

**TextSavvy: Exploring the Effectiveness of a Text Messaging Adjunct to a Dialectical
Behavior Therapy (DBT) Skills Training Intervention**

James P. Hodgins

Department of Psychology, Loma Linda University

Author Note

James P. Hodgins, Department of Psychology, Loma Linda University.

Correspondence concerning this article should be addressed to Erica Mazzone,
Department of Psychology, Loma Linda University, 11130 Anderson Street, Suite 106, Loma
Linda, CA 92354. Email: jhodgins@students.llu.edu

Abstract

Dialectical Behavioral Therapy (DBT) has emerged as an evidence-based treatment for several adolescent mental health concerns, including as a preventative approach for at-risk youth. Low-cost yet ubiquitous technologies such as automated text messaging also have indicated potential to further support youth mental health outcomes and increase treatment engagement. However, there is a lack of empirical work assessing the use of automated text messaging as an adjunct to DBT treatments. The purpose of this study was to evaluate the effectiveness of a text messaging adjunct of a tier-2 DBT skills treatment. This quasi-experimental study involved the delivery of twice-daily, automated, psychoeducational and supportive text messages over a six-week DBT skills training program. Participants included 76 at-risk adolescents from a continuation high school in an underserved community, divided into one group who received text messages during the intervention ($n=37$) and a historical control group who received the intervention only ($n=39$). Data were collected on attendance, perceived learning, DBT skill usage, and clinical outcomes using standardized measures. The addition of text messaging may have significantly improved session attendance ($t[73] = 2.53, p < .01$) and perceived learning at mid-intervention ($p < .05$). However, no significant differences were found in DBT skill usage or clinical outcomes. Text messaging may enhance engagement in adolescent mental health interventions by improving attendance and perceived learning. However, its impact on clinical outcomes and skill usage remains equivocal. Further empirical research is necessary to optimize texting as a supportive tool within youth DBT interventions, particularly more rigorous experimental methodologies.

Keywords: dialectical behavior therapy, text messaging interventions, mHealth, adolescents

TextSavvy: Exploring the Efficacy of a Text Messaging Adjunct to a Dialectical Behavior Therapy (DBT) Skills Training Intervention

Literature Review

Adolescence

Adolescence is a dynamic transitional period of development between childhood and adulthood characterized by extraordinary structural and functional changes in the brain, cognition, parent and peer relationships, and educational expectations (Dahl et al., 2018). Biological, psychological, and social changes further interact with each other with increasing complexity, making it more difficult for adolescents to successfully adapt to their shifting internal and external environments (Dahl et al., 2018). Given these dynamic demands and pressures, even typically developing adolescents are often considered a vulnerable population (Osgood et al., 2010).

The incidence of psychological disorders among adolescents has been increasing over the past several decades, with recent estimates that approximately 16.5% of youth experience a diagnosed mental health disorder (Whitney & Peterson, 2019). Among the most prevalent mental health concerns for adolescents are internalizing problems like symptoms of depression and anxiety. Nearly 40% of adolescents experience persistent feelings of sadness or hopelessness, marking a 20% increase since 2009. Additionally, almost 20% seriously consider a suicide attempt, reflecting a 5% increase since 2009. (Centers for Disease Control and Prevention, 2020). Rates of self-reported “overwhelming” anxiety among adolescents have increased nearly 25% over a similar period of time (Duffy et al., 2019). While the need for adequate evidence-based mental health care continues to increase for teens, approximately half of the adolescents living with a treatable mental health condition do not receive adequate care (Whitney & Peterson, 2019). Such a discrepancy indicates a large gap between needs and resource

availability for this vulnerable group (Whitney & Peterson, 2019). These findings are particularly alarming given that maladaptive functioning in adolescence has a significant impact on psychosocial outcomes later in adulthood, with at least 50% of adult mental illnesses emerging during adolescence (Belfer, 2008).

Despite a wide treatment gap, there are effective treatments for internalizing disorders in adolescents. Cognitive behavior therapies (CBTs) have shown effectiveness in treating internalizing disorders in adolescents (Miller & Campo, 2021). More specifically, Dialectical Behavior Therapy (DBT) is a third-wave CBT-based intervention that has demonstrated effectiveness for mental health concerns such as depression and anxiety (O'Connor et al., 2018).

Dialectical Behavior Therapy

Dialectical behavior therapy (DBT) is a comprehensive treatment approach comprising group skills training, individual psychotherapy, telephone coaching, and consultation team meetings. These four treatment modes are used in service of the five goals of DBT: (1) to increase the client's desires for change, (2) build the client's emotional skills and capabilities, (3) generalize observed gains in treatment to larger settings and contexts, (4) restructure the client's environments to reinforce therapeutic gains, and (5) increase the therapist's motivation and competence in his or her abilities to teach the tenets of DBT (Rizvi et al., 2013).

Theoretical Frameworks Underlying DBT

Three predominant theories direct and encapsulate the practice of DBT: biosocial theory, behavioral theory, and the philosophy of dialectics. The biosocial theory of the development and maintenance of psychopathology was first suggested by Linehan (1993) to describe the pervasive emotion dysregulation that is shared among mental health problems (Linehan, 1993). Linehan asserts that emotion dysregulation stems from the interaction between a dysfunction within the

brain (i.e., intensified affective sensitivity, greater emotional reactivity, and a slower return to baseline when dysregulated) and an invalidating environment (i.e., one which chronically invalidates the person's communication of their emotions and mood-states, or one in which emotions are ignored until they reach a high enough level that they must be addressed). Similar to other transactional models, these two factors exert reciprocal influences such that one's heightened emotionality leads to greater probability of invalidation from one's environment, which further intensifies displays of emotionality (Rizvi et al., 2013).

Behavioral theory also underlies DBT treatments. Within DBT, the construct of behavior includes one's cognitions/thoughts, emotions/feelings, and actions. Treatment interventions are usually designed to increase adaptive behaviors and decrease maladaptive behaviors (i.e., frequency, intensity, rate). Furthermore, interventions may include a functional or chain analysis of the antecedents and consequences of engaging in a given maladaptive behavior. Change is encouraged by assessing factors that contribute to the development and maintenance of a maladaptive behavior, breaking reinforcing associations, and manipulating consequences such that they outweigh the benefits of engaging in the undesired behavior. Simultaneously, the therapist and patient also work together on alternative adaptive ways to address the adverse behavior (Rizvi et al., 2013).

Lastly, the philosophy of dialectics is employed within DBT to address the often concrete and black-and-white thinking that so often typifies individuals with internalizing disorders. Dialectical theory asserts that reality is never certain, never static, and that seemingly competing viewpoints can both be true simultaneously. The dialectical viewpoint may be used during treatment to illustrate how opposing viewpoints can co-exist and both be correct and factual within an individual or within a given situation. For example, it is very common for those living

with Major Depressive Disorder to have an overwhelming wish for death and an equally strong desire to continue living (Rizvi et al., 2013).

Stages of DBT Therapy

Using the above theories as a guide, DBT is organized into several different stages with the ultimate goal of the client creating a life worth living (Linehan & Wilks, 2015). In pretreatment, the client's commitment or "buy-in" to treatment is sought, as the belief in the effectiveness of DBT to generate meaningful change is considered paramount to its success. The next focus of treatment is gaining control of one's behaviors, such as decreasing the intensity and/or frequency of behavioral dyscontrol events (e.g., working with a client to reduce their emergency services use for parasuicidal behaviors from seven days per week to four days per week). Behaviors are addressed in a hierarchical fashion such that life-threatening behaviors are the first targets in this stage of treatment, followed by therapy interfering behaviors, quality of life interfering behaviors, and finally increasing the use of DBT skills.

In the second stage of treatment, underlying feelings or emptiness become the focus of the clinical team. Linehan calls this second stage "quiet desperation," since one's outer or observable behaviors are now better controlled, yet the underlying emotions have yet to be addressed (Linehan & Wilks, 2015). For example, this stage may address a patient's chronic low mood that has become increasingly salient once they no longer spend a large amount of time engaged in seeking and receiving emergency services for parasuicidal behaviors. Stage three focuses on sub-clinical concerns of the patient. For example, treatment may turn to a client's chronic disorganization within their home and how deficits in activities of daily living can precipitate and exacerbate emotional dysregulation. Finally, stage four is needed for those patients who continue to struggle with finding a deeper meaning to life. In this stage, focus is

placed on self-awareness, addressing chronic emptiness, and perhaps the search for spiritual fulfillment (Linehan & Wilks, 2015). For example, a spiritually minded client may begin to research different religious practices of interest to bring a greater sense of fulfillment or meaning to their life.

DBT Treatment Modalities

Individual Therapy Sessions

Individual therapy in DBT is not based on protocol. In other words, there is no highly structured session-by-session guide for clinicians to follow when treating those experiencing mental health concerns. Instead, training is received in the overarching principles of DBT (i.e., the biosocial theory, behavioral theory, dialectics, and DBT skills), from which the therapist can subsequently choose the most appropriate approach for a given situation or session (Rizvi et al., 2013). Independent of the stage of DBT treatment, in a typical session the therapist will review the client's diary card (a monitoring tool used to keep a daily record of emotionality, maladaptive behaviors, and use of skills). Next, therapy-interfering behaviors such as failure to complete homework are addressed. Behaviors that decrease the client's quality of life (e.g., illicit substance use, anxiety, depressive symptoms, panic attacks, etc.) are subsequently addressed. A particularly distressing event or maladaptive behavior may be assessed using a chain analysis exercise wherein the therapist and client thoroughly assess the antecedents or links (i.e., vulnerabilities, emotions, thoughts, external events, etc.) that led to engaging in a maladaptive behavior, its consequences, and a solution analysis to address how the client can act adaptively in the future.

Group Skills Training

Clients receive concurrent group skills training alongside individual therapy to teach those living with mental health problems important skills across four modules: mindfulness, interpersonal effectiveness, emotion regulation, and distress tolerance. Considered to be the core of DBT, mindfulness is a set of techniques derived from both Eastern Zen meditation practices and Western contemplative psychology theories posited by researchers such as Dr. Gerald May (Linehan & Wilks, 2015). Mindfulness techniques are designed to increase the patient's awareness of the present moment without judgment, rejection, or attachment (Linehan, 1993; Neacsiu, 2012). Examples of mindfulness practices include objectively describing a physical object, abstract concept, or current mood-state, or directing attention to presently experienced physical sensations using all available senses.

The interpersonal effectiveness module focuses on how to address interpersonal conflicts, develop new relationships, and end destructive associations, as well as interact with and reinforce the environment positively (Linehan & Wilks, 2015). This might include teaching assertiveness skills that clients can use to achieve their goals while maintaining healthy relationships, integrity, and self-respect (Neacsiu, 2012). During the emotion regulation module, clients learn strategies for reducing maladaptive emotional responses and increasing the rate, frequency, and duration of desired emotions and mood-states. Clients learn the adaptive value of emotions, how to identify emotions, neurochemical and physiological responses to emotion experiences, and how to increase positive emotionality and decrease avoidance of negative affect experiences (Linehan & Wilks, 2015; Neacsiu, 2012). Finally, distress tolerance focuses on how clients can temporarily tolerate a distressing event or emotion. Tolerating stressful events is achieved using a variety of impulse control techniques wherein clients are taught self-soothing practices to use in crisis situations rather than maladaptive methods (Neacsiu, 2012). Grounding

techniques, such as instructing an emotionally dysregulated client to hold an ice cube in their hands and direct attention from the emotional crisis to the physical sensation within their body caused by the intense cold of the ice, is one example of a self-soothing technique.

Phone Coaching

As-needed phone coaching is also undertaken concurrently with both individual therapy and group skills training. Clients are encouraged to call the therapist when help is needed to use a DBT skill, or to choose which DBT skill to use in a particularly dysregulating situation. Take, for example, a situation in which a client loses their job unexpectedly and has the urge to engage in substance use. The client instead calls their therapist, who quickly assesses the severity of the situation and suggests the client use an appropriate distress tolerance technique until the next therapy session. Phone calls are meant to be quite brief (i.e., less than 15 minutes) and are designed for problem solving situations rather than in-depth therapy or acute crisis situations (Neacsiu, 2012).

Consultation Team Meetings

The importance of the consultation team for practicing therapists is an often overlooked or entirely absent aspect of many psychological therapies and/or treatments (Linehan, 2018). However, DBT underscores the importance of consulting with other clinicians when treating individuals with severe psychopathology. DBT treatment teams meet weekly for 60-120 minutes to offer support to one another, discuss cases, challenge assumptions or judgments about clients, offer suggestions, and cheerlead the efforts of each other (Neacsiu, 2012). These consultations serve another important purpose within DBT, such that these meetings also help reduce or avoid the burnout often associated with working in mental healthcare (Linehan, 2018).

Studies of DBT Efficacy with Adult Populations

There is extensive literature supporting the efficacy of DBT to treat symptoms of mental illness. In a seminal study by Linehan, Armstrong, Suarez, and Allmon (1991), a randomized clinical trial was conducted with 44 women aged 18-45 to evaluate the effectiveness of DBT to treat borderline personality disorder (BPD) among chronically parasuicidal women (Linehan et al., 1991). Treatment was provided over a period of one year, with assessment every four months. The control condition was "treatment as usual" (TAU) in the community. Those assigned to the DBT group engaged in significantly less parasuicidal behavior (e.g., fewer self-harm events) than those assigned to TAU. Also, 83% of those assigned to DBT completed the yearlong intervention, whereas only 42% of those assigned to TAU completed the treatment. Findings also demonstrated a significant decrease in hospital admissions for those within the DBT group (i.e., an average stay of 8.6 days per year compared with 38.8 days per year for the control group). However, no between-group differences on measures of depression, hopelessness, suicide ideation, or reasons for living were observed (although scores on all four measures decreased throughout the year for both treatment groups). This study was the first to indicate that DBT can reduce several psychopathology variables, parasuicidal behavior, treatment dropout, hospital admissions, and lengths-of-stay in women with a severe mental illness. Additionally, this study led to extensive research into the efficacy of DBT for other mental health concerns. Subsequent research found DBT effective for anxiety symptoms (Webb et al., 2016), depression (Koons et al., 2001), self-harm (Comtois et al., 2007), and substance misuse (Linehan et al., 2002). Subsequent research has also demonstrated that DBT is effective across many settings including community-based mental health clinics (Comtois et al., 2007), forensic and inpatient locations (Dimeff & Koerner, 2007), outpatient clinics (Linehan et al., 2006), primary care facilities (Koons et al., 2001), and schools (Mehlum et al., 2016; Mehlum et

al., 2019; Mehlum et al., 2014). While there is currently no universal remedy for mental illness, numerous studies examining DBT have found promising evidence for its use to assuage symptoms experienced by those living with poor mental health.

Studies of DBT Efficacy with Adolescent Populations

Based upon mounting positive evidence for efficacy in adult populations, Jill Rathus and Alec Miller created a DBT Skills manual for adolescents (DBT-A) in 1999 (Rathus & Miller, 2002). Similar to Marsha Linehan's original purpose for developing this treatment, initial adolescent investigations examined whether DBT may treat symptoms of BPD, such as suicidal ideation. Rathus and Miller completed a study with adolescents experiencing borderline personality symptomatology (with nearly all experiencing comorbid depression) and found that DBT-A significantly ameliorated self-harm and offered promise as a treatment for adolescents (Rathus & Miller, 2002). Subsequent studies replicated Rathus and Miller's (2002) initial findings, further supporting DBT-A as an efficacious treatment for adolescents with BPD and suicidal ideation (Cook & Gorraiz, 2016; Fleischhaker et al., 2011; Fleischhaker et al., 2006; Hjalmarsson et al., 2008; James et al., 2008; Meaney-Tavares & Hasking, 2013; Sunseri, 2004; Woodberry & Popenoe, 2008) and self-harm (Cook & Gorraiz, 2016; Geddes et al., 2013; Glenn et al., 2019). Investigations also supported the efficacy of DBT-A for many other mental health concerns such as bipolar disorder (Goldstein et al., 2007; Goldstein et al., 2015), eating disorders (Safer et al., 2007; Salbach-Andrae et al., 2008; Salbach et al., 2007), obsessive-compulsive related disorders such as trichotillomania (Welch & Kim, 2012), other former cluster B personality disorders such as antisocial personality disorder, narcissistic personal disorder, and histrionic personality disorder (Chugani et al., 2013), oppositional defiant disorder (Nelson-Gray

et al., 2006), substance misuse (Beckstead et al., 2015), and trauma symptoms such as hypervigilance and preoccupation (Geddes et al., 2013).

The Skills Deficit Model: A Possible Treatment Mechanism

Given positive findings for the efficacy of DBT, research began to examine the possible mechanisms of change underlying how the treatment leads to positive improvements for those with mental health difficulties. One hypothesis is the skills deficit model, which posits that many symptoms of internalizing disorders are the result of either not knowing the appropriate adaptive behaviors, cognitions, or processes, or when or how to use appropriate adaptive skills (Neacsiu, Rizvi, Vitaliano, et al., 2010).

A study by Soler et al. (2009) lends evidence to the skills deficit model of engaging in maladaptive behaviors, which states that internalizing symptoms are due to a lack of self-regulation skills (Soler et al., 2009). In this study, 63 women (aged 18-45) with a diagnosed mental illness were randomly assigned to two groups: DBT-skills training (including all the skills described throughout Linehan's body of work), or a Standard Group Therapy (SGT) that allowed participants to share and explore their individual difficulties. Both interventions involved 13 two-hour psychotherapy sessions. Results indicated higher dropout rates for the SGT group (i.e., a retention rate of 36.6% compared to 65.5% for the DBT-skills training group). Also, the DBT skill training group exhibited larger improvements across more psychopathology scales (i.e., greater decreases in anxiety, depression, and general psychiatric symptoms in this group compared with the SGT group). This study provides convincing evidence for reduced treatment dropout for those engaging in DBT skills treatment, and significantly larger benefits in relevant psychopathological variables versus a standard group treatment.

Neacsiu, Rizvi, and Linehan (2010) add further support to the skills deficit model by demonstrating that those who use skills more often have better outcomes than those who use skills less often (Neacsiu, Rizvi, & Linehan, 2010). The authors examined the DBT skills use of 108 women (mean age of 31.44, no range reported) with a diagnosed mental illness who partook in one of three randomized control trials throughout one year of active treatment and four months after treatment. The authors used a hierarchical linear modeling approach to assess between-group differences. Results indicated that although all individuals reported using at least some DBT skills before the start of the intervention, those who engaged in the DBT treatment reported using three times more skills at treatment termination when compared to participants treated with a control intervention. Significant mediation effects were observed and indicate that use of DBT skills mediated the treatment-related decrease in BPD-relevant symptoms such as depression, suicidal ideation, and attempts, and increased anger control over time. DBT skills use also mediated the relationship between treatment and the decrease of non-suicidal self-injury over time. This study supports a skills deficit model for mental health deficits by illustrating that increased skills use is a mechanism of change for negative mental health outcomes such as depression, suicidal behavior, and anger control.

