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## Mechanisms of change in adolescent substance use treatment: How does treatment work?

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### Abstract

**Background**—Adolescent substance use treatment outcome research generally shows small to moderate effects in reducing substance use, with no specific “brand” of treatment emerging as clearly superior to any other, and treatment gains that fade over time. The relatively weak and temporary effects of treatment call for improving the potency and durability of intervention effects. In response to this call, this critical narrative review summarizes research on mechanisms of change for both adults and adolescents in substance use treatment, with a particular focus on reviewing what is known regarding “how” adolescent substance use treatment works.

**Methods**—A comprehensive review of the adolescent (ages 11–18) substance use treatment literature was conducted to identify empirical studies that examined mediators of intervention effects. Relevant databases (e.g., PsychINFO, Medline) were searched using key words (e.g., “mediator”), and relevant articles from reference sections of identified studies and review papers were considered.

**Results**—Studies of mechanisms of psychotherapy change are rare in the adult, and particularly adolescent, substance use treatment outcome literature. The four adolescent studies that examined substance use treatment mechanisms found that positive social support, motivation to abstain, and positive parenting behaviors mediated treatment effects. To date, research has not supported therapy-specific mechanisms of change, finding instead that “common” processes of change largely account for improvements in outcome across distinct “brands” of treatment.

**Conclusions**—The lack of empirical support for treatment-specific mechanisms of change may be due to the need for greater precision in defining and measuring treatment-specific causal chains. Future directions include neuroscience approaches to examining changes in brain functioning that are associated with treatment response and recovery and examining mechanisms in adaptive treatment designs, which can accommodate individual differences in targets for intervention and response to treatment.

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#### AUTHOR CONTRIBUTIONS

Dr. Chung and Black contributed to the conception and design, analysis and interpretation, and writing and revision of the manuscript. Dr. Black performed the majority of the literature search.

## Keywords

adolescent; substance use treatment; mechanisms of change; treatment outcome

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## INTRODUCTION

A recent national survey indicated that less than one out of five (<20%) youth identified as needing substance use treatment received intervention<sup>1</sup>, despite significant health, social, and financial costs associated with youth substance use<sup>2</sup>. Given the importance of early and effective intervention, this review focuses on treatment for adolescent substance use, including what is known regarding youth treatment outcomes, and mechanisms underlying reductions in substance use. Due to the limited literature on mechanisms of change (MOC) for adolescent substance use treatment, findings from adult studies will be reviewed as a starting point for recommendations regarding MOC research with adolescent substance users. This review focuses on theorized MOC for Motivational Interviewing/Enhancement Treatment (MI/MET) and Cognitive Behavioral Therapy (CBT) because these interventions have the greatest cumulative evidence for efficacy<sup>3, 4, 5</sup>. This review concludes by discussing future directions for studying MOC in adolescent substance use treatment.

## REVIEW

### Historical Background and Effectiveness of Adolescent Substance Use Treatment

Adolescent substance use treatment has historically been based on programs developed for adults, often with little to no modification despite developmental differences in type of substances commonly used by youth (e.g., alcohol and marijuana), adolescents' lower readiness to change due to external pressure for treatment, shorter histories of use, adolescent-specific negative consequences of use (e.g., poor academic performance), and developing cognitive abilities<sup>6, 7</sup>. For example, community-based treatment for adolescent substance use commonly relies on an approach developed for adults, which has the Minnesota Model and its adherence to the 12-steps of Alcoholics and Narcotics Anonymous at its core, with supplemental training in relapse prevention<sup>8</sup>. However, based on the relatively recent recognition of the special needs and developmental context of adolescent substance use, adaptations of CBT, MI/MET, and family-based interventions have been developed to address adolescent substance use (e.g., Cannabis Youth Study treatment manuals). The National Registry of Evidence-based Programs and Practices catalogs effective treatment options for adolescents and adults (<http://nrepp.samhsa.gov/>).

