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ORIGINAL PAPER

Treating Anxiety and Depression in Children and Adolescents: The Therapeutic Potential of Overnight Summer Camp

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Abstract

Background The last twenty years have seen a notable rise in mental health concerns among children and adolescents. These concerns were profoundly exacerbated by the COVID-19 pandemic, prompting the need for timely intervention.

Objective The purpose of these studies was to evaluate the therapeutic potential of overnight summer camp.

Methods (1) A systematic review of the literature published through December 2022 was performed. Included studies presented self-report measures of anxiety at two points across the camp session using a valid and reliable instrument. Meta-analysis was performed using Cohen's *d* as an effect size. (2) Mental health was assessed among campers attending an all-boys summer camp through validated self-report questionnaires. Positive and negative mood scores were collected on the first and last full day of camp.

Results (1) Eight articles with a sample size of 720 were included for meta-analysis, yielding a statistically significant decrease in anxiety symptoms post-camp compared to pre-camp with a Cohen's *d* of − 0.25 (95% confidence interval − .37 to − .13; $p < .001$). (2) Among 464 participants (mean age 13.1 years), boys experienced increases ($p < .05$), across their 2-week camp stay, in Positive Emotion, Homesickness, and Self-Confidence along with a non-significant decrease in Negative Emotion ($p = .61$).

Conclusions Participation in overnight summer camps may have benefits in anxiety levels in youth and promote positive mood and self-confidence. While such camps are promising milieus for population-wide treatment of anxiety and depression in children and adolescents and could represent a cost-effective alternative to outpatient mental health care, additional research is needed to clarify iatrogenic effects and mechanisms of these benefits with formal fidelity monitoring and expanded outreach.

Keywords Mental health · Anxiety · Depression · Summer camp · Self-confidence

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Introduction

The national emergency in child and adolescent mental health remains an unsolved crisis in the United States (American Academy of Pediatrics, 2021). Over 20% of adolescents report experiencing symptoms of anxiety and over 40% report feelings of sadness and hopelessness (Centers for Disease Control, 2023; Kaiser Family Foundation, 2023). Corresponding increases in drug use, suicide, and mental health emergencies have been observed over the past decade (Bommersbach et al., 2023). While the burden of mental health problems among children and adolescents had already begun to grow in the early- to mid-2010s, these challenges were profoundly exacerbated by the COVID-19 pandemic.

The widespread effects of the COVID-19 pandemic were particularly detrimental to the mental health and social functioning of children and adolescents (Duan et al., 2020; Jones et al., 2021; O'Sullivan et al., 2021; Singh et al., 2020; Xiang et al., 2020). Studies reported acute increases in symptoms of anxiety and depression along with a general worsening trend in youth mental health (Hawes et al., 2022; Liang et al., 2020; Racine et al., 2021; Ravens-Sieberer et al., 2021; Samji et al., 2021). These mental health sequelae could be attributed to multiple pandemic-related factors specific to the experiences of youth, including: (1) increases in screen time (both recreational and academic) and online media consumption—secondary to youth spending more time on computers as schools migrated to virtual learning; (2) decreases in activity choice–especially in-person play and other face-to-face interactions with peers (Stieger et al., 2021; Tso et al., 2020); (3) the closure of educational institutions and resultant disappearance of familiar schedules and environments; and (4) the confinement to homes and the resultant apathy (Estacio et al., 2020). In pre-pandemic research, each of these factors had a demonstrated correlation with increased stress, depression, and anxiety (Reiss et al., 2019; Samji et al., 2021; Stelnicki et al., 2022). Post-pandemic research has shown that these mental health symptoms have persisted years after public health mandates were lifted, underscoring the need for timely intervention for children and adolescents (Park et al., 2024).

Given this constellation of increased distress and its likely pandemic-related exacerbation, it is both logical and morally imperative to identify accessible, inclusive, outdoor, socially immersive, physically healthy environments for young people. Traditional overnight camps are one such environment; whose assets may serve as a therapeutic or corrective experience. When skillfully run, these camps provide a hiatus from electronic technology and excessive screen use; instead, they immerse young people in a supportive community, engage them in regular physical recreation, and ensconce them in natural, outdoor spaces. Moreover, the experience is intentionally supervised by trained college and university students, not parents or legal guardians, thereby promoting young people's self-reliance and independence. Campers live in a community where they must learn to effectively communicate, cohabitate, share, play, and resolve conflicts with same-age peers (typically between 7 and 8, at the lower limit, and 15 or 16, at the upper limit). Summer camps also provide youth with a largely fresh peer group, a circumstance that encourages both reputational resetting and new friendships. Finally, summer camps provide a space where concepts such as fun and silliness are prioritized over achievement, the inverse of a typical school setting. For many youth, traditional overnight summer camps provide an escape from the social pressures of their lives outside camp (LaLiberte, 2019; Thurber & Weisinger, 2021).

