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# Into the Wild: Factors Mediating the Positive Outcomes of Wilderness Based Therapy

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**INTO THE WILD: FACTORS MEDIATING THE POSITIVE OUTCOMES OF  
WILDERNESS BASED THERAPY**

by

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**SUBMITTED TO SCRIPPS COLLEGE IN PARTIAL FULFILLMENT OF THE  
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### **Abstract**

Wilderness therapy is becoming increasingly popular as a treatment for adolescents. It has been established as an efficacious treatment in previous literature, but the mechanisms as to why have thus far remained a mystery. This research is looking at the connection between wilderness therapy and DBT, another evidence-based treatment. This study will examine 156 adolescents, comparing the efficacy of wilderness therapy to traditional inpatient and intensive outpatient. Pre-treatment assessments of suicidal ideation, emotional regulation, and distress tolerance will be taken. It is expected that there will be main effects for each of the treatments, but that wilderness therapy will be strongest. Additionally, it is expected that emotion regulation and distress tolerance will act as mediators, and their effect on suicidal ideation will be even greater than that of treatment.

### **Literature Review**

According to the CDC, suicide is the second leading cause of death among young people today, with 4,600 people between the ages of 10-24 taking their own lives each year (Center for Disease Control and Prevention, 2016). While there are many different treatments for psychological disorders available, none are guaranteed to be successful. Additionally, there are far fewer evidence-based treatments for adolescents than for adult populations. Clearly, there is a need for new and more impactful treatments for youth experiencing suicidal ideation who aren't responding to traditional therapy.

Suicidal ideation is common among adolescents, with rates of suicidal behavior in teens comparable to those in adults (Nock et al., 2013). Suicidal ideation in adolescents is significantly

correlated with later suicide attempts and DSM diagnoses, making it a serious mental health concern that needs to be addressed immediately (Nock et al., 2013). More specifically, a study by Miranda, Ortin, Scott, and Shaffer (2014) on 506 adolescents found that frequency of suicidal ideation, as well as duration of episodes, significantly predicted future suicide attempts even after controlling for psychiatric diagnosis, gender, substance abuse, and previous history of suicide attempts. Additionally, researchers have found that adults who reported experiencing suicidal ideation at age 15 were 12 times more likely to have attempted suicide at age 30 than those who hadn't, and 15 times more likely to have reported thoughts of suicide in the previous 4 years (Reinherz, Tanner, Berger, Beardslee, & Fitzmaurice, 2006). Suicide attempt history has been the focus of much research on preventing adolescent deaths; however, around half of completed suicides in adolescents are first time attempts (Brent, Baugher, Bridge, Chen, & Chiappetta, 1999), indicating that there is a need for more interventions focused on those experiencing suicidal ideation without a history of attempts. Risk factors for suicidal ideation include rumination and negative affect (Burke et al., 2016), hopelessness (Cyz & King, 2015), impulsivity (Auerbach, Stewart, & Johnson, 2017), and early childhood stress (Dykxhoorn, Hatcher, Roy-Gagnon, & Colman, 2017).

Oftentimes, adolescents experiencing serious suicidal ideation will be admitted to residential treatment services. These programs are oftentimes very restrictive and expensive. One review of the literature on adolescent inpatient services found that overall inpatient units seemed to have a positive impact on symptom reduction; however, they also cited many concerns with cost effectiveness and lack of clarity in the definition of "treatment success" (Bettemann & Jaspersen, 2009). Brinkmeyer et al. (2004) examined 45 adolescents admitted for inpatient treatment at time of discharge, and then again 9-months later. They found that while 52% of

patients reported reductions in symptoms, 32% of adolescents had been readmitted to the hospital at some point during those 9 months. These rates of readmittance indicate that there is a need for serious mental health services for adolescents who are struggling to engage with care. Furthermore, the experience of being admitted to an inpatient unit can be somewhat traumatic. One researcher had participants describe being admitted to the hospital as “disempowering and humiliating” (Smith et al., 2017). Another narrative study of 10 adolescents in an inpatient unit described the experience as “living in an alternate reality”, and used language such as “restrictive” and “disconnected” to describe their stays. One participant stated: “I got quite violent towards the staff because I saw them as keeping me prisoner... I just felt really hostile towards the staff, for locking me in” (Haynes, Eivor, & Crossley, 2011). Researchers concluded that while inpatient can reduce symptoms and address crises in the short term, they can also have profound impacts on adolescents’ psychological states above and beyond their disorders.

