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Adolescent Self-Assessment of an Outdoor Behavioral Health Program: Longitudinal Outcomes and Trajectories of Change

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Abstract Outdoor behavioral healthcare is an increasingly popular treatment modality for adolescents, and evidence suggests that it is effective for a wide range of complex issues. The outdoor behavioral healthcare literature still faces major limitations though, and one of these limitations is that outcomes are primarily measured at only admit and discharge. This study sought to explore the trajectory of change throughout treatment, and investigate outcomes up to 18 months post-discharge. Of the 659 adolescent participants from four outdoor behavioral healthcare programs, 29 % were female, 18 % were adopted, and the average age was 16 years old. Participants were invited to complete questionnaires four times during treatment, and at 6 and 18 months post-discharge. We used multilevel modeling to explore trajectories and predictors of change during treatment, and a regression and an ANOVA to examine outcomes post-discharge. Results of the multilevel modeling supported that adolescents make significant changes during outdoor behavioral healthcare, and also contributed new findings on demographic and diagnostic predictors. Gender and the presence of a mood or anxiety disorder predicted greater rates of change during treatment. Analysis of post-discharge data at six and 18 months post-discharge suggested that clients maintain treatment effects and that gender persists in influencing outcomes. This study is the first to examine trajectories of change in outdoor behavioral healthcare, to find diagnostic variables to be relevant, and to examine self-report outcomes past 12 months post-discharge.

Keywords Outdoor behavioral healthcare · Adolescents · Outcomes · Wilderness therapy · Youth outcome questionnaire

Introduction

Outdoor behavioral healthcare (OBH) is a relatively new and unique treatment modality that has grown over the last thirty years (Russell et al. 2008). OBH, often referred to as wilderness or adventure therapy, has primarily served adolescents who struggle with emotional and behavioral disorders and substance-related issues, and who have exhausted other forms of traditional treatment (Gass et al. 2012; Hoag et al. 2014; Norton et al. 2014; Tucker et al. 2014). OBH combines the healing value of nature with therapeutic programming (Maller et al. 2006; Russell, 2001). It has come to be defined as the prescriptive use of wilderness experiences provided by mental health professionals to meet the therapeutic needs of clients, and uses therapeutic methods typical in residential treatment settings, with immersion in the wilderness, group living with peers, individual and group therapy sessions, and educational and therapeutic curriculum (Norton et al. 2014; Gass et al. 2012; Tucker et al. 2014). This approach safely removes the client

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from unhealthy systems, peer groups, or destructive behaviors, and places them in a new and generally unfamiliar environment. Living in the wilderness and learning expedition living and survival skills builds self-efficacy and promotes personal responsibility. The use of metaphor, and a strong ethic of care and support throughout the therapeutic experience are also defining characteristics of OBH treatment (Gass et al. 2012; Tucker et al. 2014).

While growing in prevalence, OBH has also increased in clinical sophistication and built an evidence base demonstrating that it is effective for a wide range of presenting problems and complex issues in adolescents. Numerous outcome studies demonstrate that clients enter OBH programs with high clinical dysfunction, make dramatic improvements in emotional and behavioral functioning while in OBH treatment, and maintain improvements up to 6 and 12 months post-OBH treatment (Behrens et al. 2010; Bettmann et al. 2013; Combs et al. 2015; Lewis 2013; Magle-Haberek et al. 2012; Norton et al. 2014; Russell, 2003, 2005; Tucker et al. 2014). The most thorough meta-analysis to date on adventure therapy concluded: "adventure therapy programs are moderately effective in facilitating positive short-term change in psychological, behavioral, emotional, and interpersonal domains and that these changes appear to be maintained in the longer-term" (Bowen and Neill 2013, p. 41). Several studies have also looked at how client characteristics impact self-reported change in OBH programs. Magle-Haberek et al. (2012) analyzed change scores from intake to discharge of 229 clients in OBH programs. They found that gender and more dysfunctional intake scores predicted greater reported change during treatment. Tucker et al. (2014) examined data from 896 adolescents in OBH programs to see how pre-treatment youth characteristics impacted outcomes at discharge. This study found that gender was the only significant predictor of change (Tucker et al. 2014).