Adolescent treatment outcome research has shown some promising results in terms of reductions in substance use following treatment<sup>4, 9, 10</sup>. Reductions in substance use are most robust at treatment completion<sup>4</sup>. Similar to the adult treatment outcome literature<sup>11, 12</sup>, many youth return to substance use after treatment<sup>4, 13</sup>. Importantly, individuals differ in response to treatment, as evidenced by multiple post-treatment trajectories of substance use, including patterns of continuing heavy use, gradual reductions in use, an increase from low levels of use during treatment, and steady low levels of substance use<sup>14-16</sup>. Predictors of worse adolescent treatment outcome include greater severity and chronicity of use; co-occurring

psychopathology, particularly conduct problems; and early treatment drop-out<sup>13, 16</sup>. In brief, treatment gains occur, but tend to fade over time, and there is heterogeneity in response to treatment that is associated with certain client characteristics.

A landmark clinical trial for adolescent substance use, the Cannabis Youth Treatment study CYT<sup>17, 18</sup>, compared the effectiveness of five evidence-based treatments: CBT, Multidimensional Family Therapy (MDFT), Family Support Network, Adolescent Community Reinforcement Approach, and MET. These interventions were selected, in part, because they are well-defined and relatively distinct in terms of theoretical basis and prescribed techniques<sup>17</sup>. CYT results indicated that no single intervention emerged as more effective than another<sup>18</sup>. These CYT “null” results regarding differential effectiveness of specific therapies are similar to other clinical trials that compared specific “brands” of therapy among adolescent substance users<sup>4</sup>, adult substance users<sup>11, 19</sup>, and treatment research involving adults with other psychiatric conditions<sup>20</sup>. Overall, clinical trials comparing distinct types of treatment in adolescent and adult substance users have found small to moderate effects in reducing substance use, with no specific “brand” of treatment emerging as superior to another<sup>4, 11</sup>.

### Shift from Treatment Outcome Research to Studying MOC

The small to moderate effects of adolescent substance use treatment on outcomes and fading treatment gains over time, underscore the need for more potent interventions with more durable effects<sup>4, 10</sup>. To address this need, the research paradigm has shifted from documenting treatment outcomes to examining *how* treatment works<sup>21</sup>. Identifying mechanisms of behavior change, or factors that explain “how” treatment works (e.g., “active ingredients”), has important implications for increasing treatment effectiveness. For example, by identifying “active ingredients,” treatment could focus on the delivery of these “active ingredients” in an optimal dosing range and in specific combinations according to individual needs to boost effectiveness<sup>22, 23</sup>. Treatment components that are shown to be ineffective or counterproductive (e.g., confrontational therapist style) could be reduced or eliminated<sup>24</sup>. MOC research also may inform the development of novel interventions that amplify the effect of “active ingredients”<sup>22</sup>. Finally, increased understanding of how behavioral change occurs, specifically in a therapeutic context, could help to refine the theoretical basis for distinct forms of treatment and more broadly, could reveal cross-cutting or “common” processes across therapies, such as therapeutic alliance, goal-setting, and monitoring progress that lead to positive outcomes<sup>25, 26</sup>.

### Hypothesized Treatment-specific MOC: CBT and MI

Distinct forms of treatment (e.g., CBT, MI/MET) are thought to exert their effects through unique theory-based MOC (e.g., treatment-specific techniques and processes), which can be distinguished from other active treatments and placebo<sup>27</sup>. A particular “brand” of therapy could involve many active ingredients and multiple MOC. Further, MOC may operate as part of a larger causal chain of sequenced and interacting processes that lead to specific outcomes<sup>28</sup>. Although distinct therapies might be equally effective<sup>18, 19</sup>, the active ingredients used and MOC through which each treatment operates might differ<sup>29</sup>.

CBT treatment strategies, which include relapse prevention techniques<sup>8</sup>, are based in large part on social learning theory<sup>30</sup>. CBT is based on the hypothesis that substance using individuals may have deficits in the ability to cope with general life stressors and high-risk situations for substance use<sup>27, 31</sup>. CBT active ingredients include, for example, instruction in coping skills, role play, behavioral rehearsal, and positive reinforcement to improve general and substance-specific coping skills and to enhance self-efficacy to resist substance use<sup>32</sup>. Skill acquisition in CBT has been proposed to involve strengthening cognitive control over behavior, and improved ability to regulate emotion in response to stressors<sup>33</sup>. A primary goal of CBT is to enhance an individual's cognitive and behavioral coping skills and self-efficacy in handling stressors as mechanisms that lead to reduction in substance use.

