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The Impact of Wilderness Therapy: Utilizing an Integrated Care Approach

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Abstract

With roots in experiential education and Outward Bound, wilderness therapy (WT) is a growing field of mental health care for youth. WT uses outdoor modalities combined with therapeutic interventions to assist youth to promote clinical changes. Previous research has shown it to be effective in improving the mental health of clients; however, little research has looked at the impact of WT on physical outcomes as well. This study examined changes in the body composition and mental health outcomes of adolescents participating in one WT program. On average, youth in the sample moved to a more healthy weight and body mass index (BMI) or were able to maintain at a healthy level. Youth also experienced significant improvements in their mental health functioning. Given the adolescent obesity crisis along with adolescent female challenges with body image, these results show that WT could be a promising intervention for youth struggling with these issues.

Keywords

wilderness therapy, mental health, adolescents, body composition, body mass index (BMI)

The prevalence of adolescent mental health problems has become a growing concern, with 17% (almost one in every five youth) having one or more mental health or substance abuse disorders (O'Connell, Boat, & Warner, 2009). Despite the prevalence of adolescent mental health problems, a treatment gap exists in which less than 20% of

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children and adolescents receive the treatment they need (Department of Health and Human Services, 2014). Furthermore, mental health treatment for adolescents has focused mostly on behavioral health, largely ignoring the physical health conditions that are often interrelated (Kutcher, Davidson, & Manion, 2009). This is problematic, as research has shown that

> people with mental and substance abuse disorders may die decades earlier than the average person—mostly from untreated and preventable chronic illnesses like hypertension, diabetes, obesity, and cardiovascular disease that are aggravated by poor health habits such as inadequate physical activity, poor nutrition, smoking, and substance abuse (Substance Abuse and Mental Health Services Agency [SAMHSA], 2014, para. 1).

The original Adverse Childhood Experiences (ACE) Study (Felitti et al., 1998), along with many newer iterations of the study (Centers for Disease Control and Prevention [CDC], 2014), further affirms these findings and found that those who reported exposure to traumatic adverse experiences in childhood were more likely to develop long-term, chronic health problems in adulthood and even experience early death. To target both mental and physical health outcomes related to trauma and other risk factors, SAMHSA (2014) developed an integrated care model, which involves the systematic coordination of general and behavioral health care, targeting various risk levels. The integrated care model consists of screening for physical and behavioral risk factors, and then providing concurrent treatment of both. According to SAMHSA, "integrating mental health, substance abuse, and primary care services produces the best outcomes and proves the most effective approach to caring for people with multiple healthcare needs" (para. 3). Although the literature does not identify any downsides to the integrated care approach, it does identify challenges to effectively implementing it, such as lack of training, a poorly integrated health care delivery system, and lack of funding to create adequate access to integrated care (American Psychological Association, 2015).

Because of the high prevalence of obesity among adolescents (Lawrence, Hazlett, & Hightower, 2010; Peart, Velasco Mondragon, Rohm-Young, Bronner, & Hossain, 2011), research has also begun to utilize an integrated care approach by examining the relationship between body mass index (BMI) and mental health, which has been documented nationally and internationally in adults and children (BeLue, Francis, & Colaco, 2009; Bjornelv, Nordahl, & Holmen, 2011). BMI is a useful assessment and screening tool used by the World Health Organization (2006) to assess weight categories that may lead to health problems. According to the BMI, its numeric cut-off values are classified as less than 18.5 as Underweight, 18.5-24.9 representing Normal weight, 25-29.9 as Overweight and 30 or greater representing an Obese weight. In particular, findings show that youth experiencing obesity are more likely to also experience depression, anxiety, behavioral and social problems, and substance abuse (Bjornelv et al., 2011; Pasch, Velazquez, Cance, Moe, & Lytle, 2012). According to BeLue et al.'s (2009) study, which used data from the 2003 National Survey on Children's Health, youth who were Overweight, including Obese according to BMI, were significantly more likely than their non-Overweight counterparts to report depression or

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anxiety, feelings of worthlessness or inferiority, behavior problems, and bullying of others. A study in England confirmed similar findings with children classified as Obese having an odds ratio of 2.13 for being above the screening threshold for an emotional disorder compared with non-Obese young people (Tiffin, Arnott, Moore, & Summerbell, 2011). Based on these findings, BeLue et al. (2009) suggested that when addressing health issues for Overweight and Obese youth, mental health problems need to be screened for and addressed as well.