While OBH has made great gains in building an evidence base and understanding client characteristics, several important limitations exist. First, the vast majority of the OBH literature reports on findings from adolescent self-reports at intake and discharge. Given that most studies measured change only between admit and discharge, we do not have a clear picture of the trajectory of change—how and when change occurs, and what the factors influence it. Additionally, research has faced problems of inconsistent data collection of demographic and diagnostic variables and attrition after clients leave programs (Tucker et al. 2011). Given these issues, few studies have been able to use sophisticated methods of analysis, which has limited the ability to investigate client predictors of change and longitudinal treatment effects (Bettmann et al. 2013; Lewis 2013; Russell and Sibthorn 2004; Tucker et al. 2011, 2014).

This study sought to contribute to the literature by exploring the trajectory of change during treatment, investigating predictors of change during OBH treatment, and assessing outcomes up to 18-months post OBH treatment. Four in-treatment data points, data up to 18-months post-discharge, and a rigorous method of analysis (multilevel modeling) allow this study to make new contributions to the literature. Our first hypothesis was that adolescent self-report data would be consistent with previous research: clients would arrive in treatment with clinically significant levels of behavioral and emotional dysfunction, and be within the clinically normal range of functioning upon successful discharge from the OBH program. Our second hypothesis was exploratory in nature as studies examining predictors of change have been limited. We hypothesized that there would be a relationship between client demographics and presenting problems and (i) initial status (YOQ 2.0 SR score at intake; and (ii) rate of change in YOQ 2.0 SR scores during treatment. The third hypothesis was that adolescent self-report post-discharge would support the existing literature, and affirm that on average clients maintain healthy functioning post-discharge. Our fourth exploratory hypothesis was that client diagnostic and demographic characteristics would be predictors of YOQ 2.0 SR scores at six months post-discharge.

Method

Participants

This study included 659 adolescents who enrolled in one of four wilderness programs between June 2011 and June 2012. The wilderness programs were located in southern Utah, northern Utah, Oregon, and north Georgia and were connected by ownership and management. Of the 792 adolescent clients who entered the four programs, 88 refused to participate and 45 were excluded due to leaving the program before completing five weeks. This left 659 adolescents in the evaluation (83 % participation rate).

Demographic information on adoption, parent marital status, gender and age was pulled from the client's application to the program. Thirty-two percent of adolescents in the sample were female, 18 % were adopted, and 65 % had parents who lived together. The average age was 16.3 years and the average length of stay in the program was 10.4 weeks. Data on ethnicity or socio-economic status was not collected in this study; however, participants in OBH programs tend to be Caucasian and from higher income families (Russell et al. 2008). A past review of clients at the program located in southern Utah indicated that 85 % of clients were identified as white or Caucasian (Hoag et al. 2011).

Diagnostic data was collected from discharge summaries completed by the therapist upon discharge. The first four diagnoses listed on the discharge summary for each client were recorded. Category titles follow DSM diagnostic categories, including mood disorders, substance-use disorders, anxiety disorders, behavioral disorders, attachment disorders, pervasive developmental disorders, and learning disorders. The four most common diagnoses were behavior diagnoses (69 %), mood disorders (68 %), substance-related issues (64 %), and anxiety disorders (54). Four percent of the sample had attachment disorders, 4 % learning disorders, and 3 % pervasive developmental disorders. It is important to note that most clients had more than one diagnosis.

Procedures

This study utilized data from the OBH programs' internal efforts to monitor client progress and assess treatment outcomes. The program obtained informed consent from each participating parent, and explained that there was no obligation to participate. Consenting parents signed a release stating that their child could be a part of this internal project and also giving permission for the program to use theirs and their child's data for professional or research purposes, given that it was de-identified.