Whereas CBT assumes that an individual is ready to change and only needs to acquire the skills and confidence to do so, MI/MET aims to enhance motivation to change substance use by exploring an individual's ambivalence to change in the context of an empathic, directive discussion<sup>34</sup>. MI principles are based on decision-making and cognitive dissonance theories<sup>35, 36</sup>. MI active ingredients include therapist style (non-confrontational, directive, client-centered: "MI spirit") and specific techniques (e.g., decisional balance, providing normative feedback) used to elicit "change talk" or a commitment to positive behavior change<sup>34</sup>. Hypothesized MI mechanisms include client behaviors such as experiencing discrepancy between current and desired behavior, and amount of client "change talk" generated<sup>24, 37</sup>. Among proposed active ingredients, "change talk" has received the most consistent support in analyses of mechanisms underlying MI effects on outcome<sup>38</sup>.

### Methods to Identify Mechanisms that Explain "How" Treatment Works

Study design for treatment outcome research, which relies on pre- and post-treatment assessment, is not optimal for investigating "how" treatment works. Ideally, a study of treatment mechanisms would include: fine-grained (e.g., session by session) longitudinal assessment that begins prior to the first treatment session to establish a "baseline"<sup>39</sup>, evaluation of the therapist-client relationship across sessions<sup>40, 41</sup>, assessment of extra-treatment factors related to outcome (e.g., family and peer environment), and follow-up assessments to examine durability of effects. In addition, methods such as Ecological Momentary Assessment (EMA), which collect fine-grained data, have been used to identify proximal relapse precipitants<sup>42</sup>. Fine-grained, longitudinal assessment can identify individual trajectories of change during treatment<sup>43</sup>, as well as better capture discontinuities and non-linear patterns of change that predict relapse<sup>44, 45</sup>. Intensive assessment, however, increases participant burden, and assessment reactivity needs to be considered<sup>46</sup>.

In addition to study design issues, conceptual guidelines and statistical methods used to identify MOC have received attention<sup>22, 29, 47</sup>. Seven suggested requirements for testing MOC in psychotherapy research include: (1) strong association between active ingredient (e.g., coping skills training) and outcome (e.g., reduced alcohol use); (2) specificity of the association between active ingredient, proposed mechanism (e.g., assertive drink refusal behavior) and outcome; (3) dose-response relationship (i.e., greater effects with greater treatment dose); (4) manipulation of the proposed active ingredient results in a change in outcome; (5) temporal precedence of the mechanism in relation to outcome; (6) replicability

of results; and (7) plausibility and coherence, that is, the explanation of how the active ingredient works makes sense in the context of theory and the existing literature<sup>22, 47</sup>. Although all guidelines are unlikely to be met, meeting more guidelines provides stronger support for the proposed MOC<sup>22</sup>.

Statistically, MOC are most commonly examined by testing a mediator or an intervening variable through which treatment is proposed to have an effect on outcome<sup>48, 49</sup>. A mediator is a variable that is used to represent a mechanism of change<sup>50</sup>. However, a mediator may not necessarily be *the* mechanism of change. Instead, a mediator might point to or be associated with a MOC. For example, increased self-efficacy as the measured mediator might point to the mechanism of cognitive restructuring in CBT, which may, in turn, be associated with increased self-efficacy. General analytic guidelines in testing mediation include demonstration of an association between: the intervention (e.g., coping skills training) and outcome (e.g., reduced alcohol use), although this is not necessary for testing mediation<sup>48, 49</sup>; intervention and mediator (e.g., improved drink refusal behavior); and mediator and outcome<sup>51</sup>.

The basic method to statistically test mediation has been extended to examine multiple mediators simultaneously, moderated mediation, mediated moderation, and conditional indirect effects<sup>49, 50</sup>. Importantly, a moderator can provide information on “for whom” treatment has greater or lesser effect. For example, gender might moderate the extent to which improved coping skills mediate the association between an active ingredient (e.g., teaching drink refusal skills) and outcome (e.g., binge drinking frequency). Identification of moderators can aid efforts to match client characteristics and needs to specific interventions in order to improve outcomes among certain subgroups. To date, however, evidence for client-treatment matching in adult samples using CBT has resulted in small and inconsistent effects<sup>50</sup>.

