

Identifying Mechanisms of Change in Dialectical Behavior Therapy for Substance Use Disorders

(DBT-SUD): A Mixed Methods Examination of Mediators of Substance Use Reduction

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**Abstract**

Identifying Potential Mechanisms of Change in Dialectical Behavior Therapy for Substance Use Disorders (DBT-SUD): A Mixed Methods Examination of Mediators of Treatment Outcome

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Substance use disorders (SUDs) often co-occur with other mental health disorders, such as borderline personality disorder (BPD), post-traumatic stress disorder (PTSD), and eating disorders. Historically, treatment systems have struggled to treat both substance use and other co-occurring mental health symptoms concurrently, often requiring abstinence before access to therapy is offered. Such approaches miss the mark in how to meet the needs of these complex individuals with co-occurring SUD and other mental health disorders. Dialectical Behavior Therapy for Substance Use Disorders (DBT-SUD) offers an integrated model tailored to address the needs of this population, combining evidence-based strategies to address emotion dysregulation and foster behavioral changes, such as moderation or abstinence from substances, as well as targeting suicidal and non-suicidal self-injurious behaviors. However, the mechanisms

through which DBT-SUD achieve behavioral changes, particularly reductions in substance use, are not well understood. This study utilized an exploratory mixed methods design to identify and test potential mechanisms of substance use change in DBT-SUD.

Phase 1. Traditional ethnographic methods were used to analyze video-recorded therapy sessions from an RCT of DBT-SUD. Using both inductive and deductive coding strategies, four themes emerged that appeared to support reductions in substance use: reducing experiential avoidance, developing strong therapeutic alliance, cultivating self-validation and self-efficacy, and adopting dialectical thinking. Reduction in opioid use appeared to occur not through isolated skill use, but through dynamic interactions between therapist and client where trust and safety were paramount. This therapeutic alliance and safe environment seemed to allow for more willingness to experience emotions and engage in behavior change.

Phase 2. Informed by the qualitative findings, this phase tested three longitudinal path models to examine whether these hypothesized mechanisms predicted changes in positive opioid use across the treatment year. Data included repeated assessments of experiential avoidance, emotional ambivalence, emotion dysregulation, therapeutic alliance, and reduction in opioid use (via UA). While the hypothesized mediation pathways were not supported by the models, therapeutic alliance emerged as a significant predictor of reduction in opioid use and decreased emotion dysregulation. These findings provide emerging evidence for the therapeutic alliance as a potential mechanism of change in DBT-SUD and underscore the need for more nuanced and precise ways of operationalizing alliance within complex treatments.

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## Chapter 1: Introduction

For many years, people who chronically engaged in suicidal and non-suicidal self-injurious behavior (NSSI; e.g., cutting or burning oneself) were a neglected population within the field of mental healthcare. Treatments at that time were failing to address the needs of this population to decrease suicidal and NSSI behaviors and increase more effective behaviors (Linehan, 1981). Further research at the time indicated that those diagnosed with borderline personality disorder (BPD) had the highest rates of suicidal and NSSI behaviors (Bedics, 2020; Gunderson, 1984; Linehan, 1993). In response, Linehan developed a therapy that addressed this highly underserved and at-risk population: Dialectical Behavior Therapy (DBT) for BPD (Linehan, 1993). The goal of DBT was to aid these high-risk clients in decreasing life-threatening behaviors, while also identifying and building a life they experience as worth living.

While DBT was originally developed for those who have BPD, it is now widely accepted as a transdiagnostic treatment (Bedics, 2020; Ritschel et al., 2015; Swales, 2018). Research has indicated that those diagnosed with BPD typically are diagnosed with an average of four additional mental health disorders (Harned et al., 2008). DBT has been effective in addressing not only suicidal and NSSI behaviors, but also other problematic behaviors associated with these typically comorbid mental health disorders. In fact, research has shown that DBT is effective in treating a variety of disorders including eating disorders, depression (in both adolescents and the elderly), substance use disorders, and post-traumatic stress disorder (PTSD) (Axelrod, 2018; Bankoff et al., 2012; Beckstead et al., 2015; Ben-Porath et al., 2020; Chapman, 2006; Haktanir & Callender, n.d.; Harned et al., 2012, 2014; Linehan et al., 2002; Lynch, 2000; A. L. Miller, 1999; Panepinto et al., 2015; Rathus & Miller, 2002; Reilly et al., 2020; Salsman, 2020). A common thread in how we conceptualize these disorders is the existence of pervasive emotion

dysregulation which is a cornerstone to Linehan's biosocial model. Given this, the uses for DBT have expanded beyond BPD over time as the field comes to understand that pervasive emotion dysregulation is at the core of many diagnoses and DBT offers an ideal approach to addressing that dysregulation and the problematic behaviors that occur because of the dysregulation (Bedics, 2020; Swales, 2018).

In response to the high comorbidity seen between borderline personality disorders (BPD) and substance use disorders (SUD), as well as the elevated severity and lethality among this population, Linehan and colleagues updated comprehensive DBT to create DBT-SUD (Dimeff & Linehan, 2008; Linehan et al., 1999). DBT-SUD addresses patterns of behavior typically seen in those with SUDs (e.g., lying, high dropout rate, lack of skill to cope with emotion dysregulation) from a DBT lens (e.g., balance of acceptance and change; stylistic strategies to increase motivation and attendance; teach skills specific to substance use behaviors) to move clients towards behavior change. A substantial amount of literature now exists that indicates comprehensive DBT and DBT-SUD are efficacious in the treatment of comorbid BPD and SUD, and it indicates that DBT and DBT-SUD perform better than or as well as other standard SUD treatments for substance use outcomes.

While the literature on DBT and DBT-SUD for comorbid SUD and BPD is now substantial, the literature on DBT-SUD for co-morbid SUD and other mental health disorders is sparse. What has been conducted has shed some light on the potential superiority of DBT-SUD in the treatment of comorbid SUD and mental health disorders that are both marked by pervasive emotion dysregulation (e.g., eating disorders, PTSD). Given the lack of literature on this topic, it is not surprising that there is also a gap in the literature looking at the mechanisms of change for DBT-SUD. Understanding mechanisms of change for interventions is imperative to be able to

further streamline and target interventions while not adding on unnecessary components that may dilute the potency of the drivers of change. By prioritizing further research on DBT-SUD with comorbid SUD and BPD, as well as DBT-SUD with comorbid SUD and other mental health disorders, we can begin to identify what are the mechanisms of change. This in turn means we can leverage this information to make DBT-SUD more effective for a broader range of people.

### **Current Study**

This study identified and tested potential mechanisms of change in DBT-SUD for individuals with co-occurring opioid use disorders (OUD) and borderline personality disorder (BPD) (Grant Number: R01 DA014997) using an exploratory mixed methods design occurring in two phases. In Phase 1, qualitative methods were used to explore potential interactions between therapist and client that led to behavioral change processes within DBT-SUD sessions. Traditional ethnographic coding strategies were used to identify patterns related to reductions in substance use. These findings were then used to generate hypotheses about potential mediators of change. In Phase 2, quantitative path analyses were conducted to test these hypotheses using longitudinal data on key psychological and relational constructs over the course of the treatment year.

### **Significance**

Mechanisms of change offer us understanding into how and why an intervention works and as such, they are critical to aiding the development of an effective intervention (Kazdin, 2009; Mehlum, 2021). For example, when we can identify the mechanisms of change for an intervention, we can utilize that knowledge to help bolster what is effective and ensure we do not bring in pieces that may detract from the driver's potency (Mehlum, 2021). Identifying the mechanism(s) of change within interventions is critical to being able to truly understand what is

occurring within the therapy space and to help therapists deliver more impactful and targeted treatment.

Minimal research on mechanisms of change for DBT-SUD has been conducted so far. Only one study, to the study team's knowledge, has specifically looked at mechanisms of change for DBT-SUD and found that increased emotion regulation capability may be a mechanism of change for the treatment (Axelrod et al., 2011). The current study adds to the literature and extends previous work by investigating potential mechanisms of change that drive substance use reduction in DBT-SUD.

### **Study Aims**

**Aim 1a:** Identify potential mechanisms of change for DBT-SUD in Dr. Linehan's Evaluation of Dialectical Behavior Therapy (DBT) Randomized Control Trial (RCT; Grant Number: R01 DA014997) utilizing traditional ethnographic assessment strategies. Four themes emerged from Phase 1.

*Theme 1: Willing to Feel, Ready to Regulate - Reducing Emotional Avoidance to Enhance Emotion Regulation and Opioid Use Reduction*

*Theme 2: Trust Enough to Try - Trust in the Therapeutic Relationship Transforming Emotional Ambivalence and Enabling Emotion Regulation and Opioid Use Reduction*

*Theme 3: Becoming Your Own Ally - Increased Self-Validation Leading to Changes in Self-Respect and Self-Efficacy to Aid in Opioid Use Reduction*

*Theme 4: Finding the Middle Path - Dialectics Enhancing Cognitive and Emotional Flexibility and Promoting Opioid Use Reduction*

**Aim 1b:** Employ both traditional ethnographic analysis procedures and rapid ethnographic analysis procedures to a subset of the study's participants to identify and compare methodological and outcome differences.

**Aim 2:** Test the identified potential mechanisms of change for DBT-SUD via PATH analyses.

Five hypotheses were generated from Phase 1 with only three being testable. The additional two hypotheses which were unable to be tested are discussed further in the Chapter 3 Phase 1 Results.

*Hypothesis 1: The effect of experiential avoidance on changes in opioid use will be mediated by ambivalence about emotional experience and emotion dysregulation.*

*Hypothesis 2: The effect of early therapeutic alliance on changes in opioid use will be mediated by ambivalence about emotional experience and emotion dysregulation.*

*Hypothesis 3: The effect of emotional ambivalence on changes in opioid use will be mediated by therapeutic alliance over time.*

### ***Exploratory Analyses***

To examine the robustness of the hypothesized mediation models under more conservative assumptions about missing data, a set of exploratory sensitivity analyses were conducted. While the primary models assumed missing urinalysis (UA) data were missing at random (MAR) and used full information maximum likelihood (FIML) estimation, the sensitivity models recoded all missing UA values as positive for substance use. This missing assumed positive approach reflects a conservative standard in substance use research and allows for a stricter test of indirect effects.

A second exploratory analysis examined whether treatment engagement moderated the relationships proposed in the first hypothesis. Experiential avoidance was assessed via the

original version of the Acceptance and Action Questionnaire (AAQ-AAS) (Hayes et al., 2004). This analysis explored if higher baseline experiential avoidance predicted poorer substance use outcomes, particularly among participants with lower engagement.

### **Exploratory Sequential Mixed Methods Design**

The current study utilized an exploratory mixed methods design (Creswell & Plano Clark, 2018), where the qualitative findings from Phase 1 were used to inform and shape the quantitative analyses conducted in Phase 2. This approach was chosen to base the hypotheses on what was happening in treatment sessions and to test whether the patterns that showed up in the qualitative data could also be seen in the quantitative outcomes. This design is well suited for contexts in which limited prior research exists on specific mechanisms, and where integrating lived experiences and treatment dynamics is central to advancing the field.

## **Chapter 2: Literature Review**

### **Prevalence, Significance, and Risk Factors of SUDs in the United States**

#### ***Prevalence***

SUDs occur when the recurrent use of alcohol, other substances (e.g., opioids), or both lead to impairment in various areas of a person's life including physical and mental health, and failure to meet life (e.g., school, work, home) requirements and/or responsibilities (SAMSHA, 2023). The 2023 National Survey on Drug Use and Health utilized criteria based on the *Diagnostic and Statistical Manual of Mental Disorders*, 5<sup>th</sup> edition to assess for the presence of a SUD within the past year. The survey found that in 2023, approximately 48.5 million people (12 years or older) who responded to the survey (17.1%) met criteria for a SUD within the past year. This percentage differed by age: 9.2 million (27.1%) young adults aged 18 to 25 had the highest rate of SUDs, 37.0 million (16.6%) adults aged 26 or older, and 2.2 million (8.5%) adolescents

aged 12 to 17. Rates also differed by race/ethnicity and were highest among American Indian or Alaska Native (25.3%), Multiracial (24.3%), or White individuals (17.8%).

### ***Significance***

SUDs are a significant public health problem in the United States. Individuals, families, communities, and health care systems all experience the consequences and costs that accompany SUDs. Consequences that come from SUDs can include death, as well as acute and chronic injuries/impairments from overdoses or motor vehicle crashes, financial hardships, lost productivity, and loss of community (Administration (US) & General (US), 2016; Bautista et al., 2019). SUD-related healthcare, legal, and work productivity costs are estimated to exceed \$400 billion annually (Bautista et al., 2019; Gerson et al., 2001; Schulte & Hser, 2013). SUD treatment, on the other hand, is associated with benefits such as decreased risk of overdose, physical and mental health problems, and legal issues (Gossop et al., 2005, 2006; Paquette et al., 2022). In fact, it is estimated that the benefits of SUD treatments outweigh the costs 7:1 (Etter, 2006). However, there are significant barriers to accessing SUD treatment within the United States.

### ***Risk Factors for SUDs***

Risk factors for the development of SUDs can be broken down into three categories including community, individual, and family (Brumback et al., 2021; Estreet et al., 2022; Kopak et al., 2019; Nawi et al., 2021; Rosen et al., 2020; Stumbo et al., 2017). Individual risk factors for SUDs include high impulsivity, age (teenagers tend to have higher levels of impulsivity as their frontal lobes continue to develop), previous substance use history, co-occurring mental health disorders, and lack of skill to regulate emotions (Brumback et al., 2021; Groenman et al., 2017; Lander et al., 2013; Simpson et al., 2021). Notably, co-occurring mental health disorders and

SUDs can have a bidirectional effect on one another, meaning SUDs can trigger chemical changes in the brain to increase the likelihood of developing a mental health disorder. Behavioral effects of SUDs (e.g., acting on cravings, withdrawal symptoms) can also contribute to the development of other mental health disorders. Similarly, studies have found that those with a mental health disorder such as depression, post-traumatic stress disorder (PTSD), or eating disorders (EDs) may turn to substances to cope with the dysregulation they are experiencing. While temporary relief may occur, the use of substances has been found to increase the severity of symptoms overtime, to which people return to the substances to decrease the negative effects and the cycle continues. Family risk factors for SUDs include things such as genetics, parenting styles, and exposure to environmental stress (e.g., trauma, low SES) (Brumback et al., 2021; Kopak et al., 2019; Lander et al., 2013; Nawi et al., 2021; Rosen et al., 2020; Simpson et al., 2021). Finally, community risk factors for SUDs include peer influence, polysubstance use among peers, and environmental stressors (Brumback et al., 2021; Nawi et al., 2021).

## **The Role of Pervasive Emotion Dysregulation with Co-Occurring SUDs and Other Acute Mental Health Disorders**

### ***Conceptual Framework***

The prevalence of co-occurring SUDs and other acute mental health disorders within the United States is significant. The 2023 National Survey on Drug Use and Health found that approximately 20.4 million people (7.9%) had co-occurring mental illness and SUD within the past year (SAMSHA, 2023). Much of these co-occurring mental health disorders, including SUDs, can be conceptualized as a problem rooted in pervasive emotion dysregulation (Ritschel et al., 2015), meaning these associated disorders stem from an inability to cope with painful negative affect and thus turn to engaging in dysfunctional and usually harmful coping strategies.

Mental health disorders that fall within this framework include SUDs, borderline personality disorders (BPD), eating disorders (EDs; particularly binge eating disorder and bulimia nervosa), and post-traumatic stress disorder (PTSD). Engaging in dysfunctional coping behaviors (e.g., binge drinking or eating) may alleviate the emotional suffering temporarily; however, the suffering returns and the urges to engage in the dysfunctional behavior arises again and the cycle continues. Addressing the co-occurring substance use and mental health disorders is critical as the combined presentation can have significant impacts on functional impairment, increased risk for becoming unhoused or incarcerated, worse treatment outcomes, higher rates of injury and death, increased deaths by suicide, and increased treatment costs (Compton et al., 2007; Grant et al., 2004; Han et al., 2017; Mojtabai et al., 2014).

### ***Barriers and Answers to Care***

Historically, many providers who treated those with SUDs held the belief that treatment for substance use must occur prior to treating other co-occurring mental health issues (Axelrod, 2018; Dimeff et al., 2023; Mehta et al., 2021; Salsman, 2020). This meant that those clients would not be eligible to receive much needed, and at times lifesaving, treatment for their other mental health issues until they were able to manage their substance use. The flaw with this chronological approach to treatment means people are being denied access to needed care until they meet what might be an unattainable goal. More specifically, for those where the SUD and other co-occurring mental health disorder shared similar patterns of etiology and maintenance via pervasive emotion dysregulation, treating one without including the other was like asking a patient to take only half of their antibiotic regimen for an infection—it might act as a Band-Aid, but it is not getting at the root of the issues for both co-occurring disorders. This flaw continues through to present day. By mandating treatment of the SUD first, providers are ignoring a large

part of the landscape, which is quite invalidating for the clients. Furthermore, treating only one at a time will not garner much movement as the disorders transact and impact each other. For example, with PTSD, people often engage in substance use to cope with the distress caused by the trauma. Conducting exposure therapy, a common and effective treatment for PTSD, becomes ineffective when occurring in the context of high SUD behavior as being intoxicated blocks new learning that would have otherwise been gained from the exposure. However, at the same time, trauma related symptoms such as nightmares or intrusive thoughts might be prompts for substance use as a coping mechanism. Treatment must be concurrent while balancing the impact that the disorders may have on each other. This is what is understood in Dialectical Behavior Therapy (DBT) as a dialectic (Linehan, 1993). DBT is a treatment that for 30 years has shown efficacy with individuals with comorbid and high acuity presentations. To address this problem of prioritizing treating SUDs versus other important parts of a multi-problem presentation, an adaptation was created specifically for use with substance use disorders.

### **Dialectical Behavior Therapy for Substance Use Disorders: A Treatment for Co-Occurring SUDs and Other Acute Mental Health Disorders**

Dialectical Behavior Therapy (DBT) was developed by Dr. Marsha Linehan with the goal of helping individuals who are experiencing tremendous suffering to build a life they experience as worth living (Linehan, 1993). Beginning her work in the 1970s, Linehan sought to address the needs of a chronically underserved and high-risk population by working with individuals who engaged in frequent suicidal and non-suicidal self-injurious (NSSI) behaviors (Linehan, 1981). At the time, existing treatments were largely ineffective in reducing these behaviors. In identifying a primary diagnostic group for intervention, Linehan found that individuals with borderline personality disorder (BPD) had the highest rates of suicidal ideation, suicide attempts,

and NSSI (J. Bedics, 2020; Gunderson, 1984; Linehan, 1993). Research estimated that approximately 75% of individuals with BPD had attempted suicide ( $M = 3.4$  attempts per person) (Soloff et al., 1994), and a similar proportion had engaged in NSSI during their lifetime (Clarkin et al., 1983; Cowdry et al., 1985). As a result, the initial development and implementation of DBT was specifically tailored to address the clinical challenges associated with BPD (Linehan, 1993). DBT has since been extensively researched and established as a gold-standard, evidence-based treatment for BPD. It has demonstrated robust effectiveness in reducing suicidal behaviors, NSSI, emotional dysregulation, and other core features associated with BPD.

The rate of comorbidity between SUDs and BPD is significant. The complex presentations of those with co-occurring BPD and SUD led many providers to feel hesitant at that time to treat them due to their own fears surrounding the high-risk nature. Linehan recognized that those who suffer from BPD and SUDs had a much higher severity and lethality from both their suicidal behaviors as well as accidental death via overdose (e.g., additional higher risk from the interaction of impulsivity from pervasive emotion dysregulation and drug use). To address this specific at-risk and in need subpopulation, Linehan and colleagues updated comprehensive DBT to create Dialectical Behavior Therapy for Substance Use Disorders (DBT-SUD) (Dimeff & Linehan, 2008; Linehan et al., 1999). DBT was well-positioned as a treatment to be adapted for those with co-occurring SUDs, particularly those with higher risk presentations, or for those who were treatment-resistant to substance use therapy for several reasons (Dimeff et al., 2023). First, DBT was created with higher-risk populations in mind, so treatment teams were already well trained and equipped to address LTBs (Linehan, 1993). When looking at DBT compared with the main SUD treatments and theoretical understandings of the time, there were several commonalities across both treatment conceptualizations and frameworks. For example,

both DBT and addiction sciences postulated that problem behaviors arise from a person trying to regulate their emotions (e.g., those with BPD turn to SI and NSSI as “solutions” to the problem of suffering; those with SUDs turn to various substances to relieve unbearable suffering) (Berking et al., 2011; Bradley et al., 1992; Crowell et al., 2009; Dimeff et al., 2023; Khantzian, 1997; Kushner et al., 1990). Additionally, there was overlap between DBT and SUD treatment strategies such as reality acceptance (akin to 12-step program’s Serenity Prayer and asking to accept where the person is) and validation (motivational interviewing) (Miller & Rollnick, 2002; Rollnick & Miller, 1995), as well as contingency management and other CBT oriented approaches. Furthermore, since research indicated that DBT was effective in treating impulsive behaviors, such as suicidal behaviors, it was posited that DBT would be able to be adapted to also address substance use behaviors in the context of impulsivity (Koons et al., 2001; Linehan et al., 1991). It was one of the first treatments of its kind as an integrated approach that concurrently targeted symptoms of BPD and SUDs.

### ***DBT-SUD Overview***

DBT-SUD is an integrative approach to comorbid BPD and SUD that concurrently targets both disorders rather than focusing on disorders in a sequential manner (Bedics, 2020; Dimeff et al., 2023; Salsman, 2020). The goals, as is with comprehensive DBT, are to decrease target behaviors (e.g., LTBs, TIBs, and QOLs), as well as increase more helpful, values-driven behavior (e.g., utilizing more skills in the face of distress) to move towards a life they view as worth living. As opposed to comprehensive DBT, DBT-SUD places a heavier emphasis on the SUD behaviors and any tangential problems.

The framework of comprehensive DBT remained the same, which meant the principles, strategies, and the four modes of treatment were not altered. Instead, Linehan and colleagues

focused on what could be added or adapted to better address the needs of those with BPD and SUD. The following areas were either adapted or added based on empirical research from the SUD and emotion dysregulation fields: 1) incorporating, adapting, and synthesizing principles and interventions from the leading SUD treatments at the time (e.g., abstinence from 12-step programs); 2) integrated research backed SUD treatment practices (e.g., toxicology screens and opioid agonist therapy for someone with opioid use disorder (OUD)); 3) created and applied specific DBT-SUD skills to help with skills deficits seen within this population (e.g., DCBA skills); and 4) adapted DBT attachment strategies to specifically target clinical challenges and barriers common among this population (e.g., getting clients to return to treatment).