Wilderness Therapy (WT) as an Integrated Care Model

For this reason, an intervention is needed for adolescents with high behavioral and physical health risk factors, such as mental illness, substance abuse, and unhealthy body composition. These youth often need a more intensive intervention than outpatient, community-based mental health services. With roots in experiential education and Outward Bound, WT is an innovative approach to behavioral health treatment that can address some of these high-risk levels (Russell & Phillips-Miller, 2002). WT is an intensive intervention used most often with adolescent clients and young adults, which includes "immersion in wilderness or comparable lands, group living with peers, individual and group therapy sessions, and educational and therapeutic curricula, including backcountry travel and wilderness living skills" (Russell & Phillips-Miller, 2002, p. 415). WT is designed to address behavioral and emotional issues, improve social relations, enhance levels of personal responsibility, and promote personal growth in clients (Russell & Phillips-Miller, 2002). With extended periods of time spent in the wilderness, participants learn experientially the skills needed to live and travel outdoors. In addition, group living and the natural environment provide opportunities for impromptu teachable moments and learning experiences (Tucker, Norton, Itin, Hobson, & Alvarez, in press). Through processing these moments, clinicians and field guides can then support the transference of learning when the client applies their personal growth gained in a wilderness setting to their everyday lives (Gass, Gillis, & Russell, 2012). Extant WT outcome research has found it an effective intervention for decreasing mental health symptoms for both adolescents (Norton et al., 2014) and young adults (Hoag, Massey, Roberts, & Logan, 2013).

Few studies, however, have looked at the combination of physical and mental health changes. A study by Jelalian, Mehlenbeck, Lloyd-Richardson, Birmaher, and Wing (2006) of a group-based Cognitive Behavioral Therapy weight loss program for Obese adolescents found that an added adventure therapy component was related to 4 times the average weight loss in older adolescents compared with a similar group with an added exercise component. These findings suggest that adventure-based therapeutic interventions can increase the effectiveness of weight loss programs; however, this study evaluated a community-based program, not WT. A recent study by DeMille, Comart, and Tucker (2014) examined the body composition changes of adolescents participating in a WT program. The sample was grouped by BMI categories of Underweight, Normal, Overweight, and Obese to discern the physiological changes across these categories as a result of participation. On average, adolescents had

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significantly changed toward healthier body compositions from intake to discharge. In addition, there were gender differences in terms of weight loss. Underweight females gained significantly more weight than Underweight males, while Overweight and Obese males lost more weight than females (DeMille et al., 2014). Although this study examined the impact of WT on some of the high-risk physical health factors that youth brought to the program, it did not examine the relationship between changes in body composition and resulting changes in youth functioning and mental health outcomes.

The current study addresses the gaps in the research and is the first of its kinds to apply an integrated care approach by examining the changes in body composition of adolescents participating in a WT program along with changes in youth functioning and mental health outcomes. Specific research questions included the following:

Research Question 1: How did participation in a WT program affect the body composition of youth participants in terms of weight, BMI, lean mass, and fat mass across BMI groups and gender?
Research Question 2: How did participation in a WT program affect the mental health functioning of youth participants and were there differences across BMI groups and gender?
Research Question 3: Is there a relationship between changes in body composition and mental health functioning?

For clarity, BMI groups included in this study were Underweight, Normal weight, Overweight, and Obese as determined by each participant's BMI number and set by the World Health Organization (2006).