To add further support to the skills deficit model, researchers then sought to demonstrate that it is the DBT-specific skills that cause improved outcomes rather than common and general therapy features. In a study by Barnicot and colleagues (2016), a sample of 70 participants containing 90% women and 10% men (mean age of 32 years old; no range reported) with diagnosed mental illness presently receiving DBT were examined in a short-term longitudinal design (Barnicot et al., 2016). Subjects were assessed every two months for one year for use of DBT skills and three common treatment processes (treatment credibility, therapeutic alliance,

and self-efficacy). Mixed-multilevel modeling was used to determine the association of the above factors with self-harm occurrences and treatment dropout. Results indicated that those who used fewer DBT skills or used skills less often at any timepoint were more likely to drop out of treatment in the subsequent two months, regardless of the individual's ratings on measures of self-efficacy, therapeutic alliance, or perceived treatment credibility. Using more DBT skills, more frequent use of these skills, and higher self-efficacy were each independently associated with less frequent concomitant self-harm. Treatment credibility and the therapeutic alliance were not associated with either self-harm or treatment dropout. The findings of this study lend support to the assertion that it is the performance of DBT-specific skills that lead to reductions in negative outcomes such as self-harm and treatment dropout rather than general treatment processes. However, it is worth noting that there was no control group in this study, and the sample size was not large enough to complete more advanced statistical analyses (i.e., structural equation modelling). Confidence in these findings could be increased in the future by the inclusion of a control group to eliminate possible biases and outside influences that may have impacted the results of this experiment.

Studies of DBT Efficacy for Adolescents with Internalizing Disorders

Published research that investigates the efficacy of DBT interventions for adolescents with internalizing disorders is scarce. As of the present review, one study was found that directly measured the effect of DBT on anxiety and depression. Lenz and colleagues (2016) examined whether DBT skills use predicted significant differences in anxiety or depression symptoms in a community sample of adolescents diagnosed with an internalizing disorder (Lenz et al., 2016). The authors report that emotion regulation and interpersonal effectiveness skills predicted change in symptomatology through significantly reduced depression and anxiety symptoms.

Anxiety and depression are more often examined as secondary outcome measures among studies investigating other severe psychopathology such as suicidal ideation or self-harm. Several investigations have found significant reductions in depressive symptoms (Cook & Gorraiz, 2016; Goldstein et al., 2007; Goldstein et al., 2015; James et al., 2008; James et al., 2011; Katz et al., 2004; Meaney-Tavares & Hasking, 2013). Chu and colleagues (2015) examined a school refusal intervention based on DBT principles and discovered significantly reduced anxiety-influenced school refusal (Chu et al., 2015). Other adolescent DBT interventions demonstrated significant reductions in symptoms of both anxiety and depression (Geddes et al., 2013; Khalid-Khan et al., 2016; Moran et al., 2018; Nelson-Gray et al., 2006; Turan & Akıncı, 2022; Woodberry & Popenoe, 2008). Given these results, DBT has demonstrated some effectiveness in reducing internalizing symptoms in adolescent populations. However, a significant gap in the literature remains for studies to directly measure changes in internalizing symptomatology.

DBT Conclusions

DBT empowers clients with mental health concerns and those at-risk for poor mental health and assists them in building a “life worth living” by equipping these individuals with coping skills and creating a structured environment conducive to the practice of these skills. A survey of the rather considerable research literature provides further evidence for the effectiveness of DBT in the treatment of maladaptive behaviors. Furthermore, emerging literature suggests that adaptations and modifications of the original DBT model may serve to increase its cost-effectiveness and reduce resource use. One under researched possibility is whether emerging or established technologies can be used as an adjunct to DBT treatment dissemination and administration.

Mobile Health: Emergence of a new Treatment Paradigm

As of 2021, over seven billion people or 97% of the global population live in an area covered by a mobile or cellular phone network (Taylor, 2023). With mobile phones increasing in popularity and reach, researchers have seen potential in using this new technology in the field of health care. Initial studies used basic text messages to send appointment reminders (Dyer, 2003), treatment reminders (Franklin et al., 2003), and collect symptom reports (Tasker et al., 2007). Initial success in physical health led psychological researchers to assess potential use for mobile phones in mental health treatment. As mobile phones became increasingly powerful and more complex, studies on their use for health began to split into different strands of research: those who utilized the complex computing now possible to create advanced mobile phone apps that capitalized on the “latest and greatest” technology smartphones have to offer, and those who continued to focus on the capabilities of more basic, universal, and low-tech options such as text messaging (Willcox et al., 2019). Given that business and economic forces prioritize the monetization of flashy high-tech applications, text messaging interventions began to be seen as comparatively archaic and subpar (Willcox et al., 2019). However, if one works within the parameters of what SMS offers, evidence shows that text messaging can be a powerful tool to create behavior change, as well as disseminate psychoeducation and support to a wide variety underserved populations such as low SES groups with poor access to the latest mobile phones or costly data plans required for more advanced mobile interventions, and those with low digital literacy (Willcox et al., 2019). Text messaging interventions continue to be valuable to social science researchers due their ubiquity (i.e., all cellphones have SMS capabilities), low implementation cost (i.e., no worries about loss of functionality or errors in coding as cellphone operating systems are updated), lower barriers to entry for those who are less technologically savvy (i.e., there is no need to navigate to an application store front or website to download the

intervention), and easier reach (i.e., text messages are delivered straight to users, and users do not need to consciously activate an application to access intervention content; Willcox et al., 2019).

Text messaging offers several advantages compared to using more advanced mobile technologies, such as high consumer understanding, near ubiquitous use, fewer required resources (both in terms of workforce and financial costs), less cognitively challenging, and does not require a specific type of mobile phone, operating system, or costly cellular data packages (Willcox et al., 2019). Texting is also used by most adolescent cell phone users and has surpassed telephone calls, instant messaging, social network messaging, and face-to-face conversation as the preferred communication modality for this age group (Lenhart, 2012). Adolescents report preferring text messaging for a variety of reasons such as convenience, discretion and privacy, and reduced anxiety compared to telephone or face-to-face communication (Joyce & Weibelzahl, 2011).

Text Messaging as an Intervention Strategy

Initial studies of how text messaging could be applied to address health behaviors began in the early 2000s. For example, British patients began receiving text message reminders of upcoming healthcare appointments (Dyer, 2003), pilot testing began on supportive text messaging for youth with diabetes engaged in intensive insulin therapy (Franklin et al., 2003) and text messaging was being explored to engage with individuals living with mental health diagnoses (Bauer et al., 2003). Within a short time, research expanded into the assessment of how to use mobile phones and text messaging in healthcare provision.

Ganapathy and colleagues (2020) discuss the contemporary role of text messaging in healthcare provision (Ganapathy et al., 2020). The authors note that text messaging is widely used to share information across a variety of domains such as administrative (e.g., appointment

reminders), health and disease management, psychoeducation, health and behavior change, physical and mental health triage, symptom monitoring, and screening. The authors also note that text messaging interventions can provide access to remote, underserved, and uninsured populations and allow clinicians to collect data remotely. This review will focus on how text messages have been used in healthcare provision as reminders and in bidirectional counselling, symptom tracking and assessment, disseminating behavior change interventions, and delivering automated intervention content.

Reminders

Text message reminders may be an efficient and cost-effective strategy for engaging youth, since missed appointments and attrition are common barriers for adolescents' engagement in mental health treatment. One of the first assessments of a youth-directed SMS intervention was completed in Denmark (Kruse et al., 2009). The authors of this study found that reminders sent via text messaging significantly reduced nonattendance for youth attending an outpatient mental health clinic. Branson and colleagues (2013) found that weekly text message reminders led to significantly higher attendance rates and higher patient satisfaction in a racially diverse sample of forty-eight adolescent Americans (Branson et al., 2013). However, not all studies have found beneficial effects. For example, Bjørnholt and colleagues (2016) found that daily text message reminders were not enough to significantly improve medication regimen compliance in a randomized control trial with a Danish sample of 118 youth (ages 15-20) who were followed for seven weeks (Bjørnholt et al., 2016).

Bidirectional counseling

Text messaging is also used to extend existing counseling relationships out of the office and into clients' daily lives. For example, a daily supportive text messaging intervention was developed by Duan and colleagues (2020) to reduce deliberate self-harm in Chinese adolescents

(ages 12-17; Duan et al., 2020). Twenty-three Chinese adolescents completed in-depth semi-structured interviews to aid in the development of the text messaging intervention. Participants reported being highly receptive to receiving communications via text message, prioritized caring and supportive content, and emphasized the importance of receiving text messages more than once per week, for a duration of approximately one-to-two months.

Sindahl and colleagues (2019) completed a content analysis of approximately 100 sessions of supportive and psychoeducational counselling via text messaging between clinicians and youth experiencing suicidal ideation in Denmark (Sindahl et al., 2019). The authors found that nearly 36% of youth reported improved mood following the session, and over half finished the session with a safety plan. However, 37% felt worse after the text messaging session. It is important to note that individuals in this study were living with severe mental illness and thoughts of suicide, and therefore caution must be used when generalizing such findings to less severe populations.

Summerhurst and colleagues (2017) assessed the use of text messaging communication with a clinical adolescent population (Summerhurst et al., 2018). The authors found adolescents experiencing their first episode of mood or psychotic disorders were highly engaged with mental health interventions that included supportive and/or psychoeducational text messaging content as measured by messaging frequency. The authors concluded that using SMS technology with adolescents may improve cost-effectiveness and efficiency of interventions.

Assessment of symptoms

Text messaging has shown effectiveness as a symptom assessment tool. Chen and colleagues (2017) developed an automated text messaging intervention to track clients' mental health symptoms, behaviors, and thoughts (Chen et al., 2017). In two small pilot studies (nine participants overall), the authors found that participants universally reported satisfaction with the

text messaging intervention and received a 100% response rate for intervention measures (e.g., mood and sleep ratings, and PHQ-9 responses). Furthermore, a study by Mellor and colleagues (2020) that examined the effectiveness of collecting data from self-report symptom measures in healthcare settings provides evidence that text messaging can be used to obtain patient-reported health outcomes among youth while allowing asynchronous contact, increasing compliance, and reducing labor costs (Mellor et al., 2020).

Behavior Change and Health Outcomes

Text-messaging health promotion interventions that target pediatric and adolescent populations are uniquely positioned to reach youth, bridge treatment gaps, and improve a variety of health outcomes for youth in health condition management, post-organ transplant care, physical activity, and physical health behaviors (Militello et al., 2012). Text messaging interventions have demonstrated effectiveness among adolescents with diabetes (Markowitz et al., 2014), obesity (Keating & McCurry, 2015), sexual health (Gold et al., 2010; Trent et al., 2015), and smoking cessation (Whittaker et al., 2017).

Automated delivery of curated intervention content

Standalone Text Messaging Interventions

Standalone text message-based mental health interventions are potentially effective therapies for youth. Anstiss and Davies (2015) completed an evaluation of a text messaging intervention aimed to improve anxiety and depression symptoms in twenty-one youth (ages 12-24; Anstiss & Davies, 2015). The authors' 10-week "Reach Out, Rise Up" intervention consisted of three text messages sent to users each week based on themes such as self-care, cognitive restructuring, coping strategies, and goal setting. Users were also given weekly challenges to encourage skill use, such as keeping a mood journal or practicing a mindfulness exercise. Post-intervention anxiety and depression scores were significantly lower than pre-intervention scores.

Interestingly, scores did not significantly differ between those who received the text messaging intervention and those who received the intervention and additional support from a trained paraprofessional, indicating that text messaging interventions may provide a more efficient, cost-effective way to support youth with subclinical mental health concerns.

Feasibility and acceptability of using text messages for mental health promotion was examined by Ammerman and Weiss (2015) in a pilot study ($N = 40$) for a text-messaging psychoeducational health intervention for uninsured adolescents in Northern California (Ammerman & Weiss, 2015). The 14-week intervention consisted of three text messages per week developed by healthcare providers regarding general healthcare, mental health, and nutrition. Adolescents universally endorsed text messaging as an ideal format for communicating various types of health information. A majority reported feeling engaged by the intervention, and many reported subjective improvements in target health behaviors. The authors note that emotional and mental health topics such as stress, depression, and anger management, were rated as most important to this group of teenagers.

Using a qualitative research strategy, Chandra and colleagues (2014) created an intervention consisting of daily text messages sent to forty low-income Indian adolescent girls and women (ages 16-18) for one month (Chandra et al., 2014). Messages alternated between mental health psychoeducation and information on how to access community resources. The majority of girls and women reported positive feelings about the intervention, such as feeling emotionally supported.

Additionally, a pilot study was completed by Czyz and colleagues (2020) to assess the acceptability and feasibility of using a theory-guided text messaging intervention to address mental health symptoms of adolescents (ages 13 – 17) at elevated suicide risk (Czyz et al., 2020).

Forty participants received twice daily text messages for four weeks that provided adaptive coping skills and safety planning tips. Participants reported that the intervention served as a positive reminder to use coping strategies, contributed to improvements in mood, and provided encouragement and hope. Given these findings, using text messages to deliver wellness content is a feasible and acceptable option for individuals engaged in mental health treatment.

Observed clinical improvements may also last after treatment termination. In a series of studies headed by Dr. Rachel Gonzales at UCLA, feasibility, acceptability, and longitudinal recovery outcomes were assessed in youth transitioning out of community substance abuse treatment programs while concurrently engaging with Project ESQYIR (Educating & Supporting Inquisitive Youth in Recovery). Project ESQYIR is a program designed to deliver structured, behavioral-based wellness content via daily text messages for a 12-week period. In a qualitative pilot study, over 70% of youth positively endorsed the text messaging intervention (Gonzales, Douglas Anglin, et al., 2014). In a follow-up randomized control trial, the intervention group was significantly less likely to experience relapse, endorsed fewer substance abuse problems, and reported reduced severity of substance abuse when compared to a treatment as usual control group (Gonzales, Ang, et al., 2014). In a follow-up longitudinal randomized control trial, those engaged with Project ESQYIR were significantly less likely to test positive for illicit substances and had significantly higher self-efficacy and confidence to abstain from substance misuse when compared to a treatment as usual control group up to nine months post-intervention (Gonzales et al., 2016).

Not all studies have found beneficial effects when evaluating standalone text messaging interventions. For example, Whittaker and colleagues (2012) developed a CBT-based intervention delivered via multimedia text messages for teens in New Zealand and found high

satisfaction, perceived usefulness, and intervention adherence in an initial study of over 1,300 adolescents (Whittaker et al., 2012). In a follow-up randomized control trial, over eight hundred adolescent students from fifteen high schools were randomized to receive either the proposed intervention or a control intervention featuring alternative content not targeting internalizing symptoms that was matched for intensity and type of message (Whittaker et al., 2017). There was no evidence of benefit from the proposed intervention when comparing several depression measures to those of the control group immediately post-intervention nor at 12-month follow-up. However, the proposed intervention was created as a standalone treatment. It is possible that text messaging interventions for internalizing symptoms among youth may improve outcomes if developed as an adjunct to an existing intervention. Furthermore, Whittaker and colleagues' intervention was designed as a universal treatment; an intervention targeted specifically to at-risk youth may have demonstrated significant results. Lastly, this study was completed in New Zealand in a largely Caucasian and Maori sample of participants; communities with different racial/ethnic demographics may react differently to such interventions.

Text Messaging Adjuncts to Existing Interventions

Scholarly interest in leveraging the unique capabilities of mobile telephones such as text messaging as an adjunct to mental health interventions has been increasing alongside interest in examining standalone interventions (Boschen & Casey, 2008). A pilot study by Kobak and colleagues (2015) assessed the feasibility, acceptability, and effectiveness of a 12-week technology-enhanced cognitive-behavioral therapy (CBT) intervention that included a text messaging component for between-session homework reminders and self-monitoring (Kobak et al., 2015). Seventy-two patients currently engaged in CBT with a licensed clinician were randomly assigned to receive either the intervention or treatment as usual. Both self-report and clinician ratings indicated significantly reduced depression symptoms and increased knowledge

of CBT content in the technology-enhanced group compared to the CBT-only group. Nearly all (95%) of youth found the intervention helpful and highly satisfying, and all participants indicated that they would use texting messaging in treatment in the future. However, caution must be taken when extrapolating such encouraging results since text messaging was not the only technology used in this pilot study (e.g., online therapy sessions were an additional component of the intervention).

To illustrate efficacy when text messaging content is the only technology-added component, Pisani and colleagues (Pisani et al., 2018) pilot-tested a text-messaging intervention (Text4Strength) as an extension to a school-based suicide prevention and mental health promotion intervention (Sources of Strength). In their pilot study, forty-two ninth-grade students completed a nine-week text message intervention featuring 28 message sequences across nine content categories. Over 70% found the intervention useful, and over 90% believed that the program should be repeated, providing evidence that text messages are useful for extending school-based interventions to promote protective and positive mental health factors. High acceptability and high participation were also found using a similar text-messaging framework for a school-based substance use prevention program (Pisani et al., 2019).

A randomized control trial by Ranney and colleagues (2018) assessed the effectiveness of a text-messaging intervention for adolescent violence and depression prevention based on CBT- and MI-derived content. The intervention group received eight weeks of automated daily text messages, whereas the control group received a brief educational presentation and bi-weekly text messages on healthy behaviors. Interestingly, depressive symptoms and peer violence were significantly lower in the treatment group compared to those in the control group but only for the

most symptomatic participants, indicating that treatment efficacy may depend upon symptom severity in some instances.

Benefits of Text Messaging Interventions for At-Risk Adolescents

Text messaging strategies are useful because they can reach adolescents quickly, with teens reading received messages within three minutes of delivery (Gates et al., 2014). A qualitative study by Ranney and colleagues (2014) elucidated the acceptability, language, and structure of text message-based behavioral interventions targeted to adolescent populations. In this study, youth preferred variety in text messages, with simple and positive content, and conversational tone (but not full of slang). Automated messages were viewed positively if sufficiently tailored (e.g., referring to the user by name).