While the five functions of DBT remained the same in DBT-SUD, given the challenges that therapists face when working with these clients (e.g., missing sessions, lack of attachment between therapist and client), the functions had specific focuses when keeping BPD and SUD clients in mind.

**Enhancing Client Capabilities.** To increase client capabilities, Linehan added in new DBT skills specific to substance use (“DCBA” skills) and synthesized two seemingly opposing prominent substance use treatment approaches at the time to frame recovery in SUDs for therapists and clients (Linehan, 2015a, 2015b; Salsman, 2020). The “D” in the DCBA skills stands for Dialectical Abstinence, which is the synthesis of abstinence-based and harm-reduction based SUD treatment approaches. On their own, each of these treatments have strengths and weaknesses; dialectical abstinence pulls on the strength of each program, while leaving out the areas of weakness to ensure greater client growth. Specifically, abstinence-based approaches in SUDs (e.g., 12-step programs) work well at getting clients to achieve lengthier periods without using substances, and harm-reduction approaches are adept at helping clients get back to non-use

after a slip or a lapse. On the other hand, abstinence-based approaches also tended to lead clients to relapsing fully into the SUD, oftentimes cued by high amounts around shame or guilt from having a lapse (e.g., black-and-white thinking). The weakness that Linehan saw with harm-reduction approaches was the difficulty in getting clients to achieve abstinence from substances (e.g., not enough of a push or clear path to move fully into abstinence). As such, the synthesis of the two approaches occurs with Dialectical Abstinence by committing to complete abstinence on one hand, and on the other, committing to complete acceptance that a slip or relapse may occur as a part of the recovery process and can be a learning experience.

Clear Mind, Community Reinforcement (e.g., building contingencies within your life that reward abstinence), Burning Bridges (e.g., slamming the door on relationships that centered on substance use), Building Bridges (e.g., replacing cues that trigger substance use with new cues for recovery that are typically sensory based), Alternate Rebellion (e.g., practicing non-destructive and values-centered behaviors that allow for the desire to shock or break the rules), and Adaptive Denial (e.g., mitigating the distress associated with moving towards abstinence by purposefully telling yourself falsehoods such as needing to get through just one more day) are the remaining DBCA skills that help enhance client capabilities within DBT-SUD (Linehan, 2015a, 2015b).

**Enhancing Client Motivation.** A common problem that occurs within co-occurring BPD and SUD populations is butterfly attachment, which refers to the pattern of coming in and out of treatment frequently and showing little to no desire to form a bond with the clinician, which is starkly contrasted to what is typically since in non-SUD BPD populations. This can lead to problems with treatment adherence and retention, which decreases the dose of treatment received and leads to poorer outcomes. Given this, DBT-SUD utilizes specific attachment strategies (e.g.,

increased contact between sessions via scheduled phone check-ins; getting family involved and committed to finding the client if they are missing; etc.) and contingency management (e.g., shorter session times as a reward for attending session) to increase client motivation and ultimately increase adherence and retention.

**Generalizing to the Environment.** Clients in DBT-SUD are expected to practice their skills even when they are using to ensure that skills generalization occurs to these highly relevant and risky environments outside of session (Linehan et al., 1999).

**Structuring the Environment.** Given that those with co-occurring BPD and SUD often face chaos in their lives outside of session (e.g., unhoused, unemployment), DBT-SUD emphasizes the importance of utilizing case management strategies with these clients. Therapists and case managers focus on restructuring the environment in order to reduce the client's contact with cues for substance use.

**Enhancing Clinician Capabilities and Motivation.** Therapists who deliver DBT-SUD work with clients that can often engage in butterfly attachment behaviors, which can be tiring and demoralizing for the therapist. As such, DBT-SUD places emphasis on the consultation team to help enhance the clinician's capabilities and motivation to deliver treatment. They do this through cheerleading, reinforcement, and validation on the consultation team.

## **Empirical Evidence for DBT and DBT-SUD**

### ***DBT and DBT-SUD for Co-occurring SUDs and BPD***

Overall, research has supported DBT and DBT-SUD's efficacy for SUDs amongst those with comorbid BPD. This support has been seen through several RCTs, uncontrolled, and quasi-experimental studies conducted with DBT and DBT-SUD (Axelrod, 2018; Dimeff et al., 2023; Salsman, 2020).

## ***RCTs***

The first RCT looking at DBT-SUD was conducted at the University of Washington and aimed to compare the efficacy of DBT-SUD and community-based treatment-as-usual (TAU) (Linehan et al., 1999). The study included 28 female participants who met criteria for BPD and as well as being dependent on a substance (often engaging in polysubstance use). Of the participants, 74% of them met criteria for a SUD. Alcohol (52%) and cocaine (58%) were the two primary substances of choice among the participants. The participants were randomized into either one year of DBT-SUD (n = 12) or the TAU group (n = 16). Findings indicated that DBT-SUD performed better than TAU in several ways. First, those in DBT-SUD were less like to dropout than those in TAU (36% dropout vs. 73%) and had a higher retention rate (64% vs. 27%). Second, those in DBT-SUD had significantly less positive drug screens throughout treatment and the four-month follow up period following treatment. Related to this, the analyses indicated that those in the DBT-SUD condition who had therapists with higher treatment adherence ratings did significantly better with regards to urinalysis outcomes than therapists with non-high adherence ratings. This finding may suggest that something about the DBT-SUD treatment, when delivered with adherence, increases the likelihood of decreased substance use behavior. Finally, those who received DBT-SUD also had overall greater social and global functioning following treatment. These findings suggest that DBT-SUD not only targets substance use behaviors, but also other behaviors related to pervasive emotion dysregulation.

The next RCT looking at the efficacy of DBT-SUD was also conducted at the University of Washington (Linehan et al., 2002). The study included 23 females who met criteria for BPD and a primary SUD diagnosis of opioid dependence. This second RCT of DBT-SUD utilized a more rigorous comparison group than the first RCT to decrease threats to internal validity, such

as length of time engaged in treatment: comprehensive validation therapy with 12-step intervention (CVT + 12S). Participants were randomized into DBT-SUD ( $n = 11$ ) or the comparison group CVT + 12S ( $n = 12$ ). All participants receiving psychosocial treatment also were given the opiate agonist LAAM through treatment year. Both groups had significant reductions in opiate use when looking from baseline to the end of the treatment. However, compared to those in the those in the CVT + 12S arm, the DBT-SUD arm had significantly larger reductions of opiate use during the last four months of the active treatment year. In fact, those in the CVT + 12S arm had more positive urinalyses during the last four months as compared to the DBT-SUD arm. The CVT + 12S condition did have a smaller dropout rate than the DBT-SUD arm (0% vs. 36%). In conjunction, these findings may suggest that 1) validation is an important component for treatment retention, particularly among those with BPD and SUD, and 2) while DBT-SUD may perform just as well as CVT + 12S, it may have better longer-term effects.

An RCT conducted out of a lab from the Netherlands aimed to see if comprehensive DBT could treat females diagnosed with BPD, some of whom engaged in substance use (Verheul et al., 2003). Among the 58 female participants, 58% met criteria for engaging in substance abuse on the Addiction Severity Index (ASI) (Kokkevi & Hartgers, 2009). Participants were randomized to one year of TAU or one year of DBT. Notably, this study utilized comprehensive DBT and did not include the adaptations to DBT for those with SUDs (e.g., strategies, skills). Results from the follow-up data that was collected six months post-treatment intervention showed that DBT was more effective than TAU at decreasing frequency of non-suicidal self-injurious (NSSI) behaviors, impulsive behaviors, and alcohol use. However, no differences between DBT and TAU were found on substances other than alcohol. McMain et al. (2004) also conducted an RCT of DBT-SUD where DBT-SUD was compared to TAU. The study

randomized 27 females who met criteria for a SUD and BPD into one of the two treatment arms. Findings indicated that DBT-SUD was more effective than TAU in terms of alcohol use reduction. There was a notable decrease in alcohol severity scores among those in the DBT-SUD arm; furthermore, alcohol use behaviors did not change for those in the TAU arm. However, overall DBT-SUD did not perform better than TAU in the reduction of other substance use. These findings, along with those of Verheul et al. (2003), may indicate that DBT and DBT-SUD may be equivalent in terms of efficacy to standard SUD treatments for reducing substance use behaviors. Notably, these two studies also suggest that DBT and DBT-SUD, while equivalent to other SUD treatments, may provide more improvement to other behavioral problems seen in those with BPD (e.g., decreased NSSI behaviors, decreased impulsivity). Linehan et al. (2009) found similar results as these previous two RCTs when conducting a multisite RCT comparing DBT-SUD to individual and group drug counseling (IGDC). That study recruited 125 participants who met criteria for both BPD and a co-occurring OUD. All participants received opiate replacement medication (buprenorphine-naloxone) in conjunction with the treatment they were randomized to. Results from this study found that both treatments led to reduced rates of opiate and cocaine use during and after the study (Dimeff et al., 2023). Furthermore, DBT-SUD led to a significant reduction in rates of depression and anxiety as compared to IGDC. Findings from this and previously mentioned RCTs may indicate that while DBT-SUD's effectiveness is like that of other gold-standard substance use treatments, it may be more effective at treating SUDs and other co-occurring mental health disorders simultaneously (rather than in parallel through distinct treatments occurring at the same time or sequentially).

Comprehensive DBT that does not target SUDs specifically has also been shown to be highly effective at reducing a person's diagnostic status for SUDs and AUDs (Dimeff et al.,

2023; Harned et al., 2008). A secondary data analysis from an RCT looking at utilizing DBT for suicidal women who met criteria for BPD found that nearly 88% of those who met criteria for a SUD at baseline and were randomized into the DBT group were fully remitted of this SUD diagnosis (Harned et al., 2008). Furthermore, the secondary data analysis found that those in the DBT arm were two and a half times more likely to reach full remission from a SUD than those in the comparison arm.

### ***Uncontrolled and Quasiexperimental Trials***

Overall, studies involving uncontrolled and quasiexperimental trials of comprehensive DBT have shown it to be effective with regards to substance use outcomes, as well as other behavioral and research outcomes (e.g., decreased suicide and self-harm attempts; higher retention rates). For example, Axelrod et al. (2011) analyzed the data of 27 females diagnosed with BPD and a SUD who were enrolled in 20 weeks of DBT in an academic community outpatient SUD treatment program. Findings showed that participants had significant decreases in substance use from baseline to after treatment ended. A study conducted in Egypt looked at DBT versus TAU for 40 males and females who were diagnosed with BPD and a SUD (Abdelkarim et al., 2017). This study was nonrandomized and lasted for one year. Results indicated that those in the DBT arm had higher retention rates, abstained from alcohol and other substances for longer durations, and had significantly lower doses of drugs used as compared to the TAU arm. Furthermore, those in the DBT arm also had significantly better improvements on other behavior that continued through the 4-month follow-up. Such behaviors included decreased suicide attempts, instances of self-injury, and frequency of hospital admissions and emergency department visits. The DBT arm also had significant improvements in emotion regulation.

## ***Summary***

Overall, research across various formats has supported the efficacy of DBT and DBT-SUD among those with SUDs and BPD. However, DBT and DBT-SUD may not be superior to other SUD treatments; instead, DBT and DBT-SUD seem to be comparable to other SUD treatments in terms of SUD outcomes. The research may indicate that DBT and DBT-SUD might be superior to other SUD treatments in how it can simultaneously target other mental health outcomes as well as substance use outcomes.

## **DBT and DBT-SUD for Co-Occurring SUDs and Other Mental Health Disorders**

Despite the high rates of comorbid SUDs and other mental health disorders and significant need for effective treatments, little research has focused on utilizing DBT-SUD for this population. Some preliminary research suggests that DBT-SUD may be superior at treating these co-occurring disorders as compared to TAU (Axelrod, 2018; Courbasson et al., 2012). One RCT compared DBT-SUD with TAU for individuals with co-occurring SUDs and eating disorders (ED) (Courbasson et al., 2012). Twenty-five female participants were randomized into either the DBT-SUD arm or the TAU arm. Those randomized into the TAU arm experienced worsening of both ED and SUD symptoms. This, along with the significantly better treatment retention rates in the DBT-SUD arm, prompted the study team to terminate recruitment for the TAU arm early. Participants in the DBT-SUD arm also had significant decreases in ED symptoms and substance use (excluding alcohol use).

This lack of literature on DBT-SUD among such a high risk and large population is a significant gap in the field's literature. While DBT-SUD may not be best suited for those who only meet criteria for a SUD, it may offer a much-needed treatment for those with SUDs and

other co-occurring disorders that have pervasive emotion dysregulation as a core feature of the disorders' etiologies and maintenance (e.g., eating disorders, PTSD).

### **Mechanisms of Change for DBT-SUD**

Mechanisms of change offer us understanding into how and why an intervention works (Kazdin, 2009). For example, when we can identify the mechanisms of change for an intervention, we can utilize that knowledge to help bolster what is effective and ensure we do not continue to bring in pieces that may take away from the mechanism's potency (Mehlum, 2021). As such, identifying the mechanism(s) of change within interventions seem paramount to being able to truly understand what is occurring within the therapy space and to help therapists deliver more impactful and targeted treatment.

While some research has investigated possible mechanisms of change for comprehensive DBT, the literature is not robust. Furthermore, studies focus predominantly on female adult samples, so the generalizability of the identified mechanisms of change comes into question (e.g., with different ages, racial/ethnic groups, gender identity). What has been identified as potential mechanisms of change for comprehensive DBT in these samples includes increased ability to regulate emotions (Axelrod et al., 2011; Linehan, 1993; McMMain et al., 2018), utilization of DBT-skills (Linehan et al., 2015; Neacsiu et al., 2012; O'Toole et al., 2012), and favorable therapeutic alliances (Bedics et al., 2012; Carson-Wong et al., 2018; Shearin & Linehan, 1994; Uliaszek et al., 2018).

Only one study, to our knowledge, looked at mechanisms of change for DBT-SUD and found that increased emotion regulation may be a mechanism of change for the treatment (Axelrod et al., 2011). The study analyzed the data of 27 female participants who were diagnosed with BPD and a SUD and received 20 weeks of DBT in an academic community outpatient SUD

treatment program. Substance use was the primary quality of life target among these participants. The researchers found that when emotion regulation improved, it partially accounted for the decrease in regularity of substance use. There were limitations with this study and its finding. First, the study was a single arm trial and as such, we cannot attribute increased emotion regulation to DBT-SUD specifically. Additionally, the sample size consisted of only female participants which limits how generalizable these findings are.

### **Summary**

In response to the high comorbidity seen between BPD and SUDs, as well as the elevated severity and lethality among this population, Linehan and colleagues updated comprehensive DBT to create DBT-SUD (Dimeff & Linehan, 2008; Linehan et al., 1999). DBT-SUD addresses patterns of behavior typically seen in those with SUDs (e.g., lying, high dropout rate, lack of skill to cope with emotion dysregulation) from a DBT lens (e.g., balance of acceptance and change; stylistic strategies to increase motivation and attendance; teach skills specific to substance use behaviors) to move clients towards behavior change. A significant amount of literature now exists that indicates comprehensive DBT and DBT-SUD are efficacious in the treatment of comorbid BPD and SUD, and it indicates that DBT and DBT-SUD perform better than or as well as other standard SUD treatments for substance use outcomes.

While the literature on DBT and DBT-SUD for comorbid SUD and BPD is now substantial, the literature on DBT-SUD for co-morbid SUD and other mental health disorders is sparse. What has been conducted has shed some light on the potential superiority of DBT-SUD in the treatment of comorbid SUD and mental health disorders that are both marked by pervasive emotion dysregulation (e.g., eating disorders, PTSD). Given the lack of literature on this topic, it is not surprising that there is also a gap in literature looking at the mechanisms of change for

DBT-SUD. Understanding mechanisms of change for interventions is imperative to be able to further streamline and target interventions while not adding on unnecessary components that may dilute the potency of the drivers of change. The current study aimed to address these gaps by identifying and testing potential mechanisms of change in DBT-SUD for individuals with co-occurring OUD and BPD (Grant Number: R01 DA014997) using an exploratory, sequential mixed methods design.

### **Chapter 3: Phase 1 - Qualitative Analyses and Hypothesis Generation**

#### **Phase 1 Introduction**

Phase 1 consisted of qualitative analyses to identify themes related to processes of substance use behavior change. Because of the complexity of DBT-SUD and the complex difficulties faced by people with severe co-occurring emotion dysregulation and SUD, the study utilized qualitative methods to attempt to capture the nuanced and contextually embedded processes that are not easily observable via quantitative assessment alone. From the systematic exploration of videotapes of therapy sessions across a course of DBT-SUD, this phase aimed to elicit emerging patterns of therapeutic processes, including emotion regulation, dialectical thinking, and the therapeutic alliance as it related to substance use behavior change. The identified themes then directly informed the construction of testable hypotheses for the second phase of this project. The following chapter presents the qualitative methodology, including the data sources, coding procedures, and analytic strategies used to identify key themes. Key themes are discussed and hypotheses generated from the key themes are presented.

## **Phase 1 Methods**

### ***Study Design and Rationale***

Phase 1 utilized a traditional ethnographic approach to explore potential mechanisms of substance use change in DBT-SUD. Rooted in anthropological methods, ethnography involves the systematic observation and interpretation of human behavior within its natural context. Within clinical research, traditional ethnographic methods have been increasingly applied to better understand the lived experiences of clients and the interpersonal dynamics that unfold within therapeutic settings (Tufford & Newman, 2012). In this study, this methodology allowed for an in-depth examination of therapy process through direct engagement with videotaped sessions, offering a rich insight within the therapy relationship and processes to gain perspective on how DBT and DBT-SUD strategies may support change in clients with co-occurring substance use and pervasive emotion dysregulation. The decision to use a traditional ethnographic framework was guided by the complexity of the clinical population and the treatment modality. DBT-SUD is a complex, principle-based therapy with many factors at play in any given moment (e.g., skills acquisition and generalization, DBT stylistic strategies, transactional nature of therapeutic relationship). Capturing how these factors interact over time and impact substance use requires a methodology capable of attending to both explicit interventions and the more subtle interpersonal and emotional shifts that occur during sessions. The use of ethnographic coding allowed for the integration of both theory-driven and emergent insights. This, in turn, allowed for the identification of nuanced psychological processes, such as shifts in emotion regulation or changes in cognitive rigidity, or that may serve as signals of treatment response.

This methodological approach was well suited to the exploratory focus of Phase 1 to illuminate client-therapist interactions and emerging client perspectives in a natural way. Instead of starting with predetermined hypotheses, the ethnographic approach prioritized a process of data immersion and inductive discovery to develop clinically relevant and theoretically grounded hypotheses to be tested in the subsequent quantitative phase.

### ***Participants and Sampling***

**Parent Study.** The current study used baseline data and therapist-client session recordings collected from a larger randomized controlled trial (RCT) that evaluated DBT-SUD compared to individual and group drug counseling (IGDC) among participants with BPD and OUDs ( $N = 125$ ) (Grant Number: R01 DA014997). Participants were recruited across two study sites: the University of Washington in Seattle, WA and Duke University in Durham, NC. The study randomized participants into one of two study arms ( $n = 62$  DBT-SUD;  $n = 63$  IGDC). To be eligible, participants met the following criteria: screen positive for a current substance dependence disorder for opiates, meet criteria for BPD, and be between the ages of 18 and 60 years old. Participants were excluded from the study if they were pregnant, intended to become pregnant, or were unable to tolerate taking opiate-replacement medication. Additional exclusion criteria included a current diagnosis of schizophrenia, schizoaffective disorder, bipolar disorder, or psychotic disorder not otherwise specified; seizure disorder; court-mandated treatment; cognitive delays or disabilities; other conditions requiring primary treatment (e.g., life-threatening anorexia); or other circumstances that could hinder participation in treatment (e.g., impending incarceration).

**Principles for Sample Size in the Current Study.** Qualitative research has traditionally lacked a set of standards to guide researchers on the appropriate and adequate sample size for

their studies. Unlike quantitative research which traditionally is guided by power calculations, qualitative research does not have a formula or set of principles that provides a specific  $N$  for qualitative studies. Oftentimes, reviews of qualitative research remark on the low transparency for how researchers came to their sample sizes (Carlsen & Glenton, 2011; Mason, 2010). Researchers claim to have reached saturation without describing the processes to obtain saturation or how they knew they reached saturation. Saturation was developed for a specific qualitative analysis approach called Grounded Theory (GT) (Glaser & Strauss, 2010) where the sample size is dictated by if new observations (e.g., themes, patterns) are noticed during analysis of the data. If new observations are found when coding data, then saturation has not been reached, and more participants are added. However, if no new observations are found, then saturation has been achieved. Saturation has been applied liberally to non-GT analyses without explanation as to how this GT-specific concept can be arcuately applied to justify the number of participants in a study.

To address this methodological flaw, Malterud et al. (2016) presented the idea of using information power. This concept focuses on shared methodological concepts for the estimation of adequate data size, such as an adequate number of interviews, focus groups, or participants. The larger the information power the sample has (e.g., the richer the interview), the lower amount ( $N$ ) will be needed. This guiding concept recognizes the importance of an approximation of a sample when proposing studies, while also emphasizing that the final sample size will be an iterative process throughout the study. Information power is impacted by five items and their associated domains, which then influence the sample size needed. The items include study aim(s), sample specificity, use of established theory, quality of dialogue, and analysis strategy. If items are lacking specificity, then the sample size will need to be larger to capture the necessary

information for analyses. However, if items are more specific, then the necessary sample size will be smaller. When reflecting on the items and identifying a sample size, it is important to think about where on the domain's spectrum does the study's item land. If a study has broader aims, the data collected has sparse specificity (e.g., general questions rather than targeted questions), is not based on theory, the sample's dialogue quality is weak, and the analyses cuts across cases rather than remaining case specific, the information power of the study will be lower. This indicates a larger sample size is required. In contrast, if a study has narrow aims, densely collected data, driven by theory, strong dialogue, and the analyses is case specific, the information power study will be higher and thus, a smaller sample size is required. See Figure 1 for a visual depiction of information power.

