



Who Declines and Who Improves in Wilderness Therapy?

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Accepted: 31 October 2023

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Abstract

Background Extensive research into wilderness therapy has not explored who benefits the most and who does not thrive in these programs.

Objective The present study examined demographic, clinical, and familial characteristics that distinguished adolescents who improve most in wilderness therapy programs from those who deteriorate.

Method Using data collected by the National Association of Therapeutic Schools and Programs Practice Research Network, the study sample consisted of 5639 adolescents attending wilderness therapy programs which collected and contributed data to the Practice Research Network between 2017 and 2022. Measures included the Youth Outcome Questionnaire-Self Report and the McMaster Family Assessment Device, as well as demographic, familial, and clinical data collected by program staff.

Results Using binary and univariate logistic regression, the study found individual and familial factors that predicted membership in the top 10% of adolescent participants in terms of mental health improvement from pre-to-post wilderness therapy and those factors which predicted membership in the bottom 10% in terms of poorer mental health from pre-to-post program.

Conclusions Considering the intensity, length, and financial resources associated with wilderness therapy program participation, these findings have important implications for wilderness therapy program staff professional development, communication of expectations to adolescents' parents/caregivers, and program admission decisions.

Keywords Outdoor behavioral healthcare · Wilderness therapy · Adolescent residential treatment · Nature-based treatment · Adolescent · Adolescent treatment outcome

Introduction

Research suggests that wilderness therapy (WT), a type of intensive adolescent treatment, may be an effective adjunct to trauma treatment and for treatment-resistant adolescents (Bettmann et al., 2016; Johnson et al., 2020). WT is defined as “[t]he use of traditional therapy techniques, especially group therapy techniques, in a wilderness setting, when the wilderness is approached with therapeutic intent” (Russell, 2000, p. 170). WT is designed to “reveal and address problem behaviors, foster personal and social responsibility, and

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enhance the emotional growth of clients” (Russell & Phillips-Miller, 2002, p. 415). The WT process uses traditional therapeutic interventions, such as group and individual therapy, delivered in a group setting in a wilderness environment (Bettmann & Tucker, 2011).

However, existing research suggests that some adolescents may respond negatively to wilderness therapy (Currie, 2003; Dobud et al., 2020). Research describing these adolescents is limited (Currie, 2003; Dobud et al., 2020; Izmirian et al., 2019; Mooney & Leighton, 2019). Clear guidelines suggesting for whom WT treatment is likely to be effective do not exist (Currie, 2003; Izmirian et al., 2019; Wisdom & Gogel, 2010). Thus, the present study investigated which adolescents improved the most in WT and those who declined in order to illuminate who is best supported by this intervention and who could use modifications, increased support, or another form of treatment.

Theoretical Foundations of Wilderness Therapy

Adventure therapy, of which wilderness therapy is a subset, is defined as “any intentional, facilitated use of adventure tools and techniques to guide personal change toward desired therapeutic goals” (Alvarez & Stauffer, 2001, p. 87). Adventure therapy is rooted in experiential learning theory (Alvarez et al., 2020; Gass et al., 2020; Newman et al., 2023). Experiential learning is defined as learning through doing (Knecht-Sabres, 2013). The experiential learning process utilizes and relies on “the transcendent reconstruction of meanings from first-hand experiences” (Newman et al., 2023, p. 2). WT provides the experiences, the experiential learning opportunities, and the space for transcendent reconstruction of the experiences within an outdoor therapeutic context (Alvarez et al., 2020; Gass et al., 2020; Newman et al., 2023).

Adolescents in Wilderness Therapy

Adolescents often enter mental health treatment following outside pressure from sources such as family, school, and the legal system, which puts them at higher risk for treatment resistance compared to adults entering mental health treatment (Wisdom & Gogel, 2010). Some research indicates that adolescents who do not consent to treatment or do not have input in the treatment itself may have poor or even traumatizing responses to residential and wilderness therapy (Currie, 2003; Golightley, 2020). Research suggests that poor treatment outcomes sometimes are related to circumstances in which the adolescent was either lied to or not told about the type of treatment they were entering (Currie, 2003; Mooney & Leighton, 2019; Steiker, 2008). Some adolescents report that time alone to reflect during WT was uniquely helpful (Russell, 2000; Tucker et al., 2023). However, some adolescents report that WT was not helpful for them due to the isolation of the treatment setting and distance from home (Currie, 2003; Fernee et al., 2017). Knowledge about which adolescents need this reflective time and which need home support is clearly critical (Currie, 2003; Fernee et al., 2017; Russell, 2000).

The majority of adolescents in WT have mood disorders, externalizing behavior disorders, substance use disorders, and/or anxiety disorders (Hoag et al., 2014). But research has yet to determine whether all adolescents with these disorders are treated effectively in WT. Research should distinguish which adolescents are likely to be treated effectively, which would be unaffected, and which may deteriorate (Mooney & Leighton, 2019). Existing research suggests that some demographic factors such as age, gender, sexual orientation, gender identity, and adoption status may link to WT outcomes. These are discussed below.

Age in Adolescent Wilderness Therapy Outcomes

Research suggests that WT can be an effective intervention for adolescents aged 13 to 17 (Ferneer et al., 2017; Tucker et al., 2016a, b, c), but younger adolescents may be more likely to have poorer outcomes (Ferneer et al., 2017; Tucker et al., 2016a, b, c). Indeed, younger adolescents are more likely to report wilderness therapy as scary (Ferneer et al., 2017). Younger adolescents have different therapeutic needs, require different structures, and may need a higher staff ratio than older students (Huefner & Vollmer, 2014).

Gender in Wilderness Therapy

Gender also appears to influence adolescents' experiences in wilderness therapy. Specifically, male and female adolescents in WT can present differently in terms of mental health issues (Bettmann et al., 2014; Hussey, 2008). The existing research on this topic appears to utilize gender as a binary: male and female categories only. Female adolescents are more likely than male adolescents to present with a history of suicidality and self-harm (Bettmann et al., 2014; Hussey, 2008). Male adolescents are more likely than female adolescents to present to WT with a history of trouble with the law and being arrested (Bettmann et al., 2014; Hussey, 2008). Illicit substance use rates, however, are similar for males and females who present for WT (Bettmann et al., 2014). These differences by gender suggest potentially differential needs of these adolescent populations.