Neil and colleagues (2009) found that setting matters to youth engaged in technologically enhanced interventions. The authors found that adolescents were significantly more engaged with a technology enhanced CBT intervention when completed within a school versus community setting. High acceptability and high participation were also found using a similar text-messaging framework for a school-based substance use prevention program (Pisani et al., 2019). A qualitative study completed by Sharifi and colleagues (2013) at Harvard University found that parents and youth were generally enthusiastic about receiving mental and physical health-related text messages and preferred them to both paper and email communications since they are brief and more difficult to ignore or forget.

Text Messaging Conclusions

Using text messaging as an intervention strategy offers several advantages compared to using more advanced mobile technologies, such as increased consumer understanding, near ubiquitous use, fewer required resources (both in terms of workforce and financial costs), less

cognitive challenge for users, and fewer barriers to entry (e.g., does not require a specific type of mobile phone, operating system, or costly cellular data packages). Text messaging interventions have been shown to be effective when used in physical and mental health interventions and are an attractive treatment delivery modality to adolescents and their caregivers.

DBT for the 21st Century: Technology Assisted DBT Interventions

Quantitative examinations into the utility and efficacy of online, mobile, and blended alternatives to standard (i.e., face-to-face) DBT therapy and skills training are currently scant. Research on technology assisted DBT is an emerging field of interest, with results only beginning to emerge in the literature. Wilks and colleagues completed a randomized control trial to evaluate feasibility, acceptability, and efficacy of an internet-delivered DBT skills training intervention (iDBT) for adults who engage in heavy drinking and endorse suicidality (Wilks et al., 2017; Wilks et al., 2020; Wilks et al., 2018). While engaging in this eight-session intervention, participants also received daily encouragement to practice DBT skills via email or text message. There were immediate and significant reductions in suicidal ideation, alcohol quantity and frequency of use, and emotion dysregulation for those who engaged in the iDBT intervention when compared to a wait list control. Unfortunately, the effect of text messaging was not systematically evaluated during these studies, thus it is currently unknown what effect (if any) receiving daily encouraging text messages had on the obtained results of this evaluation.

The effect of text messaging on engagement and clinical outcomes within a DBT intervention was examined as part of a 2018 study by Schroeder and colleagues that assessed the feasibility and efficacy of a mobile web application (“Pocket Skills”) for adults diagnosed with a mood disorder (Schroeder et al.). Pocket Skills uses a digital conversation agent to offer basic information on DBT, DBT coping skills, and a DBT Diary Card. As part of this study, the

authors assessed whether semi-personalized text messages that reminded users to engage with the mobile application would significantly improve engagement (measured via DBT skills use) and clinical outcomes (depression measured via PHQ-9 scores; anxiety measured via OASIS scores), compared to those who received non-personalized text messages. The authors found a significant three-way interaction such that individuals randomized to receive semi-personalized text messages practiced more DBT skills, which resulted in faster improvements in clinical outcomes. Although there was no control group of participants to allow comparison to individuals who did not receive any text message reminders, this study offers preliminary evidence that text messages can be used successfully as an adjunct to existing DBT interventions to increase both engagement with the primary intervention and improve clinical outcomes for those who receive semi-personalized text messages.

The initial evidence emerging in the literature suggests that text messaging may offer benefits when added to DBT interventions. However, there is still a desperate need for additional research on technology assisted DBT interventions, particularly studies with younger individuals.

Current Study

The present study examined whether a text messaging adjunct (composed of psychoeducational text messages and supportive text messages) increased treatment engagement or improved clinical outcomes when added to the School-Based Opportunities for Adolescent Recovery (SOARing) program, a Tier 2 DBT skills treatment among at-risk youth in a school setting. Measures of clinical outcomes and treatment engagement were collected and analyzed among at-risk adolescents participating in a text messaging adjunct to the SOARing program offered at one continuation high school within an underserved community in San Bernardino County, California. It was anticipated that receiving daily psychoeducational and supportive text

messages would be associated with higher reported treatment engagement and greater improvement on clinical outcomes measures compared to those who did not participate in the text messaging adjunct. The aims and hypotheses of the present study are summarized as follows:

Aim 1: Determine whether a daily text message (SMS) intervention will increase treatment engagement for this population of at-risk youth.

Hypothesis 1.1: Individuals who receive the text message intervention will attend more SOARing sessions compared to those who do not receive the intervention.

Hypothesis 1.2: Individuals who receive the text message intervention will display greater perceived knowledge of DBT compared to those who do not receive the intervention.

Hypothesis 1.3: Individuals who receive the text message intervention will use significantly more DBT coping skills compared to those who do not receive the intervention.

Aim 2: Determine whether a daily text message (SMS) intervention will improve scores on measures of clinical dysfunction for this population of at-risk youth.

Hypothesis 2.1: Individuals who receive the text message adjunct to the SOARing intervention will report significantly fewer and less severe internalizing symptoms (i.e., depression and anxiety) compared to those who do not receive the adjunct intervention.

Hypothesis 2.2: Individuals who receive the text message adjunct to the SOARing intervention will have significantly fewer and less severe emotion regulation difficulties compared to those who do not receive the adjunct intervention.

Method

Participants

Participants over the age of 16 were recruited from Sierra High School located in San Bernardino, California. Sierra High School provides continuation education, an alternative high school diploma program for those who are sixteen or older, have not yet graduated, may still be legally required to attend school, and who are at-risk of failing to graduate. Since students at continuation education schools often encounter socioeconomic challenges to both scholastic achievement and psychological wellbeing, all incoming students are administered a mental health survey upon admission to Sierra High School to assess for trauma history, and symptoms of depression and anxiety. Eligible students were those who were identified as at-risk for emotion regulation difficulties as determined by initial assessment by the lead school counselor. Students without mobile phones were still eligible to participate in the SOARing program while collecting data on the intervention adjunct but were included in the SOARing-only treatment condition.

Selected demographics for the present study were as follows. Seventy-six participants were included in the analyses. Thirty-nine participants were in the SOARing-Only group. In this group, mean age of participants was 16.70 years with a standard deviation of 0.69, predominantly comprising individuals aged 17 (51.22%) and 16 (34.15%), with smaller representations from those aged 18 (9.76%) and 15 (2.44%). In terms of gender, the majority identified as cisgender male (53.66%), followed by cisgender female (43.90%), with a small percentage falling under the 'other' category (2.44%). Regarding race and ethnicity, the largest group was Hispanic/Latino (87.80%), followed by Black/African American (9.76%), White/Caucasian (4.88%), and individuals identifying with other races (4.88%). In terms of sexual orientation, the majority identified as heterosexual (65.85%), followed by bisexual (24.39%), with smaller percentages identifying as gay/lesbian (7.32%), and “other” sexual

orientations (2.44). See Table 1 for full sociodemographic characteristics of study participants by group.

The participants in the SOARing-Only group reported various psychosocial stressors. Within the realm of adverse childhood experiences, a notable percentage reported histories of abandonment (14.63%), adoption or foster care placements (12.20%), and abuse or violence (9.76%). Academic-related stressors were also prevalent, with a significant portion having current or past Individualized Educational Plans (IEP; 21.95%) and below-average academic functioning (21.95%). In terms of family history, a considerable number had relatives with mental illness (24.39%) and a history of substance use (19.51%). In terms of neurological and psychological history, a smaller percentage reported experiencing head trauma or seizures (4.88%) or endorsed that they were currently taking psychotropic medication (2.44%). Additionally, a portion reported past (9.76%) and current (9.76%) substance use. See Table 2 for full list of psychosocial stressors endorsed by study participants by group.

Thirty-seven participants were in the SOARing+Text group, the mean age of participants was 16.74 years with a standard deviation of 0.74. The majority of participants were aged 15 (42.86%) and 16 (17.14%), with smaller representations from those aged 14 (4.00%) and 17 (17.14%). In terms of gender, this group included mainly cisgender females (77.14%), followed by cisgender males (17.14%), and a smaller percentage fell under another gender category (5.71%). Concerning race/ethnicity, a significant portion identified as Hispanic/Latino (71.43%), followed by individuals identifying as Black/African American (17.14%) and White/Caucasian (17.14%). In terms of sexual orientation, the majority identified as heterosexual (54.26%), followed by gay/lesbian (17.14%), with smaller percentages identifying as bisexual (11.43%),

pansexual (11.43%), “other” (2.86%) and one participant who chose not to disclose their sexual orientation (2.86%).

In the SOARing+Text group, participants reported various psychosocial stressors. Among adverse childhood experiences, a significant percentage reported histories of abuse or violence (22.86%), abandonment (17.14%), and adoption or foster care placements (8.57%). Academic-related stressors were notable, with a considerable portion having current or past Individualized Educational Plans (IEP; 28.57%) and below-average academic functioning (8.57%). Family history revealed a substantial number of participants with relatives having mental illness (31.43%) and a history of substance use (31.43%). In terms of neurological and psychological history, some reported currently taking psychotropic medication (14.29%) and experiencing head trauma or seizures (5.71%). Additionally, a portion reported past (8.57%) and current (8.57%) substance use.

Procedures

Eligibility Criteria. Cut-off scores on the Revised Child Anxiety and Depression Scales (RCADS; Chorpita et al., 2000) were used to determine eligibility for the proposed study. Given that the RCADS developer defines a T-score of 70 as the clinical threshold and a T-score of 65 as borderline clinical symptoms (Chorpita et al., 2005; Trickey, 2014), a T-score of 60 was used as an appropriate cut-off point for heightened internalizing symptoms. Students who exhibited suicidal ideation, acute psychosis, or profound intellectual disability (determined by the lead school counselor) were excluded from study participation. Students were permitted access to the intervention without participating in the research study at their request.

Recruitment. Lead counselors at Sierra High School used the school’s own mental health screening instrument that is administered to all entering students to identify those experiencing

difficulties in emotion regulation. Counselors subsequently met with students who endorsed these symptoms and satisfied the other eligibility requirements to evaluate whether they were willing to engage in group therapy and the proposed research.

Consent. Students under the age of 16 who expressed an interest in participating in the planned research provided written and verbal assent, and a parent consent form was sent home to collect mandatory approval from a parent, caregiver, or guardian. Students over age 16 (legal age in California to receive mental health support without parental consent) provided written and verbal informed consent.

Assignment and scheduling. Initially, students were to be assigned to either an immediate treatment group or delayed treatment group (i.e., waitlist control condition), depending on when school counsellors identified students with noted symptomatology. Students in the immediate treatment group were to receive the text messaging adjunct in addition to the SOARing intervention (SOARing+text), whereas students in the waitlist control condition were to receive the SOARing intervention alone after a period of approximately three months (SOARing-only). However, difficulties with the recruitment timeline and the ethical need to provide distressed students with immediate treatment led to a modification in the assignment schedule, such that all available participants who engaged in the SOARing program in the 2022-2023 school year received SOARing+Text and were compared to a historical control group who engaged in the SOARing program in the 2021-2022 school year before the text messaging adjunct was developed. Individuals who did not have a cell phone were provided the opportunity to receive text message content via email or paper copies if requested while engaging in the SOARing program. No students in the present study opted to received the context via alternative methods.

Data Collection. All data for the proposed study were gathered using tablet computers. Participants completed baseline measurements at Time 1 (T1). Following the last session of the concurrent school-based DBT intervention offered at Sierra High School (approximately six weeks later), these individuals completed post-treatment assessment questionnaires (T2). Six weeks after the intervention ended (T3), measures were completed once again to assess for any prolonged treatment benefit. This data collection schedule was followed during the 2021-2022 school year before the creation of the text-messaging adjunct. For the 2022-2023 school year, the same data collection schedule was followed, with participants completing baseline measurements at T1 before receiving the first text message of the adjunct intervention. Figure 1 provides a flowchart of the study schedule.

The recruitment goal for adequate statistical power of the proposed study was collecting complete data from at least 60 participants. The assessment schedule described above was repeated as needed to achieve minimum participant recruitment, with a cohort commencing approximately every 6 weeks. Upon study conclusion, data were pooled across all eligible participants from the 2022-2023 groups to create an overall SOARing+text group. The same procedure was used for all eligible participants from the 2021-2022 groups to create an overall SOARing-only group.

Intervention

Text messages were written by a clinical psychology graduate student with additional training and experience delivering DBT. The resulting bank of seventy-four text messages were reviewed and critiqued by a DBT-trained clinical psychology faculty member. After necessary revisions, the messages were reviewed and critiqued by clinical psychology graduate students with training in DBT. After any further revisions, messages were discussed with a focus group of

students at Sierra High School to receive critiques from a population most like those who would complete the intervention. Feedback from the focus group was solicited to make final revisions to the bank of text messages that were used in the proposed intervention. However, feedback from the focus group was overwhelmingly positive and thus no substantive revisions were required.

Beginning on the first day of treatment, participants in the SOARing+text group received twice daily unidirectional pre-programmed supportive and psychoeducational text messages. Students received messages for six weeks to best align with class scheduling at Sierra High School. Messages were programmed into an online software (i.e., TextMagic) to deliver the intervention content. This service cost \$10.00 per month to reserve a local phone number capable of sending and receiving messages, and \$0.04 per text message. Text messages were sent at 10 am and 7 pm each day (timing communications in line with research that adolescent circadian rhythms are shifted slightly later than other developmental periods; Crouse et al., 2021). Psychoeducational text messages were devised based on DBT principles and skills covered by the SOARing intervention, including (1) mindfulness skills, (2) interpersonal effectiveness skills, (3) distress tolerance skills, and (4) emotion regulation skills (adapted from DBT Skills in Schools; Mazza et al., 2016). Content of supportive text messages was guided by content categories found in prior research such as (1) increasing self-efficacy to bring about positive change, (2) increasing motivation to continue treatment engagement, (3) providing crisis resources, (4) increasing social support seeking, (5) providing reminders to engage in skills and to attend the intervention, and (6) instilling hope and setting positive expectations (Czyz et al., 2020).

Developed by Becker and colleagues, the REACH framework identifies five critical elements (Relationship, Expectancy, Attendance, Clarity, and Homework) to enhance engagement in therapeutic settings (Becker et al., 2018). The REACH framework was also used to guide the creation of messaging content.

To foster a therapeutic relationship in a text messaging format, messages employed first-person language and pseudo-interactive elements such as questions to simulate a conversational tone. For example, messages like, “Did you know that there are numbers you can text if you need support? Text 988 to reach a volunteer crisis counselor any time 24/7,” aimed to establish a connection and provide a sense of ongoing dialogue rather than passive transmission of content. Expectancy was addressed by motivating participants and setting positive expectations about the outcomes of their treatment. Messages such as “Acceptance and change: In DBT, we learn strategies to accept life as it is right now. We also learn skills to help make positive changes in our behavior and relationships” emphasized the potential benefits of persistent engagement in the program. Attendance was encouraged through practical reminders, in service of potentially reducing no-shows and tardiness, and keeping the intervention consistently in participants’ daily lives with messages like, “See you tomorrow at 12:30 for DBT life skills class! Set your alarm now so you don’t forget.” Clarity about the treatment process was enhanced through messages explaining DBT’s goals and methods, such as, “The main goals of DBT are to teach you how to live in the moment, develop healthy ways to cope with stress, manage emotions, and improve your relationships,” potentially helping participants understand the rationale and roles within the therapy. Although the SOARing program does not traditionally include homework, the daily text messages served as out-of-session activities, reinforcing DBT skills practice and perhaps enriching the overall therapeutic experience by aiding in the consolidation of new skills.

Two different messages aligned with content synchronized to the SOARing session manual were dispatched every day with no repetition throughout the six-week period. The same messages were delivered to all patients in the same sequence according to the day they entered the proposed study, with no individual tailoring of message content. See Appendix 1 for examples of text messages.

Participants in the SOARing-only group did not receive any communication via text messaging from study personnel. Research assistants collected assessment data across all stages of the proposed intervention. For the proposed study, all measures were completed at baseline, post-intervention, and six weeks follow-up.

Measures

Revised Child Anxiety and Depression Scales (RCADS). Anxiety and depression symptoms were assessed using the Revised Child Anxiety and Depression Scales (RCADS) (Chorpita et al., 2000). On a four-point Likert-type scale, participants assess how often they experience internalizing thoughts and behaviors across 47 self-report items with response choices including 0 = Never, 1 = Sometimes, 2 = Often, 3 = Always. RCADS features six subscales, including seven items that address separation anxiety disorder (SAD; e.g., “I worry about being away from my parents”), nine items that address social phobia (SP; e.g., “I worry I might look foolish”), six items that address generalized anxiety disorder (GAD; e.g., “I worry that bad things will happen to me”), nine items that address panic disorder (PD; e.g., “I suddenly feel as if I can't breathe when there is no reason for this”), six items that address obsessive compulsive disorder (OCD; e.g., “I have to do some things over and over again, like washing my hands, cleaning or putting things in a certain order”), and ten items that address major depressive disorder (MDD; e.g., “I feel sad or empty”). Higher scores on all subscales imply more severe

symptomatology in that category. The five anxiety subscales are added together to produce a Total Anxiety Scale, and the 47 items are added together to produce a Total Internalizing Scale. (Chorpita et al., 2000). The MDD subscale and the Total Anxiety Scale were used to evaluate these symptoms in students in the proposed study. RCADS subscales display acceptable to good internal consistencies, with Cronbach's alpha values ranging from: SP = 0.81 - 0.82, PD = 0.79 - 0.85, GAD = 0.77 - 0.80, MDD = 0.76, SAD = 0.76 - 0.78, and OCD = 0.71 - 0.73 (Chorpita et al., 2000). Furthermore, the subscales had good internal consistencies among a clinical youth sample with Cronbach's alpha values including SP = 0.87, PD = 0.88, GAD = 0.84, MDD = 0.87, SAD = 0.78, and OCD = 0.82 (Chorpita, Moffitt, et al., 2005). In the present study, Cronbach's alpha for this measure was .97 pre-intervention and .98 post-intervention. See Appendix 2 for Revised Child Anxiety and Depression Scales.