**Current Study.** To estimate and justify the qualitative sample size, the current study applied the principle of information power (Malterud et al., 2016). The current study had high information power due to its narrow aims (identifying mechanisms of substance use change in DBT-SUD), dense and specific coding guided by applied theory, high-quality in-session dialogue, and a case-based analysis strategy. A subset of participants from the DBT-SUD arm of the parent study ( $N = 62$ ) was considered, and two high-engaging participants were ultimately selected for analysis (current study  $n = 2$ ). High engagers were defined as individuals who completed the full treatment year and had over 70% of their therapy sessions available for coding. Information power was used iteratively throughout Phase 1 of the study. The initial proposal estimated that one participant would be sufficient for an in-depth investigation, but ongoing team discussions identified a second high engager whose inclusion strengthened the analytic completeness. Purposeful sampling of high engaging participants and high information

power together enabled a rich, focused analysis of within-case mechanisms of change. See Figure 2 for the current study's consort diagram.

### ***Data Sources***

Phase 1 data consisted of videotaped individual therapy sessions from the parent RCT on DBT-SUD. All sessions were conducted at the Behavioral Research and Therapy Clinics at the University of Washington, a training-based outpatient clinic that served a diverse adult population with complex clinical presentations. Participants included in this qualitative analysis were enrolled in the DBT-SUD treatment arm of the parent study and consented to have their sessions recorded for research purposes. Two participants were identified for in-depth coding based on their completion of the treatment year, high session attendance, and availability of session recordings. For the first participant, all 51 available individual therapy sessions were reviewed and coded, providing a comprehensive view of the participant's experience, changes in substance use behaviors, and overall clinical processes over the course of treatment year. For the second participant, 30 of 47 available sessions were reviewed and coded. Guided by both information power analysis and team discussions, it was determined that not all 47 sessions required coding as new themes were not emerging. Coded sessions for this participant were distributed across the treatment year, to ensure all relevant behaviors were captured. This approach still captured a longitudinal examination of therapeutic processes and change mechanisms over time. These recordings served as the primary data source for the traditional ethnographic analysis conducted in this phase.

### ***Coding Procedures***

Coding was conducted using a traditional ethnographic assessment (TEA) approach, which emphasizes sustained, immersive engagement with the data to facilitate the discovery of

meaningful patterns over time. Atlas.ti software was used to manage, annotate, and organize the video recordings of individual therapy sessions (Friese, 2018). Codes were developed and documented in a “codebook” using both deductive and inductive strategies (Elo & Kyngäs, 2008). Deductive codes were derived from established literature on DBT and substance use treatment and included constructs such as emotion regulation skills, biosocial theory, and therapeutic alliance (Axelrod et al., 2011). Inductive codes emerged directly from the session data. The behaviors that received inductive codes were observed repeatedly both within and across sessions. Examples include codes such as therapist warmth, self-efficacy, self-confidence, and willingness to experience emotions. Subcodes were created to capture finer distinctions within broader categories (e.g., levels of validation strategies). The codebook was updated throughout the analysis to ensure comprehensive representation of observable clinical processes and to accommodate the evolving understanding of mechanisms of substance use change.

Consistent with TEA methodology, each session was first viewed in its entirety with minimal notetaking, allowing for an open, uninterrupted orientation to the therapeutic material. During the second viewing, the coder re-watched each session, pausing to annotate meaningful segments and apply initial codes within Atlas.ti. Administrative and coding time were tracked for each session to document the iterative and time-intensive nature of the work.

### ***Data Analysis***

Following the coding process, data were analyzed using thematic analysis, a flexible and rigorous method for identifying, analyzing, and interpreting patterns across qualitative datasets (Braun & Clarke, 2006). The goal was to distill coded material into meaningful themes that highlighted how reductions in substance use may occur within DBT-SUD. Themes were developed through an iterative process of reviewing codes, examining their contextual placement

within sessions, and grouping related content under higher-order conceptual categories. Thematic development was grounded both in emerging insights from the data and in theoretical constructs drawn from the DBT and substance use treatment literature. The analytic process paid close attention to the timing, tone, and interpersonal nature of client-therapist interactions. Several themes identified through this process appeared to reflect potential mechanisms of change with regards to reduction in opioid use within DBT-SUD. In addition to their descriptive function, these themes played an integral role in the broader study design by informing the development of formal hypotheses for the quantitative phase. Specifically, the findings from this qualitative analysis guided the selection of candidate mediators to be tested in longitudinal path models in Phase 2.

### ***Aim 1b Rationale and Procedures***

**Two Ethnographic Analysis Approaches.** Ethnographic assessment, a qualitative research method rooted in anthropology, emphasizes a detailed, immersive analysis of a particular cultural or social context. This study not only utilized TEA as described previously, but also rapid ethnographic assessment (REA), to begin to compare the two methodological approaches. Traditional ethnographic approaches involve extensive fieldwork, typically lasting several months or even years, where researchers gather and analyze rich data through participant observation, interviews, and video recordings (Spradley, 2016). TEA, while a gold standard for qualitative methodology for obtaining detailed, contextualized insights into social phenomena, can be resource-intensive, both in terms of time and effort. It often requires a long period of engagement with the study subjects and the environment, which can be impractical in some research settings or when quick results are imperative (Ritchie et al., 2013). REA offers a more streamlined and efficient alternative to traditional ethnography. REA is designed to capture the

essential elements of a social context within a shortened timeframe. This approach is useful when researchers need to conduct assessments quickly without sacrificing the depth of qualitative analysis. While it does not involve the extensive immersion of traditional ethnography, REA condenses the process by engaging with fewer data sources and shortening the duration of fieldwork while still aiming to generate rich, contextual understanding (Johnson et al., 2017; Vindrola-Padros & Vindrola-Padros, 2018).

REA has been shown to be effective in providing valuable insights into complex social systems in a shortened timeframe. It is often used in settings where rapid decision-making is needed (e.g., clinical settings). The rapid approach can also be paired with other techniques (e.g., structured interviews and pre-existing data) to help guide the analysis and ensure that the findings remain robust and relevant (Ritchie et al., 2013). For psychologists working in community-based clinics, residential programs, or integrated care teams, REA may offer a pragmatic alternative to TEA that still attends to the social, cultural, and environmental factors influencing outcomes. In high-risk clinical populations, such as those experiencing co-occurring SUDs and other serious mental health disorders, the ability to quickly identify systemic barriers or gaps in care may be critical for efficiently improving safety and continuity of care. However, while it has been implemented readily in other disciplines so far, it has not yet been implemented in a significant way within Clinical Psychology. This offered an opportunity to investigate a potentially more efficient way of analyzing and disseminating information. As such, a subaim of this study was to compare TEA and REA to see whether consensus on codes and themes could be reached.

**Coding: Rapid Ethnographic Assessment Analysis.** Coding consisted of one identified DBT-SUD participant. This participant was one of the participants that was coded via TEA,

specifically the participant for whom every session was coded, in order for the team to ensure findings were in line with the available theory (e.g., deductive codes), as well as allowing the data to provide answers (e.g., inductive coding). In line with the more efficient nature of REA, the assessment team discussed which videos to select for coding. To capture the entire treatment year, therapy sessions were selected at an even distribution throughout the twelve months. During team discussions and coding debriefs, check ins were held among the team to see if additional videos from the identified participants were needed. The REA coder coded 11 of the available 51 therapy sessions. Coding consisted of watching the session one time through while concurrently taking memoing notes. During memoing, the REA coder listened and watched for possible themes related to reduction in substance use occurring over therapy sessions. The REA coder then selected specific moments in the sessions to code that supported these themes. All coding occurred in Atlas.ti. Time to complete memoing and coding, including administrative tasks, was recorded for each session.

## **Phase 1 Results**

### ***Overview of Emergent Themes***

Thematic analysis of coded therapy sessions revealed four key themes. These themes represent psychological and interpersonal processes that may contribute to reduced substance use during DBT-SUD treatment. The four emergent themes included:

*Theme 1: Willing to Feel, Ready to Regulate - Reducing Emotional Avoidance to Enhance Emotion Regulation and Opioid Use Reduction*

*Theme 2: Trust Enough to Try - Trust in the Therapeutic Relationship Transforming Emotional Ambivalence and Enabling Emotion Regulation and Opioid Use Reduction*

*Theme 3: Becoming Your Own Ally - Increased Self-Validation Leading to Changes in Self-Respect and Self-Efficacy to Aid in Opioid Use Reduction*

*Theme 4: Finding the Middle Path - Dialectics Enhancing Cognitive and Emotional Flexibility and Promoting Opioid Use Reduction*

Table 1 provides a summary of each theme and its observed and hypothesized contribution to opioid use reduction. These themes were apparent in both participants and were consistently observed across multiple sessions. The presence of these themes across time offered insights into how DBT-SUD may support meaningful change in substance use behaviors for complex, high risk clients. The following sections describe each theme in detail, with illustrative quotations and examples from therapy sessions. Rather than a strict linear sequence, the organization of themes here reflects a loose progression observed over the treatment year from early efforts to regulate emotion and build trust, to later developments in self-efficacy and dialectical thinking.

***Theme 1: Willing to Feel, Ready to Regulate - Reducing Emotional Avoidance to Enhance Emotion Regulation and Opioid Use Reduction***

A key theme that emerged was participants moving away from the urges and typical behavioral patterns of suppressing, avoiding, or escaping from painful internal experiences. This then seemed to help participants increase their ability and willingness to experience pleasant and unpleasant emotions. As participants became more willing to experience and tolerate distressing emotions, they were increasingly able to apply emotion regulation skills effectively, particularly in the face of urges and cravings.

*T: Do you feel guilty?*

*C: Yeah. I feel bad. I feel bad about things.*

*T: I am going to have you put your hands down and just let it be. It's hard to do.*

*C: Yeah it is...*

*T: A lot of this is guilt.*

*C: Yeah I think so. The kids ya know...*

*T: Just let it be...try not to squash it. [T holds silence for several moments.] ...So feeling sad about the kid situation?*

*C: ...and for him...because I don't know...*

*[C does not push emotion away. Proceeds to sit with guilt and sadness for several minutes. C cries.]*

*C: The drug urge was that I had valium [on me] and I wanted to take it. But I didn't!*

*T: I'm glad you didn't!*

*C: Right? I noticed how my body got tense, and I felt like my skin was crawling. I was having a lot of intense anxiety and overwhelm. I just let myself notice that and the urges and eventually they went away!*

*T: How mindful of you! Really!*

This behavioral shift meant participants were less reliant on substances when painful emotions arose and instead, described learning to observe these experiences nonjudgmentally and respond with skills such as opposite action, problem solving, adaptive denial, checking the facts, or self-soothing (Linehan, 1993, 2015a). This shift reflected an increase in their ability to tolerate emotional discomfort and was a turning point in how they responded to internal distress. This theme informed the first hypothesis of the quantitative arm of the study:

*Hypothesis 1: The effect of experiential avoidance on changes in positive opioid use will be mediated by ambivalence about emotional experience and emotion dysregulation.*

### ***Theme 2: Trust Enough to Try - Trust in the Therapeutic Relationship Transforming Emotional Ambivalence and Enabling Emotion Regulation and Opioid Use Reduction***

Another prominent theme that emerged through qualitative analysis of session data was the role of the therapeutic alliance in facilitating emotional risk-taking (the risk of feeling a distressing emotion) and the application of DBT skills. Across coded sessions, trust in the therapist appeared to help clients be able to tolerate distressing emotions, receive feedback, and remain engaged in the therapeutic process.

*T: [Said with extreme warmth]...I want you to know my dear, when you use no drugs, have no suicide attempt, and are not engaging in therapy interfering behaviors, then you are in total control [of the agenda]!*

*T: ....I find myself vicariously getting irritated for you...*

*T: I hear that you are being stepped on. Being not appreciated.*

*C: Yes!*

*T: ...I would consider being a drug addict harder than almost anything...and you're on your way out [of addiction], LOOK AT YOU!*

This alliance was characterized by consistent interpersonal, transactional features that clients appeared to experience as central to their emotional engagement in treatment: nonjudgmental stance, honest yet matter-of-fact communication, and various levels of validation. These highly interpersonal strategies are core to DBT and emphasize the importance of dialectical balance between acceptance and change (Linehan, 1993). Trust developed quickly in the early stages of treatment between therapist and client, a testament to the DBT commitment strategies. What also was evident was though was how the trust significantly deepened over the course of the treatment year. This trust was shaped by the therapist's consistent openness and warmth. In turn, this created a non-stigmatizing environment, which is crucial for a SUD population where ineffectively high levels of shame typically are a barrier to engaging in long-term treatment. As clients came to believe that their therapist would meet them with both honesty and compassion, they appeared increasingly open to receiving feedback, experiencing emotions, and applying a variety of DBT skills. What was notable as this connection grew was clients' willingness to lean more into emotion regulation and mindfulness skills in the face of highly distressing, strong emotions and urges for use. The development of therapeutic alliance appeared

to function as a key process by which participants moved from emotional avoidance to increased engagement with core DBT skills. While it was clear therapeutic alliance played a central role in allowing for clients to have emotions and then utilize skillful means, it was less clear if the alliance earlier on or further into treatment was more influential. As such, this theme informed two study hypotheses:

*Hypothesis 2: The effect of early therapeutic alliance on changes in positive opioid use will be mediated by ambivalence about emotional experience and emotion dysregulation.*

*Hypothesis 3: The effect of emotional ambivalence on changes in positive opioid use will be mediated by sustained therapeutic alliance over time.*

### ***Theme 3: Becoming Your Own Ally - Increased Self-Validation Leading to Changes in Self-Respect and Self-Efficacy to Aid in Opioid Use Reduction***

A third theme that emerged from the coded sessions was the gradual development of being able to self-validate. As participants began to acknowledge their emotional experiences without judgment and respond with compassion and understanding rather than self-judgment, participants began to view themselves differently. Over time, this practice of self-validation appeared to create a growing sense of self-respect as participants began to see themselves as worthy of care, capable of change, and no longer defined by shame or past behaviors. This emerging self-respect seemed to lay the foundation for increased confidence in their ability to act skillfully even in the face of difficult situations.

*T: ...So if we get down to the very core of it, it's hurt, right?*

*C: Yeah...*

*T: That's really hurtful! [holds silence] ....I want to hear you describe it to yourself. Why does this make sense?*

*C: ...Because he is saying hurtful things to me and expects me to make big life decisions when he does not prioritize me.*

*T: Yes! That's self-validation.*

*C: ...I used to think if I cry about it, that would be bad...but now it is not an issue anymore. It is ok to cry and it is ok to feel sad. It makes sense why I am sad!*  
*T: That is so powerful for your brain to learn!*

Participants described how, by quieting self-critical inner voices and validating their own internal experiences, they developed a stronger, more supportive inner dialogue. Rather than viewing themselves as flawed, participants began to reframe their emotional and behavioral patterns through the lens of the biosocial model, which contextualizes dysregulation as the transaction of biological sensitivity and invalidating environments. This then allowed for increases in self-respect and confidence in being able to regulate emotions and resist the urge to use substances in high-risk moments. The theme shaped the following hypothesis:

*Hypothesis: The effect of self-validation will predict changes in positive opioid use, and this relationship will be mediated by self-respect and self-efficacy.*

Due to data limitations in Phase 2 (the absence of data or proxies for self-validation, self-respect, and self-efficacy), this model could not be tested quantitatively. However, the qualitative data suggest a sequential relationship among these constructs that may be important for recovery.

#### ***Theme 4: Finding the Middle Path - Dialectics Enhancing Flexibility and Promoting Reduction in Opiate Use***

Over the treatment year, participants moved away from rigid, black-and-white beliefs and ways of behaving in life toward a more balanced, dialectical approach. This shift reflects a core principle in DBT as dialectics is the capacity to hold multiple, often seemingly opposing truths at once and to navigate dialectical tensions (Linehan, 1993). More dialectical thinking allowed for

more flexibility and less impulsive responses to distressing situations, such as a slip with substances.

*T: Remember addict mind, where all your decisions are ruled by things like wanting heroin?*

*[C nods.]*

*T: People then can swing over here to clean mind and think nothing will tempt them. That can be dangerous too. Have you been there too?*

*C: Oh yeah, definitely.*

*T: Yeah, many people who struggle with substances swing between those two. Clear Mind is where we want to get people where you acknowledge the past and the dangers associated with it while striving to move forwards in recovery...and it seems like you are there now by taking your suboxone and coming to therapy!*

*C: [C smiles] I am!*

*T: Do you sit and list all these kinds [negative things about self and partner] to yourself?*

*C: Yes...*

*T: Ok, on the one hand it's useful for me to get these kinds of examples and on the other hand just sitting and listing them out is just going to increase the intensity [of emotion] and at some point you'll hit a point where you won't be able to make wise choices or think clearly.*

*C: Yeah that happens...*

*T: So, I want to work on not sitting here and listing them all, but I don't want you to lose the validation from me because, boy, you got it! It's very confusing and hurts your brain!*

*C: YES!*

*T: How wise is it in your deepest gut to make this decision [about the relationship] so quickly?*

*C: Well, I don't know if I have enough to make a decision...*

*T: Ok, so not today?*

*C: Oh...there it is, I was thinking in extremes in the past and I am not doing that so much anymore! Before I thought because I [used], I am a total f\*\*\*-up and so continued to use because what's the point, you know? I know now I may f\*\*\* up so I want to prepare for that...and I still want to not use...*

*T: You're ahead of the game thinking about this stuff...this is exactly how you want to think and eventually you'll get to place where you don't have to think about it!*

This internal shift was not immediate but developed gradually through modeling from the therapist, repeated coaching and practice, and reinforcement across the course of treatment. For

example, when participants started treatment, they were trapped in extreme thinking patterns and beliefs. This often-fueled high intensity of unpleasant emotions, such as shame, and increased risk for ineffective, non-values aligned behaviors, such as relapsing on opiates. Over time and through coaching and reinforcement from the therapist, participants began to apply dialectical thinking to the concept that progress, and setbacks can coexist, and that striving for effectiveness did not require perfection. By learning to find this middle path through dialectics, participants gained access to a “wise mind” perspective which balanced emotion with reason and made room for more adaptive responses. This cognitive and emotional expansion seemed to become a foundation for sustained behavior change and reductions in substance use. The theme shaped the following hypothesis:

*Hypothesis: The effect of dialectical thinking will predict changes in positive opioid use, and this relationship will be mediated by cognitive and emotional flexibility.*

Due to data limitations in Phase 2 (absence of data or proxies for dialectical thinking) this model could not be tested quantitatively. However, the qualitative data suggested a mediated relationship among these constructs that may be important for recovery.

### ***TEA vs. REA***

TEA and REA analysis approaches reached similar conclusions with respect to the main themes of the mechanisms of change in DBT-SUD treatment. With TEA, 81 total videos were coded across two participants. In-depth session by session analysis took approximately 2.5 hours per video to code. When factoring in administrative time to set up to code in the UW Clinic (approximately 0.5hrs/coding session), the approximate time it took to code all 81 videos was 245 hours. For REA, information power and purposeful sampling were utilized to identify a group of 11 videos for coding. Each video took approximately 1.75 hours to code for REA.

When factoring in administrative time to set up to code in the UW Clinic (approximately 0.5hrs/coding session), the approximate time it took to code all 11 videos was 25 hours. Although the analytical intensity and scope were different, the convergence of themes in our findings suggest that REA analysis may be a viable, or reasonable, approach to identify key therapeutic processes in a more time efficient and less resource intensive way. These preliminary findings suggest that REA may offer a more time efficient alternative approach than TEA. However, more research is needed to determine the conditions under which REA results in comparable depth and nuance to TEA.

## **Phase 1 Discussion**

### ***Summary of Key Findings***

The themes that emerged in Phase 1 offer preliminary insight into the interpersonal and intrapersonal processes that may support substance use change in DBT-SUD. Meaningful shifts were observed in the participants coded in this phase. Participants' observable changes over the course of treatment point to recovery as more than behavioral compliance. Instead, it involves shifting how they relate to their emotions, themselves, and others. These shifts tended to arise not from skill use alone, nor solely from the therapeutic relationship, but from the interplay between the two. Through ongoing, reciprocal transactions with their therapists, marked by growing trust, validation, and gentle, yet direct challenging, clients appeared increasingly able to approach their internal experiences with curiosity rather than fear and avoidance behaviors. They began to turn toward emotions they had previously avoided, using DBT skills to manage distress and to make meaning of it. Consistently throughout sessions, these shifts seemed to be made possible through the trust the therapist cultivated with the participant. This then allowed for the participant to focus on internal growth, such as developing the capacity to tolerate discomfort, learning to be

curious about emotions, and responding dialectically and from a values-aligned place. While these findings remain exploratory, they suggest that change in DBT-SUD may be shaped by both interpersonal support and clients' growing capacity to respond to their emotions with flexibility and intention. These themes are discussed again in Chapter 5, where they are considered alongside the quantitative findings from Phase 2.

### *Integration with Existing Literature*

#### **Theme 1: From Avoidance to Willingness, A Foundation for Emotion Regulation.**

Participants over the course of therapy shifted from emotional avoidance to increased willingness to engage with distressing internal experience, which is an essential step toward emotion regulation. This shift mirrors the process of exposure wherein you learn that you can handle situations or emotional states by approaching and engaging in the feared thing. As clients stayed engaged in treatment, they appeared increasingly able to apply DBT emotion regulation skills in high-risk moments, highlighting a potential bidirectional relationship between treatment exposure and internal change. Given the participants who were coded remained in treatment for the full year, their sustained treatment engagement may have also played a role in developing willingness to experience emotions and ability to utilize emotion regulation skills over time. This is in line with some research that longer treatment duration in both substance use and general mental health care is associated with improved outcomes with the argument that sustained treatment engagement allows for repeated skill practice, stronger therapeutic alliance, and greater neurobiological integration of change (Hansen et al., 2002; Linehan et al., 2006; Simpson, 2004; Tang et al., 2015). This theme informed the hypothesis that changes in opioid use may be mediated by emotional ambivalence and emotion dysregulation.

**Theme 2: Trust from Therapeutic Alliance as a Catalyst for Change.** The therapeutic alliance emerged as a potential active mechanism of change rather than a passive condition of treatment. Observation of the therapeutic relationship indicated that it served as a dynamic interpersonal process that fostered a learning environment. In doing this, the participants were better able to engage in experiencing emotions, emotional risk-taking, and skill application. Participants named the importance of feeling seen and understood, while also not being judged for their target behaviors. This underscores the alliance's role in creating a context of safety where in the consequence of experiencing emotions will not be harm but instead will benefit the participants and help facilitate new behavioral learning. This finding resonates with prior evidence linking alliance to better outcomes in substance use treatment (Meier et al., 2005). Furthermore, it aligns with how in DBT and DBT-SUD, levels of validation is a key strategy that therapists utilize to foster the relationship with clients and help provide them with new, corrective learning from past invalidation (Linehan, 1993). Within DBT's biosocial model, repeated validating interactions can directly counter the effects of invalidating environments (Linehan, 1993). By fostering a validating environment, therapists may also be increasing the likelihood of participants continued engagement in treatment, which could also play a role as a therapeutic mechanism. Moreover, the alliance may serve as a scaffold for helping clients develop more flexible or dialectical ways of emotional and behavioral responding even if emotional distress is also occurring (Hayes et al., 2006; Linehan, 1993). This theme informed two hypotheses that focus on therapeutic alliance aiding in changes in opioid use through emotional ambivalence and emotion dysregulation.