Adolescents Who Identify as Transgender in Mental Health Treatment

The challenges individuals who identify as transgender face in a society that marginalizes them puts these individuals at risk for developing psychosocial and mental health concerns such as depression anxiety, suicidality, body dysmorphia, and self-harm (Lyons et al., 2015; Tucker et al., 2020). Individuals who identify as transgendered experience higher rates of psychosocial stress compared to individuals who identify as cis-gender; these stressors can include family rejection, peer rejection, harassment, trauma, abuse, inadequate housing, legal problems, lack of financial support, and educational problems (Tucker et al., 2020). Adolescents who identify as transgender are also at increased risk for denial of access to medical and mental health treatment and homophobia, which impact mental health (Lyons et al., 2015; Tucker et al., 2020). There is little research investigating the outcomes of adolescents who identify as transgender in WT (Tucker et al., 2020).

Sexual Orientation and Mental Health Treatment

Adolescents who identify as LGBTQ+ experience higher risk for mental health conditions and worse treatment outcomes compared to their heterosexual peers (Lyons et al., 2015; Painter et al., 2018). This is particularly significant in the case of adolescents who identify as LGBTQ+ and have depressive symptoms, suicidality, and substance misuse (Painter et al., 2018). Research appears not to have yet examined the specific outcomes of these adolescents in WT.

Adopted Adolescents in Wilderness Therapy

Adolescents with adoption histories are over-represented in residential and WT settings (Bettmann et al., 2015; Brodzinsky et al., 2016). Adopted adolescents in these settings report higher rates of recent trauma, suicidal tendencies, and biological parents' mental illness than their non-adopted peers (Bettmann et al., 2015; Brodzinsky et al., 2016). Notably, adopted adolescents in these settings, despite having equivalent intelligence scores as their non-adopted peers, report poorer academic achievement (Bettmann et al., 2015). Given these differences from non-adopted peers, adopted adolescents may have specific needs currently unaddressed by existing treatment models.

Family Involvement

Existing research on adolescent treatment links lack of family involvement in treatment with poorer adolescent outcomes (Coll et al., 2018; Israel et al., 2007). This linkage may exist because complex and systemic family issues can go unaddressed in adolescent treatment; for example, responsibility for some issues may be placed on the adolescent in treatment, by the family or by the adolescents themselves (Currie, 2003). Literature suggests that parental involvement in adolescent treatment for anxiety links with stronger short-term and long-term treatment outcomes (Cardy et al., 2020). Additionally, parental involvement in adolescent treatment is associated with greater treatment retention (Coll et al., 2018; Israel et al., 2007), while lack of parental involvement is a risk factor for adverse outcomes (Coll et al., 2018; Israel et al., 2007).

Focus of the Present Study

Previous research on WT supports the effectiveness of this type of intervention and highlights program factors which contribute to positive outcomes (Currie, 2003; Haefel, 2022; Izmirian et al., 2019). But research has not yet explored the specific demographic, clinical, and familial factors associated with benefits from WT and deterioration from it (Currie, 2003; Haefel, 2022; Izmirian et al., 2019). Rarely is a specific therapeutic intervention effective, or indicated, for all people (Mewton et al., 2014). Expanding our understanding of who WT is indicated for and for whom WT is contraindicated is a necessary part of researching this treatment. Given the specific needs of adolescents in terms of their age, gender, sexual orientation, gender identity, and adoption status, research should explore specific WT outcomes for these subpopulations. Advancing knowledge in this area will help to foster optimal treatment and minimize harm (Haefel, 2022; Izmirian et al., 2019). The present study aimed to answer the question: Which demographic, clinical, and familial factors predict the greatest improvement in adolescent WT and which predict deterioration during WT?

The authors hypothesized that adolescents with a higher levels of family involvement and stronger family functioning were more likely to endorse improved mental health from WT compared to adolescents with lower levels of family involvement and poorer family functioning. The second hypothesis was: adolescents with low family involvement and poorer family functioning were more likely to deteriorate while participating in WT. These hypotheses are supported by previous research that shows a strong

correlation between family involvement and positive youth therapeutic outcomes (Coll et al., 2018; Israel et al., 2007).

Methods

Study Design

The present study was a one-group pre-post study of adolescents in wilderness therapy programs.

Participants

Seventeen WT programs were members of the National Association of Therapeutic Schools and Programs Practice Research Network and contributed data to the present dataset. Members of this network administered research and evaluation surveys to adolescent clients and staff within seven days of adolescent admission and again within seven days of discharge. The present study's sample was drawn from 5639 adolescent participants whose 17 different wilderness therapy programs collected and contributed data to the network between 2017 and 2022. Electronically submitted data were housed in a central database managed by Outdoor Behavioral Healthcare Center at the University of New Hampshire, who provided data to the researchers that were anonymized at client and program levels. Because data was anonymized at the program level in the present study, the spectrum and variety of treatment frameworks, therapeutic approaches, varied length of stay, location, and other program elements could not be defined.

A broad description of WT is an intervention during which clients are immersed in wilderness for extended periods and engage in individual and group therapeutic work that focuses on self-reflection, coping mechanisms, interpersonal communication, physical and mental challenges, identity development, and skill development (Bettmann & Tucker, 2011; Bettmann et al., 2017; Hoag et al., 2013; Russell, 2003). Adolescents in the present study stayed an average of 78.15 ($SD=32.45$) days in the WT program. Only adolescents who consented (if 16 or over) or who assented with parental consent to participate in the research were included in the present study. The study was approved by the University of New Hampshire Institutional Review Board prior to any data collection. The present study was also reviewed and approved by the University of Utah Institutional Review Board.

Measures

Youth Outcome Questionnaire-Self Report

The outcome variable of interest was the Youth Outcome Questionnaire Self-Report 2.0 (YOQ-SR; Ridge et al., 2009; Wells et al., 2003). The YOQ-SR is a 64-item Likert-type assessment of overall youth functioning and includes seven subscales: depression and anxiety, somatic problems, interpersonal relations, social problems, behavioral dysfunction, and critical items (such as paranoia and suicidal ideation). For the present study, only the YOQ total score was used as a measure of mental health distress. No YOQ subscales were utilized in the analyses. The YOQ is widely used and has well established reliability (0.96)

and validity (Ridge et al., 2009). The authors were unable to conduct reliability analyses for this study as the data received by the authors included only subscale totals and total scores, not individual item scores. The well-established psychometrics of the tool, however, provided confidence in its reliability (McClendon et al., 2011; Wells et al, 2003, 2007).