Method

Participants

The study sample included 516 adolescent clients between the ages of 13 and 18 who enrolled in wilderness treatment between January 1, 2011, and December 31, 2013. As shown in Table 1, the majority of the clients were male (70.0%) and around 16 years of age (M = 16.2, SD = 1.2 years). Clients were primarily Caucasian (79.3%) followed by mixed race (9.5%) and Hispanic (7.0%). The average length of stay for participants was 79.8 days (SD = 24.1). Participants referred to this wilderness therapy program have been previously diagnosed or demonstrated symptoms from a number of categories. These diagnostic labels are Major Depression, Bipolar Disorder, Attention Deficit/Hyperactivity Disorder (ADHD), Oppositional Defiant Disorder (ODD), Learning Disorder, Adjustment Disorder, Impulse Control Disorder, and Substance Related Disorders.

Program Description

Data for this study were gathered at a WT program licensed by the Utah Department of Licensing and a member of the Outdoor Behavioral Healthcare Council (OBHC).

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Table 1. Demographics Data for Participants.

Sample descriptives	%	*n*
Gender (*N* = 414)		
Male	70.0	290
Female	30.0	124
Ethnicity (*N* = 242)		
Caucasian	79.3	192
African American	0.8	2
Hispanic/Latino	7.0	17
Native American	1.2	3
Asian	2.1	5
Mixed	9.5	23
Age at admission (*N* = 415)	*M* = 16.2 years	*SD* = 1.2 years
Length of stay (*N* = 415)	*M* = 79.8 days	*SD* = 24.2 days

This program works with approximately 160 adolescents a year, who are referred for emotional, behavioral, or substance related disorders. Most participants have tried and been unsuccessful with less restrictive treatment modalities (community-based services) or present with levels of distress that make them a threat to themselves or others. This program uses a continuous flow wilderness trek model, where the treatment team (therapist, medical staff, and direct care staff) and clients rotate in and out of ongoing groups on wilderness expedition. The group does not have a set base camp but moves in a nomadic style within a designated field of operation. Clients receive mental health, substance abuse, and general health care services while they are immersed in a wilderness-living setting to ensure integration of care.

The mental health and substance abuse services are provided by state licensed mental health providers (psychologist, clinical social worker, clinical mental health counselor) with a master's degree or higher level of education. The mental health providers spend 2 days per week in the field where participants receive individual and group psychotherapy. In addition, participants engage in a treatment milieu, which involves wilderness-living, psycho-education groups, adventure therapy activities, a value-based academic curriculum, and a healthy lifestyle (i.e., healthy diet, sleep habits, work, and exercise). In addition, to address dysfunction in family dynamics and to prepare participants to reintegrate home after treatment, family therapy is also provided weekly using a narrative therapy approach. The narrative approach provides the family the structure to "tell and retell" a problem-saturated story and change the family's relationship to their story to one that is more strengths based. This is done through questions and structured letters to deconstruct problem-saturated narratives and to identify unique outcomes leading to alterative or preferred family narratives (DeMille & Burdick, 2015).

The general health care services are provided by a licensed medical doctor and a registered nurse. An initial medical evaluation is conducted within 3 days of arriving in the program for treatment. The assessment includes a physical and psychiatric

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evaluation. After the initial evaluation, ongoing medical evaluations occur biweekly with high-risk participants being assessed weekly by a registered nurse. The assessments are done while in treatment so that participants do not have to be removed from their treatment environment for the weekly or biweekly physical assessments.

The entire treatment team meets weekly face-to-face to coordinate treatment services. This includes medical staff, mental health providers, administrators, and direct care staff supervisors. Within the context of each treatment team member's role, participant's mental health, substance, and general health care needs are discussed and necessary services are coordinated. Both the medical staff and mental health providers work collaboratively to develop a client's treatment and discharge plan.

This program complies with the diet and nutrition standards outlined by the State of Utah for Youth Outdoor Programs. This includes access to 3,000 calories each day. The breakdown for food includes oatmeal, farina, and powdered milk for breakfast; trail mix, which includes granola, a variety of dried fruits and nuts, to snack on throughout the day; rice, beans, lentils, dehydrated potatoes and vegetables, and whole wheat flour for dinner. Participants received a variety of fresh fruits, vegetables, 5 ounces of fish and meat twice per week, and an alternating supply of 1 pound of peanut butter and cheddar cheese each week. During winter months, participant's diet is supplemented with 4 ounces butter and a pound of salt pork each week. Food supplies are evaluated and replenished twice a week to ensure participants have access to necessary nutrition.