Overnight camps may help to mitigate several well-documented shortcomings of traditional youth mental health services. Traditional systems often require referrals with delayed evaluations, particularly in schools facing counselor shortages (Iyer et al., 2025). Furthermore, summer breaks inherently interrupt school-based services, contributing to gaps in care (Mojtabai & Olfson, 2020). Other community systems may vary widely in funding and insurance coverage; often disproportionately affecting publicly insured and low-income families as well as underserved rural areas (American Academy of Child and Adolescent Psychiatry [AACAP] Committee on Community-Based Systems of Care & AACAP Committee on Quality Issues, 2023). Lastly, the stigma associated with seeking care can deter young people from participating in formal therapy. Camps can offer direct, rapid enrollment during the summer, minimizing the time to daily support and monitoring. They provide continuous structure, peer connection, and adult oversight during the high-risk summer discontinuity window. As camps are cheaper than traditional outpatient treatment and are geographically accessible, they can potentially buffer inequities while clinical care is pursued. Finally, camps offer low-stigma, community-based entry points for self and family referral pathways that can reach youth who avoid clinics. To support its role as an effective adjunctive care option, the therapeutic impact of participation in overnight summer camp must be established.

To understand and explore the potentially therapeutic effects of participation in overnight summer camp, two paired studies were performed. Study One was a systematic review and meta-analysis of published articles documenting the association between young people's participation in overnight summer camp and changes to their levels of anxiety. The intent of the meta-analysis was to aggregate data from pre-pandemic, empirical studies of youth at summer camps that used psychometrically sound, self-report measures of anxiety. We hypothesized the meta-analysis would validate camps' beneficial effect on youth mental health by showing lower levels of self-reported anxiety post-camp, compared to pre-camp.

Study Two was a prospective, quantitative study, designed to further assess the longitudinal mood trajectory of young people over the course of their two-week stay on a more granular level, following the COVID-19 pandemic. We hypothesized that nearly all youth at the camp we studied—regardless of their pandemic-related risk profile—would report decreased levels of negative mood states and increased positive mood states near the end of their two-week stay, relative to their self-reports near the start of their stay. Our primary goal for these two studies was to find compelling evidence for the mental health benefits of traditional, overnight summer camps. Although young people's social and emotional struggles following the COVID-19 pandemic had been well documented, cost-effective therapeutic supports and opportunities had not. If our hypothesis about overnight camps' benefits were supported by Studies One and Two, our secondary, exploratory goal was to identify the subgroups for which this experience was most beneficial.

Methods: Study One

Study One was a systematic review and meta-analysis. This study was conducted based on the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) 2020 reporting guidelines (Page et al., 2021). No formal protocol was registered for this review, however, to our knowledge, no similar meta-analysis exists. A systematic review of the

literature was performed using PubMed, PubPsych, PsycInfo, and the research bibliographies of the American Camping Association (ACA) and the Canadian Camping Association (CCA), using the keywords “summer camp,” “camp,” and “anxiety.” The PubMed search string was: ("summer camp" OR camp) AND anxiety. Similar search strings were adapted for each database. The final database search was conducted on December 22, 2022, and encompassed literature published through December 2022. One reviewer independently evaluated each article against inclusion and exclusion criteria listed below at stages: by title, abstract review, and full-text review. Any uncertain cases during full-text review were discussed with a second author until a consensus was reached.