Gender Identity

The admission questionnaire to adolescents included: *Which of the following choices best describes your gender identity?* Response options were: *male, female, transgender, gender fluid, I identify as (please specify)____, and I am not sure.*

Sexual Orientation

The admissions questionnaire for adolescents also included: *Which of the following choices best describes your sexual orientation?* Response options were: *heterosexual (straight), homosexual (gay or lesbian), bi-sexual, I identify as (please specify)____, and I am not sure.*

Adolescent Substance Use Frequency

The admissions questionnaire for adolescents included the question: *During the 30 days prior to enrolling in this program, how many times did you use any drugs or alcohol?* Response options were: *daily, a couple of times a week, once a week, a couple of times a month, once a month, less than once a month, and not at all.* The researchers recoded these response options to numbers (0–6), with higher numbers representing higher substance use frequency.

Living Arrangement Prior to Treatment

The admission questionnaire for adolescents included the question: *Prior to coming to this program, where were you living?* Response options were: *living on your own, with a parent or guardian at home, with another relative, another therapeutic program (please specify) ____, an academic boarding school or college, jail, hospital, foster care, and other (please specify) __.*

Adolescent Primary Presenting Issue

On the admission questionnaire for adolescents, program staff were asked: *What, if any, is the client's primary reason for referral?* There were 15 response options spanning mood disorders, behavioural disorders, and developmental disorders.

Adoption

Agency staff at each WT program indicated at admission whether the adolescent was adopted or not. Staff responses were verified by comparing them to parent responses on admission surveys.

Staff Observation of Parent Effort

Agency staff at each WT program completed discharge surveys for each adolescent, which included the following question: *Please rate the parents' personal effort in their therapeutic work at home or on their own.* Response options were: *None, Low, Moderate, High, and Exceptional.*

Family Functioning

The McMaster Family Assessment Device, General Functioning Scale, Youth-report (FAD) is a 12-item Likert-type assessment of one's perception of their family member's acceptance and agreeableness with each other (Ryan et al., 2006). The FAD is widely used and has > 0.70 reliability (Ryan et al., 2006) and good validity (Sperry, 2012). The North American "healthy" family scores range from zero to two, with higher scores indicating greater dysfunction (Ryan et al., 2006). The FAD was administered to adolescent in each WT program at admission and again at discharge. In the present study, the researchers subtracted admission scores from discharge scores for a change variable "ΔFAD" with negative change indicating improvement.

Analyses

Given that the present study's research question focused on predictors for group membership in a sub-sample of the data and specifically in one of two polar groups (Most Improved and Deteriorators), the researchers used a binary logistic regression.

The developers of the YOQ-SR proposed the following to interpret findings for general use: YOQ-SR scores above 47 indicate problematic functioning. However, the developers recommended researchers develop normative and cut-off values for special populations (Wells et al., 1999). Thus, researchers in the present study followed a standard cutoff score formula $c = \frac{(SD_1)(mean_2) + (SD_2)(mean_1)}{SD_1 + SD_2}$, and determined a clinical cutoff score for the present study's sample of 52.24. Of the 5639 adolescents who contributed data, 4905 completed the YOQ-SR at admission and 3864 completed YOQ-SR at both admission and discharge. From these data, the researchers calculated a Reliable Change Index (RCI) score (Jacobson & Truax, 1992) to assess how much change occurred during the course of the WT program:

$$RCI = \frac{YOQ_{ADM} - YOQ_{DIS}}{\sqrt{2(SE^2)}}$$

where YOQ_{ADM} are scores at admission and YOQ_{DIS} are scores at discharge. The standard error was calculated such that:

$$SE = SD_{YOQ_{ADM}} (\sqrt{1 - r_{xx}})$$

where SD is the standard deviation and r_{xx} is the test-retest reliability estimate for the YOQ. Note that the test-retest reliability estimate for the YOQ was set by the researchers to 0.89 (Ridge et al., 2009).

Although *RCI* scores tend to include the subtraction of scores at admission from scores at discharge (i.e., $YOQ_{DIS} - YOQ_{ADM}$), researchers for the present study reversed this direction to more intuitively interpret the *RCI* scores whereby positive *RCI*s indicate better outcomes.

From the dataset, researchers for the present study extracted data for 393 adolescent whose *RCI* was in the 90th–100th percentile (Most Improved) and 395 whose *RCI* was in the 1st to 10th percentile (Deteriorators). Those in the “Most Improved” group had the largest change in the positive direction ($M=5.35$, $SD=1.03$) whereas Deteriorators had the largest change in the negative direction ($M=-2.38$, $SD=1.19$). These 788 adolescents comprised the present study’s final sample. The researchers used a cut-off score of 1.96 to confirm that adolescents in the Most Improved group clinically improved ($RCI > 1.96$) and that the adolescents in the Deteriorator group clinically deteriorated ($RCI < 1.96$).

Researchers for the present study assessed the assumption of linear associations via lack of fit tests for the continuous predictors in the model and by plotting the Pearson residuals against each predictor and the predicted values. The lack of fit tests for age, ΔFAD and drug use were non-significant, suggesting a properly specified model. Likewise, the fitted lowest curves for the Pearson residuals suggested satisfactory linear functional forms.

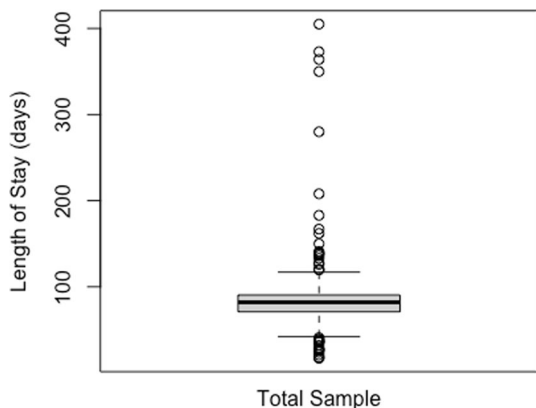
Results

Descriptives

Adolescents stayed in the WT programs for a range of 17–405 days, with an average of 82 days. Considering the presence of outliers (see Fig. 1), the authors chose to utilize the robust 10% trimmed mean ($M=80.73$ days) and its associated standard deviation ($SD=16.14$). Length of stay was a factor the authors considered as a model predictor, but analyses showed it to be non-significant, possibly due to lack of variability.