The Difficulties in Emotion Regulation Scale. Emotion dysregulation was assessed using subscales from Difficulties in Emotion Regulation scale (DERS; Gratz & Roemer, 2004). A version of the DERS adapted for use with adolescents was administered in the proposed study (Weinberg & Klonsky, 2009). On a 5-point Likert-type scale, participants assess how often they experience emotion regulation issues across 36 self-report items. The response choices include: 1 = Almost Never, 2 = Sometimes, 3 = About Half the Time, 4 = Most of the Time, and 5 = Almost Always. DERS subscales include six items addressing non-acceptance of emotional responses (e.g., "When I'm upset, I feel ashamed of myself for feeling that way"), five items addressing difficulties engaging in goal directed behavior (e.g., "When I'm upset, I have difficulty thinking about anything else"), six items addressing impulse control difficulties (e.g., "When I'm upset, I become out of control"), six items addressing lack of emotional awareness (e.g., "When I'm upset, I acknowledge my emotions" [reverse scored]), eight items addressing

limited access to emotion regulation strategies (e.g., “When I’m upset, I believe that I will remain that way for a long time”), and five items addressing lack of emotional clarity (e.g., “I have difficulty making sense out of my feelings”). The items in each subscale are averaged to create an overall emotion dysregulation score. Higher scores indicate greater difficulties with emotion regulation. The DERS has displayed adequate predictive and construct validity, good test-retest reliability, and high internal consistency ($\alpha = .93$), with subscale Cronbach’s alpha values greater than .80 (Gratz & Roemer, 2004). Similar internal consistency has been reported for the overall adolescent adapted measure ($\alpha = 0.93$), with subscale internal consistency values varying from adequate to good ($\alpha = .76 - .89$) (Weinberg & Klonsky, 2009). In the present study, Cronbach’s alpha for this measure was .94 pre-intervention and .93 post-intervention. See Appendix 3 for Difficulties in Emotion Regulation Scale.

The Mindfulness Attention Awareness Scale (MAAS). Frequency of mindful states (i.e., non-judgmental directed attention and awareness to the present moment) was assessed by the Mindfulness Attention Awareness Scale (MAAS; Brown & Ryan, 2003; Carlson & Brown, 2005). On a six-point Likert-type scale, participants assess the frequency of behavioral experiences that are not indicative of mindful states across 15 self-report questions (e.g., “I tend to walk quickly to get where I’m going without paying attention to what I experience along the way”). Response choices include 1 = Almost Always, 2 = Very Frequently, 3 = Somewhat Frequently, 4 = Somewhat Infrequently, 5 = Very Infrequently, and 6 = Almost Never. Higher scores suggest more mindfulness due to the structure of the answer alternatives and the valence of the items. MAAS exhibits good internal consistency in adult populations, with a reported Cronbach’s alpha value 0.87 (Brown & Ryan, 2003). The MAAS was adapted for youth populations leading to the Mindful Attention Awareness Scale - Adolescent (MAAS – A)

(Brown et al., 2011). Item 12 has been removed from the MAAS – A because it pertains to driving a vehicle, which is not a developmentally appropriate task for younger teenagers. MAAS-A has been psychometrically validated for use with adolescents and has demonstrated good internal consistency, with Cronbach’s alpha values from 0.82 to 0.84, and good test-retest reliability evidenced by an intraclass correlation of 0.79 (Brown et al., 2011; De Bruin et al., 2011). The current study used the original MAAS since the proposed sample of students will consist of older adolescents. In the present study, Cronbach’s alpha for this measure was .90 pre-intervention and .94 post-intervention. See Appendix 4 for the Mindfulness Attention Awareness Scale.

Symptom Checklist-90-Revised (SCL-90-R). Interpersonal effectiveness was assessed using the Interpersonal Sensitivity (INT) subscale of the Symptom Checklist-90-Revised (SCL-90-R; Derogatis & Cleary, 1977; Derogatis et al., 1973). On a 5-point Likert-type scale, respondents are asked to indicate how often they were concerned about a variety of interpersonal difficulties over the preceding week across 10 self-report items. Example items include, “Feeling critical of others,” and “Feeling that people are unfriendly or dislike you.” Response choices include 0 = Not at All, 1 = A Little Bit, 2 = Moderately, 3 = Quite a Bit, and 4 = Extremely. The INT subscale measures self-criticism, severe self-consciousness, and perceived personal inadequacy and inferiority in interpersonal situations (Derogatis & Cleary, 1977; Derogatis et al., 1973; Derogatis et al., 1976). Higher scores indicate heightened interpersonal sensitivity or reduced interpersonal effectiveness. The INT subscale has demonstrated good internal consistency, with a Cronbach’s alpha value of 0.86 in an initial psychometric study (Derogatis et al., 1976). Furthermore, this measure has also shown high reliability in adolescent samples, such as a Cronbach’s alpha value of 0.91 in a recent adolescent DBT evaluation study (Lenz et al.,

2016). Since the aim of the interpersonal effectiveness skills module is to help individuals appropriately assert their social needs and maintain relationships while maintaining self-respect, INT subscale scores are anticipated to decline between baseline and post-treatment assessments. In the present study, Cronbach's alpha for this measure was .92 pre-intervention and .91 post-intervention. See Appendix 5 for the Interpersonal Sensitivity (INT) subscale of the Symptom Checklist-90-Revised.

DBT Ways of Coping Checklist (DBT-WCCL). Effective employment of distress tolerance coping strategies was assessed by the DBT Skills Subscale (DSS) of the DBT Ways of Coping Checklist (DBT-WCCL; Neacsiu, Rizvi, Vitaliano, et al., 2010). An adaptation of the Revised Ways of Coping Checklist (RWCCCL), the DBT-WCCL was created to comprehensively assess DBT skills (Neacsiu, Rizvi, Vitaliano, et al., 2010; Vitaliano et al., 1985). On a 4-point Likert-type scale, respondents are asked to identify how often they have a range of thoughts and/or behaviors to either accept or ameliorate issues and stressors throughout the preceding month across the DSS's 38 self-report items. Example items include "Came up with a couple different solutions to my problem" and "Accepted my strong feelings but did not let them interfere with other things too much." Response choices include 0 = Never Used, 1 = Rarely Used, 2 = Sometimes Used, and 3 = Regularly Used (i.e., at least 4 to 5 times per week). All of the DSS skills are representative of adaptive coping strategies, and thus higher scores indicate increased DBT skills use when confronted with a problem or stressor. The DSS subscale has demonstrated good internal consistency with Cronbach's alpha values from 0.92 to 0.96 across a variety of clinical samples (Neacsiu, Rizvi, Vitaliano, et al., 2010). The DSS subscale has been psychometrically examined with youth populations, with excellent internal consistency ($\alpha = 0.94$) reported in a recent adolescent DBT evaluation study (Flynn et al., 2018; Lenz et al.,

2016). In the present study, Cronbach's alpha for this measure was .95 pre-intervention and .97 post-intervention. See Appendix 6 for DBT Ways of Coping Checklist. See Table 3 for descriptive statistics for all analyzed self-report measures for the present study.

Perceived Learning. Participants' perceptions of their own learning were measured by one question within the intervention satisfaction survey given after the second weekly session throughout the intervention (i.e., weeks 2-5) to examine for possible between group differences throughout the intervention. The question text was as follows: "I have greater knowledge of the topic covered today." Response choices were 0 = Disagree, 1 = Somewhat Disagree, 2 = Somewhat Agree, 4 = Agree.

Statistical Analysis

A priori power analyses were conducted using G*Power to determine the number of participants needed to detect small to medium effect sizes with the number of predictors included in the study (Faul et al., 2007). To detect significant differences between the two independent groups using t tests, a series of power analyses were conducted. Analyses were completed using effect sizes of small ($d = 0.2$), medium ($d = 0.3$), and large ($d = 0.5$), and each aimed to achieve 80% power ($1 - \beta = 0.80$) with an alpha error probability of 0.05. For a small effect size ($d = 0.2$), the power analysis indicated that a total sample size of 620 participants was required, with 310 individuals in each group. This size provided power of approximately 80.02%, and a critical t-value of 1.65, based on 618 degrees of freedom. For a medium effect size ($d = 0.3$), the required total sample size decreased to 278 participants, equally divided into two groups of 139. This size provided power close of approximately 80.23%, and a critical t-value of 1.65, with 276 degrees of freedom. For a large effect size ($d = 0.5$), the analysis indicated a total of 102 participants was

necessary with 51 in each group. This analysis indicated power of approximately 80.59%, with a critical t-value of 1.66, using 100 degrees of freedom.

To determine the appropriate power for a repeated measures MANOVA, power analyses were performed across three anticipated effect sizes: small (partial $\eta^2 = 0.2$), medium (partial $\eta^2 = 0.3$), and large (partial $\eta^2 = 0.5$). These analyses aimed to achieve 80% power ($1 - \beta = 0.80$) with an alpha error probability of 0.05, accounting for two groups and two time points, with a correlation among repeated measures of 0.3. For a small effect size (partial $\eta^2 = 0.2$), the power analysis indicated that a total sample size of 72 participants was required. This size provided a power of approximately 80.76%, with a critical F-value of 3.98, based on 1 numerator degree of freedom and 70 denominator degrees of freedom. Considering a medium effect size (partial $\eta^2 = 0.3$), the required total sample size decreased to 34 participants. This configuration suggested power close to 81.78%, with a critical F-value of 4.15, calculated over 1 numerator degree of freedom and 32 denominator degrees of freedom. For a large effect size (partial $\eta^2 = 0.5$), the results of the analysis indicated that a total of 14 participants was necessary. This setup indicated power of approximately 82.68%, with a critical F-value of 4.75, across 1 numerator degree of freedom and 12 denominator degrees of freedom.

Data were examined prior to conducting analyses for outliers and/or any violations of the necessary conditions to calculate t-tests and MANOVA. No outliers or violations were detected. All analyses were conducted using statistical analysis software (SPSS, Version 29). There was no need to control for missing data as there were none across each of the included outcome measures.

The goal of Aim 1 was to determine whether participating in the text messaging adjunct to the SOARing intervention significantly predicted improvements in engagement with the

SOARing program (i.e., increased DBT knowledge, increased DBT skills use, increased attendance). The goal of Aim 2 was to determine whether participating in the text messaging adjunct to the SOARing intervention significantly predicted improved scores on measures of clinical dysfunction (i.e., decreased depression symptoms, decreased anxiety symptoms, and improved emotion dysregulation). MANOVAs were completed to examine whether treatment condition (SOARing+text or SOARing-only) and time (pre- and post-intervention) were significantly associated with (1) changes in treatment engagement and (2) changes in clinical outcomes. For MANOVA analyses, we examined whether there were main effects for treatment condition (i.e., changes in outcomes based on group assignment), time (i.e., changes in outcomes across pre- and post-intervention), and treatment by time interactions. Independent samples *t*-tests were also performed to compare mean differences between groups regarding session attendance and perceived knowledge throughout the intervention (i.e., across four time points).

For Aim 1, we hypothesized that the treatment condition effect would be significant, such that the SOARing+text group would demonstrate greater perceived DBT knowledge, greater DBT skills use, and more SOARing group sessions attended at Time 2 in comparison to the SOARing-only group. Furthermore, we hypothesized that the treatment by time interaction effect would be significant, such that engagement would remain high for those in the SOARing+text group, while engagement scores of the SOARing-only group would decline over time.

For Aim 2, we hypothesized that treatment condition effect would be significant, such that the SOARing+text group would show greater reductions of depression and anxiety symptoms and greater reductions in emotion dysregulation at Time 2 in comparison to the SOARing-only group. Furthermore, we hypothesized that the time effect would be significant,

such that scores would improve within groups at post-intervention and follow-up when compared to baseline.

Results

Intervention Engagement

The study employed several independent samples *t*-tests and a 2x2 mixed MANOVA to examine the effects of treatment and time on various measures of engagement.

Group Attendance

Firstly, in terms of percentage of groups attended, it was found that individuals who received text messages attended more sessions ($M = 68.66$, $SD = 19.46$) compared to those who did not receive text messages ($M = 55.84$, $SD = 24.01$). This difference was statistically significant ($t[73] = 2.53$, $p < .01$), with a moderate effect size (Cohen's $d = .58$).

Perceived Knowledge

Next, perceived knowledge was assessed across four time points that were collected during weekly satisfaction surveys completed throughout the intervention (i.e., at the end of the second session held during weeks 2-5). On average, individuals who received text messages reported higher perceived learning, although this difference was only significant at time points 2 and 3. At time 1, as expected there was no significant difference in perceived learning between those who received text messages ($M = 3.32$, $SD = .95$) and those who did not ($M = 3.18$, $SD = .82$; $t[45] = 0.53$, $p = .30$, Cohen's $d = .16$). However, at time 2, individuals who received text messages reported significantly higher perceived learning ($M = 3.65$, $SD = .71$) compared to those who did not ($M = 3.20$, $SD = .76$; $t[46] = 2.11$, $p = .02$, Cohen's $d = .61$). Similarly, at time 3, individuals who received text messages reported significantly higher perceived learning ($M = 3.72$, $SD = .74$) compared to those who did not ($M = 3.33$, $SD = .59$; $t[41] = 1.84$, $p = .04$,

Cohen's $d = .57$). However, at time 4, there was no significant difference in perceived learning between the two groups ($t[36] = 0.14, p = .45$, Cohen's $d = .05$). It is likely that the statistical power for these t -tests was limited, and this may have affected the obtained results. See Table 4 for a summary of mean differences between groups on measures of treatment engagement.

Skills Use

To assess DBT skills use, a 2x2 mixed MANOVA was conducted (see Table 5), examining both the DBT Ways of Coping Checklist (DBT-WCCL) and the Mindfulness Attention Awareness Scale (MAAS). The results revealed a significant effect for time ($F[2] = 7.18, p = .001$, partial $\eta^2 = .164$), indicating that scores on DBT skills use significantly improved when comparing post-intervention measures to pre-intervention measures.

Further analysis of the univariate tests showed a non-significant effect for the DBT Ways of Coping Checklist ($p > .05$). However, there was a significant effect for the Mindfulness Attention Awareness Scale ($F[1] = 14.543, p < .001$, partial $\eta^2 = .164$). This suggests that, while the intervention did not lead to an increase in specific DBT skills use, it did significantly enhance individuals' utilization of mindfulness techniques.

Additionally, the study found no significant effect of text messaging ($F[2] = 0.98, p = .38$, partial $\eta^2 = .03$) on measures of skills use, indicating that those who received text messages did not exhibit different responses compared to those who did not receive them. Moreover, there was no significant interaction between time and text messaging ($p > .05$), suggesting that the impact of time on skills use measures was independent of whether individuals received text messaging or not.

Clinical Outcomes

The study utilized a 2x2 mixed MANOVA to investigate the effects of treatment and time on various clinical outcome measures (see Table 6). Specifically, the Revised Child Anxiety and Depression Scales (RCADS), Difficulties in Emotion Regulation Scale (DERS), and Symptom Checklist-90-Revised (SCL-90-R) were included as outcome variables in the analysis.

The results indicated a non-significant effect for time ($F[3] = 2.61, p = .06$, partial $\eta^2 = .10$), suggesting that there were no significant differences in scores on the clinical outcome measures when comparing post-intervention scores to pre-intervention scores. Although the p -value was close to the threshold for significance, it did not reach the conventional level of statistical significance. Similarly, there was a non-significant effect for text messaging ($F[3] = 0.96, p = .42$, partial $\eta^2 = .04$), indicating that individuals who received text messaging did not demonstrate different responses on the clinical outcome measures compared to those who did not receive text messaging. Furthermore, there was a non-significant interaction between time and text messaging ($F[3] = 1.92, p = .14$, partial $\eta^2 = .07$), indicating that the effect of time on the clinical outcome measures was not dependent on whether individuals received text messaging or not. In other words, the impact of time on the clinical outcomes did not vary based on the presence or absence of text messaging in the intervention.

Discussion

Adolescence represents a challenging transitional developmental phase characterized by a notable prevalence of mental health concerns, including depression and anxiety. However, effectively connecting this population with evidence-based treatments and keeping them engaged once connected remains a significant challenge. This study investigated the potential of ubiquitous devices, such as mobile phones, and low resource technologies, such as text messaging, to address these challenges. Specifically, the researchers explored whether the

integration of a text messaging adjunct to a Dialectical Behavior Therapy (DBT)-skills intervention could enhance intervention engagement and ultimately improve clinical mental health outcomes for attendees.

Intervention Engagement

One of the key findings of the present study was that individuals who received text messages demonstrated significantly higher session attendance compared to those who did not receive text messages. This finding suggests that the integration of text messaging can enhance engagement and commitment to the intervention, as reflected by increased attendance rates. However, it is important to consider potential historical artifacts that may have influenced these outcomes. For instance, the differing impacts of the COVID-19 pandemic across the 2021-2022 and 2022-2023 cohorts could have affected attendance, such as variations in public health measures and personal health concerns (Nathwani et al.). The moderate effect size (Cohen's $d = .58$) supports the practical significance of the text messaging effect, but these external factors must be acknowledged as they may confound the observed benefits. Improved attendance is important because it allows individuals to receive a higher dosage of the intervention, potentially leading to better treatment outcomes. Therefore, future analyses should carefully control for these variables to isolate the effect of the text messaging intervention more precisely.

Another important aspect examined in this study was perceived knowledge, which was assessed across four time points during the intervention. The results showed that individuals who received text messages reported higher perceived learning compared to those who did not, although the differences were only significant at time points 2 and 3. These findings indicate that the text messaging adjunct may have a positive impact on participants' subjective perception of knowledge acquisition during the intervention. It is critical to note, however, that perceived

knowledge may not necessarily correlate with actual knowledge gained (Wei et al., 2015).

Literature on cognitive biases, including the Dunning-Krueger effect, suggests that individuals' confidence in their knowledge can sometimes exceed their actual competence, highlighting a potential discrepancy between perceived and actual knowledge (Canady & Larzo, 2023). The variation in significance between the different time points may be attributable to factors such as the novelty effect of the messages wearing off or changes in the participants' engagement levels over time (Rodrigues et al., 2022). It is also possible that other variables not accounted for in this study could have impacted these results, such as individual differences in learning styles, prior knowledge, or external educational influences (Feinstein et al., 2015). The implications of these findings are significant for treatment outcomes, as higher perceived knowledge might improve motivation and adherence to the intervention even if it does not always correspond with actual learning (Jensen et al., 2011). Future research should explore these dynamics to better understand the conditions under which text messaging most effectively enhances perceived knowledge.

Furthermore, DBT skills use was examined using the DBT Ways of Coping Checklist (DBT-WCCL) and the Mindfulness Attention Awareness Scale (MAAS). The overall analysis indicated a significant improvement in DBT skills use when comparing post-intervention measures to pre-intervention measures across groups, as evidenced by the significant effect of time. However, when examining the specific measures separately, there was a non-significant effect for the DBT-WCCL but a significant effect for the MAAS. This finding highlights the potential of the DBT-skills intervention to foster mindfulness skills among adolescent attendees. It is important to consider, however, that these results could also be influenced by historical artifacts rather than solely by the intervention, especially given the quasi-experimental design of the study and the different historical conditions between the 2021-2022 and 2022-2023 cohorts

(such as the ongoing COVID-19 pandemic as discussed above). This interpretation underscores the potential of the DBT-skills intervention to be associated with the enhancement of mindfulness skills among adolescent attendees, yet a causal relationship should not be inferred without considering other influencing factors.