### Research on MOC for CBT and MI/MET in Adults

Findings from the adult literature on how substance treatment works may serve as a guide for future adolescent MOC research, as the extant adolescent work is limited. Overall, studies examining MOC for CBT and MI/MET in adult substance users generally have not shown that treatments work through the theorized treatment-specific mechanisms<sup>29, 31</sup>. For example, interventions such as MET and 12-step facilitation, which do not focus on teaching coping skills, tend to be just as effective as CBT in increasing substance-specific and general coping skills, as well as increasing self-efficacy to reduce use<sup>52, 53</sup>. Thus, some researchers have concluded that existing treatments, despite different theoretical foundations and prescribing distinct techniques, may not be sufficiently different in terms of MOC<sup>50</sup>. Specifically, distinct therapies might operate through “common” MOC, such as positive therapeutic alliance and social support (see Figure 1). Alternatively, greater elaboration of causal chains, focusing on therapy-specific micro-processes, may reveal subtle differences in the time course of intervention effects (i.e., rapidity of treatment response) or the pathways through which a particular sequence or combination of therapy-specific active ingredients may have an effect on outcome<sup>50, 54</sup>. Emerging findings suggest that failure to confirm hypothesized treatment-specific causal chains may be due to imprecise definition

and/or measurement of key constructs, the need to identify relevant parameters of change (e.g., rapidity and durability of effects), and the need for greater specificity of the causal chains to be tested<sup>31, 55</sup>.

### MOC in Adolescent Substance Use Treatment Research

Few studies have examined MOC in the youth treatment outcome literature<sup>22</sup>, which often lags behind research conducted with adults. To identify articles that examined MOC in adolescent substance use treatment, PsychINFO, Medline, and Global Health databases were searched using key words such as mediator, indirect effect, substance use (including separate terms for alcohol, cannabis, polysubstance use), treatment, intervention, and adolescent. Further, potentially relevant articles from the reference section of identified studies, and reviews of adolescent substance use treatment were extracted for consideration. Criteria for inclusion in the review were: (1) empirical results from an intervention for youth substance use; (2) participants ages 11–18; (3) test of mediation. Studies involving college students were excluded since they are considered “emerging adults”. The search yielded seven adolescent studies that could be considered as potentially examining mediators of treatment effects (see Table 1). Two studies reported results from the same parent study<sup>56, 57</sup>. One study did not test mediation due to the lack of a significant relationship between treatment condition and outcomes over follow-up<sup>58</sup>. Another study, which focused on aftercare (and is thus not reviewed in detail), found that adherence to continuing care and social/environmental risk mediated the association between Assertive Aftercare and substance use outcomes<sup>59</sup>. Among the remaining four studies, two studies involved youth in community-based treatment<sup>60, 61</sup>, and two studies were randomized trials<sup>56, 57, 62</sup>.

In the two community-based treatment studies<sup>60, 61</sup> both examined 12-step affiliation as the “intervention” of interest but tested different mediators. Social support was found to mediate the association between 12-step affiliation and abstinence from substance use at 3-year follow-up<sup>60</sup>. The strength of evidence for mediation in the study, however, is limited because certain variables were assessed at the same time, making temporal ordering of the variables indeterminate. In the other study, only motivation for abstinence was identified as a mediator of 12-step attendance (during the first 3-months post-treatment) and number of abstinent days at 4-to-6-months post-treatment, although coping and self-efficacy also were tested as mediators<sup>61</sup>. In addition to testing different mediators, the two studies differed in treatment setting, timing of assessments, and length of follow-up, which limits comparability of results across these two studies.