Outcome Tools (an online data storage program) was used to collect and store data. During OBH treatment, data was collected from adolescent clients at intake, at weeks 3 and 5 of treatment, and at discharge. Adolescent participants completed measures on paper, and their answers were entered into the online database by office staff. All post-discharge data was collected electronically through emailed links that allowed participants to submit questionnaires online. All participants were invited to participate in the six-month follow-up. Given the extensive efforts to follow-up with clients, 200 clients were randomly selected for the 18-month follow-up. Participants were not offered an incentive for participation. The post-discharge response rates were 55 % at 6 months and 31 % (of the random sample of 200) at 18 months.

These OBH programs used an open-group, traditional wilderness therapy model. Characteristics of this model include that the group engages in a nomadic or expedition hiking plan; as well as an experiential approach utilizing skills such as bow drill fire making, cooking over an open flame, and building shelters in the forest or high desert. The 'wilderness' sites for these programs were undeveloped areas of land typically administered by the Bureau of Land Management or the U.S. Forest Service (USFS). Clients remained in the wilderness for the entirety of their stay with the wilderness being used as a critical therapeutic tool. Treatment elements include aspects of cognitive behavioral

therapy, choice therapy, family systems, mindfulness techniques, and a focus on diet and physical exercise. Therapists were doctoral or masters level clinicians and were in the field with clients two days per week conducting individual therapy sessions and group therapy sessions. Clients were supervised on a daily basis by staff that underwent extensive training on backcountry living skills, wilderness first aid, de-escalation and various therapeutic techniques. General treatment goals include crisis management, individualized treatment process, assessment in a natural substance-free environment, developing coping skills, self-esteem through task accomplishment, family systems work, and socialization.

Measures

We used the Youth Outcome Questionnaire® Self-Report (Y-OQ-SR) to assess treatment progress and outcome. The Y-OQ-SR is a self reported instrument designed to measure the psychological and behavioral symptoms as well as social functioning of adolescents. It has 64 items that make up six subscale categories: Interpersonal distress, somatic symptoms, interpersonal relations, critical items, social problems, and behavioral dysfunction (Wells et al. 2003). The measure is easily administered and has an internal consistency estimate of .96 (Wells et al. 1996).

The Y-OQ-SR has a reliable change index (RCI) and a clinical cutoff score. The reliable change index (Jacobson and Truax 1991) identifies whether the magnitude of change is clinically significant, as statistical significance does not always equate to clinical significance. The YOQ®-SR defines scores below 47 to be in the community range of functioning, and a change of 18 points to be reliable change. When cutoff scores are reached, a client may be labeled "recovered" (Wells et al. 2003).

Data Analyses

A multi-level model (MLM) was created to answer our first two research questions: to assess differences in initial status (YOQ-SR score at admission) and rate of change (ROC) in Y-OQ-SR scores during treatment and to explore predictors of initial status and ROC. MLMs are ideal for examining longitudinal data, and also allow for variations in data collection across the sample. It is acceptable for some of the sample to be missing data at some time points, and for subjects to have varying data collection schedules (due to varying discharge dates). In order for this approach to be applied, there must be variation in the outcome variable across all data collection points and variation in ROC across individuals. To assess variation in ROC, empirical growth trajectories were estimated for all 659 clients in the main sample by fitting OLS regression lines to their Y-OQ-SR

scores starting at intake (0 weeks), three weeks into treatment, five weeks into treatment, and discharge (in weeks) and ten randomly selected cases were tested to asses variation in initial YOQ score and rate of change in YOQ score through treatment. A hierarchy of multilevel models was created to estimate the effects of all independent variables on growth trajectories in YOQ total scores during treatment.

