more salient points voiced in our 2014 RSA presentation. Applying meta-analytic techniques¹, we reported on the magnitude and stability of effects associated with *common* (i.e., social support, abstinence self-efficacy) and *12-step specific* (i.e., spiritual practices, sponsorship, 12-step work) mechanisms thought to operate in AA. Consistent with standard mediation nomenclature, summarized relationships between AA attendance (AIT) and a change mechanism (MOBC) are denoted as *a path*, and aggregated relationships between a change mechanism and alcohol use are labeled, *b path*. In addition, we noted how the refinements to process measurement may enhance our understanding of how and why community-based 12-step programs work. Finally, we presented four recommendations to guide future investigations of AA-related processes of change.

Common and 12-Step Specific Change Mechanisms—Among various *common* change mechanisms that have been investigated within the AA context, there is strong evidence for increased abstinence-based social support and self-efficacy. In our meta-analytic review, 15 studies² investigated the mediating role of social support, and obtained effect sizes for frequency of AA attendance and increased social support (*a path*; $r_w = .15$) and increased support and later abstinence (*b path*; $r_w = .12$) were significant. Moreover, stronger support was found for increased abstinence self-efficacy in accounting for drinking reductions among AA members (9 studies reviewed²). Here, the obtained effect size

¹Coding of studies was done by trained research assistants. Reliability exercises, certification, and monitoring for interviewer drift was assessed twice in the course of the project. Comprehensive Meta-analysis software (2.0) was used to convert, at the study level, reported statistics, e.g., odds ratios, correlations, unstandardized regression coefficients, depicting a pathway of interest into Fisher Z. Weighted correlation coefficients (r_w) are reported for ease of interpretation.

²For full list of meta-analysis references, contact Dr. J.S. Tonigan.

between AA meeting attendance and increased self-efficacy was $r_w = .21$ (*a path*) and from gains in self-efficacy to later abstinence was $r_w = .33$ (*b path*). Noteworthy, none of these effect sizes came from homogenous distributions³, and this finding may underscore the wide variation in operational definitions of referent groups included in social support networks used by investigators.

AA can be conceptualized as the very first manual-guided therapy. For example, the core AA literature includes references to AA-specific *intrapersonal* changes purported to be required for achieving and sustaining abstinence. Review of this literature suggests two classes of *12-step specific* change mechanisms, both of which have received research attention in the past decade. First, the AA literature emphatically states that the reduction of negative affect is instrumental for achieving abstinence (AA, 2001). Here, investigators have prospectively examined how frequency of AA meeting attendance is associated with negative affect, including reductions in depression (Kelly et al., 2010a; Wilcox et al., *in press*), anger (Kelly et al., 2010b), and selfish narcissism (Tonigan et al., 2013). Findings from these studies have been relatively consistent: (1) AA members report, on average, clinically elevated levels of depression, anger, and selfish narcissism at baseline, and (2) modest changes over time, but (3) measures of negative affect have limited prognostic value in predicting subsequent alcohol use. In short, the emphasis on negative affect in the AA literature may enhance identification with AA ideology and practice, but there is currently little support for the claim that reductions in negative affect account for 12-step benefit.

The second class of MOBCs parallel the more familiar causal prediction wherein an AIT is thought to mobilize increases in a mechanism which, in turn, predicts increased abstinence. Our work meta-analyzed three MOBCs in this category: gains in spiritual practices, acquiring a sponsor, and progress working through the 12 steps. Combining the results of nine studies², we found that AA meeting attendance led to increased spiritual practices among AA members (*a path*; $r_w = .22$) and such gains predicted later increases in alcohol abstinence (*b path*; $r_w = .13$). These influences on gains in spiritual practices were relatively homogeneous ($I^2 p$ value $> .05$), but the association between such gains and drinking reduction was variable between studies (r_w range = .05 to .25). Our examination of AA sponsorship and step progress was limited to summarizing the magnitude of the *b path*. Aggregating the findings of 26 studies², the relationship between having a sponsor and increased abstinence was significant, $r_w = .26$. Likewise, combining the results of 13 studies², we found a significant and positive association between progress through the 12 steps and increased abstinence, $r_w = .23$. Between-study variability was significant for both distributions ($I^2 p$ value $< .05$).

Recommendations—Clinical referral to AA is now considered an evidence-based practice. Further, the ability to conduct meaningful meta-analytic reviews of the *common* and *12-step specific* mechanisms accounting for AA-related benefit is testimony to both the volume and evolving maturity of the 12-step literature. We anticipate in the near future that research on 12-step MOBC will provide evidence-based recommendations to improve 12-

³As indicated by significant p value for I^2 measure of between-study variability.

step treatment and, in so doing, will serve as a model for the dissemination of MOBC research to practitioners endorsing other behavioral interventions.