The two adolescent clinical trials that tested mediation examined different types of treatment. One clinical trial, which compared MDFT and group-based CBT among youth with behavioral and substance-related problems (N=83), found that youth report of improved parenting practices from pre- to post-treatment marginally mediated the relationship between treatment condition (MDFT>CBT) and abstinence at 12-month follow-up<sup>62</sup>. The other clinical trial (i.e., two reports from the same project) compared Brief Intervention with the adolescent (BI-A) against Brief Intervention with the adolescent combined with a parent session (BI-AP) among school-referred substance-using youth (N=315)<sup>56, 57</sup>. Analysis of 6-month outcomes indicated that problem solving and use of

additional community services mediated the association between both interventions (BI-AP>BI-A) and substance use outcomes<sup>56</sup>. A limitation of the 6-month mediation analyses in that study is that the mediator and outcome were both assessed at 6-months. At 12-month follow-up, motivation to change assessed at 6-months mediated BI-A and BI-AP effects on outcome, and use of additional services and parenting practices (both assessed at 6-months) mediated the association between BI-AP and 12-month outcomes<sup>57</sup>. Although these two clinical trials examined different interventions (i.e., MDFT, BI-A/BI-AP), both found some support for parenting practices as a mediator of treatment effects based on 12-month outcomes. The convergence on improved parenting behavior as a mechanism of change points to the potential importance of “common” mechanisms, although further research is needed to confirm and elaborate these effects.

In sum, the adolescent substance abuse treatment mechanism studies reviewed differed in treatment setting, type of intervention, mediators examined, and length of follow-up. Mediators of the association between community-based treatment and outcome differed in two studies, but suggest possible roles of motivation to abstain and social support in the pathway to better outcome. Improvement in parenting behaviors was supported as a mediator in two studies<sup>57, 62</sup>, which used different interventions involving parents, suggesting the operation of “common” rather than “treatment-specific” MOC. These preliminary findings suggest that social support, including parent involvement in treatment, is an important “common” mechanism of change in adolescent treatment outcome.

### **Broader Perspective on MOC: Cross-cutting Behavior Change Processes**

In the adult and adolescent substance use treatment literature, there is little evidence that treatment-specific factors are more important than “common” mechanisms of change (e.g., improved coping, improved parenting behaviors, positive social support) in determining outcome. Because therapy-specific active ingredients may work through “common” processes of change, there has been a call for research on “empirically supported treatment processes” instead of “empirically supported treatments”<sup>26</sup>. General behavioral principles, such as reinforcement and punishment, cut across specific theories of cognitive and behavioral change, and different “brands” of therapy<sup>26, 63</sup>. The idea of cross-cutting principles of therapeutic change is in line with a recent proposed framework, Research Domain Criteria (RDoC)<sup>64</sup>, which is an alternative to psychiatric diagnosis. In the RDoC framework, interventions would not target specific “disorders,” but would target more narrowly defined domains of functioning, such as improving affect regulation through empirically-supported treatment processes<sup>65</sup>.

In the absence of evidence to support treatment-specific mechanisms of change, treatment-specific mechanisms might be operating but may involve therapy-specific “micro-processes,” pathways, or parameters of treatment response (e.g., rapidity, durability) that have not yet received much attention. The study of therapy-specific mechanisms of change seems to require greater elaboration of a treatment-specific causal chain, which would ultimately need to be distinguished from, but also related to, “common” mechanisms of change. The ability to distinguish “therapy-specific” and “common” processes of change may depend on fine-grained analysis of detailed causal chains. Just as various drugs of abuse

might activate a “common final pathway” involving the mesolimbic dopamine system<sup>66</sup>, therapy-specific active ingredients may impact therapy-specific “micro-targets” through pathways that converge on, for example, increased self-efficacy as a “common” mechanism of change.