Data matched through post-discharge assessment points was insufficient to estimate a reliable MLM for maintenance of treatment effects. Therefore, to evaluate hypothesis three, a one way repeated measures ANOVA was conducted to compare mean YOQ 2.0 SR scores at discharge, six months post-discharge, and 18 months post-discharge. To address hypothesis four, an OLS regression model was conducted to predict YOQ 2.0 SR scores at six month post-discharge, controlling for demographic and diagnostic characteristics ($n = 337$). Independent sample t tests were conducted to examine differences at intake between responders and non-responders at the six-month follow-up. Those who responded at the six-month follow-up scored 5.7 points higher on Y-OQ-SR score at intake ($p = .039$). While this was statistically significant, the difference between six-month post-discharge responders and non-responders at intake was not clinically significant, as it did not meet the reliable change index of 18 points.

Results

Descriptive statistics of the sample are displayed in Table 1. On average, clients self-reported significant levels of emotional and behavioral dysfunction at intake (M YOQ 2.0SR $= 64.83$, SD $= 34.15$), made clinically significant improvements throughout treatment, and discharged at the normal range of functioning intake (M YOQ 2.0SR $= 28.33$, SD $= 30.11$). At the six (M YOQ 2.0SR $= 34.26$, SD $= 27.65$) and 18-month (M YOQ 2.0SR $= 33.75$, SD $= 26.75$) follow-ups, clients on average continued to report a normal range of functioning.

A series of MLMs for change in Y-OQ-SR scores were fitted with an increasing number of predictor variables in

Table 1 Main sample client Y-OQ-SR score descriptive statistics

	n	Mean	SD	Min	Max
Y-OQ-SR intake	619	64.83	34.15	−16	183
Y-OQ-SR 3 week	602	50.76	34.15	−16	240
Y-OQ-SR 5 Week	585	38.71	32.92	−16	193
Y-OQ-SR discharge	534	28.33	30.11	−16	165
Y-OQ-SR total change	509	−36.82	35.03	86	143
Y-OQ-SR 6 m post	365	34.26	27.65	−16	136
Y-OQ-SR 18 m post	61	33.75	26.75	−9	111

order to establish a model of best fit (see Table 2). Hypothesis one was upheld as on average, clients entered treatment with clinically significant levels of emotional and behavioral dysfunction as measured by the YOQ SR, and were within the normal range of functioning at discharge. A final model was created to evaluate the effects of the following variables on Y-OQ-SR change from intake to discharge (see Fig. 1): diagnosis, adoption, aftercare, parents living together, age, adoption status, and gender. Controlling for all other variables in the model, presenting issue of a mood ($\gamma_{04} = 11.68$, SE $= 2.79$, $p < .001$), substance use ($\gamma_{05} = 6.52$, SE $= 0.28$, $p < .05$), anxiety ($\gamma_{06} = 7.56$, SE $= 2.72$, $p < .01$), or behavioral ($\gamma_{50} = 5.45$, SE $= 2.60$, $p < .05$) disorder, age ($\gamma_{02} = -2.16$, SE $= 1.05$, $p < .05$), gender ($\gamma_{01} = 5.62$, SE $= 2.84$, $p < .05$), and parents marital status ($\gamma_{03} = 6.28$, SE $= 2.84$, $p < .01$) were significant predictors of intake Y-OQ-SR scores (Table 2). At intake, adolescents who were female, younger, and whose parents were living together assessed themselves as more dysfunctional than their counterparts. Those with a substance-use, behavioral, anxiety, or mood disorder also assessed themselves as more dysfunctional. Mood disorders were the single greatest predictor of initial status.