A less restrictive and costly form of treatment that has been increasing in popularity in recent years is partial hospitalization. These programs typically include participating in treatment at a clinic during the days, similar to inpatient; however, patients in partial hospitalization programs oftentimes still get to participate in school and are able to go home to their families in the evenings. Partial hospitalization programs have been found to generally yield positive results in reducing symptoms (Thatte et al., 2013; Lenz et al., 2014; Rudd et al., 1996; Granello, Granello, & Lee, 1999). However, one study found that while other symptoms tended to reduce in severity following partial hospitalization, chronic suicidal ideation persisted in 23.3% of discharged patients, with this group having the highest rate of future hospitalizations and suicide attempts at a 6 month followup (Wolff et al., 2018).

Wilderness therapy is a relatively new form of therapy that involves traditional psychotherapy and taking adolescents outdoors for extended periods of time. Oftentimes that means taking a group of adolescents on a backpacking trip with clinical psychologists and doing CBT sessions during the day. The treatment has been shown to have clinical utility, but it is generally unknown why. A meta-analysis of 36 studies on wilderness therapy found medium effect sizes for clinical outcomes, self-esteem, personal effectiveness, and interpersonal measures (Betteman et al., 2016). Benefits have also been found in cognitive autonomy in young males (Margalit & Ben-Ari, 2014). Great improvements were found in PTSD symptoms for military veterans who included nature in their therapy as well (Westlund, 2014, Vella et al., 2013). A study on 157 adolescents in a 7-week wilderness therapy program found significant improvements in mental health symptoms, with an effect size of  $d = .86$ . Another study found significant improvements in mental health symptoms following a seven-week wilderness therapy program (Betteman et al., 2017). Interestingly, they also found that the adolescents reported healthier attachment to their mothers and decreased anger towards their fathers post treatment. Researchers hypothesized this was because wilderness therapy activates their attachment systems, creating a sensitive period for strengthening attachment. Though research has indicated the effectiveness of these programs, others have raised concerns about the practice. Behar et al. (2007) criticized most programs lack of family involvement, with some programs reporting fewer than 5 hours of family participation. Though this criticism is directly to opposed from findings from Betteman et al. (2017) outlined previously which indicated positive benefits of this treatment on attachment, the importance of family relations in adolescent functioning means this lack of involvement is a potential limitation of the treatment. More startling than that, however, were reports from 230 previous participants who indicated serious safety issues, including

misuse of seclusion and other abuse (Behar et al., 2007). They also found accusations that abuse and neglect within unlicensed programs led to 10 deaths since 1990. It is clearly essential that a deeper understanding is formed of how wilderness therapy functions and *how* it is effective, in order to create an empirically supported model and establish guidelines for licensure to protect adolescents and their families.

A form of therapy that has been implemented in both inpatient and outpatient settings is Dialectical Behavioral Therapy. Developed in the late 1980s as a treatment for Borderline Personality Disorder by Marsha Linehan (1993), Dialectical Behavioral Therapy was born from Cognitive Behavioral Theory and has been shown to be quite effective in reducing suicidality in patients. Linehan's biosocial theory suggests that problems with emotion regulation underlie suicidal behaviors and implicates a diathesis-stress model in which emotion dysregulation is formed due to a biological predisposition and an invalidating home environment. Linehan (1993) posits that emotional vulnerability is biologically based and includes heightened emotional sensitivity, increased emotional intensity, and a slow return to an emotional baseline. This predisposition, when combined with an invalidating home environment characterized by inconsistent or inappropriate responses to child distress, leads to a pattern of emotion dysregulation that, according to Linehan (1993), is key to later suicidality. Similar findings have been reported by other researchers (Crowell et al., 2009). This theory was originally only applied to Borderline Personality Disorder, but research has indicated that it fits well with models of adolescent development and can be applied to adolescents with diagnoses other than BPD as well (Neece, Berk, & Combs-Ronto, 2013).

A key aspect of DBT is the four core themes in the skills workshop: emotion regulation, interpersonal effectiveness, mindfulness, and distress tolerance. An additional theme is found in

the dialectical theory behind the therapy, and is dubbed “walking the middle path”, which is intended to reduced polarized thinking and relieve mental tension. Skills are generally presented with easy to recall acronyms, which helps patients implement them in their daily lives (Linnehan, 1993). The program has been expanded to treat a variety of disorders other than BPD, including Substance Use Disorders and Binge Eating Disorder. Additionally, it has been adapted for adolescents and has been shown to be greatly effective (McCredie et al., 2017). The program involves both group and individual therapy sessions, as well as 24/7 skills coaching over the phone. The original DBT course typically lasts about 6-months, but versions have come out recently for use in short-term inpatient settings (Wolpo, Porter, & Hermanos, 2000).