The primary physical activity is hiking/backpacking. On average, participants went on hike/backpack expeditions 4 to 5 times a week for 3 to 10 miles each trek. Hiking/backpacking distances are also adjusted during the winter months with the distance averaging between 2 to 6 miles per trek. There is no established base camp for the program. On rest days, participants will stay at a camp site identified by the direct care staff. If necessary, hiking restrictions are applied for clients in the Obese weight category and the Underweight category. In addition, extra protein is added to a client's diet if they are considered Underweight.

Measures

BMI. One of the ways a participant's general health was monitored was by calculating their BMI and body composition. According to the BMI, its numeric cut-off values are classified as less than 18.5 as Underweight, 18.5-24.9 representing Normal weight, 25-29.9 as Overweight and 30 or greater representing an Obese weight. Body composition is used to assess the percentage of lean mass and fat mass. To calculate body composition, a bioelectrical impedance analysis (BIA) device was used. The BIA uses electricity to determine body fat percentage, which is then used to calculate the lean and fat mass of participants.

Youth-Outcome Questionnaire Self Report Version 2.0 (Y-OQ SR 2.0). Mental health was assessed using the Y-OQ SR 2.0. The Y-OQ SR 2.0 is a global measure of adolescent functioning. It is atheoretical and is not designed to be used for diagnosing.

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The instrument measures overall client functioning that includes six subscales. The subscales include (a) Intrapersonal Distress, (b) Somatic Symptoms, (c) Interpersonal Relationships, (d) Social Problems, (e) Behavioral Dysfunction, and (f) Critical Items. It is a 64-item self-assessment designed for youth aged 13 to 18 years.

The instrument reports high test–retest correlations for the total score (r = .89, p < .001) and moderate to high test–retest correlations for individual subscale scores, ranging from .68 to .86, as well as strong internal consistencies (α > .73), Overall, the test–retest coefficient estimates met or exceeded .70, the general recommendation. To track client outcomes and progress, the Y-OQ developers calculated clinical cutoff scores by comparing scores from a normative sample to samples of inpatient and outpatient populations (Burlingame et al., 2005). The clinical cutoff for Y-OQ SR 2.0 Total score is 47 with similar cutoffs created for each subscale. Participants who have Y-OQ scores at or below these clinical cutoff numbers are considered to function within a normal range of behavior, no longer clinically acute.

Procedures

A pretest–posttest research design was used to answer the research questions. Height, weight, and body fat percentages were gathered at intake from participants to establish a baseline. Immediately after completing the program, height, weight, and percentage of body fat were again gathered from each client. BMI and lean and fat mass were calculated from these data at both intake and discharge. Then changes in weight, lean mass, fat mass, and BMI between intake and discharge were determined for all participants.

Mental health data were gathered at the same time as the general health data at admission and discharge. Participants fill out a pencil and paper copy of the Y-OQ SR 2.0. Data are stored on a HIPPA compliant database, and identifying information is removed to ensure participant confidentiality. This study was approved by the Institutional Review Board at the first author's institution.

Findings

Changes in Weight and Body Composition

Paired samples t tests. Paired samples t tests with Bonferroni corrections were completed to test the differences between pre- and post-body composition in participants across BMI categories. Youth who had BMIs considered Underweight, Overweight, or Obese at intake showed healthy changes in their physical health at discharge (see Table 2). Specifically, on average, Underweight youth significantly gained weight (t = −4.37, df = 21, p < .001), BMI (t = −3.45, df = 21, p = .01), and lean body mass (t = −4.02, df = 21, p = .003). Normal weight youth significantly gained lean body mass (t = −2.90, df = 281, p = .02) and significantly lost fat body mass (t = 3.14, df = 281, p = .009). Overweight youth had significant decreases in weight (t = 9.82, df = 77, p < .001), BMI (t = 8.44, df = 77, p < .001), lean mass (t = 2.86, df = 77, p = .03), and fat mass (t = 7.00, df = 281, p < .001).