Adolescents in the Most Improved group were an average age of 15.92 years ($SD=1.34$) and those in the Deteriorator group were an average age of 15.45 years ($SD=1.48$) at admission. Thirty-seven percent ($n=144$) of the Most Improved group were male compared to 62% ($n=246$) of the Deteriorator group. Eight percent ($n=32$) of the Most Improved group and 20% ($n=78$) of the Deteriorator group were adopted.

Fig. 1 Boxplot of length of stay (in days) for the total sample



The majority of adolescents in the Most Improved group (62%, $n=243$) and the majority of adolescents in the Deteriorator group (63%, $n=250$) were white. A significant percentage of adolescents in both the Most Improved Group and the Deteriorator group were affluent, coming from homes with family incomes over \$200,000 per year (Most Improved: 36%, $n=140$; Deteriorator: 44%, $n=172$). Only 18% ($n=69$) of the Most Improved group and 13% ($n=53$) of those in the Deteriorator group came from homes with income less than \$100,000. At intake, staff identified clients' presenting problems, reporting a significant percentage of mood disorders among adolescents in the Most Improved group (31%; $n=120$) and the Deteriorator group (19%; $n=77$), as well as anxiety disorders in the Most Improved group (15%; $n=58$) and the Deteriorator group (14%; $n=54$).

Most adolescents (91.75%; $n=723$) responded to the admissions survey question asking about gender identity. Of these, 37% ($n=144$) of the Most Improved group and 62% ($n=246$) of the Deteriorator group identified as male. Additionally, 42% ($n=164$) of the Most Improved group and 26% ($n=101$) of the Deteriorator group identified as female. Adolescents that identified as neither female nor male (e.g., non-binary) were coded in the present study as "gender diverse." These "gender diverse" adolescents constituted 14% ($n=56$) of the Most Improved group and 3% ($n=13$) of Deteriorator group.

Most adolescents (91%; $n=721$) specified their sexual orientation on the admissions survey. The majority of adolescents in the Most Improved group identified as heterosexual (48%; $n=188$), while 22% ($n=86$) identified as bisexual, 6% ($n=22$) as homosexual (gay or lesbian), and, 5% ($n=21$) as pansexual. Adolescents that were questioning (i.e., "I am not sure") or identified with less common sexual orientation (e.g., asexuality) were grouped in an "other" category (12%; $n=46$). Similarly, most adolescents in the Deteriorator group identified as heterosexual (71%; $n=279$), while 10% ($n=38$) identified as bisexual, 3% ($n=10$) as homosexual (gay or lesbian), 2% ($n=6$) as pansexual, and 6% as "other" (%; $n=25$).

Prior to coming to a WT program, the majority of adolescents in the Most Improved group were living with a parent or guardian (68%, $n=266$), while 10% ($n=39$) resided in another therapeutic program, 8% ($n=33$) resided in a hospital, and 3% ($n=13$) were in an academic boarding school. Other youth-reported living situations were organized into an "other" category (11%; $n=42$). This category included "Runaway/living on your own." Similarly, the majority of adolescents in the Deteriorator group were living with a parent or guardian (73%, $n=290$), while 8% ($n=33$) resided in another therapeutic program, 4% ($n=16$) resided in a hospital, 2% ($n=9$) were in an academic boarding school, and 12% indicated "other" ($n=47$).

In the Most Improved group, adolescent mental health improved from admission to discharge with a mean pre-treatment YOQ-SR Total Score of 115.07 ($SD=25.84$), which then improved to a post-treatment mean of 27.59 ($SD=23.24$). This score decrease represents a significant change ($t=49.89$, $p<0.001$) with large mean difference of 87.48, 95% CI [84.04, 90.92] and Cohen's d of 3.56, 95% CI [3.33, 3.78].

In the Deteriorator group, adolescents reported a mean pre-treatment YOQ-SR Total Score of 45.22 ($SD=30.40$), which then deteriorated to a post-treatment average of 84.22 ($SD=31.36$). This score increase represents a significant change ($t=-17.74$, $p<0.001$) with large mean difference of -38.99 , 95% CI [-43.31 , -34.68] and Cohen's d of -1.26 , 95% CI [-1.41 , -1.11] (Table 1).

Table 1 Mean total scores and associated standard deviation across categorical predictors

		Average raw total scores		
		Pre	Post	
		Deteriorators (<i>n</i> = 395)	Most improved (<i>n</i> = 393)	Deteriorators (<i>n</i> = 395)
				Most improved (<i>n</i> = 393)
YOQ-SR Pre		45.23 (30.40)	115.07 (25.84)	84.22 (31.36)
<i>Adolescent living situation</i>				
With a parent or guardian	(<i>n</i> _{improved} = 266, <i>n</i> _{deteriorated} = 290)	44.94 (30.42)	113.89 (26.34)	83.30 (30.61)
A hospital	(<i>n</i> _{improved} = 33, <i>n</i> _{deteriorated} = 16)	53.62 (28.65)	120.52 (23.31)	86.88 (27.36)
An academic boarding school	(<i>n</i> _{improved} = 13, <i>n</i> _{deteriorated} = 9)	39.67 (37.51)	117.44 (29.41)	81.56 (39.26)
Another Therapeutic Program	(<i>n</i> _{improved} = 39, <i>n</i> _{deteriorated} = 33)	59.52 (27.25)	119.12 (25.52)	95.27 (38.50)
Other	(<i>n</i> _{improved} = 42, <i>n</i> _{deteriorated} = 47)	34.52 (27.25)	113.56 (24.17)	81.66 (29.78)
<i>Gender</i>				
Male	(<i>n</i> _{improved} = 144, <i>n</i> _{deteriorated} = 246)	42.34 (27.71)	107.85 (24.06)	80.87 (30.60)
Female	(<i>n</i> _{improved} = 164, <i>n</i> _{deteriorated} = 101)	55.05 (34.7)	119.42 (26.75)	92.53 (32.16)
Gender Diverse	(<i>n</i> _{improved} = 56, <i>n</i> _{deteriorated} = 13)	60.38 (28.37)	121.75 (24.26)	93.15 (33.93)
<i>Sexual orientation</i>				
Heterosexual	(<i>n</i> _{improved} = 188, <i>n</i> _{deteriorated} = 279)	43.79 (28.02)	110.58 (25.92)	82.68 (30.58)
Bisexual	(<i>n</i> _{improved} = 86, <i>n</i> _{deteriorated} = 38)	62.82 (36.50)	121.69 (24.81)	97.87 (34.48)