**Theme 3: Self-Validation as a Springboard for Agency.** Another possible mechanism that was identified was the development of self-validation, which was observed to be

experienced by participants as a gateway to then experiencing increased self-respect and self-efficacy. These internal shifts towards self-compassion, self-understanding, and self-worth appeared to support greater ability to then use skills to handle urges in values-aligned ways. Though not often measured directly in SUD treatment research, self-validation conceptually overlaps with constructs such as self-compassion (Neff, 2003) and is behaviorally linked to increased psychological flexibility (Hayes et al., 2006), which both have evidence supporting reductions in substance use. These findings also are similar to Bandura's (1977) theory of self-efficacy which indicated that a person's belief in their ability to cope effectively is central to behavior change. While not tested quantitatively in this study due to measurement constraints, the qualitative data informed a hypothesis for future testing that self-validation may predict changes in opioid use via self-efficacy.

**Theme 4: Dialectics Increasing Flexibility.** A final identified theme focused on observing shifts in participants from rigid, black-or-white thinking to more nuanced, balanced perspectives, which are hallmarks of dialectical thinking. These shifts appeared to be associated with more effective responses to distress, greater emotional tolerance, and a reduction in impulsive behaviors. This transformation toward finding a "middle path" reflects a foundational tenet of DBT to learn to navigate between extremes, hold multiple truths, and access a "wise mind" that balances emotional and rational information (Linehan, 1993; M. Swales et al., 2009). While this concept was not able to be directly measured in the quantitative phase of this study, participants' narratives provide rich evidence that the cultivation of dialectical thinking was experienced as deeply meaningful and transformational. Dialectical thinking has been proposed as a potential mechanism of change in DBT (Lynch et al., 2006), yet empirical measurement remains limited. The creation of DBT was deliberately structured around dialectical philosophy,

particularly the synthesis of acceptance and change, as a way to address the rigid, all-or-nothing thinking patterns often seen in complex, high-risk individuals with pervasive emotion dysregulation (Linehan, 1993). Linehan emphasized that promoting dialectical thinking was not merely a therapeutic stance but a deliberate method for fostering behavioral and cognitive flexibility. Given this, dialectical thinking can be viewed as potential mechanism that facilitates emotion regulation and psychological flexibility by helping individuals hold multiple truths, reinterpret polarized beliefs, and reduce cognitive and emotional rigidity (Linehan, 1993; Lynch et al., 2006). This is particularly relevant for individuals with co-occurring substance use disorders, where rigid thinking and experiential avoidance are risk factors for relapse. Existing literature on cognitive flexibility in SUD populations suggests that an increased ability to consider multiple perspectives and tolerate uncertainty may reduce relapse risk (Bowen et al., 2014; Price et al., 2012). This theme led to the development of a hypothesis for future testing suggesting that dialectical thinking may promote opioid use changes by both cognitive and emotional flexibility.

### ***Strengths and Limitations***

Phase 1 contributed to the existing, yet limited body of literature on mechanisms of change for DBT-SUD by focusing on interpersonal and intrapersonal shifts as potential mechanisms rather than solely on skill acquisition or symptom reduction. These findings offer a potentially richer picture of how change might unfold in this high-risk, co-occurring SUD and BDP population. A key strength of Phase 1 lies in its use of direct observation of therapy sessions, enabling rich contextual interpretation of change processes. The use of traditional ethnographic methods by clinically trained researchers allowed for nuanced, theory-informed coding grounded in both DBT principles and client/therapist behaviors. However, the small and

relatively high-engagement sample limits generalizability, and as with all qualitative work, findings are inherently interpretive rather than causal.

### ***Concluding Reflection***

Rather than isolating a singular mechanism, the findings from Phase 1 suggest that substance use recovery in DBT-SUD is supported by an interrelated network of change processes: reducing avoidance, building therapeutic trust, developing self-respect, and thinking more dialectically. The data highlight the importance of alliance not simply as a precursor to engagement, but as a transactional space where new behavioral patterns are modeled, practiced, and reinforced. Though exploratory, the findings offer direction for refining theories of change with regards to substance use reduction in DBT-SUD.

## **Chapter 4: Phase 2 - Quantitative Analyses of Hypothesized Mechanisms of Substance Use Change for DBT-SUD**

### **Phase 2 Introduction**

The second phase of this mixed methods study aimed to empirically test the hypothesized mechanisms of change in DBT-SUD. Phase 1 identified four interrelated themes reflecting key psychological and relational shifts over the course of treatment with regards to reduction in substance use. These themes led to the generation of several hypotheses including:

*Hypothesis 1: The effect of experiential avoidance on changes in positive opioid use will be mediated by ambivalence about emotional experience and emotion dysregulation.*

*Hypothesis 2: The effect of early therapeutic alliance on changes in positive opioid use will be mediated by ambivalence about emotional experience and emotion dysregulation.*

*Hypothesis 3: The effect of emotional ambivalence on changes in positive opioid use will be mediated by therapeutic alliance over time.*

Two additional hypotheses were generated from Phase 1. However, due to limitations regarding available data that could serve as proxies to the identified potential mechanisms, these hypotheses were not tested in Phase 2. These included:

*Hypothesis: The effect of self-validation will predict changes in positive opioid use, and this relationship will be mediated by self-respect and self-efficacy.*

*Hypothesis: The effect of dialectical thinking will predict changes in positive opioid use, and this relationship will be mediated by cognitive and emotional flexibility.*

Whereas the first phase of the study used traditional ethnographic assessment and thematic analysis to generate hypotheses grounded in rich clinical observation, Phase 2 utilized secondary analysis of existing longitudinal data collected as part of a randomized controlled trial of DBT-SUD. This chapter outlines the methods and analytic strategy used for the quantitative phase and presents the results of primary and exploratory models.

## **Phase 2 Methods**

### ***Participants***

Participants included 62 men and women aged 18 to 60 who met DSM-IV criteria for BPD and OUD. Participants for the current study were participants randomized into the DBT-SUD arm of the parent trial. Exclusion criteria were: 1) a lifetime diagnosis of schizophrenia, schizoaffective disorder, bipolar disorder, psychotic disorder not otherwise specified, or IQ less than 70; 2) treatment for another condition was primary compared to BPD and OUD; 3) current and chronic absence of shelter or impending jail/prison for more than three weeks; 4) a mandate to treatment; 5) pregnancy; and 6) unable to tolerate the medication induction phase and/or unwilling to change from current adequate dose of methadone. See Figure 2 for the CONSORT diagram.

## *Measures*

**Diagnostic Interviews.** In the parent study, structured diagnostic interviews were used to assess for DSM-IV Axis I and Axis II disorders. The Structured Clinical Interviews for DSM-IV (SCID-I and SCID-II) (First et al., 1996, 1997) and the International Personality Disorder Examination (IPDE) (Loranger et al., 1997) were administered as part of the screening and diagnostic process.

**Secondary Process Measures.** The Hamilton Rating Scale for Depression-17 Item (HAM-D; Hamilton, 1960) was used to evaluate the severity of depressive symptoms, and the Hamilton Rating Scale for Anxiety (HAM-A; Hamilton, 1959) was used to evaluate anxiety symptoms. The original 16-item version of the Action and Acceptance Scale (AAQ-AAS; Hayes et al., 2004) was used to assess experiential avoidance (tendency to evade unpleasant and unwanted internal experiences including thoughts, feelings, or bodily sensations). Higher scores on the AAQ-AAS are interpreted as greater experiential avoidance and lower psychological flexibility. The Ambivalence over Emotional Expressiveness Questionnaire (AEQ) is a 28-item measure used to assess the degree to which individuals feel conflicted about expressing their emotions (King & Emmons, 1990). Higher scores indicate greater ambivalence. The Difficulties in Emotion Regulation Scale (DERS) is a 36-item self-report questionnaire used to measure deficits in multiple facets of emotion regulation (Gratz & Roemer, 2004). Higher scores reflect greater emotion dysregulation. Finally, the California Psychotherapy Alliance Scale Client Version (CALPAS-C) is a 24-item self-report measure used to evaluate the strength of the therapeutic alliance from the client's perspective (Gaston, 1991). Higher scores reflect stronger perceived alliance.

**Substance Use Outcome Measures.** *Urinalyses (UAs).* Urine drug screens were collected using the BIOSITE Triage Meter Pro. A small percentage of samples (about 5.7%) were randomly selected to be observed, based on a computer-generated random number system, on days participants came into clinic. Each sample was tested and coded as either positive or negative for 11 substances: amphetamines, methamphetamines, barbiturates, benzodiazepines, cocaine, heroin, methadone, prescription opiates (e.g., OxyContin), marijuana, PCP, and tricyclics. The parent study focused on three main UA outcomes: 1) positive for any opioid (heroin, non-prescribed methadone, or prescription opioids), 2) positive for cocaine, and 3) positive for any other drug, excluding tricyclics and marijuana. UA data, collected three times per week during the treatment year, were transformed into the proportion of positive results within each 4-month interval.

*Interviewer-assessed drug use.* The Substance Abuse History Interview (SAHI) was used to assess patterns and severity of substance use at each follow-up point. The SAHI is based on the Timeline Follow-Back method (Sobell et al., 1986) and is adapted to capture use of both alcohol and drugs. To align with the UA data, three variables were captured from the SAHI: the number of days since the last assessment that participants reported using 1) opiates (including both prescribed and illicit), 2) cocaine, and 3) any other drug, excluding tricyclics and marijuana. To allow for comparability with UA outcomes, these values were then converted into proportions by dividing the number of use days by the total number of days since the previous assessment (approximately 121 days), resulting in an estimated proportion of days the drug was used during that interval.

## *Analytic Plan*

**Descriptive and Baseline Analyses.** Descriptive and baseline analyses were conducted in R (version 4.5.0). Study characteristics at pretreatment were examined to provide context for the sample, including demographic variables (age, gender, race, education, and income) and clinical indicators. Psychological diagnoses and co-occurring substance use disorders (excluding BPD and OUD, which were inclusion criteria) were summarized to characterize the clinical profile of participants. Symptom severity was indexed by the HAM-D at screening and the HAM-A at pretreatment. Substance use in the 30 days prior to starting treatment was assessed using the SAHI, including the number of days participants reported using opioids, alcohol, cannabis, and cocaine. Descriptive statistics were used to characterize the sample, including means and standard deviations for continuous variables (age, symptom scores, substance use days) and counts and percentages for categorical variables (gender, race, education, and presence of co-occurring diagnoses). Differences in treatment engagement between completers and dropouts within the DBT-SUD arm were assessed using Welch's independent samples t-test to account for unequal variances.

Descriptive analyses of substance use outcomes were conducted across four time points spanning the treatment year: pretreatment, 0 - 4 months, 4 - 8 months, and 8 - 12 months. At pretreatment, only self-reported data from the SAHI were available. During the treatment year, substance use was assessed using both aggregates of UAs and the SAHI. UA data were examined under two assumptions: missing at random (MAR), with values estimated using full information maximum likelihood (FIML), and missing is positive (MPD), reflecting a conservative approach to handling missing data. For each four-month period during the treatment year, the proportion of

days participants reported using substances (SAHI) and the proportion of positive UA results were calculated and summarized using means and standard deviations.

**Correlations Among Key Variables.** To explore the relationships among key variables across timepoints, a correlational matrix was computed using R (version 4.5.0). Pairwise Pearson correlation coefficients were calculated for each correlation, including 95% confidence intervals and p-values. Variables were selected from the primary and exploratory models and included experiential avoidance (AAQ-AAS) at pretreatment; emotional ambivalence (AEQ) at pretreatment, 4 months, and 8 months; emotion dysregulation (DERS) at 8 and 12 months; therapeutic alliance (CALPAS-C) at 4 and 8 months; change in proportion of positive opioid UAs from 4 to 12 months under MAR; and change in proportion of positive opioid UAs from 4 to 12 months under MPD. Pairwise deletion was used to accommodate missing data. No corrections for multiple comparisons were applied, as the correlations were intended to characterize bivariate relationships among model variables rather than to test specific hypotheses.

**Model Specification and Estimation.** Longitudinal path models were specified to test hypothesized mechanisms of change in opioid use over time within the DBT-SUD condition. Each model examined the indirect effect of a hypothesized predictor on reductions in opiate use through temporally ordered mediators. Models were estimated using the “lavaan” package in R (version 4.5.0), employing maximum likelihood estimation with full information maximum likelihood (FIML) to address missing data under the assumption of missing at random (MAR). All models were saturated (just-identified), meaning the number of estimated parameters matched the number of known relationships in the data, resulting in a perfect model fit. This approach was intentionally chosen to allow for clear testing of specific indirect effects, especially

given the small sample size. More complex models might have required estimating too many parameters, which could reduce power or lead to estimation issues. Using just-identified models also fit well with the exploratory nature of the study's mixed methods design. In Phase 1, qualitative ethnographic methods were used to generate grounded, data-driven hypotheses about mechanisms of change in DBT-SUD. Because these hypotheses were developed primarily inductively, saturated models allowed the flexibility to test these pathways directly, without imposing strict structural assumptions. This made it possible to evaluate whether the mechanisms that emerged from the qualitative phase were supported in the quantitative data (Kline, 2016).

Covariates were not included in the mediation models. While baseline characteristics such as age, gender, and diagnostic comorbidities may influence treatment outcomes, attempts to include them as covariates led to convergence issues and instability in model estimation. This was likely due to the small sample size and missing data. Given the goal of testing specific within-model pathways and the broader exploratory nature of the project, a simplified model structure was used to support stability and interpretability. Each model included both unstandardized and standardized path estimates ( $\beta$ ), along with standard errors, p-values, and  $R^2$  values for outcomes. Indirect effects were calculated via the product of coefficients method. Although bootstrapping is often recommended for testing mediation, it was not used for these models due to convergence issues and inflated error estimates, which were likely related to sample size and data limitations. Significance of the indirect effects was assessed using standard  $p$ -values, which is consistent with approaches used in other small-sample mediation studies when bootstrapping is not feasible (Fritz & MacKinnon, 2007; Hayes, 2022).

**Hypothesized Mediation Model Testing.** Three mediation models were tested to examine whether key treatment processes helped explain changes in opiate use over the course of

the treatment year. Each model tested a specific hypothesized pathway, with mediators ordered over time to reflect a logical sequence of change informed by qualitative findings from Phase 1. This sequencing was also guided by research on substance use treatment and work with high-risk clinical populations, which highlights the importance of emotion regulation, therapeutic engagement, and skill acquisition in supporting behavior change (Carroll & Onken, 2005; Linehan, 1993; Linehan et al., 1999; SAMSHA, 2019).

In Hypothesis 1, experiential avoidance assessed at baseline using the AAQ-AAS was hypothesized to influence changes in positive opioid use through a sequential pathway involving emotional ambivalence at four months (AEQ) and emotion dysregulation at eight months (DERS). This model reflects a theorized process in which avoidance of internal experiences contributes to ambivalence around emotional expression, which in turn undermines effective emotion regulation and sustains substance use. For Hypothesis 2, early therapeutic alliance, measured at four months using the CALPAS-C, was tested as a predictor of changes in positive opioid use through later emotional ambivalence and emotion dysregulation. Due to the absence of alliance data at baseline, emotional ambivalence was assessed at eight months (AEQ) and emotion dysregulation at 12 months (DERS) to preserve the presumed temporal ordering of the mediational process. While the timing is imperfect, this structure represents a theoretically coherent approximation of the hypothesized mechanism. Finally, Hypothesis 3 tested a simpler mediation model in which emotional ambivalence at four months (AEQ) was hypothesized to influence changes in opioid use via therapeutic alliance at eight months (CALPAS-C), reflecting a process in which interpersonal discomfort around emotional expression may hinder the development of a strong treatment relationship and, in turn, affect substance use outcomes.

All models were just-identified and therefore had zero degrees of freedom, resulting in perfect fit by definition. Traditional model fit indices such as the Tucker-Lewis Index (TLI; Tucker & Lewis, 1973), Root Mean Square Error of Approximation (RMSEA; Steiger & Lind, 1980), Comparative Fit Index (CFI; Bentler, 1990), and Standardized Root Mean Square Residual (SRMR; Bentler, 1995), were computed but not interpretable given the saturated nature of the models. This structure prioritized estimation of specific pathways rather than global model evaluation (Kline, 2016). In all models to examine change in opioid use over time, the outcome was defined as the change in the proportion of positive UA results from 4 to 12 months (i.e., UA at 12 months minus UA at 4 months). Because this outcome reflected a change score, UA at 4 months was not included as a covariate in the models. This approach allowed us to directly model predictors of change in opioid use during the latter half of treatment, without introducing redundancy or multicollinearity from including a component of the dependent variable as a predictor (Allison, 1990).

Variables were standardized to facilitate interpretation and reduce scaling-related issues. The analytic approach focused on estimating indirect effects for each model using z-tests based on the product of path coefficients. Given that indirect effects are based on the product of multiple path coefficients and often exhibit non-normal sampling distributions, 95% confidence intervals were reported alongside point estimates to offer a more accurate and transparent interpretation of mediation pathways (MacKinnon et al., 2004).

### **Exploratory and Sensitivity Analyses.**

***Moderation by Treatment Engagement.*** An exploratory follow-up analysis was conducted to examine whether treatment engagement moderated the relationship between baseline experiential avoidance and change in opiate use. Although Hypothesis 1 did not yield a

significant indirect effect, the direct path from experiential avoidance to change in opioid use approached significance. This pattern prompted further examination of whether the strength of this relationship varied based on participants' level of engagement in treatment.

Treatment engagement was operationalized as the total number of individual therapy sessions attended during the 12-month treatment period. Participants were categorized into “low” and “high” engagement groups using a median split. All variables were standardized prior to analysis. A multi-group path model was estimated to assess whether the hypothesized sequential pathway (experiential avoidance at baseline predicting emotional ambivalence at four months, emotion dysregulation at eight months, and change in opioid use from four to twelve months) differed by engagement level. Models were estimated in lavaan using FIML to address missing data.

***Sensitivity Analyses: Missing Assumed Positive.*** To evaluate the robustness of findings from the primary mediation models, sensitivity analyses were conducted using an alternative assumption for missing UA data. Missing UA results were recoded as positive for opioid use (i.e., missing presumed positive, MPD), reflecting a conservative strategy used in substance use research (McPherson et al., 2013). This approach assumes that missed UA tests may reflect potential substance use and is often used to account for nonrandom missingness in high-risk samples. Each mediation model was re-estimated using the MPD dataset, with all model specifications, including predictors, mediators, time points, and the just-identified structure, held constant from the original models. Models were again estimated in lavaan using FIML, and standardized estimates and indirect effects were examined.

## Phase 2 Results

### *Baseline Demographics, Psychological Characteristics, Session Attendance, and Descriptive Data for Drug Use Outcomes*

**Baseline Demographics.** Participants in the DBT-SUD arm ( $N = 62$ ) were, on average, 31.1 years old ( $SD = 8.28$ ). Gender distribution was relatively balanced, with 52.5% identifying as male and 47.5% as female. Most participants identified as white (80.3%), followed by Black or African American (11.4%), biracial (6.6%), and other (1.6%). In terms of education level, half of the participants (50.0%) reported having some college education, 35.0% were high school graduates or held a GED, 8.3% had less than a high school education, and 6.7% were college graduates. The sample was predominantly low-income, with nearly two-thirds (64.9%) reporting an annual income of less than \$15,000, and only 10.5% reporting income levels above \$30,000. See Table 2.

**Psychological Characteristics.** Regarding baseline psychological characteristics, 47.4% of participants met criteria for an anxiety disorder, 40.4% for major depressive disorder, 22.8% for post-traumatic stress disorder (PTSD), and 29.5% for antisocial personality disorder. Among the 28 participants assessed for other personality disorders, 21.4% met diagnostic criteria. Comorbid substance use disorders were also common. Cannabis dependence was present in 21.1% of the sample, while cannabis abuse was reported in 3.5%. Alcohol dependence and sedative dependence were observed in 10.5% and 8.8% of participants, respectively. For psychological symptoms, participants reported moderate-to-severe levels of depression with mean scores of 18.37 ( $SD = 6.14$ ) on the HAM-D and mild levels of anxiety with mean scores of 16.11 ( $SD = 8.68$ ) on the HAM-A. Substance use in the 30 days prior to treatment initiation was highest for opiates ( $M = 20.21$  days,  $SD = 10.64$ ), followed by alcohol ( $M = 6.74$ ,  $SD = 8.91$ ),

cannabis ( $M = 6.41$ ,  $SD = 10.31$ ), and cocaine ( $M = 5.75$ ,  $SD = 8.41$ ). At pretreatment, participants reported above average levels of experiential avoidance, with a mean score of 74.12 ( $SD = 10.31$ ) on the AAQ-AAS (possible range: 16-112; higher scores indicate greater avoidance). Emotional ambivalence was also high, as reflected in an average AEQ score of 87.30 ( $SD = 13.46$ ; possible range: 28-140, with higher scores indicating greater ambivalence about emotional expression). Emotion dysregulation scores on the DERS averaged 102.02 ( $SD = 17.56$ ), within the scale's possible range of 36 to 180. See Table 3.

**Session Attendance.** A Welch's independent samples t-test was conducted to compare the number of sessions attended between participants in the DBT-SUD arm who completed treatment ( $n = 32$ ) and those who dropped out ( $n = 30$ ). Treatment completers attended significantly more sessions ( $M = 40.06$ ,  $SD = 10.02$ ) than dropouts ( $M = 11.17$ ,  $SD = 8.97$ ),  $t(59.88) = 11.98$ ,  $p < .001$ ,  $d = 2.99$ , indicating a large effect size. See Table 4.