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Table 2. Mean Changes From Intake to Discharge in Weight, BMI, Lean Mass, Fat Mass, and Body Fat Percentages.

	Mean changes in weight (lbs)	Mean changes in BMI	Mean changes in lean mass (lbs)	Mean changes in fat mass (lbs)
Underweight (n = 22)	+6.73 (SD = 7.22)***	+1.20 (SD = 1.63)*	+7.45 (SD = 8.70)**	−0.72 (SD = 6.95)
Normal weight (n = 282)	−0.24 (SD = 9.39)	−0.15 (SD = 1.53)	+1.72 (SD = 9.97)*	−1.96 (SD = 10.46)**
Overweight (n = 78)	−14.69 (SD = 13.22)***	−2.22 (SD = 2.32)***	−4.0 (SD = 12.35)*	−10.70 (SD = 13.58)***
Obese (n = 33)	−36.36 (SD = 19.91)***	−5.80 (SD = 3.0)***	−13.5 (SD = 19.68)*	−22.80 (SD = 27.49)**

Note. BMI = body mass index.
*p < .05. **p < .01. ***p < .001, Bonferroni corrected p values.

Table 3. Changes in BMI Categories From Intake to Discharge.

	Discharge BMI category			
Intake BMI category	Underweight	Normal weight	Overweight	Obese
Underweight (*n* = 22)	54.5% (*n* = 12)	45.5% (*n* = 10)	0.0%	0.0%
Normal weight (*n* = 282)	0.7% (*n* = 2)	97.9% (*n* = 276)	1.4% (*n* = 4)	0.0%
Overweight (*n* = 78)	0.0%	61.5% (*n* = 48)	38.5% (*n* = 30)	0.0%
Obese (*n* = 33)	0.0%	3.0% (*n* = 1)	69.7% (*n* = 23)	27.3% (*n* = 9)

Note. BMI = body mass index.

Similarly, Obese youth had significant decreases in weight ($t = 10.49$, $df = 32$, $p < .001$), BMI ($t = 11.23$, $df = 32$, $p < .001$), fat mass ($t = 4.78$, $df = 32$, $p < .001$), and lean mass ($t = 3.94$, $df = 32$, $p = .02$).

BMI category changes. In terms of BMI changes as shown on Table 3, 45.5% of Underweight youth moved to a Normal BMI range at discharge, 61.5% of Overweight youth moved to Normal BMI at discharge, and 69.7% of Obese youth were considered Overweight in terms of BMI at discharge. Overall, 97.9% of Normal weight youth remained at this level at discharge. Of the Normal weight youth at intake who were at a different BMI category at discharge, these six participants had BMIs bordering on the other BMI categories, hence a few changes in pounds or body fat percentage moved them into another category. None of these individuals had statistically significant changes in BMI.

Gender differences. To see whether there were any gender differences in terms of physical improvements, change scores were calculated for weight, BMI, lean mass, and body fat mass. Independent samples *t* tests were calculated comparing mean changes for males and females across BMI categories. Bonferroni corrections were used to limit Type I error. The *t* tests revealed no significant differences between Underweight males and females and only one significant difference for Normal weight youth. Males slightly decreased their BMI ($M = -0.32$, $SD = 1.5$), and females ($M = 0.26$, $SD = 1.52$) of normal weight gained BMI points, $t = -3.0$, $df = 279$, $p = .017$. There were significant differences between both Overweight males and females in terms of weight, BMI, and fat mass decreases. Overweight males lost more fat mass ($M = 13.6$, $SD = 12.8$) than Overweight females ($M = 4.13$, $SD = 13.1$), $t = -2.99$, $df = 76$, $p = .019$. They lost significantly more weight ($M = 18.83$, $SD = 11.9$) than Overweight females ($M = 5.22$, $SD = 11.3$), $t = -4.70$, $df = 76$, $p < .001$; and Overweight males lost more BMI points ($M = 2.70$, $SD = 2.3$) than Overweight females ($M = 1.13$, $SD = 2.0$), $t = -2.88$, $df = 76$, $p = .026$. For Obese youth, males lost significantly more fat mass ($M = 34.33$, $SD = 16.7$) than females ($M = 5.21$, $SD = 31.9$), $t = -3.44$, $df = 31$, $p = .008$, and lost more weight ($M = 44.3$, $SD = 20.4$) than females ($M = 24.15$, $SD = 11.3$), $t = -3.23$, $df = 31$, $p = .015$.