Table 1 (continued)

		Average raw total scores			
		Pre		Post	
		Deteriorators (n = 395)	Most improved (n = 393)	Deteriorators (n = 395)	Most improved (n = 393)
Homosexual (n _{improved} = 22, n _{deteriorated} = 10)		54.00 (31.88)	117.50 (21.08)	81.80 (39.26)	34.41 (23.45)
Pansexual (n _{improved} = 21, n _{deteriorated} = 6)		52.67 (27.95)	117.14 (23.57)	79.00 (27.63)	31.48 (16.09)
Other (n _{improved} = 46, n _{deteriorated} = 25)		52.92 (36.09)	120.17 (28.72)	91.88 (32.62)	35.74 (25.02)
<i>Presenting problem</i>					
Mood (n _{improved} = 120, n _{deteriorated} = 77)		46.62 (31.46)	116.28 (27.12)	85.31 (32.00)	29.34 (25.12)
Anxiety (n _{improved} = 58, n _{deteriorated} = 54)		51.72 (35.98)	109.31 (24.71)	87.83 (33.61)	20.45 (18.76)
ADHD (n _{improved} = 18, n _{deteriorated} = 53)		35.72 (28.47)	118.94 (19.79)	72.87 (29.11)	30.94 (22.06)
ASD/OND ^a (n _{improved} = 19, n _{deteriorated} = 31)		42.00 (28.22)	113.68 (18.82)	88.61 (39.46)	24.84 (20.10)
DICCD ^b (n _{improved} = 18, n _{deteriorated} = 32)		43.72 (28.30)	108.39 (22.79)	82.50 (25.37)	26.00 (23.07)
SRAD ^c (n _{improved} = 32, n _{deteriorated} = 43)		44.77 (27.67)	110.34 (24.49)	84.49 (25.29)	23.84 (20.18)
TSRD ^d (n _{improved} = 31, n _{deteriorated} = 30)		48.87 (35.04)	118.10 (25.15)	90.97 (33.76)	27.81 (19.01)
<i>Adoption</i>					
No (n _{improved} = 253, n _{deteriorated} = 248)		47.95 (32.61)	114.55 (25.69)	88.17 (33.79)	26.99 (23.21)

Table 1 (continued)

Average raw total scores				
Pre	Post			
Deteriorators (<i>n</i> = 395)	Most improved (<i>n</i> = 393)			
Yes (<i>n</i> _{improved} = 32, <i>n</i> _{deteriorated} = 78)	40.05 (24.61)	108.59 (27.71)	77.15 (24.81)	22.28 (20.29)
<i>Parental involvement</i>				
Exceptional (<i>n</i> _{improved} = 50, <i>n</i> _{deteriorated} = 17)	46.41 (26.04)	113.16 (24.88)	81.00 (26.43)	26.80 (23.16)
High (<i>n</i> _{improved} = 144, <i>n</i> _{deteriorated} = 158)	43.91 (32.44)	113.63 (24.99)	82.62 (32.77)	26.29 (20.54)
Moderate (<i>n</i> _{improved} = 95, <i>n</i> _{deteriorated} = 135)	43.61 (30.40)	117.57 (30.40)	85.13 (30.05)	28.00 (23.86)
Low (<i>n</i> _{improved} = 20, <i>n</i> _{deteriorated} = 20)	45.00 (24.10)	105.40 (22.26)	78.65 (25.59)	22.25 (21.27)

^aASD/OND autism spectrum disorder and/or other neurodevelopmental disorder

^bDI/CCD disruptive impulse control and conduct disorders

^cSRAD substance related and addictive disorders

^dTSRD trauma and stress related disorders

Table 2 Odds Ratios for all Predictors

Predictors	Most improved (n = 393) OR [95% CI]	Deteriorators (n = 395) OR [95% CI]
<i>Adolescent living situation. Reference category 'At home with parents'</i>		
Reference Category = 'At Home with Parents'		
Hospital	1.18 [0.4, 3.9]	0.85 [0.26, 2.73]
Boarding school	0.90 [0.2, 4.4]	1.11 [0.26, 6.2]
Therapeutic program	1.35 [0.5, 3.4]	0.74 [0.3, 1.9]
Other	0.75 [0.14, 3.7]	1.33 [0.38, 1.05]
Gender. Reference Category 'Male'		
Female	1.33 [0.7, 2.7]	0.75 [0.38, 1.52]
Gender diverse	1.46 [0.4, 5.1]	0.69 [0.2, 2.3]
Sexual orientation. Reference category 'Heterosexual'		
Bisexual	2.06 [0.88, 4.9]	0.49 [0.2, 1.13]
Homosexual	1.96 [0.4, 9.7]	0.51 [0.1, 2.3]
Pansexual	10.36* [1.7, 71.4]	0.10 [0.01, 0.6]
Other	2.55 [0.95, 6.9]	0.39 [0.14, 1.1]
<i>Presenting problem. Reference category 'Mood Disorders including depression, bi-polar, and other mood issues'</i>		
Anxiety	0.79 [0.35, 1.7]	1.27 [0.6, 2.9]
ADHD	0.29 [0.08, 0.9]	3.48 [1.0, 12.4]
ASD/OND ^a	0.34 [0.12, 0.9]	2.95* [1.1, 8.5]
DICCD ^b	0.39 [0.11, 1.3]	2.56 [0.8, 8.9]
SRAD ^c	0.64 [0.25, 1.6]	1.57 [0.62, 4.0]
TSRD ^d	0.35 [0.11, 1.0]	2.90 [1.0, 8.7]
Adoption. Reference category 'No'		
Yes	0.34 [0.15, 0.7]	2.95** [1.4, 6.6]