The final model also showed that gender, mood disorders, and anxiety disorders predicted ROC during treatment (Table 2). Controlling for all other variables, being female ($\gamma_{20} = -0.87$, SE $= 0.31$, $p < .01$), having an anxiety ($\gamma_{50} = -0.57$, SE $= 0.28$, $p < .05$) or a mood disorder ($\gamma_{40} = -0.85$, SE $= 0.30$, $p < .01$) predicted a greater rate of change. The final model accounted for 7.6 % of the variance in estimated initial status ($\sigma_0^2 = 800.87$, SE $= 59.5$, $p < .001$) and 11.0 % of the variation in the ROC ($\sigma_1^2 = 4.31$, SE $= .74$, $p < .001$) compared to the unconditional growth model ($\sigma_0^2 = 866.24$, SE $= 62.13$, $p < .001$, $\sigma_1^2 = 4.84$, SE $= .76$, $p < .001$).

Figure one illustrates estimated growth trajectories of client of average age ($M = 16.3$ years) male and female clients presenting with substance abuse, anxiety, and behavioral disorders with and without mood disorders. It is noteworthy that while average female clients entered treatment with greater symptom severity than males, they improved faster, and ended up with lower symptom severity than their male counterparts before the end of an average length of stay. It is also of interest that presenting problems had a significant impact on symptom severity at intake and rate of change in YOQ score during treatment. For example, both male and female clients presenting with a mood disorder entered treatment with greater symptom severity than those who did not (see Table 2). While the symptoms of average clients presenting with a mood disorder took approximately two weeks longer to improve to the healthy range, the increased rate of change in YOQ 2.0 SR score associated with a mood disorder resulted in these clients
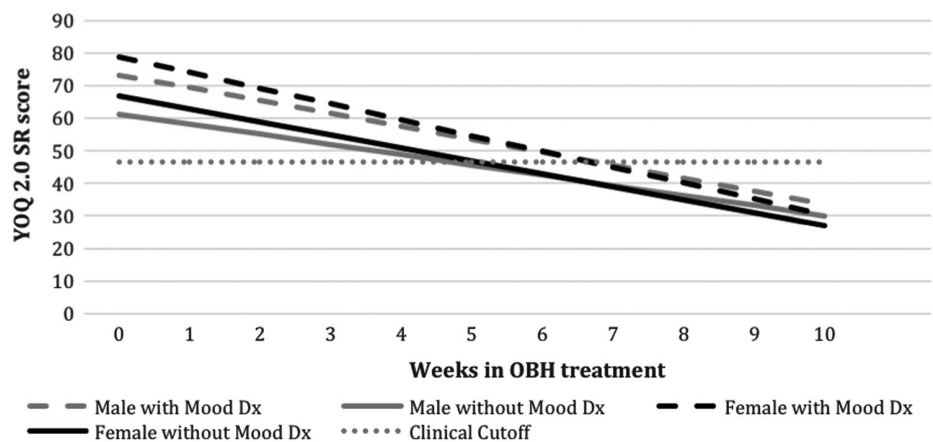
Table 2 Unconditional and final model for change in Y-OQ 2.0-SR from intake to discharge (n = 659)

	Parameter	Unconditional growth model (SE)	Final model (SE)
Fixed effects			
Initial status			
Intercept	γ_{00}	62.02*** (1.30)	35.8*** (4.71)
Female	γ_{01}		5.62* (2.84)
Age	γ_{02}		−2.16* (1.05)
ParMar	γ_{03}		6.28** (2.35)
Mood	γ_{04}		11.86***(2.79)
Substance	γ_{05}		6.52* (2.83)
Anxiety	γ_{06}		7.56** (2.72)
Behavioral	γ_{07}		5.45* (2.60)
Adopted	γ_{08}		1.12 (2.95)
ROC			
Intercept	γ_{10}	−3.53*** (.14)	−1.99*** (0.37)
Female	γ_{20}		−0.87** (0.31)
Mood	γ_{30}		−0.85** (0.30)
Substance	γ_{40}		−0.58 (0.30)
Anxiety	γ_{50}		−0.57* (0.28)
Variance components			
Level 1			
Within-person	σ_1^2	351.12*** (15.19)	353.20*** (15.38)
Level 2			
In initial status	σ_0^2	866.24*** (62.13)	800.87*** (59.50)
In rate of change	σ_1^2	4.84*** (0.76)	4.31*** (0.74)
Covariance	σ_{01}	−28.20*** (5.36)	−22.18*** (5.17)
Goodness of fit			
Deviance		22,052.5	22,818.1
AIC		22,064.5	21,826.1
BIC		22,099.0	21,849.0
% Reduction in initial status variance			7.55
% Reduction in rate of change variance			10.95