### **MOC from a Developmental Neuroscience Perspective**

Understanding how psychotherapy works at the level of brain functioning could help to identify mechanisms of behavior change<sup>67, 68</sup>, as well as client neurocognitive characteristics (e.g., on-going brain development in adolescence) that might affect treatment response<sup>7</sup>. For example, a neuroscience approach could reveal how newer approaches, such as mindfulness-based interventions<sup>69, 70</sup>, work at the level of brain functioning to reduce risk for relapse<sup>71</sup>. Although neuroimaging could provide novel insights into brain-based mechanisms of change<sup>72, 73</sup>, the approach requires a high degree of precision in definition and measurement of the “active ingredient” and “mechanism” to be tested. In this regard, Feldstein-Ewing and colleagues<sup>74</sup> proposed a neurobiological model of mechanisms underlying MI, focusing on brain-based response to “change talk” as the mechanism underlying reductions in substance use. Functional neuroimaging results with adolescent substance users suggested that “change talk” inhibited activation in brain regions that respond to alcohol cues<sup>75</sup> or among cannabis users, increased activation in brain areas involved in introspection, which was in turn associated with reductions in cannabis use over 1-month follow-up<sup>76</sup>. The narrow focus on a single mechanism of change (e.g., change talk) suggests the potential utility of a micro-intervention approach to studying MOC, which can provide greater precision by targeting smaller units of cause and effect<sup>77</sup>, albeit with a trade-off in external validity.

### **Recommendations and Future Directions**

Research to date has not clearly identified therapy-specific mechanisms of change. However, the lack of empirical evidence might be due to limitations involving the need for detailed delineation of micro-processes embedded within causal chains. Specifically, greater precision is needed in defining and measuring proposed therapy-specific “active ingredients,” their respective “targets,” and mechanisms of action at a micro-process level (e.g., within session, session-by-session), in order to reveal treatment-specific pathways of intervention effects<sup>77</sup>. Greater attention needs to be given to the interaction between therapy-specific and “common” (e.g., therapeutic alliance) factors in generating treatment outcomes<sup>27</sup>, as well as factors that operate outside of treatment (e.g., family environment) that influence outcome<sup>26</sup>. The dynamic nature of the therapist-client relationship also has only begun to be explored in terms of therapist behavior and skill and client responses as predictors of treatment outcome<sup>24, 25, 78</sup>. Few studies have addressed all of the seven guidelines for identifying MOC<sup>22</sup>, although newer methods of real-time data collection (e.g., ecological momentary assessment) and statistical analysis (e.g., dynamic systems modeling,<sup>79, 80</sup>) provide opportunities to better assess and model the dynamic process of change.

In addition, there is movement toward discovering “what will work best for me” rather than “which treatment works best”<sup>81</sup>. In this regard, differences in client response to treatment



suggests the utility of adaptive interventions<sup>23</sup>. Adaptive interventions may involve clients choosing from a menu of intervention options<sup>82</sup>, provision of interventions based on a comprehensive assessment of client needs and capacities<sup>83</sup> or other types of treatment algorithms based on decision rules that specify when and how to alter interventions provided based on client response<sup>84, 85</sup>.

## CONCLUSIONS

Substance use treatment research has shifted from examining treatment outcome to determining “how” treatment works and “for whom” it may work best. Studies that test MOC, however, are still rare in the adult, and especially adolescent, treatment literature. Further, MOC research has generally not supported the identification of treatment-specific MOC, despite the distinctiveness of the treatments examined. Identification of treatment-specific mechanisms appear to require greater precision in defining and measuring causal chains, possibly using a micro-intervention approach, more fine-grained assessment (e.g., within session, session-by-session), and novel analytic methods (e.g., dynamic systems analysis). Future directions in studying MOC include neuroscience approaches to examining cognitive processes and affect regulation that are associated with relapse and successful recovery and using adaptive treatment designs to better accommodate individual differences in response to treatment.