Inclusion Criteria

1. Empirical studies, written in the English language that included a quantitative analysis of psychological and/or psychosocial effects of participation in overnight summer camp programs
2. Longitudinal studies that measured psychosocial constructs at a minimum of two time points before camp (or during the initial days) and after camp (or during the final days)
3. Use of at least one valid and reliable self-report measure of anxiety
4. Camp stays lasting at least five days and four nights

Exclusion Criteria

1. Studies conducted at day camps, rather than at overnight/residential camps
2. Insufficient data provided to view or calculate the mean and standard deviation of self-reported anxiety scores

The quality of included articles was assessed by two researchers based upon research questions and methods used. Any necessary deliberations were conducted together by the researchers to ensure the quality of the selected studies. Following the full-text review, one investigator independently extracted data from each included study. Extracted data elements included author(s), year of publication, setting, population, measure of self-reported anxiety, sample size, mean and standard deviation of anxiety survey scores at time point 1 (before or within the initial days camp) and time point 2 (after camp or in the final days). In studies where standard deviation was not explicitly reported in the study, an average standard deviation of pre- and post-camp anxiety scores was estimated using corresponding *t* values from *p* values provided within the article. This value was then converted to a standard deviation using the following relations:

$$\text{Standard Error} = \text{mean difference}/t\,\text{value} \tag{1}$$

$$\text{Standard deviation} = \text{standard error}/\sqrt{1/Npre + 1/Npost} \tag{2}$$

where N=number of participants completing both pre- and post-camp anxiety measures.

For studies reporting separate values for state and trait anxiety as part of the State-Trait Anxiety Inventory for Children (STAIC), the two scores were averaged to derive an overall anxiety score. Statistical meta-analysis by random model was performed through SPSS version 28.0.01 using Cohen's *d* as an effect size measurement and an inverse-variance risk for continuous data. Egger's test was used to check publication bias. Statistical significance was defined as a *p*-value less than 0.05.

Results: Study One

A total of 184 studies were identified through database searches, with the following distribution: PubMed ($n=41$), PubPsych ($n=20$), PsycInfo ($n=20$), ACA ($n=88$), and CCA ($n=15$). After removing 19 duplicates, 165 remained for screening. Following a review of titles and abstracts, 150 studies were excluded due to lack of relevance for the topic of the study, leaving 15 articles for full-text assessment. Seven articles were excluded, based on one or both exclusion criteria, yielding eight studies for the meta-analysis (Fig. 1).

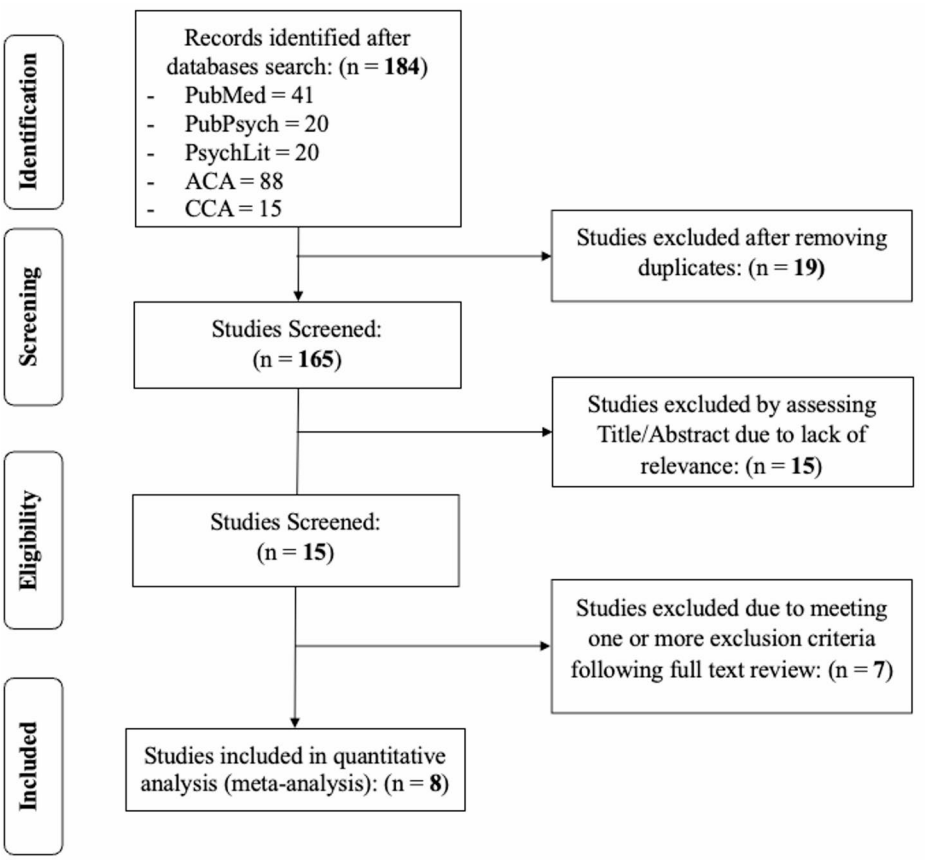

Fig. 1 PRISMA flowchart diagram. This flow chart shows the number of articles screened, assessed for eligibility, and included in final analysis based on pre-determined inclusion and exclusion criteria