We summarize these recommendations as follows. Meta-analytic evidence is clear that the acquisition of a sponsor, especially during early affiliation, improves the odds of achieving and sustaining abstinence in AA. For this reason, we believe the development and refinement of measures that more fully capture the nature and types of interactions in AA sponsor-sponsee dyads should be assigned a high priority. We can also be confident that AA meeting attendance is associated with later increases in abstinence self-efficacy, social support for abstinence, and spiritual practices, all of which account for AA-related benefit. Preliminary evidence also suggests that progress in AA step work may account for AA-related benefit. Given the intersection of having a sponsor, working the 12 steps, and gains in spiritual practices, we recommend that future work investigate the *unique contributions* of each of these change processes in explaining drinking reduction. We can also be *reasonably* confident that while AA neonates report elevated negative affect as defined by depression, anger, and selfish narcissism at baseline, AA attendance was largely unrelated to changes occurring over time in these negative affect measures.

From our research we recommend that 12-step researchers address four questions in the future. First, what are the *temporal change trajectories* of evidence-based mechanisms in AA, and at what point does a given mechanism become “operative”? Second, what are the *salient* moderators of a given change mechanism? By saliency we mean that a proposed moderator is both plausible and anchored to current knowledge. Third, how can we model the *simultaneous effects of multiple change mechanisms*, acknowledging the strong possibility that these mechanisms have different temporal trajectories and different moderating factors? And, finally, how can we integrate verbal, behavioral and neurophysical data in understanding a change mechanism as a *fully-articulated construct*?

Discussion

Richard Longabaugh

It is encouraging to see this decade of progress in identifying AITs and MOBC in behavioral interventions for alcohol and other drug use disorders. Not only have we established some of the mechanisms through which these evidence-based treatments work, but we have also uncovered some of the limitations in our research approaches. Each author’s contribution has nicely articulated many of these limitations, as well as the state of our current knowledge. I will therefore limit my focus to a few issues meriting further emphasis.

An important misconception may be the expectation that the *real MOBC* has yet to be identified when findings yield only partial mediation of the treatment/outcome relationship, or when a particular MOBC is not consistently supported across studies. Let us agree, for discussion, that we will have achieved a sufficient theoretical model when all of the outcome variance has been explained. This might be an unlikely actuality. Yet the success of our behavior change theories is judged by the extent to which they account for increasing portions of the outcome variance with the most parsimonious model. As emphasized by these contributors, such an achievement might be conditional upon adoption of more

sophisticated statistical techniques. And yes, these models should be multilevel, including measures of within-organism brain activity, interpersonal contexts and events, as well as individual behaviors and histories. The development of the necessary multivariable, multilevel, linear and non-linear models may not be achieved in the near future. As Einstein has purportedly said “theory should be as simple as (but not simpler than) the phenomena it is representing”.

Current treatment theories may over-simplify the causal processes through which the outcome is obtained. As the conditions for optimal effectiveness have not been adequately articulated, this hinders the success of our treatment theories, manifested in inconsistent support across studies. Over-generalization of a treatment’s range of effectiveness will be tempered by testing the conditions under which AIT/MOBC effects are obtained. To do so, it is imperative to measure and incorporate into our models pertinent characteristics of the patient, and even more importantly, the context in which a treatment occurs. Incorporation of these parameters will help to identify the conditions under which a treatment will, and will not be, effective and for whom.

Not only is it likely that different people change through different causal processes, it is also likely that the same person changes through different causal processes at different time points. Perhaps our theories have been too ambitious. Rather than using methods that attempt to generalize across individuals, maybe we should develop models that describe how an individual changes over time, and then attempt to aggregate such models across sub-sets of individuals? Morgenstern and colleagues (e.g., Kuerbis et al., 2014) have provided proof of concept for this type of person-centered approach.

Finally, instrumentation matters. The invention of the telescope permitted observation of a universe that has expanded exponentially in tandem with the capacity of the instruments developed to measure it. No doubt this will happen with some of the technologies identified by our contributors (e.g., fMRI’s). The study of behavior therapies involving interpersonal interactions, however, will require more powerful instrumentation. At present, the state-of-the-art involves labor intensive observational coding methodologies which can only sample portions of the evolution of the therapeutic relationship from its beginning to end. Analytic tools for understanding the nuances, complexity, and evolution of what occurs is limited by the paucity of the data base. However, in an example of promising interdisciplinary measurement work, researchers have developed automated tools for evaluating MI fidelity through novel methods such as speech signal processing and statistical text modeling. This effort, if successful, should dramatically expand the size and scope of the data base. Their initial findings also show proof of concept (Atkins et al., 2014). Such an effort may be the analogue of the first telescope. Once our view becomes more dynamic and complete, we will have the capacity to examine the AIT/MOBC of the behavioral change universe more fully.

In conclusion, while AIT/MOBC research has made impressive beginnings in this first decade, major advances will likely require more complex and better articulated theory, sophisticated analytic approaches to test such theories, and more powerful instrumentation for describing and measuring the phenomena we seek to understand.

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Figure One.

A Conceptual Framework for Research on Causal Process in AUD Treatment

Notes. The illustrated model is typically tested via the lagged product of the *ab path* coefficients. While unidirectional arrows are shown, the authors recognize these relationships may be bi-directional.