Fig. 1 Estimated YOQ 2.0 SR trajectories for non-adopted male and female OBH clients of average age presenting with behavioral, anxiety, and substance use problems and without mood disorder

scoring within three points (clinically insignificant difference) on the YOQ as their same-gendered peers who did not present with a mood disorder at discharge (see Fig. 1).

A one-way repeated measures ANOVA was conducted to examine change after discharge. The sample of clients included 41 participants who completed discharge,

Table 3 OLS regression of six months post-discharge Y-OQ-SR scores

Independent variables	B	SE	Sig.
Mood	−3.26	3.28	.318
Substance	−1.39	3.25	.676
Anxiety	1.20	3.18	.699
Behavior	3.45	3.29	.301
Attachment	9.01	9.11	.343
Adopted	1.22	3.99	.667
Gender	7.88	3.26	.016
Length of stay	1.15	.664	.084
Parents living together	−0.99	3.06	.735
YOQ intake score	0.23	0.04	.000
Attended AC	2.39	4.83	.620
Age at intake	−0.64	1.34	.631

6 months-post, and 18 months-post questionnaires. The ANOVA sample looked similarly to the main sample: 18 % were adopted, 65 % had parents living together, and 29 % were female. The sample's average intake score was 67 (SD = 37), and they changed an average of 37 points (SD = 32) during the program. The ANOVA did not show significant change from discharge to the 18-month follow-up on YOQ-SR scores, $F = (2, 80) = 1.74$, $p = 0.183$. The average scores for the repeated measures ANOVA at each data point were: discharge = 29.8 (SD = 31.3), 6 months post = 38.2 (SD = 29.5), and 18 months post = 36.2 (SD = 28.7).

Since the sample at the six-month follow-up was larger than the 18-month follow-up, we conducted an OLS regression to better understand what factors affect well-being six months post OBH treatment. The independent variables included diagnosis, gender, age at intake, length of stay, adoption status, after care status (whether a client went to another level of care or treatment), parent marital status, and Y-OQ-SR intake scores. The regression model (Table 3) significantly predicted scores at 6 months post-discharge ($F = 4.282$, $p < .001$, $R^2 = 0.137$), though only two of the 13 included independent variables were found to be significant predictors. On average, clients who reported more severe problems at intake showed poorer functioning six months post-discharge regardless of presenting issue, length of stay, age, parent's marital status, and adoption status. Controlling for all other variables in the model, clients who were female also tended to have higher scores at the six-month follow-up ($B = 7.90$, SE = 3.26, $t = 2.43$, $p = .016$).

Discussion

This study corroborates consistent findings in the OBH literature, and also adds further depth to them. The OBH literature has consistently found dramatic changes from intake to discharge for adolescent clients, which this study confirms (Lewis 2013; Norton et al. 2014; Tucker et al. 2014). The current published OBH research has only looked at differences between intake and discharge though. This study's additional in-treatment data points and use of multi-level modeling provide a better understanding of ROC during treatment and a richer picture to 'see' what factors affect initial status and ROC. Multiple independent variables impacted initial status and ROC. It is noteworthy that the predictors for greater ROC (being female, and mood and anxiety disorders) were also predictors of greater acuity in initial status. This is the first published study on adolescent self-reports to find any diagnostic variables to be relevant, and it may shed light on expected treatment length for clients.