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Y-OQ Changes Across BMI Categories and Gender

To see whether there was a relationship between youth with different BMIs at intake, pre–post mean changes in the Y-OQ SR 2.0 and its subscales were compared across all four BMI groups. Independent samples *t* tests with Bonferroni corrections revealed that youth in Normal, Overweight, and Obese groups at intake, on average, significantly improved at discharge across all Y-OQ scores ($p < .001$) with large effect sizes ($d > .82$; see Table 4). In addition, although Normal, Overweight, and Obese youth were functioning at acute levels at intake, these scores decreased enough to be considered within normal ranges of functioning at discharge, as measured by clinical cutoffs. Youth who were Underweight at intake, however, only showed significant improvements on the Intrapersonal Distress subscale ($p < .05$) at discharge, with no significant improvements on the other six measures and only Total and three subscales scores below the clinical cutoffs.

When change scores were computed, a two-way ANOVA of gender (male, female) and BMI at intake found no main effects for BMI and no interaction effects between gender and BMI; however, significantmain effects for gender were found with females ($M = 52.8$, $SD = 37.8$) reporting significantly higher levels of Total Y-OQ improvements than males ($M = 33.4$, $SD = 31.8$), $F = 8.89$, $df_1 = 1$, $df_2 = 294$, $p = .003$. Despite no main effects for BMI, post hoc analyses revealed that Obese youth had significantly larger improvements on Y-OQ Total scores than Overweight youth ($M_{diff} = 19.0$, $p = .032$).

Relationships Between Physical and Y-OQ Improvements

Finally, this study was interested to see whether physical improvements were related to Y-OQ improvements. Bivariate correlations between changes in Total Y-OQ and its six subscales, weight, BMI, lean body mass, and fat mass were conducted and compared. For Normal, Overweight, and Obese youth at intake, no significant correlations were found between physical changes and mental health changes. For Underweight youth, it seemed that higher Y-OQ Total changes were positively correlated with higher BMI gains ($r = .524$, $p = .045$). Similarly, for Underweight youth, gains in BMI were also positively correlated with higher improvements in the subscale Interpersonal Relations ($r = .598$, $p = .019$) as well as Social Problems ($r = .715$, $p = .003$).

Discussion

The future of health care is moving toward an integrated care approach that supports the incorporation of behavioral health services into primary care, with the purpose of addressing both physical and mental health (Kodner, 2008); however, very little research exists on integrated care treatment approaches with adolescents. Perhaps this is due in part to the fact that 80.5% of adolescents are in excellent or very good health, and most physical health problems tend to have their onset in adulthood (CDC, 2013). However, given what is known about the relationship between childhood trauma, negative adult health and psychiatric outcomes, and medical under-utilization of health

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Table 4. Y-OQ Changes from Admission to Discharge across BMI Admission Groups.