Table 2 (continued)

Predictors	Most improved (n = 393) OR [95% CI]	Deteriorators (n = 395) OR [95% CI]
Parental involvement. Reference category 'Exceptional'		
High	0.21 [0.07, 0.6]	4.77** [1.7, 14.6]
Moderate	0.20 [0.06, 0.6]	5.04*** [1.7, 15.9]
Low	0.12 [0.02, 0.6]	8.22*** [1.7, 42.2]
Drug use	1.09 [0.96, 1.2]	0.92 [0.8, 1.03]
ΔFAD ^e	0.06 [0.03, 0.1]	15.6*** [8.8, 29.9]
Age ^f	1.0 [0.8, 1.2]	1.0 [0.8, 1.2]

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

^a ASD/OND autism spectrum disorder and/or other neurodevelopmental disorder

^b *DI*CCD disruptive impulse control and conduct disorders

^c SRAD substance related and addictive disorders

^d TSRD trauma and stress related disorders

^e FAD family assessment device (change scores)

^f Age was mean-centered

Multivariate Logistic Regression

Logistic regression effects are reported for each predictor variable in Table 2. For each variable response option, the results are noted in the context of a reference category. Interpretations are made by comparing each response option to the reference category. The study outcome was binary, specifically whether each adolescent was in the 90th–100th percentile indicating Most Improved or the 1st to 10th percentile indicating Deteriorator. Therefore, interpretations are understood by dichotomous prediction of membership in the Deteriorators group or Most Improved group.

The researchers observed a significant overall effect of adoption, parental effort, presenting issue, and Δ FAD. The effect of adoption was significant ($\chi^2 = 7.2, p = 0.0071$). Holding all predictors constant, adopted adolescents were 2.95 times more likely to be in the Deteriorators group (rather than the Most Improved group) compared to non-adopted adolescents.

Parental involvement also predicted membership in the Deteriorators group ($\chi^2 = 9.6, p = 0.022$). Compared to adolescents whose parents' efforts were rated as exceptional, adolescents whose parents' effort was anything other than exceptional were 4.8–8.2 times more likely to be in the Deteriorators group (rather than the Most Improved group).

Adolescents whose primary reason for program referral was Autism Spectrum Disorder (ASD) and/or other neurodevelopmental disorder were 2.95 times more likely to be in the Deteriorators group than adolescents whose primary reason for referral was a Mood Disorder.

Another significant predictor of deterioration was the Δ FAD. Deterioration in family functioning strongly predicted deterioration in adolescent mental health during the WT program. Specifically, for every one unit increase in Δ FAD, the odds of being in the Deteriorators group increased by a factor of 15.6.

Among adolescents who most improved during the WT program, those whose parents' personal effort was rated *exceptional* by staff were 8.22 times more likely to be in the Most Improved group compared to adolescents whose parents' personal effort was rated low by staff. One other factor predicted membership in the Most Improved group: identification as pansexual. Adolescents who identified as pansexual were 10.36 times more likely to be in the Most Improved group compared to adolescents that identified as heterosexual.

Discussion

The present study aimed to determine which adolescent demographic, clinical, and familial characteristics predicted the largest improvement during WT and which predicted deterioration. Factors predicting membership in the Most Improved group were gender and sexual orientation. Factors predicting membership in the Deteriorator group were adoption, family functioning, parent engagement, and diagnosis of ASD or other neurodevelopmental disorder (OND). Female adolescents who identified as gender diverse and sexual minority adolescents (adolescents who identified as bisexual, pansexual, homosexual, or other) were also more likely to be in the Most Improved group. Each of these specific findings will be discussed below.

Predictors of Membership in Most Improved Group

Gender

Existing research, as well as the present study, found that female adolescents enter WT with higher levels of mental health distress compared to male adolescents (Combs et al., 2016a; Russell, 2003). Additionally, the present study, congruent with some previous studies of WT outcomes, found that female adolescents reported greater improvement during WT compared to male adolescents (). Some studies reported varied findings in terms of gender differences in mental health outcomes of WT: one study found that females had higher YOQ-SR scores at discharge compared to males (Russell, 2003) while other studies found that female adolescents had lower YOQ-SR scores at discharge compared to males (Combs et al., 2016a; Tucker et al., 2014). In the present study, female adolescents reported greater change in YOQ-SR than male adolescents, but female adolescents still finished WT with higher mental health distress than males. Congruent with present study, existing research suggests that female adolescents globally suffer from greater mental health distress compared to males (Campbell et al., 2021).

Studies examining mental health treatment outcomes for adolescents often examine gender differences based solely on male and female gender identities (Combs et al., 2016a, b; DeMille et al., 2018; Tucker et al., 2014, 2018). The current study is unique in that it examined outcomes related to a wider spectrum of gender identities, including a third category of gender-diverse. Notably, gender diverse adolescents in the present study were more likely to be in the Most Improved group compared to their cis-gender peers. These gender-diverse adolescents made significant progress during treatment. However, they were more likely to have greater mental health distress at intake and discharge than males in either in the Most Improved or Deteriorator groups. Research on gender diverse adolescents indicates that gender diverse adolescents often experience stress related to their gender identity and experiences as minorities (Johns et al., 2019). Therefore, identity stress may contribute to the greater mental health distress at intake among gender diverse adolescents in this study. Although gender diverse adolescents exhibited greater change scores from intake to discharge, gender diverse adolescents still exhibited higher YOQ scores at discharge than male or female-identified adolescents in either in the Most Improved or Deteriorator groups.