Included articles were published between 1993 and 2020. Five of these studies were conducted in the United States, one was conducted in Canada, one was conducted in Ireland, and one was conducted in Spain (see Table 1). The means and standard deviations of participants' self-reported pre-camp and post-camp anxiety scores were aggregated for meta-analysis ($n = 720$; 62.1% males; age range 6–21 years). Calculations of overall effect size yielded a statistically significant decrease in anxiety symptoms at post-camp compared to pre-camp with a Cohen's d of − 0.25 (95% confidence interval (CI) -.37 to -.13; $p < .001$). Effect size of individual studies (Table 2) show an average decrease in anxiety symptoms of campers at each of the eight overnight summer camps included in the analysis. The distribution of studies suggests a low risk of publication bias (Fig. 2). This finding is further supported by Egger's regression test ($p = .38$), indicating no evidence of minor study effects or publication bias among the included studies.

Table 1 Characteristics of studies included in meta-analysis

Authors and year	Country	Sample	Length of camp	Camp characteristics	Anxiety scale used
Briery and Rabian (1999)	United States	90 children (males and females), ages 6–16	1 week	Three camps tailored to pediatric needs (asthma, diabetes, spina bifada); involves educational and traditional camp activities	State-Trait Anxiety Inventory for Children (STAIC)
Bultas et al. (2013)	United States	49 children (males and females), ages 8–15	5 days	A pediatric cardiac camp designed for children with heart disease; offers traditional camp activities and onsite medical support staff	State-Trait Anxiety Inventory for Children (STAIC)
Kiernan et al. (2004)	Ireland	119 children (males and females), ages 7–16	10 days	A therapeutic recreation camp for children with an oncology, hematology-related, immunodeficiency-related, or renal-related illness; offers traditional camp activities and onsite medical support staff	The Physiological Hyperarousal and Positive and Negative Affect Scale for Children (PH-PANAS-C)
Anarte et al. (2020)	Spain	20 children (males and females), ages 8–14	10 days	Specialized camp for children with type 1 diabetes, includes educational activities and circuits alongside traditional camp activities	State-Trait Anxiety Inventory for Children (STAIC)
Feltis (2020)	Canada	169 campers (males and females), ages 6–15	6 days	General summer camp with no registration restrictions; engagement in traditional camp activities	Social Phobia Inventory (SPIN)
Simons et al. (2007)	United States	29 children (males and females), ages 8–17	5 days	A camp designed for children with complex cardiac defects; included educational programming and enjoyable camp activities	The Revised Children's Manifest Anxiety Scale (RCMAS)
Gant (2009)	United States	53 campers (males and females), ages 6–21	1 week	The camp is designed for campers with muscular dystrophy with traditional camp activities adapted to the abilities of the children	State-Trait Anxiety Inventory for Children (STAIC)
Rawson and Barnett (1993)	United States	191 campers (males and females), ages 8–12	10 days	A residential therapeutic camp specifically designed for children with severe emotional disorders. Includes traditional camp activities and programming that incorporate behavior modification techniques	The Revised Children's Manifest Anxiety Scale (RCMAS)

Table 2 Effect size estimates for individual studies

ID	Effect size[a]	Std. error	*Z*	Sig. (2-tailed)	95% Confidence interval		Weight	Weight (%)
					Lower	Upper		
Briery and Rabian, (1999)	− 0.20	0.15	− 1.35	0.18	− 0.49	0.09	38.12	14.1
Bultas et al., (2013)	− 0.37	0.21	− 1.76	0.08	− 0.78	0.04	20.78	7.7
Kiernan et al., (2004)	− 0.40	0.15	− 2.76	0.01	− 0.68	− 0.12	39.76	14.7
Anarte et al., (2020)	− 0.46	0.38	− 1.20	0.23	− 1.21	0.29	6.65	2.5
Feltis, (2020)	− 0.05	0.11	− 0.50	0.62	− 0.27	0.16	63.53	23.5
Simons et al., (2007)	− 0.25	0.34	− 0.73	0.47	− 0.93	0.42	8.16	3.0
Gant (2009)	− 0.20	0.19	− 1.00	0.32	− 0.58	0.19	23.91	8.9
Rawson and Barnett (1993)	− 0.32	0.10	− 3.06	0.002	− 0.52	− 0.11	68.96	25.6