**Descriptive Data for Drug Use Outcomes. UA Outcomes.** Under the assumption that missing UA data were missing at random (MAR), the average proportion of opioid-positive UAs decreased slightly over time: 0.36 ( $SD = 0.37$ ) at 0 to 4 months ( $n = 61$ ), 0.35 ( $SD = 0.38$ ) at 4 to 8 months ( $n = 38$ ), and 0.38 ( $SD = 0.38$ ) at 8 to 12 months ( $n = 28$ ). Similar patterns were observed for all drug use and for all drugs excluding THC and TCA. When missing UA data were treated as positive (MPD), opioid-positive rates increased across each time interval: 0.54 ( $SD = 0.35$ ) at 0 to 4 months ( $n = 61$ ), 0.61 ( $SD = 0.37$ ) at 4 to 8 months ( $n = 47$ ), and 0.68 ( $SD = 0.35$ ) at 8 to 12 months ( $n = 38$ ). As expected, this more conservative approach yielded consistently higher estimates of drug use. See Table 5.

**Self-Reported Drug Use.** According to self-reported data via the SAHI, the average proportion of days using heroin declined from 0.61 ( $SD = 0.34$ ;  $n = 54$ ) at pre-treatment to 0.42

( $SD = 0.43$ ;  $n = 31$ ) at 0 to 4 months, 0.31 ( $SD = 0.30$ ;  $n = 20$ ) at 4 to 8 months, and 0.33 ( $SD = 0.38$ ;  $n = 16$ ) at 8 to 12 months. Similar reductions were observed for opiate use, which declined from 0.16 ( $SD = 0.28$ ,  $n = 54$ ) at pretreatment, to 0.08 ( $SD = 0.13$ ,  $n = 16$ ) at 0 to 4 months, and 0.03 ( $SD = 0.02$ ,  $n = 10$ ) at 4 to 8 months. However, a slight increase to 0.13 ( $SD = 0.12$ ,  $n = 7$ ) occurred at 8 to 12 months. When combining across opioids, reductions were also observed, which declined from 0.71 ( $SD = 0.33$ ;  $n = 49$ ) at pre-treatment to 0.44 ( $SD = 0.36$ ;  $n = 12$ ) at 0 to 4 months and remained relatively stable through 4 to 8 months at 0.44 ( $SD = 0.30$ ,  $n = 5$ ). There was an increase to 0.66 ( $SD = 0.63$ ) at 8 to 12 months. These observed changes should be interpreted cautiously given the small number of participants at later timepoints. See Table 5.

Patterns of use varied across other substances. Cocaine use slightly increased over time, from 0.18 ( $SD = 0.26$ ;  $n = 56$ ) at pre-treatment to 0.30 ( $SD = 0.33$ ;  $n = 19$ ) at 4 to 8 months and 0.29 ( $SD = 0.39$ ,  $n = 15$ ) at 8 to 12 months. Cannabis use also rose across assessment points from 0.21 ( $SD = 0.32$ ,  $n = 59$ ), to 0.49 ( $SD = 0.41$ ,  $n = 16$ ) at 4 to 8 months and 0.44 ( $SD = 0.43$ ,  $n = 12$ ) at 8 to 12 months. Alcohol use showed a small increase by 8 to 12 months (from 0.21 to 0.33;  $SD = 0.27$ , 0.46;  $n = 42$ , 20). Again, observed changes should be interpreted cautiously given the small number of participants at later timepoints.

### ***Correlations Among Key Variables***

Descriptive statistics and Pearson correlations for all study variables are presented in Table 6. Psychological variables demonstrated moderate temporal consistency. Emotional ambivalence showed strong intercorrelations across timepoints ( $r$  at pretreatment and 4 months = .61, 95% CI [.39, .77],  $p < .001$ ;  $r$  at 4 and 8 months = .64, 95% CI [.42, .79],  $p < .001$ ;  $r$  at pretreatment and 8 months = .65, 95% CI [.44, .79],  $p < .001$ ). Emotion dysregulation at 8 and 12

months was strongly correlated ( $r = .68$ , 95% CI [.48, .81],  $p < .001$ ). Therapeutic alliance at 4 and 8 months was similarly stable ( $r = .60$ , 95% CI [.33, .78],  $p < .001$ ).

Higher therapeutic alliance at 4 months was significantly associated with lower experiential avoidance at pretreatment ( $r = -.34$ , 95% CI [-.58, -.04],  $p = .026$ ) and less emotion dysregulation at 12 months ( $r = -.43$ , 95% CI [-.66, -.13],  $p = .007$ ). These findings may suggest that clients who were more open to internal experiences early in treatment were better able to form strong alliances, while stronger alliance later may have served a compensatory role for clients with ongoing emotional dysregulation.

Reduction in opioid use, which was operationalized as the change in the proportion of positive UA results from 4 months to 12 months, was not significantly correlated with experiential avoidance, emotional ambivalence, emotion dysregulation, or therapeutic alliance. Contemporary mediation theory posits that indirect effects can occur even in the absence of a significant predictor/outcome association (Hayes, 2022). Given this, model testing proceeded to evaluate whether the hypothesized mediated pathways could account for changes in positive opioid use over time.

### ***Primary Analyses: Mediation Model Testing***

All model estimates presented below reflect analyses conducted on standardized variables. The reported coefficients indicate the expected change, measured in standard deviations, in the outcome variable for each standard deviation increase in the predictor or mediator variable. All models were just-identified ( $df = 0$ ) and therefore demonstrated perfect model fit (CFI = 1.00; TLI = 1.00; RMSEA = 0.00; SRMR = 0.00). Analyses for all models were conducted using FIML to address missing data, and all variables were standardized prior to analysis.

**Hypothesis 1.** A serial mediation model was tested to examine whether the effect of experiential avoidance at pretreatment on changes in opioid use was mediated by emotional ambivalence and emotion dysregulation. Emotional ambivalence at 4 months was specified as the first mediator, followed by emotion dysregulation at 8 months as the second mediator. The outcome variable was change in the proportion of positive opioid UA results from 4 to 12 months. See

Figure 3 for a schematic of the hypothesized model.

The hypothesized serial mediation pathway was not supported. Experiential avoidance at baseline did not significantly predict emotional ambivalence at 4 months ( $\beta = .214$ ,  $SE = .132$ ,  $p = .105$ ) and emotional ambivalence did not significantly predict emotion dysregulation at 8 months ( $\beta = .116$ ,  $SE = .157$ ,  $p = .460$ ). Additionally, neither emotional ambivalence ( $\beta = .211$ ,  $SE = .183$ ,  $p = .249$ ) nor emotion dysregulation ( $\beta = .195$ ,  $SE = .229$ ,  $p = .395$ ) significantly predicted change in opioid use. The direct path from experiential avoidance to change in opioid use was not statistically significant ( $\beta = -.402$ ,  $SE = .242$ ,  $p = .097$ ), though the effect size was moderate and in the hypothesized negative direction, indicating that greater experiential avoidance at baseline may be associated with less reduction in opioid use over time. While not conclusive, this pattern suggests a potentially meaningful relationship that may warrant further investigation in larger samples or alternative model specifications. See Table 7.

Indirect effects revealed no significant mediation. The sequential indirect effect from experiential avoidance to opioid use change through emotional ambivalence and emotion dysregulation was small and non-significant ( $\beta = .005$ ,  $SE = .009$ ,  $p = .597$ , 95% CI [-.013, .023]). Similarly, the individual indirect effects through emotional ambivalence alone ( $\beta = .045$ ,  $SE = .049$ ,  $p = .353$ , 95% CI [-.050, .140]) and through emotion dysregulation alone ( $\beta = .029$ ,

$SE = .044, p = .516, 95\% \text{ CI } [-.058, .115]$ ) were not significant. The total indirect effect was also non-significant ( $\beta = .079, SE = .072, p = .272, 95\% \text{ CI } [-.062, .219]$ ), and the overall total effect of experiential avoidance on change in opioid use did not reach statistical significance ( $\beta = -.324, SE = .216, p = .134, 95\% \text{ CI } [-.747, .100]$ ). The total direct effect was also not statistically significant ( $\beta = -.402, SE = .242, p = .097, 95\% \text{ CI } [-.877, .072]$ ). See Table 8.

The model accounted for 4.6% of the variance in emotional ambivalence ( $R^2 = .046$ ), 4.3% of the variance in emotion dysregulation ( $R^2 = .043$ ), and 18.0% of the variance in change in opiate use ( $R^2 = .180$ ). These findings did not support the proposed serial mediation model. Although not statistically significant, the marginally stronger direct effect of experiential avoidance on opioid use change may suggest a more direct relationship that is not mediated through emotional processing variables in this sample. See Table 9.

**Hypothesis 2.** A serial mediation model was tested to examine whether the effect of therapeutic alliance at 4 months on changes in opioid use was mediated by emotional ambivalence and emotion dysregulation. Emotional ambivalence at 8 months was specified as the first mediator, followed by emotion dysregulation at 12 months as the second mediator. The outcome variable was change in the proportion of positive opioid UA results from 4 to 12 months. See Figure 4 for a schematic of the hypothesized model.

The hypothesized serial mediation pathway was not supported. Therapeutic alliance at 4 months did not significantly predict emotional ambivalence at 8 months ( $\beta = -0.138, SE = 0.203, p = .498$ ), and emotional ambivalence at 8 months did not significantly predict emotion dysregulation at 12 months ( $\beta = -0.090, SE = 0.148, p = .541$ ). However, there was a significant direct association between therapeutic alliance at 4 months and emotion dysregulation at 12 months ( $\beta = -0.451, SE = 0.149, p = .002$ ), such that stronger early alliance predicted lower

levels of emotion dysregulation later in treatment. Neither emotional ambivalence ( $\beta = 0.187, SE = 0.208, p = .367$ ) nor emotion dysregulation ( $\beta = 0.132, SE = 0.238, p = .579$ ) significantly predicted change in opioid use. The direct path from therapeutic alliance to change in opioid use was also not statistically significant ( $\beta = -0.123, SE = 0.305, p = .688$ ). See Table 10.

Indirect effects revealed no evidence of mediation. The sequential indirect effect from therapeutic alliance to opioid use change through both emotional ambivalence and emotion dysregulation was negligible and non-significant ( $\beta = 0.002, SE = 0.005, p = .736, 95\% CI [-0.008, 0.011]$ ). The individual indirect effects through emotional ambivalence alone ( $\beta = -0.026, SE = 0.047, p = .585, 95\% CI [-0.118, 0.067]$ ) and through emotion dysregulation alone ( $\beta = -0.060, SE = 0.109, p = .585, 95\% CI [-0.274, 0.155]$ ) were not significant. The total indirect effect was also non-significant ( $\beta = -0.084, SE = 0.111, p = .451, 95\% CI [-0.302, 0.134]$ ), and the total effect of therapeutic alliance on change in opioid use did not reach statistical significance ( $\beta = -0.207, SE = 0.285, p = .468, 95\% CI [-0.765, 0.352]$ ). See Table 11.

The model accounted for 1.9% of the variance in emotional ambivalence ( $R^2 = .019$ ), 20.0% of the variance in emotion dysregulation ( $R^2 = .200$ ), and 8.7% of the variance in change in opioid use ( $R^2 = .087$ ). Overall, these findings did not support the proposed serial mediation model. The only significant path in the model was from therapeutic alliance to later ability to regulate emotions, suggesting that alliance may have a meaningful relationship with emotion regulation independent of ambivalence or opioid use outcomes. See Table 12.

**Hypothesis 3.** A mediation model was tested to examine whether the effect of emotional ambivalence at baseline on change in opioid use was mediated by therapeutic alliance at 8 months. The outcome variable was change in the proportion of positive opioid UA results from 4 to 12 months. See Figure 5 for a schematic of the hypothesized model. The hypothesized

mediation pathway was not supported. Emotional ambivalence at pretreatment did not significantly predict therapeutic alliance at 8 months ( $\beta = 0.054$ ,  $SE = 0.169$ ,  $p = 0.745$ ). The direct effect of emotional ambivalence on reduction in opioid use was marginally significant ( $\beta = 0.286$ ,  $SE = 0.151$ ,  $p = 0.057$ ). Therapeutic alliance did significantly predict reduction in opioid use from 4 to 12 months ( $\beta = -0.473$ ,  $SE = 0.188$ ,  $p = 0.013$ ), indicating that participants who had stronger relationships with their therapists at 8 months tended to show greater changes in positive opioid use between months 4 and 12 of treatment. See Table 13.

Indirect effects indicated no evidence of mediation. The indirect effect from emotional ambivalence to opioid use reduction via therapeutic alliance was small and non-significant ( $\beta = -0.026$ ,  $SE = 0.080$ ,  $p = 0.747$ , 95% CI [-0.182, 0.130]). The total effect of emotional ambivalence on reduction in opioid use also did not reach statistical significance ( $\beta = 0.261$ ,  $SE = 0.160$ ,  $p = 0.102$ , 95% CI [-0.052, 0.576]). See Table 14. The model accounted for a small proportion of the variance in therapeutic alliance ( $R^2 = 0.003$ ) and a moderate proportion of the variance in reduction in opioid use ( $R^2 = 0.291$ ). Overall, findings did not support the proposed mediation model. Although therapeutic alliance was a significant predictor of reduced opioid use, emotional ambivalence at baseline was not significantly related to alliance or opioid outcomes through the indirect pathway. See Table 15.

### ***Exploratory and Sensitivity Analyses***

All model estimates presented below for exploratory and sensitivity analyses reflect analyses conducted on standardized variables. Reported coefficients represent the expected standard deviation change in the outcome per standard deviation change in the predictor or mediator. All models were just-identified ( $df = 0$ ) and therefore demonstrated perfect model fit (CFI = 1.00; TLI = 1.00; RMSEA = 0.00; SRMR = 0.00). Analyses for all models were

conducted using FIML to address missing data, and all variables were standardized prior to analysis.

**Hypothesis 1 Exploratory Multi-Group Model.** An exploratory multi-group mediation model was estimated to examine whether the effect of experiential avoidance at pretreatment on reduction in opioid use was mediated by emotional ambivalence at 4 months and emotion dysregulation at 8 months, with treatment engagement (low vs. high) modeled as a grouping variable. The outcome variable was the change in the proportion of positive opioid UA results from 4 to 12 months. A schematic of the hypothesized model is presented in Figure 6.

**Low Engagement Group.** The hypothesized mediation pathway was not statistically supported, though some individual pathways were significant. Experiential avoidance at pretreatment did not significantly predict emotional ambivalence at 4 months ( $\beta = .230$ ,  $SE = .249$ ,  $p = .239$ ). However, greater emotional ambivalence at 4 months significantly predicted more emotional dysregulation at 8 months ( $\beta = .654$ ,  $SE = .144$ ,  $p = .001$ ). Greater emotional ambivalence at 4 months was associated with smaller changes in positive opioid use over time ( $\beta = .820$ ,  $SE = .367$ ,  $p = .004$ ). Experiential avoidance was significantly associated with reductions in positive opioid UAs ( $\beta = -.514$ ,  $SE = .380$ ,  $p = .026$ ), meaning participants who approached difficult thoughts and emotions more showed more changes in positive opioid use over time. Emotion dysregulation did not significantly predict reduction in opioid use from 4 to 12 months ( $\beta = .058$ ,  $SE = .428$ ,  $p = .814$ ). See Table 16.

Indirect effects indicated no significant mediation. The full sequential indirect effect through both mediators was small and nonsignificant ( $\beta = .009$ ,  $SE = .063$ ,  $p = .818$ , 95% CI [-.108, .137]). The total indirect effect was also nonsignificant ( $\beta = .175$ ,  $SE = .329$ ,  $p = .381$ , 95%

CI [-.357, .933]). The total effect of experiential avoidance on reduction in opioid use was negative but nonsignificant ( $\beta = -.338$ ,  $SE = .394$ ,  $p = .158$ , 95% CI [-1.328, .217]). See Table 17.

**High Engagement Group.** None of the direct paths in the high engagement group reached statistical significance. Experiential avoidance at pretreatment did not significantly predict emotional ambivalence at 4 months ( $\beta = .179$ ,  $SE = .160$ ,  $p = .338$ ). Emotional ambivalence at 4 months did not predict emotion dysregulation at 8 months ( $\beta = .068$ ,  $SE = .195$ ,  $p = .701$ ) or changes in positive opioid use from 4 to 12 months ( $\beta = -.144$ ,  $SE = .166$ ,  $p = .429$ ). The direct effect of experiential avoidance on opioid use reduction was also nonsignificant ( $\beta = -.460$ ,  $SE = .253$ ,  $p = .153$ ). See Table 16.

Indirect effects were small and nonsignificant across all pathways. The full sequential indirect effect from experiential avoidance to reduction in opioid use via both emotional ambivalence and emotion dysregulation was not significant ( $\beta = .000$ ,  $SE = .003$ ,  $p = .921$ , 95% CI [-.005, .005]). The total indirect effect was also nonsignificant ( $\beta = -.035$ ,  $SE = .081$ ,  $p = .734$ , 95% CI [-.187, .132]). The total effect of experiential avoidance on reduction of opioid use was not significant ( $\beta = -.495$ ,  $SE = .215$ ,  $p = .070$ , 95% CI [-.811, .031]). See Table 17.

The model accounted for a substantial proportion of the variance in reduction of opioid use for the low engagement group ( $R^2 = .814$ ) and a more modest proportion for the high engagement group ( $R^2 = .266$ ). Variance explained in the mediators was also greater for the low engagement group ( $R^2 = .457$  for emotion dysregulation, .053 for ambivalence) compared to the high engagement group ( $R^2 = .122$  and .032, respectively). These patterns suggest that the hypothesized mechanisms may operate more robustly among clients who attended fewer sessions. See Table 18.

The hypothesized sequential mediation pathway was not supported in either engagement group. Although some individual paths were significant in the low engagement group (e.g., the association between emotional ambivalence and reduction in opioid use), the sequential indirect effect from experiential avoidance to opioid use reduction via both mediators was not significant. No significant effects were observed in the high engagement group.

**Hypothesis 1 Sensitivity Analysis.** As a follow-up to the primary test of Hypothesis 1, a sensitivity analysis was conducted to examine whether the effect of experiential avoidance at pretreatment on change in opioid use was mediated by decreased ambivalence about emotional experience at 4 months and decreased emotion dysregulation at 8 months. This analysis used an alternative scoring approach for the outcome variable using change in the proportion of positive opioid urinalysis results from 4 to 12 months under the conservative assumption that missing data reflected opioid use (i.e., missing is positive). See Figure 7 for a schematic of the hypothesized model.

The hypothesized sequential mediation pathway was not supported. Experiential avoidance at pretreatment did not significantly predict ambivalence about emotional experience at 4 months ( $\beta = .211, SE = .132, p = .113$ ). Neither ambivalence at 4 months nor emotion dysregulation at 8 months significantly predicted changes in positive opioid use from 4 to 12 months (ambivalence:  $\beta = .066, SE = .052, p = .705$ ; emotion dysregulation:  $\beta = -.151, SE = .061, p = .451$ ). The direct effect of experiential avoidance on reduction in opioid use was not statistically significant ( $\beta = -.270, SE = .058, p = .168$ ). See Table 19.

Indirect effects were small and non-significant. The sequential indirect effect through both mediators was negligible ( $\beta = -.002, SE = .002, p = .747, 95\% CI [-.004, .003]$ ), and neither of the single-mediator indirect effects reached significance (via ambivalence:  $\beta = .014, SE =$

.011,  $p = .714$ , 95% CI [-.018, .026]; via emotion dysregulation:  $\beta = -.023$ ,  $SE = .011$ ,  $p = .530$ , 95% CI [-.029, .015]). The total indirect effect was also non-significant ( $\beta = -.011$ ,  $SE = .017$ ,  $p = .837$ , 95% CI [-.036, .029]), as was the total effect of experiential avoidance on reduction of opioid use under the MPD assumption ( $\beta = -.282$ ,  $SE = .053$ ,  $p = .114$ , 95% CI [-.188, .020]). See Table 20.

The model accounted for a small proportion of variance in ambivalence at 4 months ( $R^2 = .044$ ), emotion dysregulation at 8 months ( $R^2 = .032$ ), and changes in positive opioid use ( $R^2 = .104$ ). Overall, results from this sensitivity analysis did not support the proposed sequential mediation model under the conservative assumption that missing urinalysis data reflected opioid use. See Table 21.

**Hypothesis 2 Sensitivity Analysis.** As a follow-up to the primary test of Hypothesis 2, a sensitivity analysis was conducted to examine whether the effect of therapeutic alliance at 4 months on change in positive opioid use was mediated by ambivalence about emotional experience at 8 months and emotion dysregulation at 12 months. This analysis used an alternative scoring approach for the outcome variable, operationalized as change in the proportion of positive opioid UA results from 4 to 12 months under the conservative assumption that missing data reflected opioid use (i.e., missing is positive). See Figure 8 for a schematic of the hypothesized model.

The hypothesized sequential mediation pathway was not supported. Therapeutic alliance at 4 months did not significantly predict ambivalence about emotional experience at 8 months ( $\beta = -0.127$ ,  $SE = 0.204$ ,  $p = 0.535$ ). Similarly, neither ambivalence at 8 months nor emotion dysregulation at 12 months significantly predicted changes in positive opioid use from 4 to 12 months (ambivalence:  $\beta = 0.109$ ,  $SE = 0.186$ ,  $p = 0.558$ ; emotion dysregulation:  $\beta = 0.197$ ,  $SE =$

0.214,  $p = 0.360$ ). Of the direct paths, only the effect of therapeutic alliance at 4 months on emotion dysregulation at 12 months was statistically significant ( $\beta = -0.443$ ,  $SE = 0.151$ ,  $p = 0.003$ ), indicating that people who had a stronger therapeutic relationship with their therapist at 4 months tended to show better emotion regulation at 12 months. The direct effect of therapeutic alliance on change in positive opioid use was not statistically significant ( $\beta = 0.148$ ,  $SE = 0.223$ ,  $p = 0.506$ ). See Table 22.

Indirect effects were small and non-significant. The sequential indirect effect through both mediators was negligible ( $\beta = 0.002$ ,  $SE = 0.006$ ,  $p = 0.725$ , 95% CI [-0.010, 0.014]), and neither of the single-mediator indirect effects reached significance (via ambivalence:  $\beta = -0.014$ ,  $SE = 0.033$ ,  $p = 0.672$ , 95% CI [-0.078, 0.050]; via emotion dysregulation:  $\beta = -0.087$ ,  $SE = 0.100$ ,  $p = 0.383$ , 95% CI [-0.283, 0.109]). The total indirect effect was also non-significant ( $\beta = -0.099$ ,  $SE = 0.102$ ,  $p = 0.329$ , 95% CI [-0.298, 0.100]), as was the total effect of therapeutic alliance on changes in positive opioid use ( $\beta = 0.049$ ,  $SE = 0.205$ ,  $p = 0.812$ , 95% CI [-0.354, 0.451]). See Table 23.