Y-OQ and BMI admission groups	M_{pre} (*SD*)	M_{post} (*SD*)	*t*	Effect size (*d*) CI (lowest to highest)
Underweight (*n* = 15)				
Total	67.7 (34.3)	**42.8** (34.2)	2.7	0.97 [–16.39, 18.28]
Intrapersonal Distress	23.7 (14.2)	**12.9** (11.9)	3.3*	1.21 [–5.97, 7.24]
Somatic	7.3 (6.3)	**4.9** (4.7)	1.9	0.69 [–2.50, 3.07]
Interpersonal Relations	5.7 (5.4)	3.4 (5.5)	1.2	0.44 [–2.30, 3.22]
Social Problems	9.4 (4.6)	5.7 (6.5)	1.9	0.73 [–1.60, 4.02]
Behavior Dysfunction	14.5 (7.4)	**10.3** (6.8)	2.2	0.81 [–2.93, 4.25]
Critical Items	7.2 (6.4)	**5.5** (4.3)	1.5	0.61 [–2.62, 2.79]
Normal weight (*n* = 212)				
Total	61.6 (31.9)	**29.4** (26.3)	17.0***	1.33 [–2.97, 4.87]
Intrapersonal Distress	20.6 (12.6)	**9.6** (8.8)	14.9***	1.21 [–0.48, 2.40]
Somatic	8.0 (5.1)	**3.9** (3.7)	11.8***	1.19 [0.51, 1.69]
Interpersonal Relations	6.6 (5.6)	**1.0** (4.9)	12.4***	1.21 [0.45, 1.87]
Social Problems	8.9 (5.5)	**2.4** (4.4)	14.8***	1.44 [0.70, 2.03]
Behavior Dysfunction	14.9 (6.9)	**8.4** (6.7)	13.1***	1.29 [0.36, 2.19]
Critical Items	8.6 (5.6)	**4.2** (3.7)	12.8***	1.29 [0.53, 1.78]
Overweight (*n* = 57)				
Total	61.2 (31.5)	**28.9** (25.8)	7.6***	1.45 [–6.72, 8.15]
Intrapersonal Distress	20.5 (12.5)	**9.6** (8.7)	7.4***	1.45 [–1.79, 3.71]
Somatic	7.5 (5.4)	**3.5** (3.1)	6.4***	1.35 [–0.05, 2.15]
Interpersonal Relations	5.6 (5.7)	**0.6** (4.7)	5.6***	1.06 [–0.42, 2.28]
Social Problems	8.1 (6.2)	**3.0** (5.5)	5.5***	1.03 [–0.58, 2.45]
Behavior Dysfunction	12.5 (7.0)	**8.0** (7.3)	4.4***	0.82 [–0.99, 2.72]
Critical Items	7.3 (4.8)	**4.5** (3.6)	5.0***	0.98 [–0.27, 1.91]
Obese (*n* = 23)				
Total	79.4 (33.5)	**28.6** (21.7)	6.3***	1.90 [–11.79, 10.76]
Intrapersonal Distress	27.7 (13.5)	**8.6** (7.5)	6.2***	1.92 [–3.60, 4.99]
Somatic	10.1 (4.7)	**4.3** (2.8)	6.1***	1.91 [–0.01, 3.05]
Interpersonal Relations	6.5 (5.4)	–**0.04** (4.1)	5.4***	1.62 [–0.58, 3.30]
Social Problems	7.7 (7.4)	**1.4** (4.2)	4.1***	1.32 [–1.70, 3.04]
Behavior Dysfunction	16.1 (7.4)	**8.3** (5.3)	4.0**	1.19 [–1.84, 3.35]
Critical Items	11.4 (6.3)	**6.0** (2.9)	4.2***	1.34 [–1.24, 2.52]

Note. Bold scores reflect scores at or below the clinical cutoff. Y-OQ = Youth-Outcome Questionnaire; BMI = body mass index; CI = confidence interval.
*$p < .05$. **$p < .01$. ***$p < .001$, Bonferroni corrected *p* values.

care services (Arnow, 2004; Springer, Sheridan, Kuo, & Carnes, 2007), it could be argued that if an integrated care approach was applied earlier, which provides treatment interventions for adolescents that promote both physical and mental well-being, adult outcomes might also improve.

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This study begins to fill this gap in the literature and supports the idea that WT can improve both the physical health and mental health of its young participants. On average, participants in the sample moved to a more healthy weight and BMI or were able to maintain at a healthy level. These findings are similar to DeMille et al.'s (2014) findings in which participants in WT showed statistically significant body composition improvements across all four BMI categories at discharge. Beyond this, no other research on WT exists to compare our findings; however, research with overweight youth who participated in a non-therapeutic 8-week weight loss residential camp that included hiking, challenge course activities, and wilderness camping as well as team sports, aerobics, and lifting weights did show similar BMI and weight improvements for youth (Huelsing, Kanafani, Mao, & White, 2010). Hence, it seems that outdoor activity used to improve physical health in overweight youth has been embraced by health care professionals.