[a]Effect size is the calculation of Cohen's *d* for each individual study

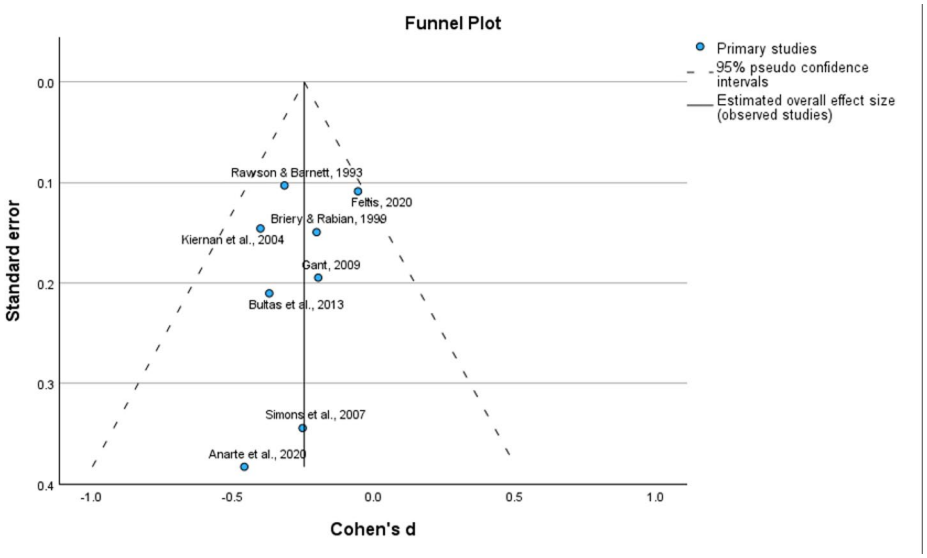

Fig. 2 Funnel plot of overall and individual effect size estimates. Funnel plot assessing the risk of publication bias in the meta-analysis. Each point represents an individual study, plotted according to its effect size and standard error. Egger's regression test ($p = 0.38$) indicates no evidence of small-study effects or publication bias among the included studies

Methods: Study Two

Study Two was a prospective, observational cohort study. This study was conducted at Camp Belknap, a traditional, all-boys, agency, overnight summer camp located in Tuftonboro, New Hampshire during the summer of 2021. Campers ranged in age from 8 to 17 years ($M = 13.1$; $SD = 1.9$) and attended camp for either two weeks (89.1%) or four weeks (10.9%). Senior staff (not the researchers) placed campers in cabins of nine or ten age peers and one or two counselors. Campers were further grouped into one of five equal-sized divisions, by chronological age: Cadets ($n = 100$; 8–11 years old), Juniors ($n = 99$; 11–12 years old),

Middlers ($n=94$; 12–13 years old), Besserers ($n=96$; 13–15 years old), or Seniors ($n=75$; 14–17 years old). All campers participated in a standardized daily schedule that included choice programming, cabin activities, and unstructured free time. While this general framework is consistent across camp sessions, specific activities and staff composition slightly vary. Fidelity of program delivery was monitored internally by the camp through routine staff training, daily oversight by senior staff and division heads, and regular staff meetings to ensure consistency across sessions. Although these internal procedures promoted standardized implementation, no independent formal fidelity monitoring was conducted by the researchers. Campers were not randomly assigned to conditions, and no control or comparison group was used. As this was a naturalistic study performed within an ongoing camp session, it was not feasible to alter camper assignments or withhold programming for research purposes. All participants received a comparable camp experience, consistent with an open trial design. During the summer of 2021, due to complications and precautions related to the pandemic, scheduling and distancing protocols were implemented such that cabins of boys spent more time together in the first few days, as a unit, before physically interacting with other cabin groups. Due to the closure of the camp in the summer of 2020, the summer of 2021 had a second idiosyncrasy: an increased percentage of first-year campers (41.3%), compared to the average pre-pandemic summer ($M=27.2\%$ for the five summers preceding 2020).