The model accounted for a small proportion of variance in ambivalence at 8 months ( $R^2 = 0.016$ ), emotion dysregulation at 12 months ( $R^2 = 0.194$ ), and changes in positive opioid use ( $R^2 = 0.042$ ). Overall, results from this sensitivity analysis did not support the proposed sequential mediation model under the conservative assumption that missing urinalysis data reflected opioid use. See Table 24.

**Hypothesis 3 Sensitivity Analysis.** A sensitivity analysis was conducted as a follow-up to the primary test of Hypothesis 3 to examine whether the effect of ambivalence about emotional experience at pretreatment on reduction in opioid use was mediated by therapeutic alliance at 8 months. Opioid use was operationalized as the change in the proportion of positive

opioid UA results from 4 to 12 months using a conservative scoring approach in which missing urinalysis data were treated as positive for opioid use (i.e., missing assumed positive). All variables were standardized prior to estimation, and the model was estimated using FIML to address missing data. See Figure 9 for a schematic of the hypothesized model.

The hypothesized mediation pathway was not supported. Ambivalence at pretreatment did not significantly predict therapeutic alliance at 8 months ( $\beta = 0.092$ ,  $SE = 0.166$ ,  $p = 0.585$ ). Therapeutic alliance at 8 months did not significantly predict changes in positive opioid use ( $\beta = -0.327$ ,  $SE = 0.196$ ,  $p = 0.091$ ). Notably, under the MAR assumption in the primary model, therapeutic alliance significantly predicted changes in positive opioid use from 4 to 12 months ( $\beta = -0.473$ ,  $SE = 0.188$ ,  $p = 0.013$ ). This effect was no longer statistically significant in the current model using a missing assumed positive approach. The direct effect of ambivalence at pretreatment on opioid use reduction was also not significant ( $\beta = 0.264$ ,  $SE = 0.158$ ,  $p = 0.094$ ). See Table 25.

The indirect effect of ambivalence on opioid use through therapeutic alliance was small and non-significant ( $\beta = -0.030$ ,  $SE = 0.059$ ,  $p = 0.609$ , 95% CI [-0.145, 0.085]). The total effect of ambivalence on opioid use reduction, combining both direct and indirect effects, was also not significant ( $\beta = 0.234$ ,  $SE = 0.158$ ,  $p = 0.136$ , 95% CI [-0.074, 0.544]). See Table 26. This model explained a negligible proportion of variance in therapeutic alliance at 8 months ( $R^2 = 0.008$ ) and a modest proportion of variance in reduction of opioid use from 4 to 12 months ( $R^2 = 0.161$ ). See Table 27. Overall, results from this sensitivity analysis did not support the hypothesized mediation pathway when assuming missing UA data reflect opioid use.

## Phase 2 Discussion

### *Summary of Key Findings*

Although the hypothesized mediation pathways were not supported, several interesting findings emerged that underscore the potential importance of the therapeutic alliance in DBT-SUD. In Hypothesis 3, stronger alliance predicted greater reductions in positive UAs from 4 to 12 months ( $\beta = -0.473, p = .013$ ). Under a more conservative missing data assumption (MPD), this finding diminished but remained directionally consistent ( $\beta = -0.327, p = .091$ ). Therapeutic alliance also emerged as a significant predictor of improved emotion regulation, as evidenced in the model for Hypothesis 2 and its sensitivity analysis. However, alliance did not occur through the hypothesized mediators of emotional ambivalence or emotion regulation, suggesting that its impact may occur through alternative, unmeasured mechanisms. These findings are in line with some literature on the importance of the therapeutic relationship in substance use treatment (Meier et al., 2005). Yet, more recent meta-analyses have shown mixed results with regards to the impact of therapeutic alliance on SUD treatment (Fleming et al., 2015; Norcross & Lambert, 2018). One possible explanation for the strength of alliance effects in the current study may have to do with the complex clinical profile of the sample, which included individuals with co-occurring OUD and BPD (and typically additional comorbidities), histories of pervasive emotion dysregulation, and elevated suicide and self-harm risk. In such high-risk populations, therapeutic alliance may not function merely as a background factor. Clients navigating intense ambivalence, distrust, or trauma may require stronger and more sustained relational safety to tolerate distress, accept feedback, and practice new skills. Thus, the therapeutic relationship may be especially critical in DBT-SUD for clients with layered vulnerabilities, functioning as both a stabilizing

force and a catalyst for change in ways that may be less pronounced in lower-risk SUD populations.

Emotional ambivalence showed a trend-level association with poorer opioid outcomes ( $\beta = 0.286, p = .057$ ), suggesting that difficulties with emotional expression and internal conflict may pose a barrier to substance use recovery. Experiential avoidance, assessed using the original version of the AAQ-AAS, was not a statistically significant predictor of decreases in positive UAs. Although one model yielded a marginal direct effect ( $\beta = -0.402, p = .097$ ). The wider confidence interval (95% CI [-0.877, 0.072]) and the absence of a replicated finding via the sensitivity analysis using MPD suggest using caution in interpreting this finding due to imprecision and restricted generalizability. A possible explanation for this lies in measurement limitations. The original AAQ-AAS only measures experiential avoidance rather than a broader construct of psychological flexibility, which may more accurately capture the behavior changes occurring in the study participants through treatment.

### ***Exploratory and Sensitivity Analyses***

Exploratory multi-group analyses revealed interesting differences in the mechanisms of change based on treatment engagement. Among participants with lower engagement, experiential avoidance was significantly associated with improved substance use outcomes, and emotional ambivalence emerged as a predictor of both emotion dysregulation (such that more ambivalence led to more dysregulation) and continued opioid use. These results may suggest that for lower-dose treatment formats with less client/therapist contact and less available teaching and modeling of skills, clients' avoidance and ambivalence regarding their emotions may more heavily influence early change. Early change may depend on more internal processes for these individuals. For high engagement participants, none of the exploratory pathways were

statistically significant. Interestingly, the model accounted for more variance in outcomes and mediators for participants with lower treatment engagement. A possible explanation is that individuals who attend fewer sessions may rely more on early internal therapeutic processes to drive early change rather than more external factors such as therapeutic alliance. In contrast, high engagers may benefit from a broader set of therapeutic ingredients, such as ongoing skills practice and more consistent therapist input, that current models did not capture. These findings should be interpreted with caution. The exploratory nature of the model, small subgroup sample sizes, and high levels of missing data limit the precision and generalizability of the results. Several path estimates also yielded wide confidence intervals, and there is potential for biased estimates due to high treatment dropout.

### ***Strengths and Limitations***

This study offers several important strengths that contribute to the growing understanding of mechanisms of change in DBT-SUD. It utilized a longitudinal design with repeated assessments of both psychological processes and substance use outcomes, allowing for temporal modeling of hypothesized mechanisms. Including both self-report and objective UA data strengthens the validity of the outcome measures. Sensitivity analyses that used missing assumed positive (MPD) assumptions and found similar effects enhances the strength of findings and highlights the importance of handling missing data transparently. The exploratory multi-group analyses also provided a preliminary look at how treatment engagement may moderate mechanisms of change, offering possible directions for future research.

At the same time, these findings should be interpreted cautiously given several limitations. The modest sample size ( $N = 62$ ) limited statistical power to detect indirect effects in the longitudinal mediation models, which typically require larger samples to detect these effects

(Fritz & MacKinnon, 2007). Wide confidence intervals for several key path estimates reflect this limitation and constrain the generalizability of the results. Attrition was also a concern, particularly for UA data, with only 28 participants contributing outcome data at the 8-to-12-month follow-up. Although FIML estimation under MAR assumptions was used to address missingness, this assumption may not fully hold in substance use treatment contexts where dropout is often non-random and related to relapse or increased use. Finally, the study experienced a high treatment dropout rate, reducing the proportion of participants who completed a full dose of DBT-SUD and limiting the interpretation of longitudinal outcomes.

### ***Concluding Remarks***

Taken together, the results of Phase 2 offer a preliminary yet meaningful test of hypothesized mechanisms of change within the DBT-SUD treatment arm. While the tested mediation models did not support mediation, several patterns emerged that point towards the potential importance of therapeutic alliance in supporting changes in positive opioid use. Therapeutic alliance predicted improvements in both emotional functioning and substance use outcomes, which suggests that alliance may function as a possible mechanism of change in DBT-SUD, even if it operates through pathways not fully captured by the current models. Findings from sensitivity analyses provided important context, showing that results, especially those involving alliance, were somewhat sensitive to how missing data were handled. Exploratory subgroup analyses also pointed to potential differences in mechanisms based on treatment engagement, highlighting the complexity and potential heterogeneity of change processes in high-risk comorbid SUD populations. Overall, these findings provide preliminary evidence for the relevance of alliance in DBT-SUD and underscore the importance of continuing to explore it as a dynamic, multifaceted process.

## Chapter 5: Integration of Qualitative and Quantitative Findings

When examined together, findings from Phase 1 and Phase 2 converge on an important, albeit preliminary, insight: therapeutic alliance may function not only as a foundation for engagement in DBT-SUD, but as a potential mechanism that enables clients to tolerate distress, reflect on internal experiences, and gradually adopt new behavioral patterns that support opioid use reduction. Across both phases, alliance emerged as more than a backdrop. In the qualitative phase, it was observed as a living, evolving relational dynamic that appeared to scaffold emotional risk-taking, skill application, and dialectical thinking. In the quantitative phase, alliance was the only process variable that significantly predicted opioid use reduction in the primary model, and its association with decreased emotion dysregulation was present across both primary and sensitivity analyses.

Gaining insight into how and why therapy works is essential for improving clinical interventions and ensuring they are both efficient and effective (Kazdin, 2009; Mehlum, 2021). Isolating active ingredients that drive outcomes allows for the ability to strengthen those elements and avoid diluting the treatment with components that do not contribute meaningfully to change. This is particularly salient in complex interventions like DBT-SUD, where clients often present with severe emotion dysregulation, life-threatening behaviors, and co-occurring complex disorders such as SUD and BPD. Identifying these processes can therapists target what matters most in session and ensures that treatment delivery is both impactful and tailored to the needs of complex clients. Despite its strong empirical support, minimal research has examined mechanisms of change in DBT or DBT-SUD. While hypotheses of mechanisms have been posited (Lynch et al., 2006), only one study to our knowledge has suggested and tested emotion dysregulation as a possible mechanism (Axelrod et al., 2011). The current study aimed to build

on that early work by using a sequential exploratory mixed methods design to first generate grounded hypotheses through qualitative analyses and then test those ideas quantitatively.

These findings, though not definitive, suggest that the therapeutic relationship in DBT-SUD may be more than a static context for change and that it may actively contribute to change itself. In Phase 1, clients seemed to engage more deeply in treatment as they came to trust their therapists, with this trust grounded not just in warmth, but in the consistent delivery of validation, nonjudgemental stances, dialectical strategies, clear instructions on how to apply skills, and coaching. This safe environment that the therapist created appeared to enable clients to lean into emotional experiencing for both pleasant and unpleasant emotions, try new behaviors in reaction to those emotions, and consider more flexible ways of thinking. In essence, the therapist functioned not only as an emotional anchor but as a teacher and coach whose influence extended beyond alliance as a “nonspecific factor” to a role that facilitated specific psychological learning processes.

The quantitative data provide a complementary perspective. While the hypothesized mediational pathways were not statistically supported, the direct association between therapeutic alliance and opioid use outcomes suggests that something clinically meaningful may be happening in between the therapist and client to enable changes in positive opioid use. It is possible that alliance operates through interpersonal mechanisms not fully captured by the variables included in the current models. These might include in-session phenomena such as applying different levels of validation, proximal reinforcement of effective behaviors, or therapist modeling of dialectical thinking, which are all processes that are difficult to reduce to self-report scales or traditional mediation pathways.

When considered together, this research points towards rethinking our understanding of therapeutic alliance in DBT-SUD as not only a predictor of change, but possibly as a necessary facilitator for it. The client-therapist relationship, particularly with high-risk populations, may function to alleviate shame, loosen defenses, and forge the trust required to engage with emotionally challenging content. If this is the case, that trust may then provide the environment for clients to begin to apply new ways of interacting with themselves and others, regulate emotions more effectively, and practice more nuanced, dialectical thinking to help them move towards a life worth living. Importantly, this process may unfold transactionally over time and not through a single moment of alliance, but through repeated interactions where the therapist balances acceptance and change in ways that both model and reinforce client growth.

### **Implications for Future Research: Reimagining How We Measure Alliance**

One of the most compelling implications of this integrated analysis is the need to move beyond traditional alliance measures. Widely used instruments of alliance are valuable but may not capture the transactional, skill-facilitative aspects of alliance that appear to be critical in DBT-SUD. Alliance in this context is not just about agreement on goals or the general sense of trust. Instead, it may include moment-to-moment transactions where the therapist engages in a variety of skillful and strategic behaviors, such as validating emotional experiences at differing levels (e.g., level 4 based on history vs. level 5 normalization), naming and challenging avoidance when it shows up in the therapy room, or modeling and dragging out dialectical thinking, to shape client learning of new behaviors. To better capture this complexity, future research may consider employing micro-qualitative methods to analyze and develop observational methods that allow for coding of in-session therapist behaviors (e.g., validation, contingency management, etc.) and client responses to them. Researchers could, for example,

develop measures that focus on the timing and amount of therapist interventions (e.g., number of validation statements per session, amount of time that an irreverent strategy is used) and analyze whether these are predictive of behavior change. This kind of micro-qualitative/microprocess research may allow us to be more precise in how therapeutic interactions lead to behavior change over time (Clemence et al., 2012; Sexton et al., 1996; Society for the Advancement of Psychotherapy, 2023). Moreover, refining alliance measurement in this way may also help differentiate between alliance as a precondition for treatment retention and alliance as an active vehicle of change. In DBT-SUD, where clients often present with complex trauma histories, pervasive dysregulation, and entrenched avoidance, it may be that alliance is not merely a prerequisite for skill acquisition, but the vehicle that makes such learning possible.

### **Final Thoughts**

While these findings must be interpreted with caution and within the context of methodological limitations including modest sample size, attrition, and non-significant mediation pathways, they do still convey an emerging story: therapeutic alliance in DBT-SUD may operate not only as an active ingredient to reduction in substance use, but also as a relational foundation that enables other change processes to occur. Rather than functioning solely as a backdrop for DBT-SUD, alliance appears to shape the conditions under which clients can engage in emotional risk-taking and behavioral experimentation. These insights underscore the need for more granular, process-oriented measurement approaches and continued mixed methods research to truly understand the transactional nature of change in therapy. These considerations are particularly important for improving models of recovery for high-risk, comorbid SUD populations.

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**Table 1***Summary of Emergent Themes and Their Contribution to Opioid Use Reduction*

Theme Title	Brief Description	Hypothesized Contribution to Opiate Use Reduction
Willing to Feel, Ready to Regulate	Participants shifted away from emotional avoidance and toward greater willingness to experience difficult internal states, allowing them to engage more consistently with emotion regulation strategies.	Reductions in experiential avoidance may have enabled more effective emotion regulation, thereby decreasing reliance on opiates to manage distress.
Trust Enough to Try	Trust in the therapeutic relationship fostered willingness to take risks in session and experiment with new skills.	A strong alliance functioned to create an environment where participants were willing and able to learn new, more values-aligned behaviors the use of emotion regulation strategies to support reductions in use.
Becoming Your Own Ally	Participants shifted from self-judgment to self-validation, increasing in self-respect and self-efficacy to make and sustain change.	Strengthened self-efficacy and self-compassion supported goal-directed behavior and decreased reliance on substances.
Finding the Middle Path	Clients moved away from extreme thinking toward dialectical reasoning, allowing for more balanced emotional and cognitive responses.	Greater cognitive and emotional flexibility enabled participants to respond more adaptively to stressors without resorting to substance use.

**Table 2***Baseline Demographics of Patients in DBT-SUD Arm (N = 62)*

Variable	<i>n</i> (used)	<i>n</i> (%)	<i>M</i> ( <i>SD</i> )
Age ( <i>M</i> ± <i>SD</i> )	58		31.1 (8.28)
Gender	61		
Male gender		32 (52.46)	
Female gender		29 (47.54)	
Race	61		
White		49 (80.33)	
Black/African American		7 (11.41)	
Biracial		4 (6.56)	
Other		1 (1.64)	
Education	60		
Less than high school		5 (8.33)	
High school graduate or GED		21 (35.00)	
Some college		30 (50.00)	
College grad		4 (6.67)	
Annual income	57		
Less than \$15,000		37 (64.91)	
\$15,000 - \$29,000		14 (24.56)	
\$30,000 and up		6 (10.53)	

*Note.* *n* (used) refers to the number of participants who provided data for each demographic item. Percentages and *M*(*SD*) are based on available data. Subcategory *n*'s are not repeated when all share the same denominator.

**Table 3***Baseline Psychological Characteristics of Patients in DBT-SUD Arm (N = 62)*

Variable	<i>n</i> (used)	<i>n</i> (%)	<i>M</i> ( <i>SD</i> )
<b>Psychological Diagnoses</b>			
Anxiety disorder	57	27 (47.37)	
Major depressive disorder	57	23 (40.35)	
Post-traumatic stress disorder	57	13 (22.81)	
Antisocial personality disorder	61	18 (29.51)	
Other personality disorder	28	6 (21.43)	
<b>Other Substance Use Disorders</b>			
Cannabis dependence	57	12 (21.05)	
Cannabis abuse	57	2 (3.51)	
Alcohol dependence	57	6 (10.53)	
Sedative dependence	57	5 (8.77)	
Sedative abuse	57	1 (1.75)	
<b>Psychological Symptoms</b>			
Depression <sup>a</sup>	62		18.37 (6.14)
Anxiety <sup>b</sup>	56		16.11 (8.68)
<b>Psychological Functioning<sup>c</sup></b>			
Emotional ambivalence <sup>d</sup>	60		87.30 (13.46)
Experiential avoidance <sup>e</sup>	60		74.12 (10.31)
Emotion dysregulation <sup>f</sup>	61		102.02 (17.56)
<b>Substance Use</b>			
No. days used opiates (past 30)	53		20.21 (10.64)
No. days used alcohol (past 30)	42		6.74 (8.91)
No. days used cannabis (past 30)	58		6.41 (10.31)
No. days used cocaine (past 30)	56		5.75 (8.41)

*Note.* *n* (used) refers to the number of participants who provided data for each demographic item. Percentages and *M*(*SD*) are based on available data.

<sup>a</sup>Depression symptoms were assessed using the Hamilton Rating Scale for Depression 17-Item (HAM-D; Hamilton, 1960) at screening, which proceeded pretreatment.

<sup>b</sup>Anxiety symptoms were assessed using the Hamilton Rating Scale Anxiety Rating Scale for Anxiety (HAMA; Hamilton, 1959) at pretreatment.

<sup>c</sup>Psychological functioning data were assessed at pretreatment.

<sup>d</sup>Emotional ambivalence was assessed using the Ambivalence over Emotional Expressiveness Questionnaire (AEQ; King & Emmons, 1990). Higher scores indicate greater emotional ambivalence.

<sup>e</sup>Experiential avoidance was assessed using the Action and Acceptance Scale (AAQ-AAS; Hayes et al., 2004). Higher scores indicate greater experiential avoidance and lower psychological flexibility.

<sup>f</sup>Emotion dysregulation was assessed using the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004). Higher scores reflect greater emotion dysregulation.

**Table 4**

*Comparison of Sessions Attended by Treatment Completers and Dropouts in the DBT-SUD Arm*

	Completed treatment ( <i>n</i> = 32)		Dropped out ( <i>n</i> = 30)		<i>t</i> (59.88)	<i>p</i>	<i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Sessions attended	40.06	10.02	11.17	8.97	11.98	< .001***	2.99

*Note.* Group differences in sessions attended were examined using Welch's *t*-test to account for unequal variances. A significant difference was observed,  $p < .001$ , with a large effect size ( $d = 2.99$ ).

**Table 5***Descriptive Data for Drug Use Outcomes*

	Pre-treatment		0-4 Months		4-8 Months		8-12 Months	
	<i>n</i>	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>
Urinalysis (MAR <sup>a</sup> )								
Opiate	—	—	61	0.36 (0.37)	38	0.35 (0.38)	28	0.38 (0.38)
All drugs	—	—	61	0.65 (0.36)	38	0.61 (0.40)	28	0.55 (0.41)
All drugs excluding THC or TCA	—	—	61	0.54 (0.36)	38	0.50 (0.39)	28	0.47 (0.40)
Urinalysis (MPD <sup>b</sup> )								
Opiate	—	—	61	0.54 (0.35)	47	0.61 (0.37)	38	0.68 (0.35)
All drugs	—	—	61	0.75 (0.30)	47	0.77 (0.32)	38	0.75 (0.33)
All drugs excluding THC or TCA	—	—	61	0.69 (0.30)	47	0.70 (0.33)	38	0.72 (0.33)
Interview <sup>c</sup>								
Heroin	54	0.61 (0.34)	31	0.42 (0.43)	20	0.31 (0.30)	16	0.33 (0.38)
Opiates	54	0.16 (0.28)	16	0.08 (0.13)	10	0.03 (0.02)	7	0.13 (0.12)
Combined opioids <sup>d</sup>	49	0.71 (0.33)	12	0.44 (0.36)	5	0.44 (0.30)	3	0.66 (0.63)
Cocaine	56	0.18 (0.26)	33	0.26 (0.32)	19	0.30 (0.33)	15	0.29 (0.39)
Cannabis	59	0.21 (0.34)	30	0.30 (0.43)	16	0.49 (0.51)	12	0.44 (0.43)
Alcohol	42	0.21 (0.27)	32	0.23 (0.32)	23	0.20 (0.27)	20	0.33 (0.46)

*Note.* No pre-treatment urinalysis data are available, because urinalyses were not collected until treatment was initiated.

<sup>a</sup>MAR: missing data are assumed random (missing = missing)

<sup>b</sup>MPD: missing data are assumed positive (missing = 1.00)

<sup>c</sup>Pre-treatment values are the proportion of drug use days in the past 4 months.