A significant effect was not found for text messaging on measures of skills use. This implies that the addition of text messaging may not result in notable differences in participants' responses compared to those who did not receive text messages. Moreover, the absence of a significant interaction between time and text messaging suggests that the impact of time on skills use measures may be independent of whether individuals received text messaging or not. These findings indicate that the overall improvement in skills use observed in this study may be attributed to the DBT-skills intervention itself rather than the integration of text messaging. However, it is important to consider that the lack of significant effects could be influenced by limited statistical power, which may have attenuated the observed relationships (Collins & Watt, 2021).

In conclusion, the integration of a text messaging adjunct to a DBT-skills intervention showed promise in enhancing intervention engagement, as evidenced by higher session attendance among individuals who received text messages. Additionally, the perceived learning of participants appeared to be positively associated with the text messaging adjunct at certain time points. However, no significant effects of text messaging were found on measures of skills use, suggesting that the observed improvements in skills utilization may be primarily attributable to the DBT-skills intervention itself. These findings contribute to the growing body of literature elucidating nuances of the potential benefits of technology-enhanced interventions and highlight

the importance of considering multiple outcome measures when evaluating the impact of adjunctive interventions in clinical settings.

Clinical Outcomes

The results of the study indicated a non-significant effect for time, suggesting that there were no significant differences in scores on the clinical outcome measures when comparing post-intervention scores to pre-intervention scores. Although the p -value ($p = .058$) approached the conventional threshold for statistical significance ($p < .05$), it did not reach it. Several factors could account for these nonsignificant findings. Firstly, the intervention may not have been sufficiently intense or long enough to elicit measurable changes in the clinical outcomes assessed (McMain et al., 2018). Additionally, the sample size may have been too small to detect subtle effects, which is supported by the p -value's proximity to the threshold of significance, suggesting that with a larger sample size, results might achieve statistical significance (Collins & Watt, 2021). The current study may have also lacked sufficient power to detect symptom changes in a non-clinical sample of individuals, where significant symptom shifts are less likely due to fewer and generally milder psychopathological symptoms in these populations. Given these considerations, these findings should be interpreted with caution, noting that the proximity of the p -value to the threshold for significance and the potential influence of a larger sample size may affect statistical power and outcomes.

Similarly, results of the study indicated a non-significant effect for text messaging on the clinical outcome measures. This indicates that individuals who received text messaging did not demonstrate different responses on measures of internalizing disorders, emotion dysregulation, or interpersonal sensitivity compared to those who did not receive text messaging. There are several potential reasons why the inclusion of the text messaging adjunct did not contribute to

additional improvements in the targeted clinical outcomes. First, the nature of text messaging—being relatively low in intensity and less personalized—may not be sufficient to affect deeper clinical changes required for significant improvements in complex conditions like emotion dysregulation or internalizing disorders (Gan et al., 2021). Additionally, the frequency and content of the messages may not have been adequately tailored to meet the specific needs of the participants (Goldberg et al., 2022). It is also possible that the effectiveness of text messaging is more pronounced in improving engagement rather than directly influencing clinical symptoms (Aguilera et al., 2017). These factors suggest that while text messaging may have potential in sustaining engagement, its impact on clinical outcomes is more complex and may require more nuanced approaches and further investigation to clarify its efficacy.

Furthermore, the study found a non-significant interaction between time and text messaging, indicating that the effect of time on the clinical outcome measures was not dependent on whether individuals received text messaging or not. This suggests that any changes observed in the clinical outcomes over time were not influenced by the presence or absence of the text messaging adjunct. Several potential explanations could account for the lack of interaction. It is possible that the general therapeutic elements of the primary intervention were sufficiently robust, thereby overshadowing any additional effects that text messaging could have offered. Alternatively, the text messaging component may not have been integrated in a manner that significantly differentiated the experiences of the two groups, such as similar levels of engagement or adherence being achieved through other aspects of the intervention. The consistency of time's impact across intervention groups suggests that while text messaging may enhance certain aspects of patient engagement or adherence, its capacity to influence clinical outcomes directly may be limited. Further research could explore modifying the frequency,

content, and personalization of the text messages to better assess their potential impact on clinical outcomes.

Clinical Implications

The text messaging adjunct introduced in the present pilot study may have shown some potential for enhancing treatment engagement in clinical practice. For instance, the use of reminder messages could have contributed to better treatment attendance by sending reminder messages prompting group participation. Additionally, those in the text messaging adjunct group reported high means levels of perceived learning during a portion of the intervention, potentially indicating that receiving text messages made participants perceive the content as more enriching or approachable. Moreover, text messaging may have served as a useful tool to maintain continuity of care for individuals who missed sessions and would not have access to those skills within the traditional group format. However, these observations should be interpreted with caution, as the potential cohort effects due to the COVID-19 pandemic might have influenced study results.

Observed results indicate that the SOARing intervention may be associated with improvements in clinically relevant variables such as time spent engaged in states of mindfulness, whether or not text messaging is included as an adjunct. However, it is important to note that the expected results were not observed across all outcomes, particularly the clinical outcome measures. Several factors may have contributed to this lack of significant findings. One significant factor is the multitude of contextual stressors experienced by those engaging in mental health treatment while living in resource-scarce geographical areas such as San Bernardino, California (Arthur et al., 2019). It is possible that clinicians practicing in such areas may need additional case management supports to help impoverished clients access necessities that would allow them to focus more on improving their mental health, such as access to

housing, food, clothing, and so forth. Furthermore, it is also possible that text messaging as a medium for reviewing DBT skills may not be captivating enough in clinical practice, particularly as mental health content increases on numerous competing and potentially more engaging platforms such as YouTube, TikTok, and other social media applications like Instagram.

Quality and quantity issues with the text message content also warrant consideration. Despite a thorough editing and revision process, the quality of the message content may not have met the required standards for effectiveness in clinical practice. Additionally, the complexity of teaching DBT skills through text messaging may necessitate more extensive messaging, since some skills required review over multiple days to adequately convey the skill while staying within the constraints of the technology.

Limitations

There are several limitations to the present study that warrant discussion. First, participants were not randomly assigned to different treatment conditions. Instead, they were compared to historical controls from the previous academic year. This limits the ability to attribute the positive observed effects on treatment engagement solely to the text messaging adjunct. Another limitation is the small sample size of this study, which imposed constraints on the use of certain statistical techniques (such as perceived learning, which required a series of independent samples *t*-tests at each time point due to insufficient power to compute a repeated measures ANOVA on this variable). Furthermore, due to the limited number of participants, the study lacks the necessary statistical power to establish a strong level of confidence in concluding that certain non-significant findings genuinely indicate the absence of an effect. Additionally, it is worth noting that the clinicians and data collectors involved in the study were not blinded to the different conditions, introducing the potential for bias in data collection and analysis. Next,

the study was conducted at only one site, specifically a continuation high school located in a low resource area of Southern California. This raises concerns about the generalizability of the findings to other educational settings, areas with higher resources, or different geographic regions. Furthermore, post-intervention data could not be obtained for individuals who discontinued attending the group sessions. This limitation may impact the interpretation of the lack of differences observed in outcomes between and within groups. It is possible that those who stopped attending did so either because they were experiencing severe symptoms or conversely because they believed they had sufficiently recovered. To address this issue, future studies should strive to collect assessments regardless of therapy session attendance.

Recommendations for Implementation and Future Research

There are several recommendations to offer regarding implementation and future research studying the effectiveness of text messaging adjuncts to mental health interventions. First, it is advisable to randomly assign individuals to either the traditional intervention or the intervention accompanied by text messaging. This approach ensures an unbiased distribution of participants and allows for a fairer comparison between the two interventions.

It is also important to place a greater emphasis on assessing longitudinal outcomes. This would involve examining whether any effects observed during the study are sustained over time or if significant effects manifest after a longer period of time has passed. Additionally, it would be valuable to investigate whether the continuation of text messaging after the end of the intervention significantly influences outcomes for participants during follow-up assessments.

Furthermore, it is recommended to examine functional improvements such as increased school attendance and improved grades. These measures can provide valuable additional insights into the effectiveness of the interventions that were outside the scope of the present study.

To enhance the study's validity, it is suggested to incorporate additional assessment techniques beyond relying solely on self-report measures. For example, including parent and/or teacher reports may provide a more comprehensive understanding of the participants' progress and outcomes.

Lastly, it is crucial for future research to measure the extent to which the text messages were read, if at all. In the present study, authors could only observe successful delivery of messages, but it is extremely important to determine whether participants actually read the messages. These data can provide insights into the engagement level and potential influence of the text messages on participants' clinical and functional outcomes. By implementing these recommendations, we can improve the study's methodology, expand the scope of research, and enhance the overall understanding of the intervention's effectiveness and long-term impact.

Concluding Summary

Adolescence is a critical developmental period for mental health, but connecting youth with effective treatments and maintaining their engagement in therapy remains challenging. This study investigated the integration of a text messaging adjunct to a school-based DBT-skills intervention for improving engagement and mental health outcomes. The findings suggested that text messaging may have had some positive effects, as individuals who received messages tended to show higher session attendance and reported increased perceived learning. However, the effects on perceived learning were not consistent across all time points. There was no significant effect of text messaging on overall skills use, but there was an enhancement in the utilization of mindfulness techniques within both groups. However, the study did not find significant improvements in clinical outcomes, and the impact of time on measured outcomes was not influenced by text messaging. All the study's findings must be interpreted with caution

due to non-random assignment and possible cohort effects. The study had further limitations in terms of small sample size, lack of blinding to treatment condition, and limited generalizability. Future research should address these limitations and consider longer-term outcomes and functional improvements. Overall, the results of this study are encouraging by suggesting that a low-cost and widely available technology, accessible even in resource-limited areas, may enhance engagement with mental health interventions through increased attendance and perceived learning. However, further research is needed to fully understand how we can successfully leverage this ubiquitous technology to improve clinical outcomes and effectively address the mental health challenges experienced by adolescents.

References

- Aguilera, A., Bruehlman-Senecal, E., Demasi, O., & Avila, P. (2017). Automated text messaging as an adjunct to cognitive behavioral therapy for depression: A clinical trial. *Journal of Medical Internet Research*, 19(5), e148. <https://doi.org/10.2196/jmir.6914>
- Ammerman, S., & Weiss, C. (2015). Assessing the feasibility of a text-messaging health intervention for uninsured adolescents through a mobile clinic program. *Journal of Adolescent Health*, 56(2), S56-S57. <https://doi.org/https://doi.org/10.1016/j.jadohealth.2014.10.113>
- Anstiss, D., & Davies, A. (2015). 'Reach out, rise up': The efficacy of text messaging in an intervention package for anxiety and depression severity in young people. *Children and Youth Services Review*, 58(1), 99-103. <https://doi.org/https://doi.org/10.1016/j.childyouth.2015.09.011>
- Arthur, K. N., Knutsen, S. F., Spencer-Hwang, R., Shavlik, D., & Montgomery, S. (2019). Health-predictive social-environmental stressors and social buffers are place based: A multilevel example from San Bernardino communities. *Journal of Primary Care & Community Health*, 2019(10). <https://doi.org/10.1177/2150132719835627>
- Barnicot, K., Gonzalez, R., McCabe, R., & Priebe, S. (2016). Skills use and common treatment processes in dialectical behaviour therapy for borderline personality disorder. *Journal of Behavior Therapy and Experimental Psychiatry*, 52(1), 147-156.
- Bauer, S., Percevic, R., Okon, E., Meermann, R. u., & Kordy, H. (2003). Use of text messaging in the aftercare of patients with bulimia nervosa. *European Eating Disorders Review: The Professional Journal of the Eating Disorders Association*, 11(3), 279-290. <https://doi.org/https://doi.org/10.1002/erv.521>

- Becker, K. D., Boustani, M., Gellatly, R., & Chorpita, B. F. (2018). Forty years of engagement research in children's mental health services: Multidimensional measurement and practice elements. *Journal of Clinical Child & Adolescent Psychology*, 47(1), 1-23. <https://doi.org/10.1080/15374416.2017.1326121>
- Beckstead, D. J., Lambert, M. J., DuBose, A. P., & Linehan, M. (2015). Dialectical behavior therapy with american indian/alaska native adolescents diagnosed with substance use disorders: Combining an evidence based treatment with cultural, traditional, and spiritual beliefs. *Addictive Behaviors*, 51(1), 84-87. <https://doi.org/10.1016/j.addbeh.2015.07.018>
- Belfer, M. L. (2008). Child and adolescent mental disorders: The magnitude of the problem across the globe. *Journal of Child Psychology and Psychiatry*, 49(3), 226-236. <https://doi.org/10.1111/j.1469-7610.2007.01855.x>
- Bjørnholt, K., Christiansen, E., Atterman Stockholm K, & Hvolby, A. (2016). The effect of daily small text message reminders for medicine compliance amongst young people connected with the outpatient department for child and adolescent psychiatry. A controlled and randomized investigation. *Nordic Journal of Psychiatry*, 70(4), 285-289. <https://doi.org/https://doi.org/10.3109/08039488.2015.1106580>
- Boschen, M. J., & Casey, L. M. (2008). The use of mobile telephones as adjuncts to cognitive behavioral psychotherapy. *Professional Psychology: Research and Practice*, 39(5), 546-552. <https://doi.org/https://doi.org/10.1037/0735-7028.39.5.546>
- Branson, C. E., Clemmey, P., & Mukherjee, P. (2013). Text message reminders to improve outpatient therapy attendance among adolescents: A pilot study. *Psychological Services*, 10(3), 298. <https://doi.org/https://doi.org/10.1037/a0026693>

- Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology*, 84(4), 822-848. <https://doi.org/10.1037/0022-3514.84.4.822>
- Brown, K. W., West, A. M., Loverich, T. M., & Biegel, G. M. (2011). Assessing adolescent mindfulness: Validation of an adapted mindful attention awareness scale in adolescent normative and psychiatric populations. *Psychological Assessment*, 23(4), 1023-1033. <https://doi.org/10.1037/a0021338>
- Canady, B. E., & Larzo, M. (2023, 2023/06/01). Overconfidence in managing health concerns: The dunning–kruger effect and health literacy. *Journal of Clinical Psychology in Medical Settings*, 30(2), 460-468. <https://doi.org/10.1007/s10880-022-09895-4>
- Carlson, L. E., & Brown, K. W. (2005). Validation of the mindful attention awareness scale in a cancer population. *Journal of Psychosomatic Research*, 58(1), 29-33. <https://doi.org/10.1016/j.jpsychores.2004.04.366>
- Centers for Disease Control and Prevention. (2020). Youth risk behavior surveillance data summary & trends report: 2009-2019.
- Chandra, P. S., Sowmya, H., Mehrotra, S., & Duggal, M. (2014). ‘SMS’ for mental health—feasibility and acceptability of using text messages for mental health promotion among young women from urban low income settings in india. *Asian Journal of Psychiatry*, 11(1), 59-64. <https://doi.org/https://doi.org/10.1016/j.ajp.2014.06.008>
- Chen, R. Y., Feltes, J. R., Tzeng, W. S., Lu, Z. Y., Pan, M., Zhao, N., Talkin, R., Javaherian, K., Glowinski, A., & Ross, W. (2017). Phone-based interventions in adolescent psychiatry: A perspective and proof of concept pilot study with a focus on depression and autism. *JMIR Research Protocols*, 6(6), e7245. <https://doi.org/https://doi.org/10.2196/resprot.7245>

- Chorpita, B. F., Moffitt, C. E., & Gray, J. (2005). Psychometric properties of the revised child anxiety and depression scale in a clinical sample. *Behaviour Research and Therapy*, 43(3), 309-322. <https://doi.org/10.1016/j.brat.2004.02.004>
- Chorpita, B. F., Yim, L., Moffitt, C., Umemoto, L. A., & Francis, S. E. (2000). Assessment of symptoms of dsm-iv anxiety and depression in children: A revised child anxiety and depression scale. *Behaviour Research and Therapy*, 38(8), 835-855. [https://doi.org/10.1016/S0005-7967\(99\)00130-8](https://doi.org/10.1016/S0005-7967(99)00130-8)
- Chu, B. C., Rizvi, S. L., Zendegui, E. A., & Bonavitacola, L. (2015). Dialectical behavior therapy for school refusal: Treatment development and incorporation of web-based coaching. *Cognitive and Behavioral Practice*, 22(3), 317-330. <https://doi.org/10.1016/j.cbpra.2014.08.002>
- Chugani, C. D., Ghali, M. N., & Brunner, J. (2013). Effectiveness of short term dialectical behavior therapy skills training in college students with cluster B personality disorders. *Journal of College Student Psychotherapy*, 27(4), 323-336. <https://doi.org/10.1080/87568225.2013.824337>
- Collins, E., & Watt, R. (2021). Using and understanding power in psychological research: A survey study. *Collabra: Psychology*, 7(1), e28250. <https://doi.org/10.1525/collabra.28250>
- Comtois, K. A., Elwood, L., Holdcraft, L. C., Smith, W. R., & Simpson, T. L. (2007). Effectiveness of dialectical behavior therapy in a community mental health center. *Cognitive and Behavioral Practice*, 14(4), 406-414. <https://doi.org/10.1016/j.cbpra.2006.04.023>

- Cook, N. E., & Gorraiz, M. (2016). Dialectical behavior therapy for nonsuicidal self-injury and depression among adolescents: Preliminary meta-analytic evidence. *Child and Adolescent Mental Health, 21*(2), 81-89. <https://doi.org/10.1111/camh.12112>
- Crouse, J. J., Carpenter, J. S., Song, Y. J. C., Hockey, S. J., Naismith, S. L., Grunstein, R. R., Scott, E. M., Merikangas, K. R., Scott, J., & Hickie, I. B. (2021). Circadian rhythm sleep-wake disturbances and depression in young people: Implications for prevention and early intervention. *Lancet Psychiatry, 8*(9), 813-823. [https://doi.org/https://doi.org/10.1016/s2215-0366\(21\)00034-1](https://doi.org/https://doi.org/10.1016/s2215-0366(21)00034-1)
- Czyz, E. K., Arango, A., Healy, N., King, C. A., & Walton, M. (2020). Augmenting safety planning with text messaging support for adolescents at elevated suicide risk: Development and acceptability study. *JMIR Mental Health, 7*(5), e17345. <https://doi.org/https://doi.org/10.2196/17345>
- Dahl, R. E., Allen, N. B., Wilbrecht, L., & Suleiman, A. B. (2018). Importance of investing in adolescence from a developmental science perspective. *Nature, 554*(7693), 441-450. <https://doi.org/10.1038/nature25770>
- De Bruin, E. I., Zijlstra, B. J., van de Weijer-Bergsma, E., & Bögels, S. M. (2011). The mindful attention awareness scale for adolescents (MAAS-A): Psychometric properties in a dutch sample. *Mindfulness, 2*(3), 201-211. <https://doi.org/10.1007/s12671-011-0061-6>
- Derogatis, L. R., & Cleary, P. A. (1977). Confirmation of the dimensional structure of the SCL-90: A study in construct validation. *Journal of Clinical Psychology, 33*(4), 981-989. [https://doi.org/10.1002/1097-4679\(197710\)33:4<981::AID-JCLP2270330412>3.0.CO;2-](https://doi.org/10.1002/1097-4679(197710)33:4<981::AID-JCLP2270330412>3.0.CO;2-0)