As mentioned previously, one modality of DBT is interpersonal effectiveness. People experiencing high levels of psychological distress may have poor relationships with others, which can exacerbate issues. One study showed that daily prosocial behavior in adolescents boosted positive mood and decreased depressive symptoms (Schacter & Margolin, 2018). Mindfulness, another of the four key components of DBT, has been shown to have benefits in a wide variety of circumstances. A meta-analysis of studies on mindfulness-based interventions found that these treatments are efficacious in reducing mental health symptoms in youth (Kallapiran et al., 2015). More broadly, practicing mindfulness has been shown to reduce overall stress and increase positive mental states (Chang et al., 2004; Vliet et al., 2017; Mitchell & Head, 2015; Baer, Lykins, & Peters, 2012). Mindfulness based interventions can also be used to prevent relapse of depressive episodes and improve quality of life (Fjorback et al., 2011).

Low distress tolerance, or the perceived ability to withstand negative emotional states, has been shown to be a definite risk factor for many psychological disorders, including suicidality (Williams et al., 2013; O’Neil Rodriguez & Kendall, 2014). One study cited distress



tolerance as the main predictor of suicidality in veterans experiencing post-traumatic stress disorder (Vujanovic et al., 2017), and another study showed that attending a DBT skills group focused exclusively on distress tolerance led to significantly decreased suicidality in veterans (Denckla et al., 2015). Not only is low distress tolerance related to suicidal ideation, but it has also been shown to increase the capacity for suicide attempts in adolescents (Pennings & Anestis, 2013). Additionally, adolescents participating in a DBT skills group rated the distress tolerance skills as the most useful ones they had learned (Miller et al., 2000). Distress tolerance also has benefits beyond simply reducing symptoms- Daughters et al. (2005) examined 122 individuals entering a residential substance abuse treatment facility and found that low levels of distress tolerance was a significant predictor of early treatment dropout. Interestingly, psychological distress predicted treatment dropout in patients significantly more than physical distress, though researchers indicated this may have been due to the fact that participants had already undergone detoxification and proven they were capable of withstanding that discomfort. DBT addresses these deficits in distress tolerance with a variety of skills, including paced breathing, distraction, and progressive muscle relaxation (Linnehan, 1993).

Adolescents are particularly vulnerable to emotion dysregulation due to the maturation of subcortical limbic systems, which have been shown to produce exaggerated responses compared to adults and young children (Ernst et al., 2005). DBT focuses heavily on skills related to healthy emotion regulation, with skills focusing on maintaining healthy sleep and eating habits, identifying emotions, and building mastery and positive experiences. Emotion dysregulation has been shown to be a significant predictor of suicidal ideation and behaviors in adult and adolescent populations (Brausch & Woods, 2018; Jiao et al., 2010). Research has also found that depressed adults with a history of suicidal behaviors exhibited more emotion dysregulation than

depressed individual without suicidality and controls (Neacsiu et al., 2017; Tamas et al., 2007), indicating that emotion dysregulation is a predictor of suicidal ideation beyond diagnosis. Wolff et al. (2018) studied 104 adolescents who had been recently discharged from the hospital for suicidal ideation, and found that emotion dysregulation differentiated adolescents who experienced chronic suicidal ideation from those whose ratings of suicidal ideation declined. They concluded that it was critical to assess for emotion regulation when screening for suicide risk. It is also essential that any reductions in distress tolerance are coupled with greater emotional clarity, as research indicates that when low emotional clarity is paired with high distress tolerance, suicidal ideation is more likely to become lethal (Viana et al., 2018). This can be explained by Joiner's (2004) Interpersonal Theory of Suicide, which states that in order to attempt suicide one must have both the desire to die and the acquired capability for suicide. Bender et al. (2012) found that high distress tolerance combined with emotion dysregulation significantly predicted high scores on measures of acquired capability for suicide.