<sup>d</sup>“Combined opioids” reflects the proportion of the sum of heroin and other opiate days used in the past 4 month

**Table 6***Means, Standard Deviations, and Correlations Among Key Variables Across Timepoints for All Models*

Variable	<i>M</i>	<i>SD</i>	<i>N</i>	1	2	3	4	5	6	7	8	9
1. Experiential Avoidance (PreTx)	74.12	10.31	60									
2. Emotional Ambivalence (PreTx)	87.30	13.43	60	.38 [.13, .57]**								
3. Emotional Ambivalence (4 mo)	81.13	16.74	48	.23 [-.07, .48]	.61 [.39, .77]***							
4. Emotional Ambivalence (8 mo)	77.80	20.69	45	.23 [.08, .49]	.65 [.44, .79]***	.64 [.42, .79]***						
5. Emotion Dysregulation (8 mo)	84.98	22.33	45	.19 [-.11, .46]	.01 [-.30, .29]	.15 [-.16, .44]	.05 [-.24, .34]					
6. Emotion Dysregulation (12 mo)	82.28	23.89	46	.19 [-.11, .67]	.04 [-.25, .33]	.17 [-.14, .45]	.03 [-.33, .27]	.68 [.48, .81]***				
7. Therapeutic Alliance (4 mo)	5.78	0.86	44	-.34 [-.58, -.04]*	-.16 [-.44, .15]	-.13 [-.41, .17]	-.18 [-.46, .14]	-.27 [-.54, .04]	-.43 [-.66, -.13]**			
8. Therapeutic Alliance (8 mo)	5.67	0.82	37	.06 [-.27, .38]	.08 [-.26, .40]	-.09 [-.41, .26]	-.09 [-.24, .40]	-.38 [-.63, -.06]*	-.44 [-.67, -.13]**	.60 [.33, .78]***		
9. UA Change (Missing = Missing)	0.07	0.43	27	-.20 [-.55, .20]	.27 [-.14, .59]	.07 [-.33, .45]	.20 [-.20, .54]	.04 [-.35, .41]	.17 [-.23, .52]	-.08 [-.45, .32]	-.33 [-.65, .09]	
10. UA Change (Missing = Positive)	0.17	0.31	36	-.26 [-.55, .08]	.21 [-.13, .51]	.04 [-.34, .40]	.11 [-.27, .46]	-.10 [-.45, .27]	.13 [-.25, .47]	.09 [-.30, .44]	-.27 [-.61, .15]	.81 [.62, .91]***

*Note.* *M* and *SD* represent mean and standard deviation, respectively. Values in square brackets indicate the 95% confidence interval for each Pearson correlation coefficient. \*Indicates  $p < .05$ . \*\*Indicates  $p < .01$ . \*\*\*Indicates  $p < .001$ . Sample sizes (*N*) vary across variables due to missing data. Correlations are based on pairwise deletion.

**Table 7**

*Standardized Path Estimates for Aim 2, Hypothesis 1: The effect of experiential avoidance on change in positive opioid urinalysis results (MAR), mediated by emotional ambivalence and emotion dysregulation.*

Path	$\beta$	Standard Errors	p-value	95% CI
Experiential Avoidance → Emotional Ambivalence	0.214	0.132	.105	[-.045, 0.473]
Emotional Ambivalence → Emotion Dysregulation	0.117	0.157	.460	[-.192, 0.425]
Experiential Avoidance → Emotion Dysregulation	0.148	0.142	.301	[-.132, .427]
Emotional Ambivalence → Change in Opioid Use	0.204	0.183	.249	[-.147, .569]
Emotion Dysregulation → Change in Opioid Use	0.187	0.229	.395	[-.254, .644]
Experiential Avoidance → Change in Opioid Use	-0.390	0.242	.097	[-.877, .072]

*Note.* All estimates are standardized. Confidence intervals are Wald-type and were not derived via bootstrapping. Experiential avoidance was measured at pretreatment, emotional ambivalence at 4 months, emotion regulation at 8 months, and change in positive opiate use from 4 to 12 months. Urinalysis data were modeled under the assumption that missing values were missing at random (MAR) and handled using FIML.

**Table 8**

*Indirect, Total Indirect, and Total Effects for Aim 2, Hypothesis 1: The effect of experiential avoidance on change in positive opioid urinalysis results (MAR), mediated by emotional ambivalence and emotion dysregulation.*

Effect	$\beta$	Standard Errors	p-value	95% CI
Indirect Effect:				
Experiential Avoidance → Emotional Ambivalence → Emotion Dysregulation → Opioid Use	0.005	0.009	.597	[-.013, .023]
Indirect Effect:				
Experiential Avoidance → Emotional Ambivalence → Opioid Use	0.044	0.049	.353	[-.050, .140]
Indirect Effect:				
Experiential Avoidance → Emotion Dysregulation → Opioid Use	0.028	0.044	.516	[-.058, .115]
Total Indirect Effect	0.076	0.072	.272	[-.062, .219]
Total Direct Effect:				
Experiential Avoidance → Opioid Use	-0.390	0.242	.097	[-.877, .072]
Total Effect:				
Total Indirect + Total Direct	-0.314	0.216	.134	[-.747, .100]

*Note.* All estimates are standardized. Confidence intervals are based on the Wald method and were not derived via bootstrapping. The total indirect effect reflects the sum of all indirect pathways, including the sequential mediation pathway and the two individual indirect pathways through each mediator separately.

**Table 9**

*Proportion of Variance Explained ( $R^2$ ) for Mediators and Outcome Variable for Aim 2, Hypothesis 1: The effect of experiential avoidance on change in positive opioid urinalysis results (MAR), mediated by emotional ambivalence and emotion dysregulation.*

Variable	$R^2$
Emotional Ambivalence	.046
Emotion Dysregulation	.043
Change in Opioid Use	.180

*Note.*  $R^2$  values reflect the proportion of variance explained in each endogenous variable by predictors in the Hypothesis 1 serial mediation model. All variables were standardized.

**Table 10**

*Standardized Path Estimates for Aim 2, Hypothesis 2: The effect of therapeutic alliance on change in positive opioid urinalysis results (MAR), mediated by emotional ambivalence and emotion dysregulation.*

Path	$\beta$	Standard Errors	p-value	95% CI
Therapeutic Alliance → Emotional Ambivalence	-0.138	0.203	.498	[-.536, .261]
Emotional Ambivalence → Emotional Dysregulation	-0.090	0.148	.541	[-.379, .199]
Therapeutic Alliance → Emotional Dysregulation	-0.451	0.149	.002**	[-.743, -.160]
Emotional Ambivalence → Change in Opioid Use	0.187	0.208	.367	[-.220, .594]
Emotional Dysregulation → Change in Opioid Use	0.133	0.238	.579	[-.335, .599]
Therapeutic Alliance → Change in Opioid Use	-0.123	0.305	.688	[-.721, .475]

*Note.* All estimates are standardized. Confidence intervals are Wald-type and were not derived via bootstrapping. Therapeutic alliance was measured at 4 months, emotional ambivalence at 8 months, emotion dysregulation at 12 months, and change in opiate use from 4 to 12 months. Urinalysis data were modeled under the assumption that missing values were missing at random (MAR) and handled using FIML. \*Indicates  $p < .05$ . \*\*Indicates  $p < .01$ . \*\*\*Indicates  $p < .001$ .

**Table 11**

*Indirect, Total Indirect, and Total Effects for Aim 2, Hypothesis 2: The effect of therapeutic alliance on change in positive opioid urinalysis results (MAR), mediated by emotional ambivalence and emotion dysregulation.*

Effect	$\beta$	Standard Errors	p-value	95% CI
Indirect Effect:				
Therapeutic Alliance → Emotional Ambivalence → Emotion Dysregulation → Opioid Use	0.002	0.005	.736	[-.008, .011]
Indirect Effect:				
Therapeutic Alliance → Emotional Ambivalence → Opioid Use	-0.026	0.047	.585	[-.118, .067]
Indirect Effect:				
Therapeutic Alliance → Emotion Dysregulation → Opioid Use	-0.060	0.109	.585	[-.274, .155]
Total Indirect Effect	-0.084	0.111	.451	[-.302, .134]
Total Direct Effect:				
Therapeutic Alliance → Opioid Use	-0.123	0.305	.688	[-.721, .475]
Total Effect:				
Total Indirect + Total Direct	-0.207	0.285	.468	[-.765, .352]

*Note.* All estimates are standardized. Confidence intervals are based on the Wald method and were not derived via bootstrapping. The total indirect effect reflects the sum of all indirect pathways, including the sequential mediation pathway and the two individual indirect pathways through each mediator separately.

**Table 12**

*Proportion of Variance Explained ( $R^2$ ) for Mediators and Outcome Variable for Aim 2, Hypothesis 2 The effect of therapeutic alliance on change in positive opioid urinalysis results (MAR), mediated by emotional ambivalence and emotion dysregulation.*

Variable	$R^2$
Emotional Ambivalence	.019
Emotion Dysregulation	.200
Change in Opioid Use	.087

*Note.*  $R^2$  values reflect the proportion of variance explained in each endogenous variable by predictors in the Hypothesis 2 serial mediation model. All variables were standardized.

**Table 13**

*Standardized Path Estimates for Aim 2, Hypothesis 3: The effect of emotional ambivalence on change in positive opioid urinalysis results (MAR), mediated by sustained therapeutic alliance.*

Path	$\beta$	Standard Errors	p-value	95% CI
Emotional Ambivalence → Therapeutic Alliance	0.054	0.169	.745	[-.277, .387]
Therapeutic Alliance → Change in Opioid Use	-0.473	0.188	0.013*	[-.837, -.099]
Emotional Ambivalence → Change in Opioid Use	0.286	0.151	.057†	[-.008, .583]

*Note.* All estimates are standardized. Confidence intervals are Wald-type and were not derived via bootstrapping. Emotional ambivalence was measured at pretreatment, therapeutic alliance at 8 months, and change in positive opiate use from 4 to 12 months. Urinalysis data were modeled under the assumption that missing values were missing at random (MAR) and handled using FIML. † = marginally significant at  $p < .10$ . \*Indicates  $p < .05$ . \*\*Indicates  $p < .01$ . \*\*\*Indicates  $p < .001$ .

**Table 14**

*Indirect, Total Indirect, and Total Effects for Aim 2, Hypothesis 3: The effect of emotional ambivalence on change in positive opioid urinalysis results (MAR), mediated by sustained therapeutic alliance.*

Effect	$\beta$	Standard Errors	p-value	95% CI
Indirect Effect: Emotional Ambivalence → Therapeutic Alliance → Opioid Use	-0.026	0.080	.747	[-.182, .130]
Direct Effect: Emotional Ambivalence → Opioid Use	0.286	0.151	.057	[-.008, .583]
Total Effect: Indirect + Direct	0.261	0.160	.102	[-.052, .576]

*Note.* All estimates are standardized. Confidence intervals are based on the Wald method and were not derived via bootstrapping. The indirect effect reflects the single mediation pathway through therapeutic alliance. The total effect represents the sum of the direct and indirect effects.

**Table 15**

*Proportion of Variance Explained ( $R^2$ ) for Mediator and Outcome Variable for Aim 2, Hypothesis 3: The effect of emotional ambivalence on change in positive opioid urinalysis results (MAR), mediated by sustained therapeutic alliance.*

Variable	$R^2$
Therapeutic Alliance	.003
Change in Opioid Use	.291

*Note.*  $R^2$  values reflect the proportion of variance explained in each endogenous variable. All variables were standardized.

**Table 16**

*Standardized Path Estimates for Aim 2, Hypothesis 1 (Exploratory Multi-Group Model): The effect of experiential avoidance on change in positive opioid urinalysis results (MAR), mediated by emotional ambivalence and emotion dysregulation across engagement groups.*

Path	Engagement Group	$\beta$	Standard Errors	p-value	95% CI
Experiential Avoidance → Emotional Ambivalence	Low	0.230	0.249	.239	[-.194, .780]
Experiential Avoidance → Emotional Ambivalence	High	0.179	0.160	.338	[-.160, .467]
Emotional Ambivalence → Emotion Dysregulation	Low	0.654	0.144	0.001***	[.207, .773]
Emotional Ambivalence → Emotion Dysregulation	High	0.068	0.195	.701	[-.308, .458]
Experiential Avoidance → Emotion Dysregulation	Low	-0.379	0.171	.035	[-.697, -.025]
Experiential Avoidance → Emotion Dysregulation	High	0.330	0.166	.060	[-.014, .639]
Emotional Ambivalence → Change in Opioid Use	Low	0.820	0.367	.004**	[.339, 1.777]
Emotional Ambivalence → Change in Opioid Use	High	-0.144	0.166	.429	[-.458, .194]
Emotion Dysregulation → Change in Opioid Use	Low	0.058	0.428	.814	[-.737, .939]
Emotion Dysregulation → Change in Opioid Use	High	-0.027	0.220	.918	[-.454, .409]
Experiential Avoidance → Change in Opioid Use	Low	-0.514	0.380	.026**	[-1.588, -.100]
Experiential Avoidance → Change in Opioid Use	High	-0.460	0.253	.153	[-.859, .135]

*Note.* All estimates are standardized. Confidence intervals are Wald-type and were not derived via bootstrapping. Experiential avoidance was measured at pretreatment, emotional ambivalence at 4 months, emotion dysregulation at 8 months, and change in opiate use from 4 to 12 months. Engagement groups were based on number of sessions attended: the low engagement group attended fewer sessions than the median, and the high engagement group attended more. \*Indicates  $p < .05$ . \*\*Indicates  $p < .01$ . \*\*\*Indicates  $p < .001$ .

**Table 17**

*Indirect, Total Indirect, and Total Effects for Aim 2, Hypothesis 1(Exploratory Multi-Group Model): The effect of experiential avoidance on change in positive opioid urinalysis results (MAR), mediated by emotional ambivalence and emotion dysregulation across engagement groups.*

Effect	Engagement Group	$\beta$	Standard Errors	p-value	95% CI
Indirect Effect: Experiential Avoidance → Emotional Ambivalence → Emotion Dysregulation → Opioid Use	Low	0.009	0.063	.818	[-.108, .137]
Indirect Effect: Experiential Avoidance → Emotional Ambivalence → Opioid Use	Low	0.189	0.284	.275	[-.247, .867]
Indirect Effect: Experiential Avoidance → Emotion Dysregulation → Opioid Use	Low	-0.022	0.155	.815	[-.341, .268]
Total Indirect Effect	Low	0.175	0.329	.381	[-.357, .933]
Total Direct Effect: Experiential Avoidance → Opioid Use	Low	-0.514	0.380	.026*	[-1.593, -.103]
Total Effect: Total Indirect + Total Direct	Low	-0.338	0.394	.158	[-1.328, .217]
Indirect Effect: Experiential Avoidance → Emotional Ambivalence → Emotion Dysregulation → Opioid Use	High	-0.0003	0.0003	.921	[-.005, .005]
Indirect Effect: Experiential Avoidance → Emotional Ambivalence → Opioid Use	High	-0.026	0.033	.535	[-.084, .044]
Indirect Effect: Experiential Avoidance → Emotion Dysregulation → Opioid Use	High	-0.009	0.069	.918	[-.142, .128]
Total Indirect Effect	High	-0.035	0.081	.734	[-.187, .132]
Total Direct Effect: Experiential Avoidance → Opioid Use	High	-0.459	0.254	.154	[-.861, .136]
Total Effect: Total Indirect + Total Direct	High	-0.495	0.215	.070	[-.811, .031]

*Note.* All estimates are standardized. Confidence intervals are based on the Wald method and were not derived via bootstrapping. The total indirect effect reflects the sum of all indirect pathways, including the sequential mediation pathway and the two individual indirect pathways through each mediator separately.

**Table 18**

*Proportion of Variance Explained ( $R^2$ ) for Mediators and Outcome Variable for Aim 2, Hypothesis 1 (Exploratory Multi-Group Model): The effect of experiential avoidance on change in positive opioid urinalysis results (MAR), mediated by emotional ambivalence and emotion dysregulation across engagement groups.*

Variable	$R^2$	
	Low	High
Emotional Ambivalence	.053	.032
Emotion Dysregulation	.457	.122
Change in Opioid Use	.814	.266

*Note.*  $R^2$  values represent the proportion of variance explained in each endogenous variable by predictors in the Hypothesis 1 serial mediation model. The model was estimated using a multi-group approach to compare low and high engagement groups. All variables were standardized. Experiential avoidance was measured at pretreatment, emotional ambivalence at 4 months, emotion dysregulation at 8 months, and change in opioid use was calculated from 4 to 12 months. Engagement groups were defined based on session attendance: participants in the low engagement group attended fewer sessions than the sample median, and those in the high engagement group attended more.

**Table 19**

*Standardized Path Estimates for Aim 2, Hypothesis 1 (Sensitivity Analysis): The effect of experiential avoidance on change in positive opioid urinalysis results (MPD), mediated by emotional ambivalence and emotion dysregulation.*

Path	$\beta$	Standard Errors	p-value	95% CI
Experiential Avoidance → Emotional Ambivalence	0.211	0.132	.113	[-.049, .468]
Emotional Ambivalence → Emotion Dysregulation	0.060	0.161	.711	[-.256, .376]
Experiential Avoidance → Emotion Dysregulation	0.155	0.141	.279	[-.123, .428]
Emotional Ambivalence → Change in Opioid Use	0.066	0.052	.705	[-.282, .121]
Emotion Dysregulation → Change in Opioid Use	-0.151	0.061	.451	[-.164, .073]
Experiential Avoidance → Change in Opioid Use	-0.270	0.058	.168	[-.194, .034]

*Note.* All estimates are standardized. Confidence intervals are Wald-type and were not derived via bootstrapping. This table reflects the sensitivity analysis for Hypothesis 1. Experiential avoidance was measured at pretreatment, emotional ambivalence at 4 months, emotion dysregulation at 8 months, and change in opiate use from 4 to 12 months. Urinalysis data were modeled under the conservative assumption that missing values reflected opioid use (missing is positive) and were handled using FIML.

**Table 20**

*Indirect, Total Indirect, and Total Effects for Aim 2, Hypothesis 1 (Sensitivity Analysis): The effect of experiential avoidance on change in positive opioid urinalysis results (MPD), mediated by emotional ambivalence and emotion dysregulation.*

Effect	$\beta$	Standard Errors	p-value	95% CI
Indirect Effect: Experiential Avoidance → Emotional Ambivalence → Emotion Dysregulation → Opioid Use	-0.002	0.002	.747	[-.004, .003]
Indirect Effect: Experiential Avoidance → Emotional Ambivalence → Opioid Use	0.014	0.011	.714	[-.018, .026]
Indirect Effect: Experiential Avoidance → Emotion Dysregulation → Opioid Use	-0.023	0.011	.530	[-.029, .015]
Total Indirect Effect	-0.011	0.017	.837	[-.036, .029]
Total Direct Effect: Experiential Avoidance → Opioid Use	-0.270	0.058	.168	[-.194, .034]
Total Effect: Total Indirect + Total Direct	-0.282	0.053	.114	[-.188, .020]

*Note.* All estimates are standardized. Confidence intervals are based on the Wald method and were not derived via bootstrapping. This table reflects the sensitivity analysis for Hypothesis 1. The total indirect effect reflects the sum of all indirect pathways, including the sequential mediation pathway (through both emotional ambivalence and emotion regulation) and the two individual indirect pathways through each mediator separately.

**Table 21**

*Proportion of Variance Explained ( $R^2$ ) for Mediators and Outcome Variable for Aim 2, Hypothesis 1 (Sensitivity Analysis): The effect of experiential avoidance on change in positive opioid urinalysis results (MPD), mediated by emotional ambivalence and emotion dysregulation.*

Variable	$R^2$
Emotional Ambivalence	.044
Emotion Dysregulation	.032
Change in Opioid Use	.104

*Note.*  $R^2$  values reflect the proportion of variance explained in each endogenous variable by predictors in the Hypothesis 1 serial mediation model (sensitivity analysis). All variables were standardized. Urinalysis data were modeled under the conservative assumption that missing values reflected opioid use (missing is positive).

**Table 22**

*Standardized Path Estimates for Aim 2, Hypothesis 2 (Sensitivity Analysis): The effect of therapeutic alliance on change in positive opioid urinalysis results (MPD), mediated by emotional ambivalence and emotion dysregulation.*

Path	$\beta$	Standard Errors	p-value	95% CI
Therapeutic Alliance → Emotional Ambivalence	-0.127	0.204	.535	[-.527, .273]
Emotional Ambivalence → Emotional Dysregulation	-0.084	0.147	.568	[-.373, .205]
Therapeutic Alliance → Emotional Dysregulation	-0.443	0.151	.003**	[-.741, -.150]
Emotional Ambivalence → Change in Positive Opioid Use	0.109	0.186	.558	[-.255, .473]
Emotional Dysregulation → Change in Positive Opioid Use	0.197	0.214	.360	[-.224, .616]
Therapeutic Alliance → Change in Positive Opioid Use	0.148	0.223	0.506	[-.288, .584]

*Note.* All estimates are standardized. Confidence intervals are Wald-type and were not derived via bootstrapping. Therapeutic alliance was measured at 4 months, emotional ambivalence at 8 months, emotion dysregulation at 12 months, and change in positive opiate use from 4 to 12 months. Urinalysis data were modeled under the conservative assumption that missing values reflected opioid use (missing is positive) and were handled using FIML. \*Indicates  $p < .05$ . \*\*Indicates  $p < .01$ . \*\*\*Indicates  $p < .001$ .

**Table 23**

*Indirect, Total Indirect, and Total Effects for Aim 2, Hypothesis 2 (Sensitivity Analysis): The effect of therapeutic alliance on change in positive opioid urinalysis results (MPD), mediated by emotional ambivalence and emotion dysregulation.*

Effect	$\beta$	Standard Errors	p-value	95% CI
Indirect Effect: Therapeutic Alliance → Emotional Ambivalence → Emotion Dysregulation → Opioid Use	0.002	0.006	.725	[-.010, .014]
Indirect Effect: Therapeutic Alliance → Emotional Ambivalence → Opioid Use	-0.014	0.033	.672	[-.078, .050]
Indirect Effect: Therapeutic Alliance → Emotion Dysregulation → Opioid Use	-0.087	0.100	.383	[-.283, .109]
Total Indirect Effect	-0.099	0.102	.329	[-.298, .100]
Total Direct Effect: Therapeutic Alliance → Opioid Use	0.148	0.223	.506	[-.288, .584]
Total Effect: Total Indirect + Total Direct	0.049	0.205	.812	[-.354, .451]

*Note.* All estimates are standardized. Confidence intervals are based on the Wald method and were not derived via bootstrapping. This table reflects the sensitivity analysis for Hypothesis 2. The total indirect effect reflects the sum of all indirect pathways, including the sequential mediation pathway (through both emotional ambivalence and emotion regulation) and the two individual indirect pathways through each mediator separately.