While this study alone cannot suggest an appropriate length for different cases, it does suggest that treatment length guidelines for different diagnoses (or gender) may be warranted and certainly explored, as some client groups appear to require more or less time in treatment to achieve optimal results. For example, average female clients make improvements in functioning at a faster rate than males. As a result, females are able to make clinically significant improvements and enter the healthy range of functioning over a shorter time period than males, and a shorter length of stay may be appropriate.

This study also adds substantially to what we know about client outcomes after OBH treatment. While there is some promising evidence of maintenance of change after OBH treatment, post-discharge data has been a weakness in the literature. Research by Russell (2003, 2005), Bettmann et al. (2013) and Lewis (2013) show maintenance of OBH-treatment effects, and this study affirms and contributes to those findings. This study's ability to look 18 months post-treatment, and to examine diagnostic and demographic factors influencing outcome six months post-treatment is original. The longest quantitative follow-up in the literature currently is 12 months post-discharge. The results of this repeated measures ANOVA were limited as it was a small sample reflecting only those who chose to respond at all three data points (discharge, six-months post, and 18-months post) and was not representative of the larger sample. They are, however, a first look into outcomes six months further than what the field has previously seen, and suggest that clients maintain treatment gains up to 18-months post-discharge. Eighteen months post discharge is an important data point as many OBH clients go on to other forms of therapeutic care upon discharging from OBH for a full year. The 18-month follow-up was chosen in order to catch participants when they are likely to be out of structured therapeutic care. The OLS regression on the six-month follow-up also provides some of the first information

on demographic and diagnostic predictors of outcome after OBH treatment, suggesting that gender and initial status influence wellbeing post-discharge.

Mood disorders had the single largest impact on initial status. Clients entering with a mood disorder assessed themselves with a higher rate of dysfunction, almost 12 points higher on the Y-OQ-SR than those without a mood diagnosis. Anxiety also predicted greater symptom severity at intake, and both mood and anxiety were found to be predictors of faster rates of change. In a previous study looking at the diagnostic profile of OBH clients, mood disorders were the most common primary diagnosis (Hoag et al. 2014). Hoag et al. concluded that the typical wilderness therapy client is becoming more complex as the field has become more sophisticated. In earlier research behavioral and substance issues were found to be the most common reasons for referral. While behavioral and substance disorders are still ubiquitous in OBH programs, recent literature is finding that mood and anxiety are on the rise and that clinically complex clients are increasingly common (Hoag et al. 2014; Young and Gass 2010). The evidence of greater numbers of mood and anxiety disorders, and this study's finding of mood and anxiety having greater acuity and greater ROC are of clinical importance. While OBH is seeing more clinically complex cases, this study shows that these students are progressing more quickly. Perhaps this progress is reflective of the increase in clinical sophistication that has been noted in wilderness programming (Combs et al. 2015). The smaller size of these groups in the wilderness, the emotional safety related through anecdotal reports by these young people, and the emphasis on collaboration and working together provide support for the young person with mood issues or challenges with anxiety. Further, the active lifestyle, nomadic process, and emphasis on the whole person can all be seen as possible contributors to improved mood or decreased anxiety with these young people. This may mean that OBH is an especially good fit for clients with mood and anxiety disorders.

Perhaps the most surprising finding was that parents living together predicted greater dysfunction at intake. While this seems counterintuitive, one possible explanation is that a two-parent home is able to withstand more dysfunction than a separated family, and thus the two-parent home does not see the need for outside intervention and seeks help later. Another possible explanation is that in a separated home, problems could be viewed more as a result of or related to the divorce, and thus mitigates the view of the troubled teen's issues. Either way, this demographic factor will be important to further investigate. Questions around how a two-parent home may interact with given diagnoses and outcome is a relevant question for the field of OBH, especially as they seek to integrate families more into treatment.