Mental health, social functioning, and pandemic related factors were assessed with two self-report questionnaires. These surveys were optional and confidential, i.e., only the researchers would see participants' responses. Informed consent was received from parents or legal guardians during the camp registration period between January and May 2021. Parents were informed of the confidential nature of the surveys and were asked whether their child(ren) could participate. During the summer sessions, one of the researchers hand-distributed surveys and pencils to participating campers during the 50-min rest period after lunch. Participants completed surveys on the first full day of camp (day 2) and the last full day (day 13). Concurrent with survey distribution, one of the researchers (all of whom also served as camp staff) explained the purpose of the surveys, reminded boys that their participation was optional, and assured them about response confidentiality. Each questionnaire was labeled with a number corresponding to a particular bunk location, thereby preserving participants' confidentiality of responses. Surveys were completed under the supervision of the researchers; the in-cabin counselors returned completed surveys in envelopes. Outcome assessors were blinded to camper identities (as the only identifier was the number on the questionnaire) but not study hypotheses, as all data collection was overseen by members of the research team who also served as camp staff. Given the naturalistic setting and absence of a control group, blinding was not feasible. However, the use of self-administered questionnaires minimized the potential for assessor influence on camper responses. While distress or severe homesickness may have been captured by questionnaire responses, no formal monitoring system was implemented for tracking adverse psychological events.

The two questionnaires distributed to campers were the attitudes and experiences survey (AES) and the rate your day-revised (RYDR) (see Figures S1 and S2). The AES gathered demographic information such as age, camp division, year at camp, race or ethnicity, and family composition, as well as data about the young person's pandemic experience, such as estimates of the percentage of the year held remotely, screen time per day, and interactions online and in-person. The AES was administered only once, on the first full day of the

camp session. To facilitate survey comprehensibility, response choices to pandemic-related questions were broken into quintiles, with each quintile representing a range of values. Surveys determined to show a lack of item comprehension, as well as those with incomplete responses, were excluded from the final dataset. The RYDR is a reliable and valid mood checklist, initially developed for research on childhood homesickness (Thurber, 1999). The RYDR assesses four constructs: happiness, depression, anxiety, and calmness through various adjectives and phrases that young participants rate on an 11-point numerical rating scale, from 0 to 10. The RYDR used for this study included three additional questions assessing self-confidence and comfortability. These questions, also rated on a scale from 0 to 10, were drawn from published research on social pressure and masculinity at summer camps (LaLiberte, 2019). Participants completed the RYDR on both the first full day of camp and the last full day of camp.

Responses to every question on both surveys was either a number or was given a numerical rating for data entry purposes. After initial data entry, 47 (10.1%) surveys were spot-checked for accuracy, and no errors were found. While the study followed a pre-specified internal analysis plan, the protocol was not pre-registered in a public repository. Statistical analysis was performed through SPSS version 28.0.01. Normality was assessed through Shapiro–Wilk tests. Because all variables had non-normal distribution, non-parametric tests were implemented. Spearman's correlation was used to determine test–retest reliability. Minimal detectable effect estimations were performed to quantify the smallest mean change our study could detect with 80% power for each RYDR subscale score. Wilcoxon signed rank tests were used to compare average RYDR emotion scores on the first day of camp (T1) and the last day of camp (T2). Cohen's *d* with 95% CIs were calculated for mean change of each item and subscale score. The Kruskal–Wallis test was used to assess changes across more than two groups. Mood cohorts were formed of participants who experienced decreased vs. increased or unchanged levels of aggregated negative mood states, i.e., a combination of the RYDR's "depressed mood" subscale and "anxious mood" subscale. Differences between these two cohorts with regards to demographics and pandemic-related experiences were analyzed with chi-square tests. Statistical significance was defined as a *p*-value less than 0.05.

Results: Study Two

Participants

In all, 464 campers (93.0% participation among eligible campers, Fig. 3) were included in analyses (Table 3). Pandemic-related experiences varied widely across the cohort (Table 4).