**Table 24**

*Proportion of Variance Explained ( $R^2$ ) for Mediators and Outcome Variable for Aim 2, Hypothesis 2 (Sensitivity Analysis): The effect of therapeutic alliance on change in positive opioid urinalysis results (MPD), mediated by emotional ambivalence and emotion dysregulation.*

Variable	$R^2$
Emotional Ambivalence	.016
Emotion Dysregulation	.194
Change in Opioid Use	.042

*Note.*  $R^2$  values reflect the proportion of variance explained in each endogenous variable by predictors in the Hypothesis 2 serial mediation model (sensitivity analysis). All variables were standardized. Urinalysis data were modeled under the conservative assumption that missing values reflected opioid use (missing is positive).

**Table 25**

*Standardized Path Estimates for Aim 2, Hypothesis 3 (Sensitivity Analysis): The effect of emotional ambivalence on change in positive opioid urinalysis results (MPD), mediated by sustained therapeutic alliance.*

Path	$\beta$	Standard Errors	p-value	95% CI
Emotional Ambivalence → Therapeutic Alliance	0.092	0.166	.585	[-.235, .417]
Therapeutic Alliance → Change in Opioid Use	-0.327	0.196	.091	[-.715, .053]
Emotional Ambivalence → Change in Opioid Use	0.264	0.158	.094	[-.045, .575]

*Note.* All estimates are standardized. Confidence intervals are Wald-type and were not derived via bootstrapping. Emotional ambivalence was measured at pretreatment, therapeutic alliance at 8 months, and change in positive opiate use from 4 to 12 months. Urinalysis data were modeled under the conservative assumption that missing values reflected opioid use (missing is positive) and were handled using FIML.

**Table 26**

*Indirect, Total Indirect, and Total Effects for Aim 2, Hypothesis 3 (Sensitivity Analysis): The effect of emotional ambivalence on change in positive opioid urinalysis results (MPD), mediated by sustained therapeutic alliance.*

Effect	$\beta$	Standard Errors	p-value	95% CI
Indirect Effect: Emotional Ambivalence → Therapeutic Alliance → Opioid Use	-0.030	0.059	.609	[-.145, .085]
Direct Effect: Emotional Ambivalence → Opioid Use	0.264	0.158	.094	[-.045, .575]
Total Effect: Indirect + Direct	0.234	0.158	.136	[-.074, .544]

*Note.* All estimates are standardized. Confidence intervals are based on the Wald method and were not derived via bootstrapping. This table reflects the sensitivity analysis for Hypothesis 3. The indirect effect reflects the single mediation pathway through therapeutic alliance. The total effect represents the sum of the direct and indirect effects.

**Table 27**

*Proportion of Variance Explained ( $R^2$ ) for Mediator and Outcome Variable for Aim 2, Hypothesis 3 (Sensitivity Analysis): The effect of emotional ambivalence on change in positive opioid urinalysis results (MPD), mediated by sustained therapeutic alliance.*

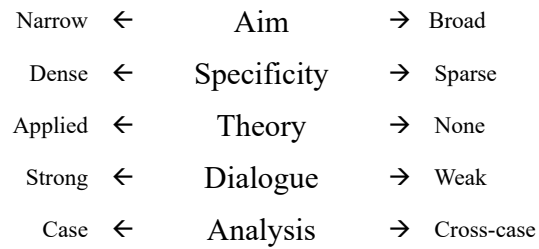
Variable	$R^2$
Therapeutic Alliance	.008
Change in Opioid Use	.161

*Note.*  $R^2$  values reflect the proportion of variance explained in each endogenous variable in the Hypothesis 3 simple mediation model (sensitivity analysis). All variables were standardized. Urinalysis data were modeled under the conservative assumption that missing values reflected opioid use (missing is positive).

## Figure 1

### *Information Power Dimensions Influencing Sample Size in Qualitative Research.*

← Higher information power,  
smaller sample size required

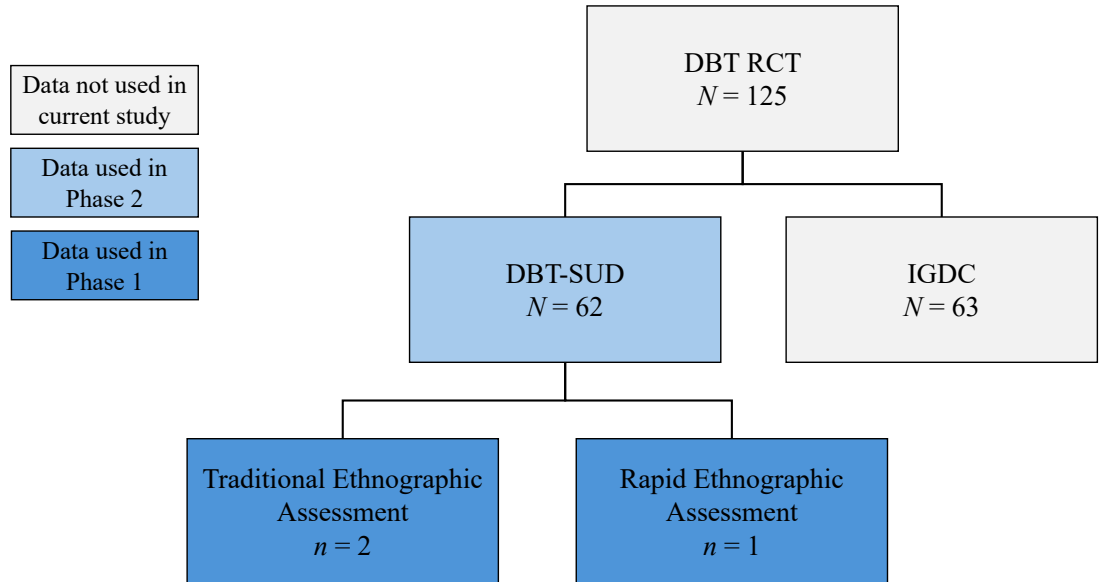


Lower information power, larger  
sample size required →

*Note.* This figure illustrates key dimensions that inform sample size adequacy in qualitative research, including study aim, specificity, theory, dialogue, and analysis approach. Adapted from Malterud et al. (2016).

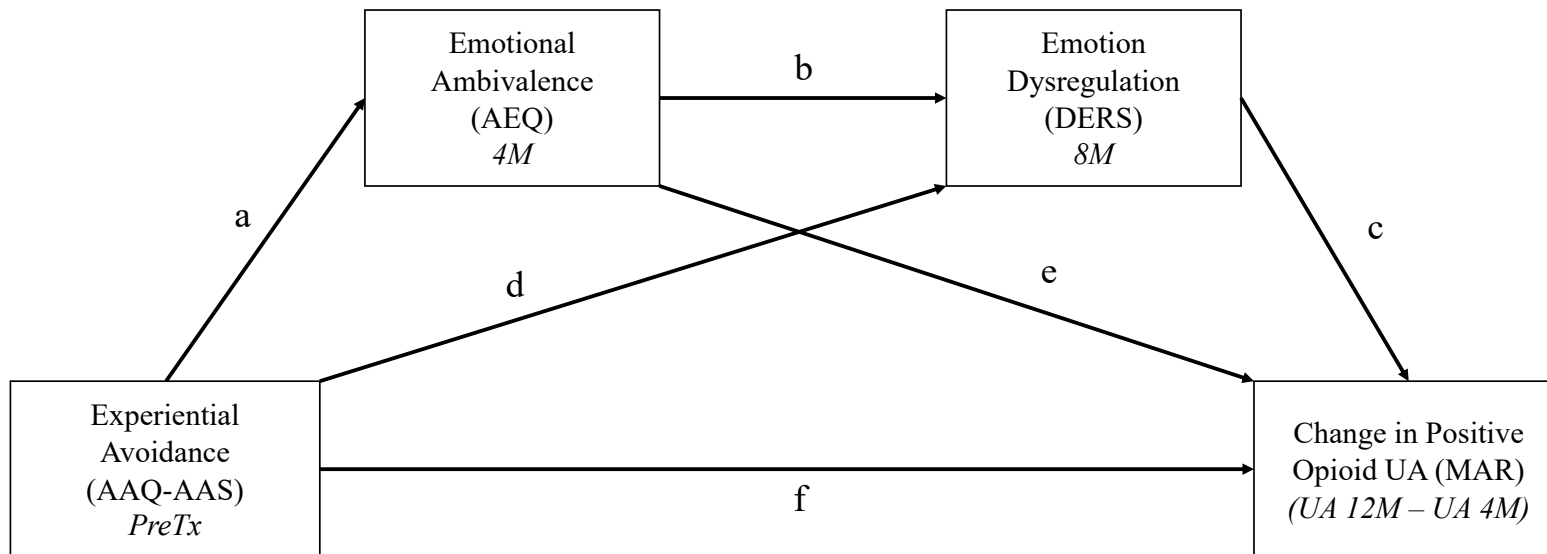
**Figure 2**

*Study consort diagram.*



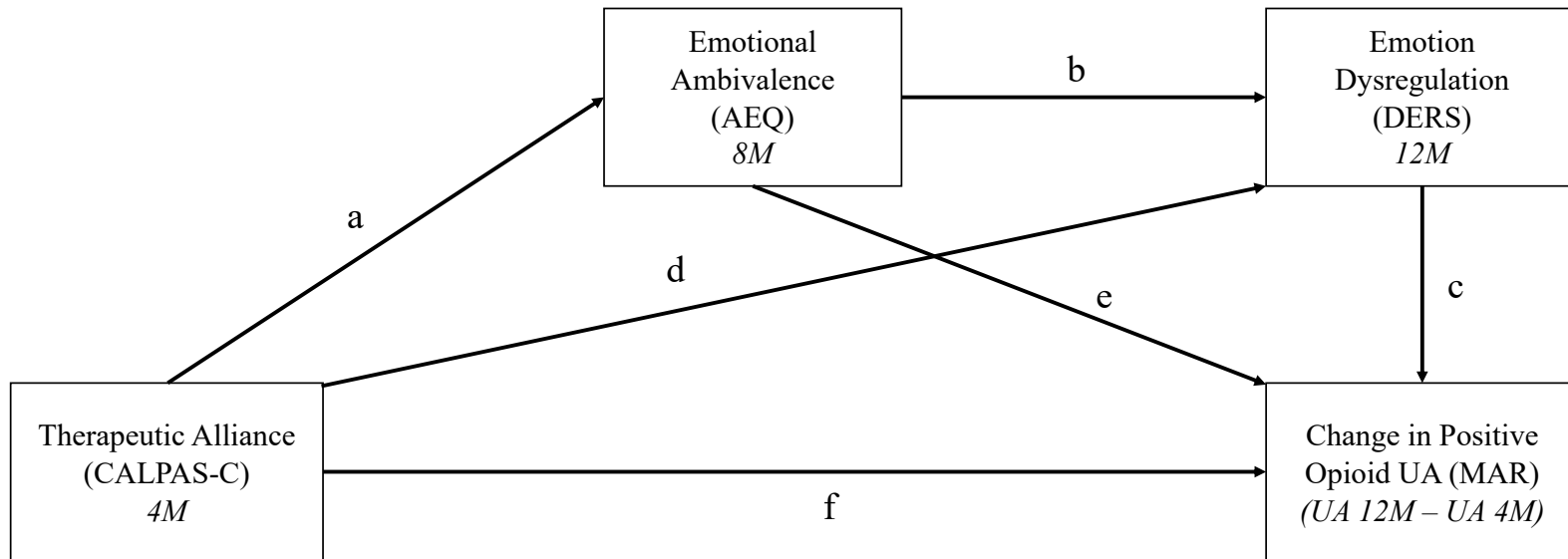
**Figure 3**

*Proposed model for Aim 2, Hypothesis 1: The effect of experiential avoidance on change in positive opioid urinalysis results (MAR), mediated by emotional ambivalence and emotion dysregulation.*



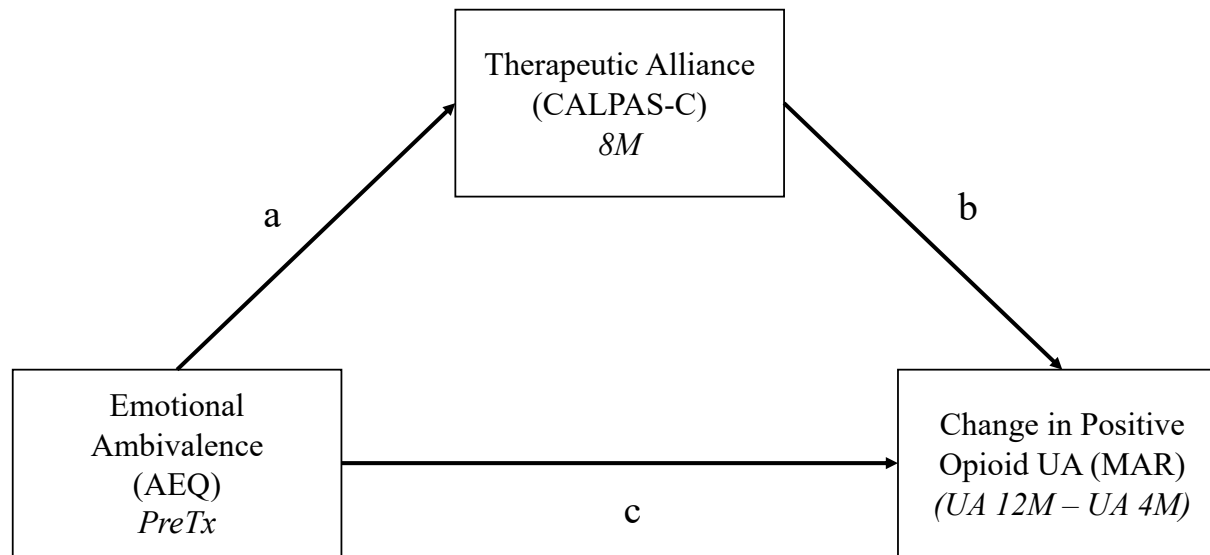
**Figure 4**

*Proposed model for Aim 2, Hypothesis 2: The effect of therapeutic alliance on change in positive opioid urinalysis results (MAR), mediated by emotional ambivalence and emotion dysregulation.*



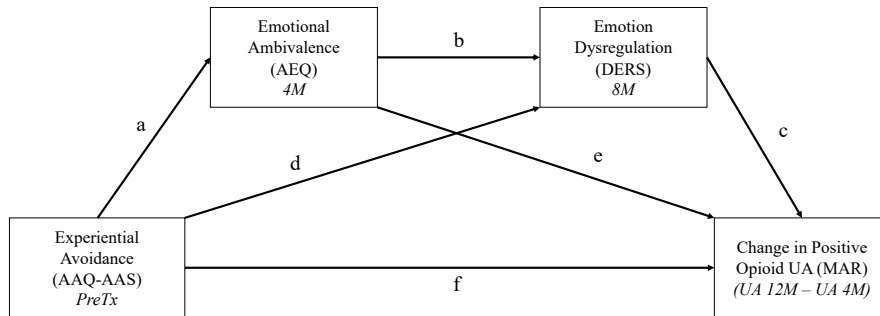
**Figure 5**

*Proposed model for Aim 2, Hypothesis 3: The effect of emotional ambivalence on change in positive opioid urinalysis results (MAR), mediated by sustained therapeutic alliance.*

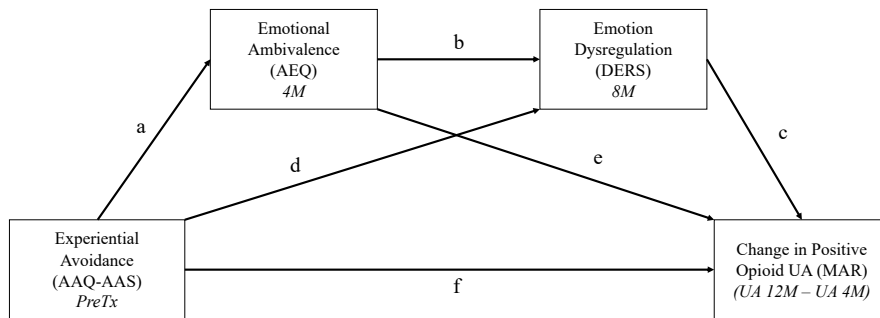


**Figure 6**

*Proposed model for Aim 2, Hypothesis 1, Exploratory Multi-Group Model.*



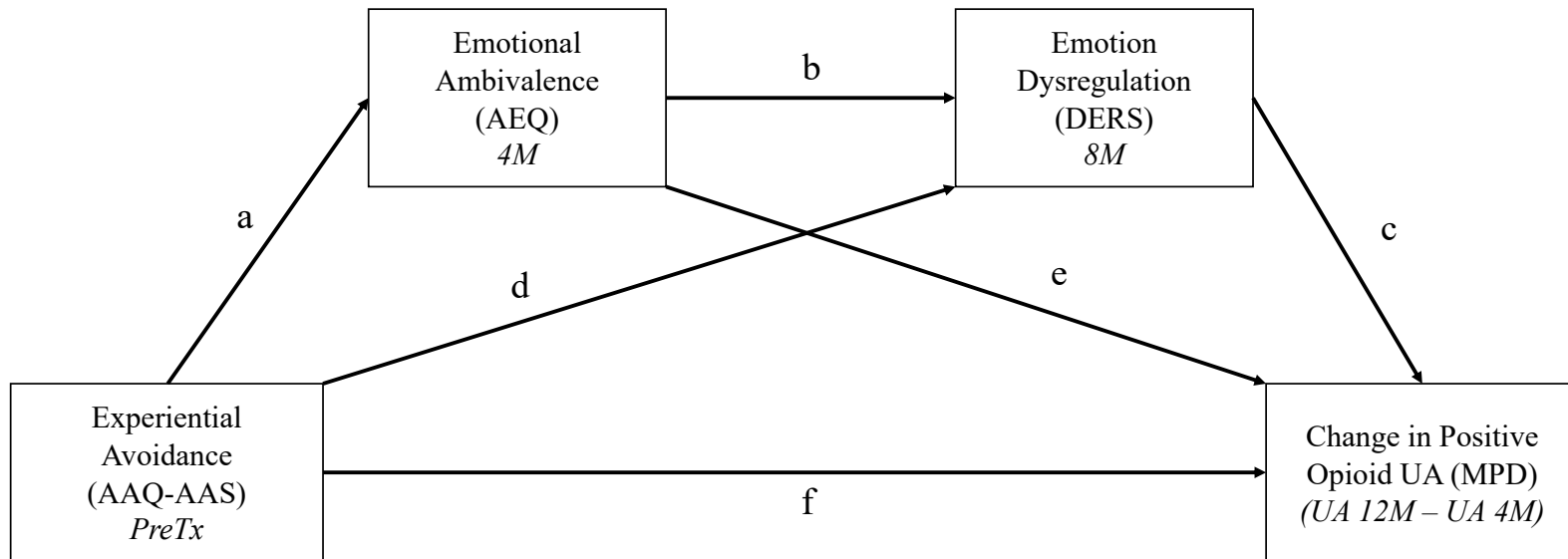
*Low Engagement Group*



*High Engagement Group*

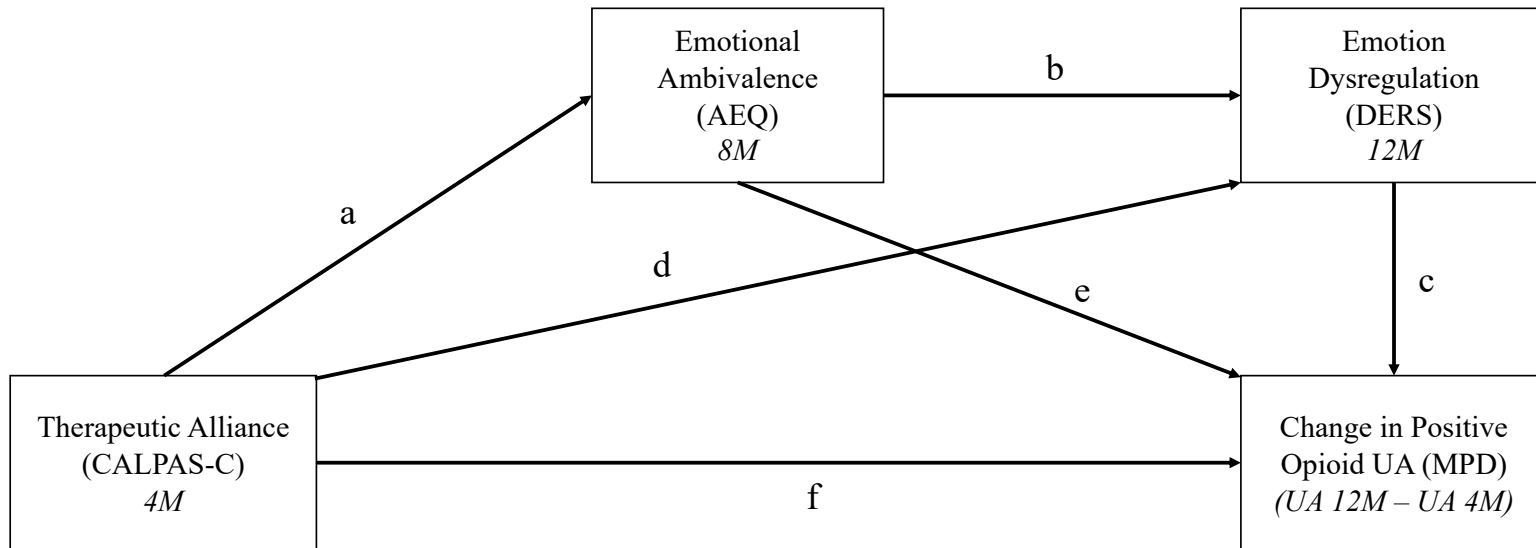
**Figure 7**

*Proposed model for Aim 2, Hypothesis 1 (Sensitivity Analysis): The effect of experiential avoidance on change in positive opioid urinalysis results (MPD), mediated by emotional ambivalence and emotion dysregulation.*



**Figure 8**

*Proposed model for Aim 2, Hypothesis 2 (Sensitivity Analysis): The effect of therapeutic alliance on change in positive opioid urinalysis results (MPD), mediated by emotional ambivalence and emotion dysregulation.*



**Figure 9**

*Proposed model for Aim 2, Hypothesis 3 (Sensitivity Analysis): The effect of emotional ambivalence on change in positive opioid urinalysis results (MPD), mediated by sustained therapeutic alliance.*