It is evident that type of treatment can produce varied outcomes, but very little research has been conducted into the effect of the environment in which treatment is administered. It has been established the environment in which an activity is performed can mediate the impact that the activity has: Bjornstad, Petil, and Raanaas (2014) found that greater nature contact during work was associated with less job stress, fewer health complaints, and less sickness related absence. Another study found that spending leisure time outdoors in nature was the most effective activity for recovery from work stress (Korpela & Kinnunen, 2011). Additionally, it was found that exercising outdoors had greater benefits for women than exercising indoors (Plante et al., 2007). If the environment in which work or exercise is performed has such impacts on their effects on people, it stands to reason that the environment of a person receiving may

impact the effectiveness of the therapy delivered. Stevens (2018) looked into the impact of horticultural therapy on those with severe mental illness and concluded that the therapeutic environment made therapeutic change more likely; however, serious methodological issues such as the sample size of 12 volunteers who weren't actually recipients of the treatment limit the validity of these results. In partial hospitalization, the therapist has no control over the patients' environment outside of sessions. Inpatient therapy has great control over the environment; however, a hospital setting does not necessarily have the same stress reducing benefits that contact with nature does. As described earlier, hospital settings can be stressful and borderline traumatic for adolescents (Smith et al., 2017).

Contact with the outdoors has also been shown to impact the different modalities of DBT. One study showed that experiencing awe inspired more prosocial behavior in participants (Prade & Saroglou, 2016). Given that daily prosocial behavior has been shown to reduce symptoms of depression and boost mood (Schacter & Margolin, 2018), wilderness therapy is in a unique position to work on interpersonal effectiveness. Mindfulness has been shown to be impacted by contact with nature as well. One study, conducted by Wolsko et al. (2013), found that higher scores on a connectedness to nature scale was significantly correlated with higher trait mindfulness and psychological wellbeing. A meta-analysis of 12 related studies also found that connectedness to nature fostered more trait mindfulness as well (Schutte & Malouff, 2018).

There is evidence that emotion regulation is mediated by the outdoors as well. One study found that a one-week white water rafting trip significantly increased well-being and decreased stress for a group of veterans and daily contact with nature led to similar outcomes for college students (Anderson et al., 2018). Previously mentioned research on wilderness therapy indicated a stronger attachment to mothers following treatment (Betteman et al., 2017). Given the context

of Linnehan's (1993) biosocial theory, improving the home environment and promoting stronger attachment to caregivers would assist with emotion regulation, and this assertion has been backed by other research (Silva, Soares, & Esteves, 2012). Additionally, Johnsen (2011) found that not only did time spent out in nature increase positive emotions and decrease negative emotions in participants, they reported more ease in describing and thinking about their feelings as well. Similar findings were reported in other studies (Korpela & Staats, 2014; Bratman et al., 2015). Even still, more research on emotional regulation as impacted by the outdoors is necessary, as these studies are few and far between. There is a significant gap in the literature on the impact of environment on distress tolerance, as no studies have been conducted on this topic at this time.

The present study aims to fill gaps in the literature on the nature of wilderness therapy. It's been established that wilderness therapy is effective, but there is still a lot of ambiguity as to why. This study will compare three groups of adolescents, one participating in a two-week wilderness therapy program and one in a traditional two-week inpatient program, with the last in a 2-week partial hospitalization program. All three will follow along with the DBT-A skills manual to keep treatments otherwise consistent. While interpersonal effectiveness and mindfulness are undoubtedly useful skills for adolescents that can be helped significantly through wilderness therapy, this research will focus on emotion regulation and distress tolerance, as those are the modalities of DBT most directly linked to suicidal behaviors (Vujanovic et al., 2017; Pennings & Anestis, 2013; Brausch & Woods, 2018; Jiao et al., 2010; Bender et al., 2012). Participants will complete dependent measure questionnaires at the start of the two weeks and after completing treatment to assess suicidal ideation, emotion regulation, and distress tolerance. I hypothesize that participants in the wilderness therapy condition will report a greater reduction

in suicidal ideation than participants in the traditional inpatient condition or intensive outpatient conditions. This reduction in suicidal ideation will be mediated by increases in the patient's ability to regulate emotion and tolerate distress through the therapeutic environment being outdoors.