Identifying as a Sexual Minority

In the present study, adolescents who did not identify as heterosexual were more likely to enter treatment with higher YOQ-SR Total scores than those who identified as heterosexual in either in the Most Improved or Deteriorator groups. Those who identified as pansexual were 10.36 times more likely to be in the Most Improved group compared to adolescents that identified as heterosexual in either in the Most Improved or Deteriorator groups. However, only 27 adolescents identified as pansexual compared to 467 adolescents in the sample that identified as heterosexual in either in the Most Improved or Deteriorator groups. Thus, this specific finding should be interpreted with caution. Existing research suggests that non-heterosexual adolescents are more likely to experience identity-based stress which may lead to higher rates of mental health distress compared to heterosexual adolescents; this identity-based stress may help explain why gender-diverse adolescents in the present

study entered treatment with higher Y-OQ scores than heterosexual adolescents (Burton et al., 2013; Katz-Wise et al., 2015; Kreski et al., 2022; Marshal et al., 2013).

Predictors of Membership in the Deteriorator Group

Autism Spectrum Disorder and Neurodevelopmental Disorders

Compared to adolescents whose primary reason for admission was a mood disorder, adolescents whose primary reason for WT admission was ASD and/or OND were 2.95 times more likely to be in the Deteriorator group than the Most Improved group. This is an important finding because existing research appears not to have examined the impact of WT or residential treatment on adolescents with ASD and/or OND. Existing research on community-based mental health interventions for adolescents with ASD suggests these interventions are more effective when modified to meet the specific needs of adolescents with ASD (Gabriels et al., 2012; Storch et al., 2022; Wood et al., 2015, 2020). One study argues that adventure therapy in the form of a peer-mediated school-based program is a customizable therapeutic approach which provides regular opportunities for spontaneous social interactions for adolescents with ASD, suggesting the model increases socialization as well as opportunities for independence (Karoff et al., 2017).

Due to their diagnoses, adolescents with ASD often face difficulties with interpersonal interactions, executive functioning, perspective taking, and flexibility. Thus adolescents diagnosed with ASD may struggle to integrate into a WT group; individual interventions may be more useful for some adolescents with ASD (Castellanos et al., 2020). WT's reliance on the therapeutic group milieu, as well as more formal group therapy sessions (Combs et al., 2016b), may be challenging for adolescents with ASD because of interpersonal deficits. Additionally, adolescents with ASD have deficits in information integration, executive functioning, and processing speed which may warrant the use of more structured therapeutic interventions, rather than the less-structured interventions often prevalent in WT (Castellanos et al., 2020).

WT often utilizes metaphor as a therapeutic tool (Combs et al., 2016b; Tucker et al., 2014). Understanding metaphor can be challenging for individuals with ASD (Isenberg et al., 2019; Pastor-Cerezuela et al., 2020). If wilderness therapy programs are not attending to the specific needs of adolescents with ASD and/or OND, this may help explain this study's findings that adolescents with ASD and/or OND are more likely to deteriorate during WT programs.

Adoption

A large percentage of adolescents in the present study were adopted: 14% in the present study in comparison to the approximately 2% of the population of children under 18 in the U.S. who are adopted (Kreider & Lofquist, 2014). Other studies have also indicated a disproportionate percentage of adopted adolescents in residential treatment and WT (Bettmann et al., 2012; Brodzinsky et al., 2016). Adopted adolescents were 2.95 times more likely to be in the Deteriorators group compared to adolescents who were not adopted. These findings from the present study are congruent with Combs et al. (2016b) which found that adopted adolescents in WT were more likely to deteriorate post-treatment compared to non-adopted adolescents. While the clinical presentations of adopted and non-adopted adolescents may be similar (Bettmann et al., 2015), the identity needs and familial

dynamics of adopted adolescents may be different. Clinicians may need to approach treatment of adopted and non-adopted adolescents differently to meet the specific needs and underlying dynamics of adopted adolescents and their families.

Additionally, WT provides out-of-home care for adolescents for a prolonged period of time (Bettmann et al., 2015). The prolonged period spent away from the family may impact adopted adolescents differently than non-adopted adolescents. It is possible that out-of-home treatment may exacerbate some adopted adolescents' attachment issues and rejection fears (Bettmann et al., 2015). If WT programs are not addressing issues specific to adopted adolescents such as potential attachment trauma or familial substance use or mental illness, this may explain this study's findings that adopted adolescents are more likely to deteriorate during WT compared to their non-adopted peers.

Parental Involvement and Family Functioning

In the present study, adolescents whose parents' effort was other than "exceptional" were 4.8–8.2 times more likely to be in the Deteriorators group rather than the Most Improved group. Adolescents whose parents' personal effort were rated as "low" were 8.22 times more likely to be in the Deteriorators group compared to adolescents whose parents' personal effort was rated as exceptional. These two findings highlight the importance of family involvement in the therapeutic process during WT.

Existing research supports these findings from the present study. Specifically, a qualitative study of WT showed that parents who were able to learn new communication and conflict resolution skills were able to utilize these skills when their child returned home and thus were able to maintain positive gains in family functioning (Harper & Russell, 2008). Another study found that YOQ-SR score improvements for adolescents enrolled in WT corresponded with improvements in family functioning (Tucker et al., 2016a, b, c). Similarly, Tucker and et al., (2016a, b, c) found that parent-reported adolescent health improvements corresponded with parent-reports in family functioning. Studies examining adolescent residential treatment outcomes have also found a relationship between adolescent symptom improvement and family functioning. For example, Sunseri (2004) found that children and adolescents whose families had high levels of functioning had higher rates of program completion, were more likely discharge to less restrictive environments, reported increased global functioning by the end of treatment, and reported greater decreases in maladaptive behavior compared to children whose families had intermediate or low functioning (Sunseri, 2020). The same study found that interventions which increased family functioning during residential treatment for adolescents linked to higher rates of successful discharge from treatment (Sunseri, 2020).

Implications for Treatment

Findings from the present study have important implications for healthcare providers, as well as WT administrators, clinicians, and field guides. Knowledge about demographic, clinical, and familial factors that predict optimal improvement in WT and those that predict deterioration should be useful for healthcare providers so they can make appropriate referrals for WT for adolescents who are likely to benefit most from it. Additionally, WT admissions personnel can use this information to communicate expectations to caregivers and other stakeholders regarding specific adolescent's admission to WT. These actions may

improve healthcare outcomes for adolescent populations and foster greater treatment efficacy (Haeffel, 2022; Izmirian et al., 2019).