Emotional Changes Over Time

The Positive Emotion subscale scores were calculated as the mean of participants' responses to the happy, excited, relaxed, calm, cheerful and peaceful items. The Negative Emotion subscale scores were calculated as the mean of participants' responses to the sad, worried, afraid, down, lonely, and nervous items. (See Figure S2 for the full questionnaire.) The Homesickness subscale scores were calculated as the mean of participants' responses to

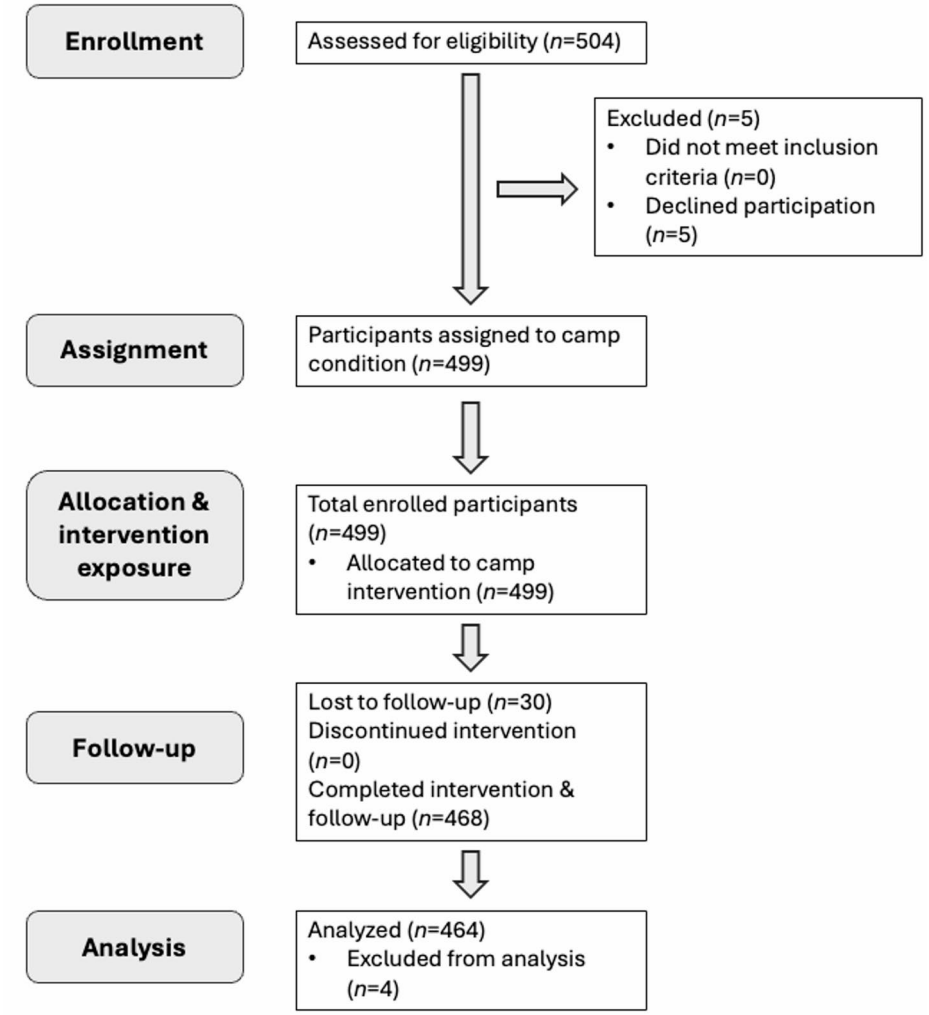

Fig. 3 Participant flow diagram. This participant flow diagram shows the number of participants who were excluded due to declined participation and lost to follow-up. Of patients that completed intervention and follow-up, 4 were excluded from analysis due to surveys determined to show a lack of item comprehension

the items "I feel homesick," "I miss my family," and "I want to go home" scores. The Self-Confidence subscale scores were calculated as the mean of participants' responses to the items: "How comfortable do you feel today being your true self?," "How comfortable do you feel today interacting with others?," and "How confident do you feel that things will go well for you?".