In addition to physical improvement, youth in our study also experienced significant improvements in their mental health functioning. These changes were especially true for youth who entered the program considered Obese, as well as female participants. Although no other research on WT has looked at the intersection of mental and physical health on youth, research has shown that overweight youth who attend a therapeutic weight loss camp had significant improvements in self-efficacy, physical functioning, and social functioning as well as BMI (Quinlan, Kolotkin, Fuemmeler, & Costanzo, 2009). In addition, females had higher improvements in self-efficacy, depressive symptoms, and social functioning than males; however, exercise in this camp did not include outdoor activities as the key components of exercise (Quinlan et al., 2009)

In this study, Underweight youth seemed to show improvements in Intrapersonal Distress as well as significant positive correlations between body composition increases and mental health improvements overall. It is unclear why these findings presented themselves; however, research has shown that Underweight children and adolescents also show high levels of internalizing symptoms of depression and anxiety especially if they have a history of disordered eating (Herpertz-Dahlmann, Dempfle, Konrad, Klasen, & Ravens-Sieberer, 2015). Hence, if youth in this group also suffered from disordered eating before coming to WT, a stabilized diet as well as ongoing clinical treatment may have affected their internalizing symptoms as they physically became fitter and approached a more healthy weight. Because no research has looked specifically at the issue of eating disorders and WT, it is important that future studies investigate whether youth who present with eating disorders, as well as internalizing symptoms like anxiety and depression, are affected differently than other youth. This is especially important as there seemed to be different impacts from WT on Obese and Overweight versus Underweight youth.

Limitations and Next Steps

Despite the positive findings, it is important to recognize the limitations of this study. First of all, without a comparable comparison group of youth, it is unclear whether these findings are due to the intervention in particular or due to other factors, like events happening in the youth's lives or maturation. Second, mental health functioning

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data were limited only to youth self-report; hence, it is unclear whether youth are accurate reporters of their own functioning or whether they under or over report problems. Previous research looking at parent and youth in WT programs reporting on the Y-OQ has shown that parents and youth are often aligned in their reporting of improvements (Tucker, Bettmann, Norton, & Comart, 2015; Tucker, Zelov, & Young, 2011); however, more research is needed that includes parent reports to build a greater confidence in these findings. Finally, this study does not follow youth longitudinally after treatment. So although there were significant physical and mental health improvements post participation, it is unclear whether these improvements remain for these youth. This is especially important because maintaining health post treatment is critical to decreasing the reoccurrence of residential treatment placements and reducing risk of continued physical and mental health issues into adulthood.

Even with these limitations, this study is the first of its kind to look at both the physical and mental health impacts of WT and builds a foundation for future research. Specifically, this study provides the findings of one WT program, hence future research is needed to replicate this study in other programs. This is especially important as many youth enter the program with normal weights and, as in the study, only 15 youth were Underweight and only 33 Obese. Hence, larger samples sizes would increase the representativeness of this sample and grow our confidence in the findings. In addition, future research needs to also look at the long-term impacts of WT programs on both the physical and mental health outcomes of youth which is supported by both the parents and youth participants.

Finally, though this study did not examine the therapeutic components of the continuous flow wilderness trek model of WT specifically, the positive outcomes of this study demonstrate that WT is uniquely suited to apply an integrated care approach, which may be due to components of the intervention such as time spent outdoors (Thompson Coon et al., 2011), physical activity (Galper, Trivedi, Barlow, Dunn, & Kampert, 2006; Goodwin, 2003), and positive social interaction (Cohen, 2004), all of which are documented in the literature to have both physical and mental health benefits. Future research on integrated care in WT should examine the relationship between these therapeutic variables and changes in physical and mental health. These therapeutic variables may provide a reason for why there are differences between youth and may help to guide WT to improve programs to maximize potential for consistent changes in both the physical and mental health of youth.

Declaration of Conflicting Interests

The author(s) declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: Steven DeMille is employed by RedCliff Ascent, an outdoor behavioral health care program, where the data were gathered. He was not involved in the data collection or analyzing.

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