- Derogatis, L. R., Lipman, R. S., & Covi, L. (1973). SCL-90: An outpatient psychiatric rating scale—preliminary report. *Psychopharmacological Bulletin*, 9(1), 13-28.
- Derogatis, L. R., Rickels, K., & Rock, A. F. (1976). The scl-90 and the mmpi: A step in the validation of a new self-report scale. *British Journal of Psychiatry*, 128(3), 280-289.
<https://doi.org/10.1192/bjp.128.3.280>
- Dimeff, L. A., & Koerner, K. E. (2007). *Dialectical behavior therapy in clinical practice: Applications across disorders and settings*. Guilford Press.
- Duan, S., Wang, H., Wilson, A., Qiu, J., Chen, G., He, Y., Wang, Y., Ou, J., & Chen, R. (2020). Developing a text messaging intervention to reduce deliberate self-harm in chinese adolescents: Qualitative study. *JMIR mHealth and uHealth*, 8(6), e16963.
<https://doi.org/https://doi.org/10.2196/16963>
- Duffy, M. E., Twenge, J. M., & Joiner, T. E. (2019). Trends in mood and anxiety symptoms and suicide-related outcomes among us undergraduates, 2007–2018: Evidence from two national surveys. *Journal of Adolescent Health*, 65(5), 590-598.
<https://doi.org/10.1016/j.jadohealth.2019.04.033>
- Dyer, O. (2003). Patients will be reminded of appointments by text messages. *British Medical Journal*, 326(1281). <https://doi.org/https://doi.org/10.1136/bmj.326.7402.1281-a>
- Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39(2), 175-191. <https://doi.org/10.3758/BF03193146>
- Feinstein, R., Heiman, N. O. A., & Yager, J. (2015). Common factors affecting psychotherapy outcomes: Some implications for teaching psychotherapy. *Journal of Psychiatric Practice*, 21(3). <https://doi.org/10.1097/PRA.0000000000000064>

- Fleischhaker, C., Böhme, R., Sixt, B., Brück, C., Schneider, C., & Schulz, E. (2011). Dialectical behavioral therapy for adolescents (DBT-A): A clinical trial for patients with suicidal and self-injurious behavior and borderline symptoms with a one-year follow-up. *Child and Adolescent Psychiatry and Mental Health*, 5(1), e3. <https://doi.org/10.1186/1753-2000-5-3>
- Fleischhaker, C., Munz, M., Böhme, R., Sixt, B., & Schulz, E. (2006). Dialectical behaviour therapy for adolescents (dbt-a)--a pilot study on the therapy of suicidal, parasuicidal, and self-injurious behaviour in female patients with a borderline disorder. *Zeitschrift für Kinder-und Jugendpsychiatrie und Psychotherapie*, 34(1), 15-25. <https://doi.org/10.1024/1422-4917.34.1.15>
- Flynn, D., Joyce, M., Weihrauch, M., & Corcoran, P. (2018). Innovations in practice: Dialectical behaviour therapy--skills training for emotional problem solving for adolescents (DBT STEPS-A): Evaluation of a pilot implementation in Irish post-primary schools. *Child and Adolescent Mental Health*, 23(4), 376-380. <https://doi.org/10.1111/camh.12284>
- Franklin, V., Waller, A., Pagliari, C., & Greene, S. (2003). " Sweet talk": Text messaging support for intensive insulin therapy for young people with diabetes. *Diabetes Technology & Therapeutics*, 5(6), 991-996. <https://doi.org/https://doi.org/10.1089/152091503322641042>
- Gan, D. Z., McGillivray, L., Han, J., Christensen, H., & Torok, M. (2021). Effect of engagement with digital interventions on mental health outcomes: A systematic review and meta-analysis. *Frontiers in Digital Health*, 2021(3), e764079. <https://doi.org/10.3389/fdgth.2021.764079>

- Ganapathy, S., de Korne, D. F., Chong, N. K., & Car, J. (2020). The role of text messaging and telehealth messaging apps. *Pediatric Clinics*, 67(4), 613-621.
<https://doi.org/https://doi.org/10.1016/j.pcl.2020.04.002>
- Gates, A., Stephens, J., & Artiga, S. (2014). *Profiles of medicaid outreach and enrollment strategies: Using text messaging to reach and enroll uninsured individuals into medicaid and chip*. Henry J. Kaiser Family Foundation. <https://www.kff.org/medicaid/issue-brief/profiles-of-medicaid-outreach-and-enrollment-strategies-using-text-messaging-to-reach-and-enroll-uninsured-individuals-into-medicaid-and-chip/#footnote-101364-8>
- Geddes, K., Dziurawiec, S., & Lee, C. W. (2013). Dialectical behaviour therapy for the treatment of emotion dysregulation and trauma symptoms in self-injurious and suicidal adolescent females: A pilot programme within a community-based child and adolescent mental health service. *Psychiatry Journal*, 2013(1), e145219.
<https://doi.org/10.1155/2013/145219>
- Glenn, C. R., Esposito, E. C., Porter, A. C., & Robinson, D. J. (2019). Evidence base update of psychosocial treatments for self-injurious thoughts and behaviors in youth. *Journal of Clinical Child & Adolescent Psychology*, 48(3), 357-392.
<https://doi.org/10.1080/15374416.2019.1591281>
- Gold, J., Lim, M. S., Hellard, M. E., Hocking, J. S., & Keogh, L. (2010). What's in a message? Delivering sexual health promotion to young people in australia via text messaging. *BMC Public Health*, 10(1), 1-11. <https://doi.org/https://doi.org/10.1186/1471-2458-10-792>
- Goldberg, S. B., Lam, S. U., Simonsson, O., Torous, J., & Sun, S. (2022). Mobile phone-based interventions for mental health: A systematic meta-review of 14 meta-analyses of

- randomized controlled trials. *PLOS Digital Health*, 1(1), e0000002.
<https://doi.org/10.1371/journal.pdig.0000002>
- Goldstein, T. R., Axelson, D. A., Birmaher, B., & Brent, D. A. (2007). Dialectical behavior therapy for adolescents with bipolar disorder: A 1-year open trial. *Journal of the American Academy of Child & Adolescent Psychiatry*, 46(7), 820-830.
<https://doi.org/10.1097/chi.0b013e31805c1613>
- Goldstein, T. R., Fersch-Podrat, R. K., Rivera, M., Axelson, D. A., Merranko, J., Yu, H., Brent, D. A., & Birmaher, B. (2015). Dialectical behavior therapy for adolescents with bipolar disorder: Results from a pilot randomized trial. *Journal of Child and Adolescent Psychopharmacology*, 25(2), 140-149. <https://doi.org/10.1089/cap.2013.0145>
- Gonzales, R., Ang, A., Murphy, D. A., Glik, D. C., & Anglin, M. D. (2014). Substance use recovery outcomes among a cohort of youth participating in a mobile-based texting aftercare pilot program. *Journal of Substance Abuse Treatment*, 47(1), 20-26.
<https://doi.org/https://doi.org/10.1016/j.jsat.2014.01.010>
- Gonzales, R., Douglas Anglin, M., & Glik, D. C. (2014). Exploring the feasibility of text messaging to support substance abuse recovery among youth in treatment. *Health Education Research*, 29(1), 13-22. <https://doi.org/https://doi.org/10.1093/her/cyt094>
- Gonzales, R., Hernandez, M., Murphy, D. A., & Ang, A. (2016). Youth recovery outcomes at 6 and 9 months following participation in a mobile texting recovery support aftercare pilot study. *The American Journal on Addictions*, 25(1), 62-68.
<https://doi.org/https://doi.org/10.1111/ajad.12322>
- Gratz, K. L., & Roemer, L. (2004). Multidimensional assessment of emotion regulation and dysregulation: Development, factor structure, and initial validation of the difficulties in

- emotion regulation scale. *Journal of Psychopathology and Behavioral Assessment*, 26(1), 41-54. <https://doi.org/10.1023/B:JOBA.0000007455.08539.94>
- Hjalmarsson, E., Kåver, A., Perseus, K. I., Cederberg, K., & Ghaderi, A. (2008). Dialectical behaviour therapy for borderline personality disorder among adolescents and young adults: Pilot study, extending the research findings in new settings and cultures. *Clinical Psychologist*, 12(1), 18-29. <https://doi.org/10.1080/13284200802069035>
- James, A. C., Taylor, A., Winmill, L., & Alfoadari, K. (2008). A preliminary community study of dialectical behaviour therapy (dbt) with adolescent females demonstrating persistent, deliberate self-harm (dsh). *Child and Adolescent Mental Health*, 13(3), 148-152. <https://doi.org/10.1111/j.1475-3588.2007.00470.x>
- James, A. C., Winmill, L., Anderson, C., & Alfoadari, K. (2011). A preliminary study of an extension of a community dialectic behaviour therapy (DBT) programme to adolescents in the looked after care system. *Child and Adolescent Mental Health*, 16(1), 9-13. <https://doi.org/10.1111/j.1475-3588.2010.00571.x>
- Jensen, C. D., Cushing, C. C., Aylward, B. S., Craig, J. T., Sorell, D. M., & Steele, R. G. (2011). Effectiveness of motivational interviewing interventions for adolescent substance use behavior change: A meta-analytic review. *Journal of Consulting and Clinical Psychology*, 79(4), 433-440. <https://doi.org/10.1037/a0023992>
- Joyce, D., & Weibelzahl, S. (2011). Student counseling services: Using text messaging to lower barriers to help seeking. *Innovations in Education and Teaching International*, 48(3), 287-299. <https://doi.org/https://doi.org/10.1080/14703297.2011.593705>
- Katz, L. Y., Cox, B. J., Gunasekara, S., & Miller, A. L. (2004). Feasibility of dialectical behavior therapy for suicidal adolescent inpatients. *Journal of the American Academy of Child &*

- Adolescent Psychiatry*, 43(3), 276-282. <https://doi.org/10.1097/00004583-200403000-00008>
- Keating, S. R., & McCurry, M. K. (2015). Systematic review of text messaging as an intervention for adolescent obesity. *Journal of the American Association of Nurse Practitioners*, 27(12), 714-720. [https://doi.org/https://doi.org/10.1002/2327-6924.12264](https://doi.org/10.1002/2327-6924.12264)
- Khalid-Khan, S., Segal, S. C., Jopling, E. N., Southmayd, K., & Marchand, P. (2016). Effectiveness of a modified dialectical behaviour therapy for adolescents within a stepped-care model. *International Journal of Adolescent Medicine and Health*, 30(2), e20160030. <https://doi.org/10.1515/ijamh-2016-0030>
- Kobak, K. A., Mundt, J. C., & Kennard, B. (2015). Integrating technology into cognitive behavior therapy for adolescent depression: A pilot study. *Annals of General Psychiatry*, 14(1), 1-10. [https://doi.org/https://doi.org/10.1186/s12991-015-0077-8](https://doi.org/10.1186/s12991-015-0077-8)
- Koons, C. R., Robins, C. J., Tweed, J. L., Lynch, T. R., Gonzalez, A. M., Morse, J. Q., Bishop, G. K., Butterfield, M. I., & Bastian, L. A. (2001). Efficacy of dialectical behavior therapy in women veterans with borderline personality disorder. *Behavior Therapy*, 32(2), 371-390. [https://doi.org/10.1016/S0005-7894\(01\)80009-5](https://doi.org/10.1016/S0005-7894(01)80009-5)
- Kruse, L. V., Hansen, L. G., & Olesen, C. (2009). Non-attendance at a pediatric outpatient clinic. Sms text messaging improves attendance. *Ugeskrift for Laeger*, 171(17), 1372-1375.
- Lenhart, A. (2012). *Teens, smartphones and texting*. Pew Internet Research Centre. https://www.pewinternet.org/wp-content/uploads/sites/9/media/Files/Reports/2012/PIP_Teens_Smartphones_and_Texting.pdf

- Lenz, A. S., Del Conte, G., Hollenbaugh, K. M., & Callendar, K. (2016). Emotional regulation and interpersonal effectiveness as mechanisms of change for treatment outcomes within a dbt program for adolescents. *Counseling Outcome Research and Evaluation*, 7(2), 73-85. <https://doi.org/10.1177/2150137816642439>
- Linehan, M. M. (1993). *Skills training manual for treating borderline personality disorder*. Guilford Press.
- Linehan, M. M. (2018). *Cognitive-behavioral treatment of borderline personality disorder*. Guilford Publications.
- Linehan, M. M., Armstrong, H. E., Suarez, A., Allmon, D., & Heard, H. L. (1991). Cognitive-behavioral treatment of chronically parasuicidal borderline patients. *Archives of General Psychiatry*, 48(12), 1060-1064. <https://doi.org/10.1001/archpsyc.1991.01810360024003>
- Linehan, M. M., Comtois, K. A., Murray, A. M., Brown, M. Z., Gallop, R. J., Heard, H. L., Korslund, K. E., Tutek, D. A., Reynolds, S. K., & Lindenboim, N. (2006). Two-year randomized controlled trial and follow-up of dialectical behavior therapy vs therapy by experts for suicidal behaviors and borderline personality disorder. *Archives of General Psychiatry*, 63(7), 757-766. <https://doi.org/10.1001/archpsyc.63.7.757>
- Linehan, M. M., Dimeff, L. A., Reynolds, S. K., Comtois, K. A., Welch, S. S., Heagerty, P., & Kivlahan, D. R. (2002). Dialectical behavior therapy versus comprehensive validation therapy plus 12-step for the treatment of opioid dependent women meeting criteria for borderline personality disorder. *Drug and Alcohol Dependence*, 67(1), 13-26. [https://doi.org/10.1016/S0376-8716\(02\)00011-X](https://doi.org/10.1016/S0376-8716(02)00011-X)

- Linehan, M. M., & Wilks, C. R. (2015). The course and evolution of dialectical behavior therapy. *American Journal of Psychotherapy*, 69(2), 97-110.
<https://doi.org/https://doi.org/10.1176/appi.psychotherapy.2015.69.2.97>
- Markowitz, J. T., Cousineau, T., Franko, D. L., Schultz, A. T., Trant, M., Rodgers, R., & Laffel, L. M. (2014). Text messaging intervention for teens and young adults with diabetes. *Journal of Diabetes Science and Technology*, 8(5), 1029-1034.
<https://doi.org/https://doi.org/10.1177/1932296814540130>
- Mazza, J. J., Dexter-Mazza, E. T., Miller, A. L., Rathus, J. H., & Murphy, H. E. (2016). *DBT skills in schools: Skills training for emotional problem solving for adolescents DBT STEPS-A*. Guilford Publications.
- McMain, S. F., Chapman, A. L., Kuo, J. R., Guimond, T., Streiner, D. L., Dixon-Gordon, K. L., Isaranuwatthai, W., & Hoch, J. S. (2018). The effectiveness of 6 versus 12-months of dialectical behaviour therapy for borderline personality disorder: The feasibility of a shorter treatment and evaluating responses (faster) trial protocol. *BMC Psychiatry*, 18(1), 230. <https://doi.org/10.1186/s12888-018-1802-z>
- Meaney-Tavares, R., & Hasking, P. (2013). Coping and regulating emotions: A pilot study of a modified dialectical behavior therapy group delivered in a college counseling service. *Journal of American College Health*, 61(5), 303-309.
<https://doi.org/10.1080/07448481.2013.791827>
- Mehlum, L., Ramberg, M., Tørmøen, A. J., Haga, E., Diep, L. M., Stanley, B. H., Miller, A. L., Sund, A. M., & Grøholt, B. (2016). Dialectical behavior therapy compared with enhanced usual care for adolescents with repeated suicidal and self-harming behavior: Outcomes

- over a one-year follow-up. *Journal of the American Academy of Child & Adolescent Psychiatry*, 55(4), 295-300. <https://doi.org/10.1016/j.jaac.2016.01.005>
- Mehlum, L., Ramleth, R. K., Tørmoen, A. J., Haga, E., Diep, L. M., Stanley, B. H., Miller, A. L., Larsson, B., Sund, A. M., & Grøholt, B. (2019). Long term effectiveness of dialectical behavior therapy versus enhanced usual care for adolescents with self-harming and suicidal behavior. *Journal of Child Psychology and Psychiatry*, 60(10), 1112-1122. <https://doi.org/10.1111/jcpp.13077>
- Mehlum, L., Tørmoen, A. J., Ramberg, M., Haga, E., Diep, L. M., Laberg, S., Larsson, B. S., Stanley, B. H., Miller, A. L., & Sund, A. M. (2014). Dialectical behavior therapy for adolescents with repeated suicidal and self-harming behavior: A randomized trial. *Journal of the American Academy of Child & Adolescent Psychiatry*, 53(10), 1082-1091. <https://doi.org/10.1016/j.jaac.2014.07.003>
- Mellor, X., Buczek, M. J., Adams, A. J., Lawrence, J. T. R., Ganley, T. J., & Shah, A. S. (2020). Collection of common knee patient-reported outcome instruments by automated mobile phone text messaging in pediatric sports medicine. *Journal of Pediatric Orthopaedics*, 40(2), e91-e95. <https://doi.org/https://doi.org/10.1097/BPO.0000000000001403>
- Militello, L. K., Kelly, S. A., & Melnyk, B. M. (2012). Systematic review of text-messaging interventions to promote healthy behaviors in pediatric and adolescent populations: Implications for clinical practice and research. *Worldviews on Evidence-Based Nursing*, 9(2), 66-77. <https://doi.org/https://doi.org/10.1111/j.1741-6787.2011.00239.x>
- Miller, L., & Campo, J. V. (2021). Depression in adolescents. *New England Journal of Medicine*, 385(5), 445-449. <https://doi.org/10.1056/NEJMra2033475>