### **Ethics**

This study would provide great benefits to adolescents struggling with suicidal ideation and those treating them. Firstly, adolescents would be provided with free treatment that has been shown to be efficacious. An even larger benefit, however, is the knowledge gained from the study. We would obtain a greater understanding of the mechanisms that influence suicidality in teens, as well as information on the way that nature heals people. Results from this study could be applied to other treatments in order to reduce the amount of adolescents committing suicide, which is a great benefit as suicide is currently the second leading cause of death for adolescents. The level of risk to participants in the study is minimal, as they will be under the supervision of trained clinical psychologists the entire time. Additionally, participants will be provided with informed consent and provided with resources for followup care during debrief. This is an essential step, as continued care is often necessary to maintain reductions in symptoms following acute treatment.

My study will be conducted on adolescents, which are a protected population. This is necessary as evidence-based treatments for adolescents are not studied nearly as often as those for adults, and adolescents are in clear need of tailor made treatments. Adolescents will be monitored by staff at all times, which will include licensed clinical psychologists. Any participants assessed as actively suicidal and at risk for an attempt will be excluded from the study as well, and any adolescents in the wilderness or intensive outpatient conditions who

progress to suicide risk will be transferred to the more controlled inpatient setting and removed from the study. Because of the very nature of treatment for suicidal ideation, participants will likely experience fairly significant emotional distress at times during the study. As stated before, they will be monitored by professionals for safety purposes, and this emotional distress will likely be more cathartic in nature as they work through their symptoms. Participation in this study is entirely voluntary. While adolescents will not be able to leave treatment until discharged by their treatment team, they will be able to leave the study and refuse to provide data at any point. Moreover, in order to protect participants all data collected will be confidential. Clinicians and staff will be bound by confidentiality laws, and all survey data collected will be anonymous. Additionally, participants will be held to the same rules as many inpatient programs to protect identities, and because of this will be barred from sharing last names and sharing any information about fellow participants with anyone outside of the study.

The benefits of this study strongly outweigh the potential risks- it is essential that adolescents in this country are provided with better care that is more based in research. While the process of treatment can be painful and upsetting, the reductions in suicidal ideation that are expected and the information gained about treatment and mediators for suicidal ideation and the outdoors could greatly improve treatment options for adolescents, which would be a massive benefit.

## **Methods**

### **Participants**

The sample will be comprised of 156 adolescents seeking treatment for suicidal ideation.

Participants will be recruited through clinician referral and posters put up throughout the

hospital. Participants must be between the ages of 13-17 in order to be included and must have exhibited suicidal ideation in the past month. Participants who are actively suicidal and assessed as high risk for suicide will be excluded for safety purposes. Other exclusion criteria include psychosis, a current diagnosis of an eating disorder, and unsupportive families.

## **Materials**

### *Beck Scale for Suicidal Ideation (SSI)*

Pre and post treatment estimates of suicidality will be assessed with the Beck Scale for Suicidal Ideation (Beck et al., 1991). The SSI is a 21-item self-report measure of the severity of suicidal ideation, including attitudes, plans, and behaviors to commit suicide. Scores on each item range from 0-2, with higher scores indicating higher severity. The first 5 items in the scale are used to screen for the presence of suicidal ideation, and if a positive score is obtained participants answer the remaining questions. This is a well-established scale that has shown great validity and reliability in adolescent populations, as Cronbach's  $\alpha$  for the SSI was 0.95 (Holi et al., 2015).

### *Distress Tolerance Scale (DTS)*

The DTS is a 14-item measure of distress tolerance created by Simon and Gaher (2005). It contains questions relating to the ability to tolerate emotion distress (eg. “feeling distress or upset is unbearable to me”), subjective appraisal of distress (eg. “there is nothing worse than feeling distressed or upset”), attention devoted to negative emotions (eg. “when I feel distressed or upset, all I can think about is how bad I feel”), and efforts to alleviate emotional distress (eg. “I’ll do anything to stop feeling distressed or upset”). Items are rated on a 5-point scale. The scale has demonstrated reliable internal consistency with an alpha level of .89 (Simon & Gaher, 2005).

### *Difficulties in Emotion Regulation Scale (DERS)*

The DERS is a 36-item self report measure of clinically significant difficulties in emotion regulation (Gratz & Romer, 2004). The scale is broken down into six subscales: 1) Lack of emotional awareness (eg. “I am attentive to my feelings”, reverse scored), 2) Nonacceptance of emotional responses (eg. “When I’m upset, I become angry at myself for feeling that way”), 3) Difficulty engaging in goal-oriented behaviors and cognition when distressed (eg. “When I’m upset, I have difficulty getting work done”), 4) Impulse control difficulties (eg. “When I’m upset, I become out of control”), 5) Lack of access to emotion regulation strategies (eg. “When I’m upset, I believe there is nothing I can do to feel better”), 6) Lack of emotional clarity (eg. “I have difficulty making sense out of my feelings”). Items are scored on a 5-point scale, and subscale scores are obtained by summing scores of pertinent items. The scale has shown good test-retest reliability (Gratz & Romer, 2004). Internal consistency has been demonstrated in samples, with a total alpha level of .94 in an adolescent sample (Rudenstein et al., 2018).