Gender was a significant predicator of initial status, ROC during treatment, and 6 months post-discharge. This study confirms previous findings of girls entering more acutely and changing at a faster rate than boys on the Y-OQ-SR, and also adds that gender may persist in playing a role post-discharge as girls assessed themselves more dysfunctional than their male counterparts. Previously, in the literature, gender has been the only variable shown to consistently impact change during treatment (Russell 2003; Tucker et al. 2011, 2014). Using the Y-OQ, Russell (2003) and the NATSAP Research and Evaluation Network found that females scored higher at admission and made greater overall change during treatment in wilderness therapy. This trend was reflected in a study among young adults in wilderness therapy (Hoag et al. 2013) and in a study on adventure therapy in community-based treatment (Tucker et al. 2013). Why these gender differences appear in OBH programs is unclear. Males largely out-number females in wilderness treatment, though females appear to be responding more to this approach. Tucker et al. (2013) proposes that girls may respond particularly well to OBH due to its focus on empowerment and self-efficacy, as well as using a social group format. Russell suggests that these differences may be explained through subscales of the YOQ.

While consistent, these gender findings are primarily with the Y-OQ-SR, an adolescent self-report instrument. In a recent study of YOQ-2.01 parent assessments (from this same sample of students in this study), gender did not predict in-treatment or post-treatment outcomes (Combs et al. 2015). Combs et al. were the first to look at parent reported data since 2003. Further investigation is needed on whether this trend is primarily among adolescent's perception of themselves or if it reaches their parents' perceptions as well. Future research looking at differences between males and females on subscales to see exactly where and how males and females are changing would also shed light on this trend.

Limitations

There are several important limitations to this study. Namely, there was no control or comparison group, which inhibits generalization of results. Additionally, the four wilderness programs represented in this study are connected by management and ownership, and are private-pay, traditional wilderness therapy models of OBH treatment. Therefore, the findings are further limited and do not represent all OBH treatment, or even all traditional wilderness therapy models, particularly those working with state-funded or adjudicated youth. The measured (Y-OQ-SR) used in this study is also specifically designed for, and presents the greatest treatment impact, when used as a progress monitoring tool. Future research utilizing the

Y-OQ-SR more frequently during treatment would enhance understanding of treatment trajectories and also have the potential to improve treatment outcomes.

The post-discharge samples were particularly limited. While this analysis can provide considerable insight into the way clients make clinical progress through OBH treatment, and the maintenance of treatment effects post-discharge, the post-discharge sample was not large enough to model variation in ROC following treatment. The post-discharge sample for the OLS regression at 6-months post-discharge was only about one-half of the entire in-treatment sample, and the repeated measures analysis included less than 10 % of the in-treatment sample. These post-discharge samples only reflect those students who chose to respond and have a high chance for bias. Future research should attempt to secure a larger and more representative post-discharge sample to better model treatment outcomes.

While the model presented in this paper was strong and found multiple predictors, it did not account for a considerable proportion of the variation in in-treatment initial status and ROC, there is still roughly to 90% of the variation in initial status and ROC that must be due to other factors. Furthermore, there is considerable within-person variation in YOQ scores across time, suggesting the need to include time-varying predictors in analyses. Future research should include additional program level and time-varying predictors to better account for these concerns.

Compliance with ethical standards This research was funded through the OBH program as part of their internal program evaluation efforts. Three of the four authors were employees of the program, and the data analyst, who was a consultant to the program (not an employee), only accessed to de-identified, aggregate-level data. Animals were not involved in this research. The OBH program obtained informed consent from each participant and explained that participation in the internal evaluation to monitor and track outcome was completely voluntary. Every participant's parent signed a release, which stated that their child could be a part of this internal project to monitor outcomes and also gave permission for the program to use theirs and their child's de-identified, aggregate-level data for potential professional development or research purposes.

Conflict of interest Three of the four authors were employed by the OBH program during the evaluation. Otherwise, the authors declare that they have no other conflict of interests.

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