The findings specific to gender diverse and sexual minority adolescents indicate that, although gender diverse and sexual minority adolescents appear to make significant mental health progress during treatment, this subsample of adolescents in WT still leave treatment with poorer YOQ-SR Total scores compared to other adolescents. WT clinicians should have an understanding of the unique challenges which these adolescents face, which include identity-based stressors such as transphobia and heterosexism. Incorporating training for WT staff to increase competency working with gender diverse and sexual minority adolescents may improve WT programs' abilities provide appropriate support to these adolescents. Additionally, allowing clients who identify as transgender specifically to decide whether they are placed into a girls' or boys' group appears likely to positively impact WT (Tucker et al., 2020).

Findings from the present study regarding adolescents with ASD or OND suggest that these adolescents have unique needs which may not be properly addressed in current WT programming. Previous research on inpatient psychiatric treatment suggests that when treatment is modified for adolescents with ASD and OND, the interventions are more effective (Cervantes et al., 2019; Donnelly et al., 2021; Melvin et al., 2022; Storch et al., 2022; Wood et al., 2015, 2020). Specific WT program modifications should include social skills coaching for adolescents with ASD and OND, increased program structure, more consistent staffing patterns, improved and direct communication with students, and better staff training on working with adolescents with ASD or OND (Isenberg et al., 2019). The authors propose that WT programs should endeavor to engage in professional development if they are going to admit neurodiverse adolescents or should clarify treatment expectations for all stakeholders and consider adjusting admissions criteria.

The present study also highlights important implications for working with adopted adolescents in WT. Adopted adolescents may present similarly to non-adopted adolescents (Bettmann et al., 2015), but vital issues need to be addressed when treating adopted adolescents. Murray and Sullivan (2017) specify needs specific to adopted adolescents and their caregivers, including potential trauma exposure, the parent-child attachment relationship, parental functioning, and adoption-specific adjustment. Bettmann et al. (2015) highlights the importance of comprehensive assessment for adopted adolescents to inform clinicians about underlying issues, driving more attuned treatment plans. Training for clinicians, such as the Training for Adoption Competency, an advanced training program for clinicians working with adoptive families and adopted adolescents, appears to be an effective training program for clinicians (Atkinson & Riley, 2017). WT programs should consider the use of this training as a means to increase clinical competency in working with adopted adolescents and their families.

Limitations

There are a number of limitations which contextualize the results of this study. The present study examined data from adolescents in seventeen different WT programs, but many more of these programs exist. Findings from the present study should not be interpreted to apply to all WT programs. Additionally, there is significant variance in the WT models and interventions delivered in each program. Future research should examine the specific contributions of each WT program model to outcomes.

Notably, the present study examined only 20% of wilderness therapy participants for whom there was pre and post data in the database. Thus, findings from the present study only apply to this subsample group of youth and cannot be generalized to the large group of youth who attend WT.

Additionally, the present study did not examine the racial or ethnic identity of participants due to the significant missing data in these variables in the database used. Future research should examine the racial and ethnic identities of WT participants in order to determine for which racial and ethnic populations this treatment is most and least effective. Further, the present study did not consider whether or not the adolescent participants had been transported to treatment, a potentially important variable.

In the present study, there was significant attrition of 18.5% from pre to post test. Thus, how youth functioned after they left the WT program is unclear. While the long-term outcomes of WT are beyond the scope of the present study, future research should explore differences between those completing the study and those who did not in terms of the variables measured here.

While the present study divided the youth into two groups (top and bottom 10% of change), it is important to note the large variations within those groups. Specifically, there were large standard deviations in the mean changes for each group. Thus, it is unclear how similar these top 10% and bottom 10% of youth are, a limitation which could impact the interpretation of findings.

Finally, the present study utilized only the YOQ-SR, a youth self-report measure. The present study did not triangulate data from parent-completed YOQs about their children's mental health symptoms. Thus, the findings from the present study are limited by their focus on adolescents' perspective on their own mental health. This is a significant limitation as many adolescents begin WT programs in significant mental health distress.

Future Research

In addition to implications for WT clinicians, field guides, and administrators, the present study suggest important areas for future research. Future research should explore relationships between post-treatment health and subsequent health trajectories as they relate to gender and gender identity. Research also should explore predictors of thriving or declining within female adolescents who attend WT. Indeed, future research should explore longitudinal outcomes for most populations of adolescents in WT as existing research in this area is limited (Thomson et al., 2011).

The present study's findings that adopted adolescents and adolescents whose primary reason for enrolment was ASD or OND were more likely to deteriorate during treatment (compared to their peers in the Most Improved group) have implications for future research. Future research should explore how adoption, attachment issues, family history of substance abuse or mental illness, and trauma experience may interplay and impact adolescents' WT outcomes. Further, future research should explore how neurodiverse-attuned programming impacts adolescent WT outcomes. This type of research has the potential to optimize healthcare for specific sub-populations of adolescents participating in WT.

The present study informs providers regarding adolescents who benefit from WT and adolescents who deteriorate while in WT, but does not identify reasons for these findings. Future research should explore factors that underpin adolescent improvement or deterioration in WT. Qualitative research could provide rich information regarding the experiences of adolescents in WT, while longitudinal quantitative research could expand upon

the findings of the current study and shed light on the longer-term trajectories of adolescent health following WT.

Conclusion

The present study examined demographic, clinical, and familial characteristics associated with adolescent WT outcomes. The present study is the first to examine which demographic, clinical, and familial factors predicted membership in the extreme poles of outcomes—those who improved the most and those who deteriorated. Thus, the findings from the present study provide important information for healthcare providers making referrals, WT programs, and adolescent caregivers about which adolescents are likely to benefit most or least from WT.

Acknowledgements The researchers thank program clients and their caregivers for completing these surveys during challenging time. The researchers also thank the staff who found the time during demanding job duties to complete assessments.

Funding This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. The fourth author received a research assistantship from the Outdoor Behavioral Healthcare Center. The fifth author works for Pine River Institute, a non-profit live-in care program for youths in Canada that has a wilderness therapy component. Pine River Institute did not contribute data to this dataset.

Availability of Data and Materials The data utilized in this study may be available via reasonable request to the Outdoor Behavioral Healthcare Center which owns and manages it.

Declarations

Conflict of Interest The authors declare that none of them have conflicts of interest.

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