### *DBT-A*

The DBT-a skills workbook is a DBT manual adapted from the original for use in adolescent populations (Rathus & Miller, 2002). It follows the same modalities as the original, with an increased focus on family-coping strategies and simplifying worksheets, as well as changing examples to be more pertinent to adolescents. It has exhibited great clinical utility, with one study reporting that while 8/12 of their participants had attempted suicide prior to beginning treatment, none had reported attempting suicide at the end of treatment or 1-year later at a post-treatment followup (Fleischhaker et al., 2011).

### **Procedure**



Participants will be randomly assigned to one of three conditions: wilderness therapy, traditional inpatient, or intensive outpatient. Pre-treatment scores for the dependent measures will be obtained. Wilderness therapy will be conducted in a typical backpacking style program in which participants are separated from their families and live outdoors for the two weeks, with family sessions at the beginning and end of treatment. Participants will then participate in a 2-week treatment program modeled after the DBT-A skills workbook. There will be daily skills workshops in groups, as well as individual therapy sessions. The only difference between the three conditions, apart from the environments, will be leisure activities, which will differ most in the intensive outpatient condition when participants return home. In the case that a participant increases in suicidality during the two weeks and is assessed as high risk for suicide, they will be excluded from the data and transferred to a secure facility. After the two weeks is over, dependent measures questionnaires will be administered and data will be analyzed.

### **Results**

First, a one-way ANOVA will be run to assess for main effects of treatment, with an a priori contrast to determine if the effect of wilderness therapy differs from that of inpatient and intensive outpatient. It is expected that participants in the wilderness therapy condition will experience the greatest reduction in suicidal ideation. This is based on previous research highlighting the efficacy of wilderness therapy programs for patients not responding to other treatments (Betteman et al., 2016; Marglit & Ben-Ari, 2014; Westlund, 2014, Vella et al., 2013).

Mediation will be assessed via Baron and Kenny's (1986) process for mediational hypotheses. Baron and Kenny specify step one of this process as establishing that there is a significant relationship between the causal variable and the outcome, which for this study is outlined above. The second step is to show that the causal variable is related to the mediator

variables. This will be done using a simple ANOVA to show that treatment type predicts increases in emotion regulation. It is expected that there will be a main effect of treatment type on emotion regulation, such that participants in the wilderness therapy condition will experience significantly increased emotion regulation, as research has shown that contact with the outdoors can have positive impacts on emotion regulation (Anderson et al., 2018; Ebner et al., 2018). The third step in this process is to demonstrate that the mediator variable has a significant effect on the outcome variable. This will be tested through Pearson's  $r$ , and it is expected that there will be a negative relationship between the two, such that as emotion regulation increases, suicidal ideation will decrease. Past research has implicated emotion dysregulation in suicidal ideation on numerous occasions (Brausch & Woods, 2018; Jiao et al., 2010; Neacsiu et al., 2017; Tamas et al., 2007). Finally, mediation is established by showing that the effect of treatment type when controlling for the mediator is zero or greatly reduced. This will be accomplished by running a multiple regression including treatment type, emotion regulation, and suicidal ideation. It is expected that the main effect of emotion regulation will remain significant, while the main effect of treatment type will be insignificant. This prediction comes from the synthesis of research outlined above, as contact with the outdoors is significantly related to higher levels of emotion regulation (Anderson et al., 2018; Johnsen, 2011; Korpela & Staats, 2014; Bratman et al., 2015), which in turn leads to reduced suicidality. The same process outlined above will be followed for the other mediator, distress tolerance, and the same pattern is expected in each step.