- Moran, L. R., Kaplan, C., Aguirre, B., Galen, G., Stewart, J. G., Tarlow, N., & Auerbach, R. P. (2018). Treatment effects following residential dialectical behavior therapy for adolescents with borderline personality disorder. *Evidence-based Practice in Child and Adolescent Mental Health*, 3(2), 117-128.
<https://doi.org/10.1080/23794925.2018.1476075>
- Nathwani, G., Shoaib, A., Shafi, A., Furukawa, T. A., & Huy, N. T. (2021). Impact of covid-2019 on school attendance problems. *Journal of Global Health*, 11(2021), E2047-E2986.
<https://doi.org/10.7189/jogh.11.03084>
- Neacsiu, A. D., Rizvi, S. L., & Linehan, M. M. (2010). Dialectical behavior therapy skills use as a mediator and outcome of treatment for borderline personality disorder. *Behaviour Research and Therapy*, 48(9), 832-839. <https://doi.org/10.1016/j.brat.2010.05.017>
- Neacsiu, A. D., Rizvi, S. L., Vitaliano, P. P., Lynch, T. R., & Linehan, M. M. (2010). The dialectical behavior therapy ways of coping checklist: Development and psychometric properties. *Journal of Clinical Psychology*, 66(6), 563-582.
<https://doi.org/10.1002/jclp.20685>
- Neacsiu, A. D., Ward-Ciesielski, E. F., Linehan, M. M. (2012). Emerging approaches to counseling intervention: Dialectical behavior therapy. *Professional Psychology: Research and Practice*, 40(7), 1003-1032. <https://doi.org/10.1177/0011000011421023>
- Neil, A. L., Batterham, P., Christensen, H., Bennett, K., & Griffiths, K. M. (2009, Feb 23). Predictors of adherence by adolescents to a cognitive behavior therapy website in school and community-based settings. *Journal of Medical Internet Research*, 11(1), e6.
<https://doi.org/10.2196/jmir.1050>

- Nelson-Gray, R. O., Keane, S. P., Hurst, R. M., Mitchell, J. T., Warburton, J. B., Chok, J. T., & Cobb, A. R. (2006). A modified dbt skills training program for oppositional defiant adolescents: Promising preliminary findings. *Behaviour Research and Therapy*, 44(12), 1811-1820. <https://doi.org/10.1016/j.brat.2006.01.004>
- O'Connor, M., Munnelly, A., Whelan, R., & McHugh, L. (2018). The efficacy and acceptability of third-wave behavioral and cognitive ehealth treatments: A systematic review and meta-analysis of randomized controlled trials. *Behavior Therapy*, 49(3), 459-475. <https://doi.org/10.1016/j.beth.2017.07.007>
- Osgood, D. W., Foster, E. F., & Courtney, M. E. (2010). Vulnerable populations and the transition to adulthood. *The Future of Children*, 20(1), 209-229. <https://doi.org/https://doi.org/10.1353/foc.0.0047>
- Pisani, A. R., Wyman, P. A., Gurditta, K., Schmeelk-Cone, K., Anderson, C. L., & Judd, E. (2018). Mobile phone intervention to reduce youth suicide in rural communities: Field test. *JMIR Mental Health*, 5(2), e10425. <https://doi.org/https://doi.org/10.2196/10425>
- Pisani, A. R., Wyman, P. A., Petrova, M., Judd, E., Schmeelk-Cone, K., Thiha, P., & Gurditta, K. (2019, 2019/04/01). Framework for supporting adolescent peer leaders: A pilot using text messaging in a school-based substance use prevention program. *The Journal of Primary Prevention*, 40(2), 243-254. <https://doi.org/https://doi.org/10.1007/s10935-019-00545-4>
- Ranney, M. L., Choo, E. K., Cunningham, R. M., Spirito, A., Thorsen, M., Mello, M. J., & Morrow, K. (2014, Jul). Acceptability, language, and structure of text message-based behavioral interventions for high-risk adolescent females: A qualitative study. *Journal of Adolescent Health*, 55(1), 33-40. <https://doi.org/10.1016/j.jadohealth.2013.12.017>

- Ranney, M. L., Pittman, S. K., Dunsiger, S., Guthrie, K. M., Spirito, A., Boyer, E. W., & Cunningham, R. M. (2018, Nov). Emergency department text messaging for adolescent violence and depression prevention: A pilot randomized controlled trial. *Psychological Services, 15*(4), 419-428. <https://doi.org/10.1037/ser0000193>
- Rathus, J. H., & Miller, A. L. (2002). Dialectical behavior therapy adapted for suicidal adolescents. *Suicide and Life-threatening Behavior, 32*(2), 146-157.
- Rizvi, S. L., Steffel, L. M., & Carson-Wong, A. (2013). An overview of dialectical behavior therapy for professional psychologists. *Professional Psychology: Research and Practice, 44*, 73-80. <https://doi.org/10.1037/a0029808>
- Rodrigues, L., Pereira, F. D., Toda, A. M., Palomino, P. T., Pessoa, M., Carvalho, L. S. G., Fernandes, D., Oliveira, E. H. T., Cristea, A. I., & Isotani, S. (2022, 2022/02/15). Gamification suffers from the novelty effect but benefits from the familiarization effect: Findings from a longitudinal study. *International Journal of Educational Technology in Higher Education, 19*(1), 13. <https://doi.org/10.1186/s41239-021-00314-6>
- Safer, D. L., Couturier, J. L., & Lock, J. (2007). Dialectical behavior therapy modified for adolescent binge eating disorder: A case report. *Cognitive and Behavioral Practice, 14*(2), 157-167. <https://doi.org/10.1016/j.cbpra.2006.06.001>
- Salbach-Andrae, H., Bohnkamp, I., Pfeiffer, E., Lehmkuhl, U., & Miller, A. L. (2008). Dialectical behavior therapy of anorexia and bulimia nervosa among adolescents: A case series. *Cognitive and Behavioral Practice, 15*(4), 415-426.
- Salbach, H., Klinkowski, N., Pfeiffer, E., Lehmkuhl, U., & Korte, A. (2007). Dialectical behavior therapy for adolescents with anorexia and bulimia nervosa (dbt-an/bn)--a pilot

study. *Praxis der Kinderpsychologie und Kinderpsychiatrie*, 56(2), e91.

<https://doi.org/10.13109/prkk.2007.56.2.91>

Schroeder, J., Suh, J., Wilks, C., Czerwinski, M., Munson, S. A., Fogarty, J., & Althoff, T.

(2020). *Data-driven implications for translating evidence-based psychotherapies into technology-delivered interventions* International Conference on Pervasive Computing Technologies for Healthcare,

Sharifi, M., Dryden, E. M., Horan, C. M., Price, S., Marshall, R., Hacker, K., Finkelstein, J. A., & Taveras, E. M. (2013). Leveraging text messaging and mobile technology to support pediatric obesity-related behavior change: A qualitative study using parent focus groups and interviews. *Journal of Medical Internet Research*, 15(12), e272.

<https://doi.org/10.2196/jmir.2780>

Sindahl, T. N., Côte, L. P., Dargis, L., Mishara, B. L., & Bechmann Jensen, T. (2019). Texting for help: Processes and impact of text counseling with children and youth with suicide ideation. *Suicide and Life-Threatening Behavior*, 49(5), 1412-1430.

<https://doi.org/https://doi.org/10.1111/sltb.12531>

Soler, J., Pascual, J. C., Tiana, T., Cebrià, A., Barrachina, J., Campins, M. J., Gich, I., Alvarez, E., & Pérez, V. (2009). Dialectical behaviour therapy skills training compared to standard group therapy in borderline personality disorder: A 3-month randomised controlled clinical trial. *Behaviour Research and Therapy*, 47(5), 353-358.

<https://doi.org/10.1016/j.brat.2009.01.013>

Summerhurst, C., Wammes, M., Arcaro, J., & Osuch, E. (2018). Embracing technology: Use of text messaging with adolescent outpatients at a mood and anxiety program. *Social Work*

in Mental Health, 16(3), 337-345.

<https://doi.org/https://doi.org/10.1080/15332985.2017.1395782>

Sunseri, P. A. (2004). Preliminary outcomes on the use of dialectical behavior therapy to reduce hospitalization among adolescents in residential care. *Residential Treatment for Children & Youth, 21(4), 59-76.* https://doi.org/10.1300/J007v21n04_06

Tasker, A. P., Gibson, L., Franklin, V., Gregor, P., & Greene, S. (2007). What is the frequency of symptomatic mild hypoglycemia in type 1 diabetes in the young?: Assessment by novel mobile phone technology and computer-based interviewing. *Pediatric Diabetes, 8(1), 15-20.* <https://doi.org/https://doi.org/10.1111/j.1399-5448.2006.00220.x>

Taylor, P. (2023). *Coverage rate of mobile network worldwide 2015-2021, by regional type* <https://www.statista.com/statistics/1228837/mobile-network-coverage-worldwide-by-regional-type/#:~:text=In%202021%2C%20the%20global%20average,covered%20by%20a%20mobile%20network.>

Trent, M., Thompson, C., & Tomaszewski, K. (2015). Text messaging support for urban adolescents and young adults using injectable contraception: Outcomes of the depotext pilot trial. *Journal of Adolescent Health, 57(1), 100-106.* <https://doi.org/https://doi.org/10.1016/j.jadohealth.2015.03.008>

Trickey, D. (2014). Rcads: The revised children's anxiety and depression scale (rcads) and the revised children's anxiety and depression scale—parent version (rcads-p). *Guide to Using Outcomes and Feedback Tools, 116.*

Turan, B., & Akıncı, M. A. (2022). A clinical follow-up study of dialectical behavior therapy skills groups among female adolescents diagnosed with depressive disorder. *Clinical*

Child Psychology and Psychiatry, 27(3), 701-715.

<https://doi.org/10.1177/13591045221088710>

Vitaliano, P. P., Russo, J., Carr, J. E., Maiuro, R. D., & Becker, J. (1985). The ways of coping checklist: Revision and psychometric properties. *Multivariate Behavioral Research*, 20(1), 3-26. https://doi.org/10.1207/s15327906mbr2001_1

Webb, C. A., Beard, C., Kertz, S. J., Hsu, K. J., & Björgvinsson, T. (2016). Differential role of cbt skills, dbt skills and psychological flexibility in predicting depressive versus anxiety symptom improvement. *Behaviour Research and Therapy*, 81(6), 12-20. <https://doi.org/10.1016/j.brat.2016.03.006>

Wei, Y., McGrath, P. J., Hayden, J., & Kutcher, S. (2015, 2015/11/17). Mental health literacy measures evaluating knowledge, attitudes and help-seeking: A scoping review. *BMC Psychiatry*, 15(1), 291. <https://doi.org/10.1186/s12888-015-0681-9>

Weinberg, A., & Klonsky, E. D. (2009). Measurement of emotion dysregulation in adolescents. *Psychological Assessment*, 21(4), 616. <https://doi.org/10.1037/a0016669>

Welch, S. S., & Kim, J. (2012). Dbt-enhanced cognitive behavioral therapy for adolescent trichotillomania: An adolescent case study. *Cognitive and Behavioral Practice*, 19(3), 483-493. <https://doi.org/10.1016/j.cbpra.2011.11.002>

Whitney, D. G., & Peterson, M. D. (2019). Us national and state-level prevalence of mental health disorders and disparities of mental health care use in children. *JAMA Pediatrics*, 173(4), 389-391. <https://doi.org/https://doi.org/10.1001/jamapediatrics.2018.5399>

Whittaker, R., Merry, S., Stasiak, K., McDowell, H., Doherty, I., Shepherd, M., Dorey, E., Parag, V., Ameratunga, S., & Rodgers, A. (2012). Memo—a mobile phone depression prevention intervention for adolescents: Development process and postprogram findings

- on acceptability from a randomized controlled trial. *Journal of Medical Internet Research*, 14(1), e1857. <https://doi.org/https://doi.org/10.2196/jmir.1857>
- Whittaker, R., Stasiak, K., McDowell, H., Doherty, I., Shepherd, M., Chua, S., Dorey, E., Parag, V., Ameratunga, S., & Rodgers, A. (2017). Memo: An mhealth intervention to prevent the onset of depression in adolescents: A double-blind, randomised, placebo-controlled trial. *Journal of Child Psychology and Psychiatry*, 58(9), 1014-1022. <https://doi.org/https://doi.org/10.1111/jcpp.12753>
- Wilks, C., Yin, Q., Ang, S. Y., Matsumiya, B., Lungu, A., & Linehan, M. (2017). Internet-delivered dialectical behavioral therapy skills training for suicidal and heavy episodic drinkers: Protocol and preliminary results of a randomized controlled trial. *JMIR Research Protocols*, 6(10), e207. <https://doi.org/10.2196/resprot.7767>
- Wilks, C., Yin, Q., & Zuromski, K. (2020). User experience affects dropout from internet-delivered dialectical behavior therapy. *Telemedicine and e-Health*, 26(6), 794-797. <https://doi.org/10.1089/tmj.2019.0124>
- Wilks, C. R., Lungu, A., Ang, S. Y., Matsumiya, B., Yin, Q., & Linehan, M. M. (2018, 2018/05/01/). A randomized controlled trial of an internet delivered dialectical behavior therapy skills training for suicidal and heavy episodic drinkers. *Journal of Affective Disorders*, 232, 219-228. <https://doi.org/https://doi.org/10.1016/j.jad.2018.02.053>
- Willcox, J. C., Dobson, R., & Whittaker, R. (2019). Old-fashioned technology in the era of “bling”: Is there a future for text messaging in health care? *Journal of Medical Internet Research*, 21(12), e16630.

Woodberry, K. A., & Popenoe, E. J. (2008). Implementing dialectical behavior therapy with adolescents and their families in a community outpatient clinic. *Cognitive and Behavioral Practice, 15*(3), 277-286. <https://doi.org/10.1016/j.cbpra.2007.08.004>

Table 1*Sociodemographic Characteristics of Study Respondents (N = 76)*

	SOARing-Only			SOARing+Text		
	<i>n</i>	%	M (<i>SD</i>)	<i>n</i>	%	M (<i>SD</i>)
Age			16.70(0.69)			16.74(0.74)
15	1	2.44		0	0.00	
16	14	34.15		15	42.86	
17	21	51.22		14	4.00	
18	4	9.76		6	17.14	
Did Not Disclose	1	2.44		0	0.00	
Gender						
Cisgender Male	22	53.66		6	17.14	
Cisgender Female	18	43.90		27	77.14	
Other	1	2.44		2	5.71	
Race/Ethnicity						
Hispanic/Latino	36	87.80		25	71.43	
Black/African American	4	9.76		6	17.14	
White/Caucasian	2	4.88		6	17.14	
Native American	0	0.00		2	5.71	
Other	2	4.88		2	5.71	
Sexual Orientation						
Heterosexual (Straight)	27	65.85		19	54.26	
Bisexual	10	24.39		4	11.43	
Gay/Lesbian	3	7.32		6	17.14	
Pansexual	0	0.00		4	11.43	
Other	1	2.44		1	2.86	
Did Not Disclose	0	0.00		1	2.86	

Table 2*Psychosocial Stressors Endorsed by Study Respondents (N = 76)*

	SOARing-Only		SOARing+Text	
	<i>n</i>	%	<i>n</i>	%
Adverse Childhood Experiences				
History of abuse/violence	4	9.76	8	22.86
History of abandonment	6	14.63	6	17.14
Adoption or history of foster care placement	5	12.20	3	8.57
Academic-Related Stressors				
Current or past Individualized Educational Plan (IEP)	9	21.95	10	28.57
Below average academic functioning	9	21.95	3	8.57
Family History				
Mental illness	10	24.39	11	31.43
Substance use	8	19.51	11	31.43
Neurological and Psychological History				
Currently taking a psychotropic medication	1	2.44	5	14.29
Head trauma or seizures	2	4.88	2	5.71
Substance Use				
Past	4	9.76	3	8.57
Current	4	9.76	3	8.57

Table 3*Descriptives For All Analyzed Self-Report Variables.*

	SOARing-Only		SOARing+Text	
	M	SD	M	SD
DBT-WCCL (DSS)				
Pre-intervention	60.02	23.20	56.66	17.49
Post-intervention	61.68	24.83	57.54	26.82
DERS				
Pre-intervention	31.07	28.75	42.86	22.28
Post-intervention	29.54	25.25	32.32	22.19
MAAS				
Pre-intervention	3.49	1.06	3.08	0.87
Post-intervention	3.70	1.20	3.61	1.07
RCADS				
Pre-intervention	51.76	32.05	63.49	28.40
Post-intervention	51.10	32.03	49.14	31.32
SCL-90-R (INT)				
Pre-intervention	14.15	10.04	18.14	9.89
Post-intervention	13.63	9.34	14.51	11.09

Note. DBT-WCCL (DSS) = DBT Skills Subscale of the DBT Ways of Coping Checklist, DERS = Difficulties in Emotion Regulation Scale, MAAS = Mindfulness Attention Awareness Scale, RCADS = Revised Child Anxiety and Depression Scales, SCL-90-R = Interpersonal Sensitivity Subscale of the Symptom Checklist-90-Revised.