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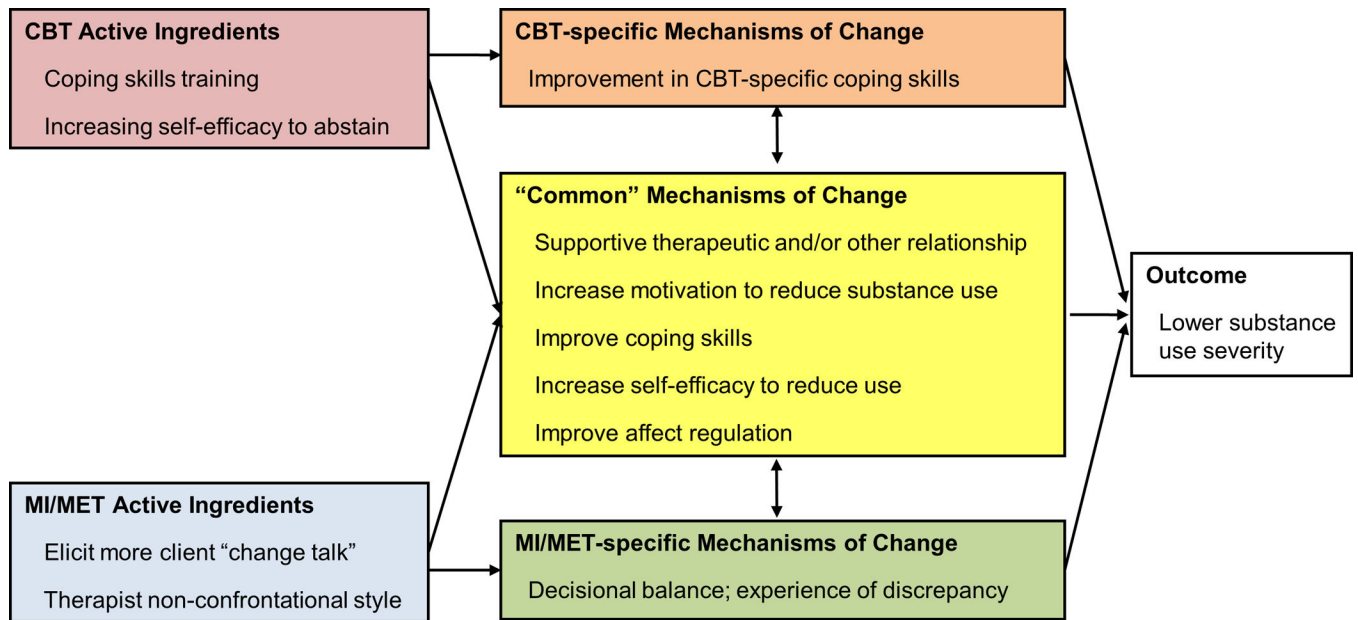
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**FIGURE 1.** Proposed relationships between therapy-specific active ingredients, “common” and “therapy-specific” mechanisms of change, and treatment outcome.  
*Note.* CBT=Cognitive Behavioral Therapy, MI/MET=Motivational Interviewing/Motivational Enhancement Intervention.

TABLE 1

## Adolescent Substance Use Treatment Studies That Proposed Tests Of Mediation

Study	N	Treatment	Mean Age	% Male	Mediators Tested	Follow-up length	Results/comments
Chi et al. 2009 <sup>60</sup>	117	12-step affiliation	16.1	66	<b>Social Support</b> , Religious Service Attendance	6-months	Mediator and outcome both measured at 6-mo.
Gamer et al. 2007 <sup>59</sup>	183	Assertive Aftercare	16.2	71	<b>Adherence to Continuing Care, Social/Environmental Risk</b>	3- and 6-months	Tested an aftercare protocol
Henderson et al. 2009 <sup>62</sup>	83	MDFT vs. Group CBT	13.7	74	<b>Parental Monitoring</b>	3- and 6-months	
Kelly et al. 2000 <sup>61</sup>	99	12-Step affiliation	16	40	<b>Motivation for Abstinence</b> , Coping, Self-Efficacy to abstain	3- and 6-months	
Stanger et al. 2009 <sup>58</sup>	69	CM + Parent Training vs. CM + Parent Psychoeducation	16	83	Not able to test mediation	Treatment type not associated with outcome	
Winters et al. 2012 <sup>56</sup>	315	BI with Teen Only; BI with Parent Session; Assessment Only	16.3	52	Motivation to Change; <b>Parenting Practices</b> ; Problem Solving Skills; Other service utilization	6-weeks	Mediator and outcome both measured at same time
Winters et al. in press <sup>57</sup>	284	BI with Teen Only; BI with Parent Session; Assessment Only	16.1	50	Motivation to Change; <b>Parenting Practices</b> ; Problem Solving Skills; Other service utilization	1-year	Same sample as Winters et al., 2012

Note. a. **Bold** indicates significant mediator. BI=Brief Intervention, MDFT=Multidimensional Family Therapy, CBT=Cognitive Behavioral Therapy, CM=Contingency Management.