### **Discussion**

There is a significant lack of empirically validated treatments for adolescents experiencing suicidality. Suicide rates have been climbing at a startling rate in recent years, with a 24% increase from 1999-2014 (Center for Disease Control and Prevention, 2016). A

nationwide survey of high school students reported that 16% of students had seriously considered suicide, 13% reported having a plan, and 8% reported attempting to take their own life in the past year. Over 55% of adolescents exhibiting suicidal behaviors were already in some form of treatment before the suicidality began (Nock et al., 2013). It is evident that we are in desperate need of evidence-based treatments for adolescents struggling with suicidal ideation, as more and more young people fall through the cracks. Inpatient treatment centers, the favored treatment at this point in time, reduce symptoms but have failed to address chronic suicidal ideation in patients (Brinkmeyer et al., 2004). Partial hospitalization programs have faced similar issues (Wolff et al., 2018).

Wilderness therapy has proven to be an effective treatment in many clinical samples; however, there is a gap in research on the mechanisms that make it effective. An improved understanding of *why* this treatment works could lead to greater knowledge of the nature of suicidality and improve treatment outcomes for adolescents struggling with chronic suicidal ideation. In addition to simply expanding our knowledge of the way that nature impacts wellbeing, findings from this study could be applied to other treatment models to improve treatment outcomes. Findings on the impact of nature-contact on emotion regulation and distress tolerance would also fill gaps in the literature, as few studies have been conducted in this area. Furthermore, wilderness therapy programs remain highly inaccessible to low-income groups, as most insurance providers will not cover treatments conducted outdoors and the average cost of these programs is upwards of \$300 per day (Scott & Duerson, 2010). Some families reported spending upwards of \$100,000 on long-term wilderness therapy treatment programs. Increasing empirical support for this treatment could force insurance providers to start covering costs under the Mental Health Parity and Addiction Act of 2008, making wilderness therapy an option for

those who previously would be unable to afford it. The standardization and regulation of wilderness therapy programs would also help families distinguish quality programs from sub-par ones, which is extremely important given the history of abuse and neglect in certain programs (Behar et al., 2007).

This study is not without limitations- one being that there could be significant differences in how leisure time is spent in the intensive outpatient condition. Depending on the participant, peer relationships in the intensive-outpatient group could have positive or negative impacts on functioning. Additionally, separating adolescents from their family unit could have impacts on suicidal ideation, as some literature has cited removal from the family as a negative of residential treatment programs (Agazio et al., 2003; Furtado et al., 2016), while others have explored the benefits of distance from dysfunctional family units (Bolt & Issenmann, 2017; Bettemann et al., 2017). The level of family involvement in each of these treatment conditions varies widely, which is a potential confound. Another limitation is the level of severity of symptoms in each condition. Wilderness therapy lacks the ability to control the environment to ensure safety in the same way that a traditional inpatient unit would, and because of this actively suicidal adolescents were excluded. This may limit generalizability to more severe populations. Moreover, the study only focused on distress tolerance and emotion regulation. It is probable that these variables are influenced by a number of other factors, including interpersonal effectiveness and mindfulness.

Future directions for research include the implementation of nature-based therapies in other treatment forms. As mentioned earlier, one study found that the introduction of plants and trees into the workplace significantly reduced employee stress and sickness related absences (Bjornstad, Petil, & Raanaas, 2014). Introducing more contact with nature through plants or time spent outside walking could increase the efficacy of traditional residential or partial

hospitalization programs. Studies should also continue examine the effectiveness of these programs in more severe populations. Wilderness therapy is often a last resort treatment for families, and while restrictive inpatient treatment is generally the go-to for suicidal patients, research from Linnehan (1993) on people struggling with Borderline Personality Disorder indicates that suicidality can be effectively reduced in outpatient settings as well. Demonstrating effectiveness of this treatment in higher risk populations could result in patients accessing empirically supported treatment earlier in their struggles. Future researchers should also look into other variables that may be implicated in the efficacy of wilderness therapy. Specifically, Joiner's (2004) Interpersonal Theory of Suicide implicates thwarted belongingness (TW) and perceived burdensomeness (PD) as two key factors in suicidal ideation, with acquired capability for suicide as the determining factor in whether or not one will actually attempt suicide. The present study focused on emotion regulation and distress tolerance as the factors implicated in acquired capability for suicide, but future research should focus on the implications of interpersonal effectiveness skills on TW and PD. Research mentioned earlier has indicated the unique position of wilderness therapy to influence interpersonal effectiveness (Prade & Saroglou, 2016), and studies on this aspect of wilderness therapy could prove very useful. Finally, longitudinal studies need to be run to determine if the effects of wilderness therapy are lasting, as currently research has not looked at the long-term impacts of wilderness therapy.

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