Table 4*Mean Differences Between Groups on Measures of Treatment Engagement*

	SOARing-Only			SOARing+Text			<i>df</i>	<i>t</i>	<i>p</i>	Cohen's <i>d</i>
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>				
Attendance	60	55.84	24.01	55	68.66	19.46	73	2.53	<.01	.58
Perceived Learning										
Time 1	28	3.18	0.82	19	3.32	0.95	45	0.53	.30	.16
Time 2	25	3.20	0.76	23	3.65	0.71	46	2.11	.02	.61
Time 3	18	3.33	0.59	25	3.72	0.74	41	1.84	.04	.57
Time 4	23	3.43	0.79	15	3.47	0.52	36	0.14	.45	.05

Table 5

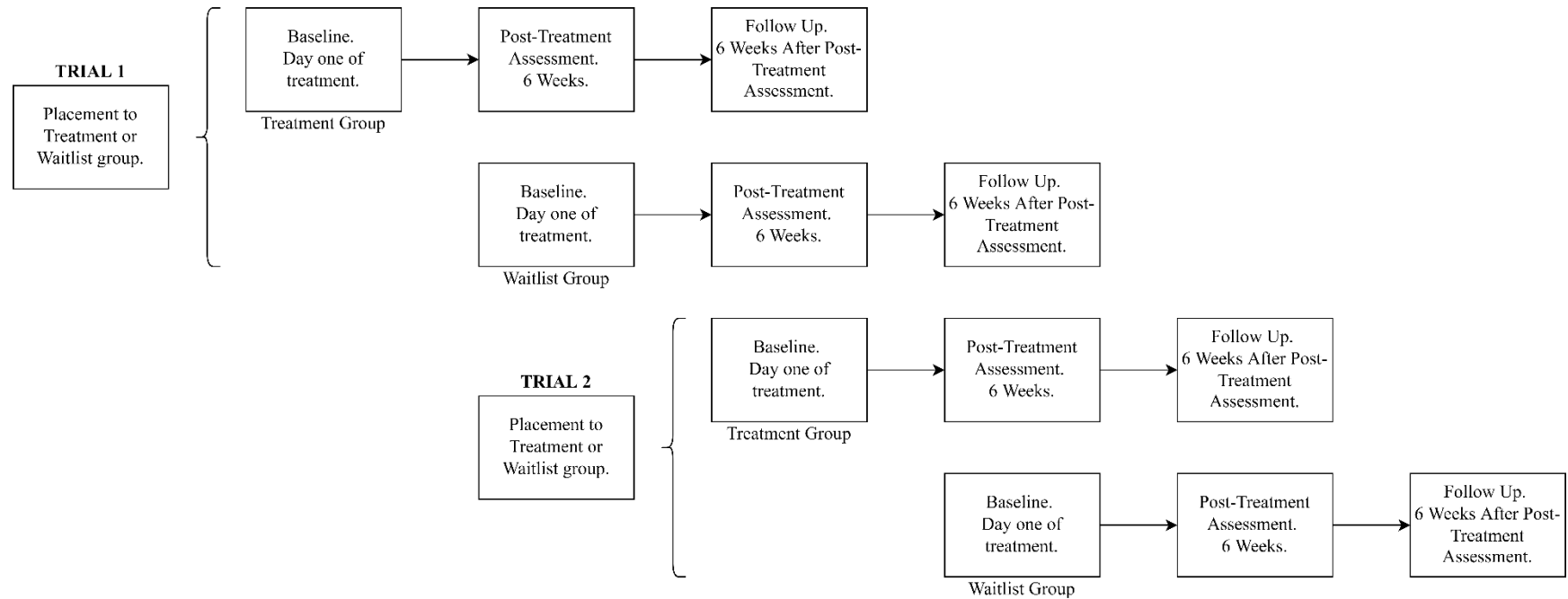
MANOVA Results Predicting Intervention Engagement from Time and Treatment Condition

Effect	<i>F</i>	Wilks' Λ	<i>p</i>	Partial η^2
<i>Main Effects</i>				
Time	7.18	0.84	.001	.16
Treatment	0.98	0.97	.38	.03
<i>Interaction Effect</i>				
Time x Treatment	1.34	0.97	.27	.04

Table 6

MANOVA Results Predicting Clinical Outcomes from Time and Treatment Condition

Effect	<i>F</i>	Wilks' Λ	<i>p</i>	Partial η^2
<i>Main Effects</i>				
Time	2.61	0.90	.06	.10
Treatment	0.96	0.96	.42	.04
<i>Interaction Effect</i>				
Time x Treatment	1.92	0.93	.14	.07

Figure 1*Flowchart of Study Schedule.*

Note. Trials were added as needed until sufficient sample size was achieved for the main analyses. The present analyses did not include the Follow Up time point due to inadequate time to gather the necessary sample size.

Appendix 1. Examples of Intervention Text Messages.

Content	Example message
<i>Psychoeducational</i>	
Orientation to DBT	<i>“Did you know? Researchers have found that DBT works for lots of people regardless of their age, sex, gender identity, sexual orientation, and race or ethnicity.”</i>
Mindfulness	<i>“Mindfulness skills help you slow down and focus on using healthy coping skills when you are upset. Mindfulness can also help you stay calm and avoid engaging in negative thoughts and impulsive behaviors.”</i>
Interpersonal effectiveness	<i>“Remember? Validation is showing that you understand your own or another person’s feelings or opinions. It’s letting someone know that their feelings or opinions are valid or worthwhile. It’s being nonjudgmental out loud.”</i>
Distress tolerance	<i>“Sometimes emotion is so intense it takes away our ability to use our other coping skills. TIP skills ask that we change our body chemistry to regain control of our emotions through Temperature, Intense exercise, and Paced breathing. Give it a try this week!”</i>
Emotion regulation	<i>“Each emotion you experience has a specific purpose. These feelings provide information to you about the situation you’re in. This is often referred to as our “gut instinct”. However, it’s important to remember that emotions are not always accurate!”</i>
<i>Supportive</i>	
Self-efficacy	<i>“Did you know that it makes most people nervous to try new things? Think about how you’ve survived everything you’ve been through up until today. If you can survive all that, you’ve got this!”</i>
Motivation	<i>“Working on yourself can be hard and sometimes scary, but it’s worth it to create a better, healthier, and happier future you!”</i>
Crisis resources	<i>“If you’re feeling down and don’t have anybody to talk to, connect with CalHOPE at (888) 739-5352. They offer safe, secure, and culturally sensitive emotional support when you’re struggling.”</i>
Social support seeking	<i>“Take some time today to think about the people that comfort you or cheerlead your efforts to become a healthier and happier you. Try spending some time with them or get connected in whatever way works best for you.”</i>
Reminders	<i>“Here’s a friendly reminder from your DBT support system that we are meeting tomorrow morning at the Wellness Center. See you there!”</i>
Instilling hope	<i>“No matter how many mistakes you make or how slow your progress, you are still way ahead of everyone who isn’t trying. Keep moving forward and it will pay off.”</i>

Appendix 2. Revised Child Anxiety and Depression Scales (RCADS).

Date: _____	RCADS				Name/ID: _____
--------------------	--------------	--	--	--	-----------------------

Please put a circle around the word that shows how often each of these things happen to you. There are no right or wrong answers.

1. I worry about things	Never	Sometimes	Often	Always
2. I feel sad or empty	Never	Sometimes	Often	Always
3. When I have a problem, I get a funny feeling in my stomach	Never	Sometimes	Often	Always
4. I worry when I think I have done poorly at something	Never	Sometimes	Often	Always
5. I would feel afraid of being on my own at home	Never	Sometimes	Often	Always
6. Nothing is much fun anymore	Never	Sometimes	Often	Always
7. I feel scared when I have to take a test	Never	Sometimes	Often	Always
8. I feel worried when I think someone is angry with me	Never	Sometimes	Often	Always
9. I worry about being away from my parents	Never	Sometimes	Often	Always
10. I get bothered by bad or silly thoughts or pictures in my mind	Never	Sometimes	Often	Always
11. I have trouble sleeping	Never	Sometimes	Often	Always
12. I worry that I will do badly at my school work ..	Never	Sometimes	Often	Always
13. I worry that something awful will happen to someone in my family	Never	Sometimes	Often	Always
14. I suddenly feel as if I can't breathe when there is no reason for this	Never	Sometimes	Often	Always
15. I have problems with my appetite	Never	Sometimes	Often	Always
16. I have to keep checking that I have done things right (like the switch is off, or the door is locked)	Never	Sometimes	Often	Always
17. I feel scared if I have to sleep on my own.	Never	Sometimes	Often	Always
18. I have trouble going to school in the mornings because I feel nervous or afraid	Never	Sometimes	Often	Always
19. I have no energy for things	Never	Sometimes	Often	Always
20. I worry I might look foolish	Never	Sometimes	Often	Always
21. I am tired a lot	Never	Sometimes	Often	Always
22. I worry that bad things will happen to me	Never	Sometimes	Often	Always

23. I can't seem to get bad or silly thoughts out of my head.	Never	Sometimes	Often	Always
24. When I have a problem, my heart beats really fast	Never	Sometimes	Often	Always
25. I cannot think clearly	Never	Sometimes	Often	Always
26. I suddenly start to tremble or shake when there is no reason for this	Never	Sometimes	Often	Always
27. I worry that something bad will happen to me ..	Never	Sometimes	Often	Always
28. When I have a problem, I feel shaky	Never	Sometimes	Often	Always
29. I feel worthless	Never	Sometimes	Often	Always
30. I worry about making mistakes	Never	Sometimes	Often	Always
31. I have to think of special thoughts (like numbers or words) to stop bad things from happening. . .	Never	Sometimes	Often	Always
32. I worry what other people think of me	Never	Sometimes	Often	Always
33. I am afraid of being in crowded places (like shopping centers, the movies, buses, busy playgrounds)	Never	Sometimes	Often	Always
34. All of a sudden I feel really scared for no reason at all	Never	Sometimes	Often	Always
35. I worry about what is going to happen	Never	Sometimes	Often	Always
36. I suddenly become dizzy or faint when there is no reason for this	Never	Sometimes	Often	Always
37. I think about death	Never	Sometimes	Often	Always
38. I feel afraid if I have to talk in front of my class	Never	Sometimes	Often	Always
39. My heart suddenly starts to beat too quickly for no reason	Never	Sometimes	Often	Always
40. I feel like I don't want to move	Never	Sometimes	Often	Always
41. I worry that I will suddenly get a scared feeling when there is nothing to be afraid of	Never	Sometimes	Often	Always
42. I have to do some things over and over again (like washing my hands, cleaning or putting things in a certain order)	Never	Sometimes	Often	Always
43. I feel afraid that I will make a fool of myself in front of people	Never	Sometimes	Often	Always
44. I have to do some things in just the right way to stop bad things from happening	Never	Sometimes	Often	Always
45. I worry when I go to bed at night	Never	Sometimes	Often	Always
46. I would feel scared if I had to stay away from home overnight	Never	Sometimes	Often	Always
47. I feel restless	Never	Sometimes	Often	Always

Appendix 3. The Difficulties in Emotion Regulation Scale (DERS).

Difficulties in Emotion Regulation Scale (DERS)

Please indicate how often the following statements apply to you by writing the appropriate number from the scale below on the line beside each item.

1-----	2-----	3-----	4-----	5-----
almost never (0-10%)	sometimes (11-35%)	about half the time (36-65%)	most of the time (66-90%)	almost always (91-100%)
_____	1) I am clear about my feelings.			
_____	2) I pay attention to how I feel.			
_____	3) I experience my emotions as overwhelming and out of control.			
_____	4) I have no idea how I am feeling.			
_____	5) I have difficulty making sense out of my feelings.			
_____	6) I am attentive to my feelings.			
_____	7) I know exactly how I am feeling.			
_____	8) I care about what I am feeling.			
_____	9) I am confused about how I feel.			
_____	10) When I'm upset, I acknowledge my emotions.			
_____	11) When I'm upset, I become angry with myself for feeling that way.			
_____	12) When I'm upset, I become embarrassed for feeling that way.			
_____	13) When I'm upset, I have difficulty getting work done.			
_____	14) When I'm upset, I become out of control.			
_____	15) When I'm upset, I believe that I will remain that way for a long time.			
_____	16) When I'm upset, I believe that I will end up feeling very depressed.			
_____	17) When I'm upset, I believe that my feelings are valid and important.			
_____	18) When I'm upset, I have difficulty focusing on other things.			
_____	19) When I'm upset, I feel out of control.			
_____	20) When I'm upset, I can still get things done.			
_____	21) When I'm upset, I feel ashamed at myself for feeling that way.			
_____	22) When I'm upset, I know that I can find a way to eventually feel better.			
_____	23) When I'm upset, I feel like I am weak.			
_____	24) When I'm upset, I feel like I can remain in control of my behaviors.			
_____	25) When I'm upset, I feel guilty for feeling that way.			
_____	26) When I'm upset, I have difficulty concentrating.			
_____	27) When I'm upset, I have difficulty controlling my behaviors.			
_____	28) When I'm upset, I believe there is nothing I can do to make myself feel better.			
_____	29) When I'm upset, I become irritated at myself for feeling that way.			
_____	30) When I'm upset, I start to feel very bad about myself.			
_____	31) When I'm upset, I believe that wallowing in it is all I can do.			
_____	32) When I'm upset, I lose control over my behavior.			
_____	33) When I'm upset, I have difficulty thinking about anything else.			
_____	34) When I'm upset I take time to figure out what I'm really feeling.			
_____	35) When I'm upset, it takes me a long time to feel better.			
_____	36) When I'm upset, my emotions feel overwhelming.			

Reverse-scored items (place a subtraction sign in front of them) are numbered 1, 2, 6, 7, 8, 10, 17, 20, 22, 24 and 34.

Calculate total score by adding everything up. Higher scores suggest greater problems with emotion regulation.

SUBSCALE SCORING:** The measure yields a total score (SUM) as well as scores on six sub-scales:

1. Nonacceptance of emotional responses (NONACCEPT): 11, 12, 21, 23, 25, 29
2. Difficulty engaging in Goal-directed behavior (GOALS): 13, 18, 20R, 26, 33
3. Impulse control difficulties (IMPULSE): 3, 14, 19, 24R, 27, 32
4. Lack of emotional awareness (AWARENESS): 2R, 6R, 8R, 10R, 17R, 34R
5. Limited access to emotion regulation strategies (STRATEGIES): 15, 16, 22R, 28, 30, 31, 35, 36
6. Lack of emotional clarity (CLARITY): 1R, 4, 5, 7R, 9

Total score: sum of all subscales

**"R" indicates reverse scored item

Appendix 4. The Mindfulness Attention Awareness Scale (MAAS)

The Mindful Attention Awareness Scale (MAAS)

The trait MAAS is a 15-item scale designed to assess a core characteristic of mindfulness, namely, a receptive state of mind in which attention, informed by a sensitive awareness of what is occurring in the present, simply observes what is taking place.

Brown, K.W. & Ryan, R.M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology*, 84, 822-848.

Carlson, L.E. & Brown, K.W. (2005). Validation of the Mindful Attention Awareness Scale in a cancer population. *Journal of Psychosomatic Research*, 58, 29-33.

Instructions: Below is a collection of statements about your everyday experience. Using the 1-6 scale below, please indicate how frequently or infrequently you currently have each experience. Please answer according to what really reflects your experience rather than what you think your experience should be. Please treat each item separately from every other item.

- | | 1 | 2 | 3 | 4 | 5 | 6 |
|-----------|--|--------------------|------------------------|--------------------------|----------------------|--------------|
| | almost
always | very
frequently | somewhat
frequently | somewhat
infrequently | very
infrequently | almost never |
| _____ 1. | I could be experiencing some emotion and not be conscious of it until some time later. | | | | | |
| _____ 2. | I break or spill things because of carelessness, not paying attention, or thinking of something else. | | | | | |
| _____ 3. | I find it difficult to stay focused on what's happening in the present. | | | | | |
| _____ 4. | I tend to walk quickly to get where I'm going without paying attention to what I experience along the way. | | | | | |
| _____ 5. | I tend not to notice feelings of physical tension or discomfort until they really grab my attention. | | | | | |
| _____ 6. | I forget a person's name almost as soon as I've been told it for the first time. | | | | | |
| _____ 7. | It seems I am "running on automatic," without much awareness of what I'm doing. | | | | | |
| _____ 8. | I rush through activities without being really attentive to them. | | | | | |
| _____ 9. | I get so focused on the goal I want to achieve that I lose touch with what I'm doing right now to get there. | | | | | |
| _____ 10. | I do jobs or tasks automatically, without being aware of what I'm doing. | | | | | |
| _____ 11. | I find myself listening to someone with one ear, doing something else at the same time. | | | | | |
| _____ 12. | I drive places on 'automatic pilot' and then wonder why I went there. | | | | | |
| _____ 13. | I find myself preoccupied with the future or the past. | | | | | |
| _____ 14. | I find myself doing things without paying attention. | | | | | |
| _____ 15. | I snack without being aware that I'm eating. | | | | | |

Scoring: To score the scale, simply compute a mean (average) of the 15 items.

Appendix 5. Interpersonal Sensitivity (INT) subscale of the Symptom Checklist-90-Revised (SCL-90-R)

Below is a list of problems and complaints that people sometimes have. Please read each one carefully and enter the number that best describes how much you were bothered by that problem during the past week.

Please enter only ONE.

FOR THE **PAST WEEK**, HOW MUCH WERE YOU BOTHERED BY:

	Not At All	A Little Bit	Moderately	Quite A Bit	Extremely
Feeling critical of others	☐	☐	☐	☐	☐
Feeling shy and uneasy with the opposite sex	☐	☐	☐	☐	☐
Your feelings being easily hurt	☐	☐	☐	☐	☐
Feeling others do not understand you or are unsympathetic	☐	☐	☐	☐	☐
Feeling that people are unfriendly or dislike you	☐	☐	☐	☐	☐
Feeling inferior to others	☐	☐	☐	☐	☐
Feeling uneasy when people are watching or talking about you	☐	☐	☐	☐	☐
Feeling very self-conscious with others	☐	☐	☐	☐	☐
Feeling uncomfortable about eating or drinking in public	☐	☐	☐	☐	☐
Feeling that you are watched or talked about by others	☐	☐	☐	☐	☐

Appendix 6. DBT Skills Subscale (DSS) of the DBT Ways of Coping Checklist (DBT-WCCL).

The items below represent ways that you may have coped with stressful events in your life. We are interested in the degree to which you have used each of the following thoughts or behavior to deal with problems and stresses.

Think back on the **LAST ONE MONTH** in your life. Then check the appropriate number if the thought/behavior is: never used, rarely used, sometimes used, or regularly used (i.e., at least 4 to 5 times per week). Don't answer on the basis of whether it seems to work to reduce stress or solve problems -- just whether or not you use the coping behavior. Use these response choices. Try to rate each item separately in your mind from the others. Make your answers as true FOR YOU as you can.

I have:

	Never Used	Rarely Used	Sometimes Used	Regularly Used
Focused on the good aspects of my life and gave less attention to negative thoughts or feelings	☐	☐	☐	☐
Told myself how much I had already accomplished	☐	☐	☐	☐
Tried to get centered before taking any action	☐	☐	☐	☐
Made sure I respond in a way so that I could still respect myself afterwards	☐	☐	☐	☐
Focused on the good things in my life	☐	☐	☐	☐
Accepted my strong feelings, but did not let them interfere with other things too much	☐	☐	☐	☐
Increased the number of pleasant things in my life so that I had a more positive outlook	☐	☐	☐	☐
Made a plan of action and followed it	☐	☐	☐	☐
Made sure to take care of my body and stay healthy so that I was less emotionally sensitive	☐	☐	☐	☐
Found something beautiful to look at to make me feel better	☐	☐	☐	☐
Stepped back and tried to see things as they really are	☐	☐	☐	☐
Concentrated on something good that could come out of the whole thing	☐	☐	☐	☐
Came up with a couple of different solutions to my problem	☐	☐	☐	☐