Some 334 participants completed the RYDR at both T1 and T2. Of these, 294 (88.0%) reported a significant increase in a positive mood score, 239 (71.6%) experienced a decrease

Table 3 Camper demographics

Demographic variable	Total camper cohort $n=464$
Age	13.1 (2.0)
Division	$n=464$
Cadets (8–11 years old)	100 (21.6%)
Juniors (11–12 years old)	99 (21.3%)
Middlers (12–13 years old)	94 (20.3%)
Besserers (13–15 years old)	96 (20.7%)
Seniors (14–17 years old)	75 (16.2%)
2 or 4 weeks	$n=405$
2 weeks	361 (89.1%)
4 weeks	44 (10.9%)
Year at camp	$n=403$
First	127 (31.5%)
Second	85 (21.1%)
Third	65 (16.1%)
Fourth	51 (12.7%)
Fifth	33 (8.2%)
Sixth	26 (6.5%)
Seventh	13 (10.2%)
Eighth	3 (0.7%)
Race	$n=390$
African-American/Black	5 (1.3%)
Asian	1 (0.3%)
Asian-American	6 (1.5%)
White	365 (93.6%)
Hispanic/Latino	6 (1.5%)
Native American	4 (1.0%)
Other	3 (0.8%)
Homeschooled	$n=172$
Yes	1 (0.6%)
No	171 (99.4%)
Home life	$n=408$
Two parents—same home	364 (89.2%)
Two parents—separate homes	28 (6.7%)
One parent—one home	14 (3.4%)
Other caregiver	2 (0.5%)
Brothers	$n=409$
0	157 (38.4%)
1	171 (41.8%)
2	57 (13.9%)
3+	24 (5.9%)
Sisters	$n=409$
0	159 (38.9%)
1	190 (46.5%)
2	52 (12.7%)
3+	8 (2.0%)
Total siblings	$n=409$
0	13 (3.2%)
1	193 (47.2%)

Table 3 (continued)

Demographic variable	Total camper cohort $n=464$
2	146 (35.7%)
3+	57 (13.9%)
Oldest/middle/youngest sibling	$n=389$
Oldest	157 (40.4%)
Middle	84 (21.6%)
Youngest	148 (38.0%)
Religious affiliation	$n=407$
Yes	158 (38.8%)
No	249 (61.2%)
Religion	$n=149$
Christian	132 (88.6%)
Jewish	12 (9.1%)
Other	5 (3.4%)

Data are presented as mean (standard deviation) or number (percentage)

in a negative mood score, and 215 (64.4%) experienced both an increase in a positive mood score and a decrease in a negative mood score.

The RYDR subscale scores each showed high test–retest reliability (Positive Emotion Scale $r=.66$; Negative Emotion Scale $r=.51$; Homesickness Scale $r=.62$; Self-Confidence Scale $r=.66$). Boys experienced statistically significant increases, across their 2-week camp stay, in Positive Emotion ($p=.01$), Homesickness ($p<.001$), and Self-Confidence ($p<.001$, Table 5). Conversely, participants experienced a decrease from T1 to T2 in Negative Emotion, however, this change did not reach statistical significance ($p=.61$, Table 5). The minimal detectable mean change thresholds with 80% power were 0.21 points for Positive Emotion, 0.20 for Negative Emotion, 0.33 for Homesickness, and 0.21 for Self-Confidence. As such, our study design was adequately powered for observed changes in Homesickness and Self-Confidence with borderline power to detect the observed change in Positive Emotion. The mean changes in Positive Emotion, Homesickness, and Self-Confidence corresponded to Cohen's *d* values of 0.16 (95% CI [0.02, 0.26]), 0.35 (95% CI [0.11, 0.39]), and 0.19 (95% CI [0.04, 0.30]), respectively.

Analysis of individual items suggested some interesting longitudinal changes in boys' experiences over their two-week stay. While decreases were seen in "I feel worried" and "I feel nervous" scores, a significant increase was seen in "I feel sad" scores across the camp stay. The "I feel sad" outcome change varied significantly by age quintile ($p<.001$) where the youngest age group reported decreases in sad scores (mean − 0.56), but the oldest four divisions all reported increased levels. Specifically, the oldest age group showed an average 2.2 increase in sad scores from T1 to T2. Moreover, boys reported decreased "I feel homesick" scores from T1 to T2 but increased "I miss my family" and "I want to be home" scores. When separated by 1st year campers and returners, both groups showed these same trends and an average increase in the Homesickness subscale, however, in all cases (at T1 and T2) 1st year campers reported significantly higher ($p<.05$) scores in each homesickness item and subscale score than returners.

Table 4 Pandemic-related experiences

Pandemic-related experience	Total camper cohort $n=464$
Percent of school held remotely	$n=405$
Not at all or just a little bit	97 (24.0%)
Less than half of the school year	72 (17.8%)
Roughly half the school year	120 (29.6%)
More than half the school year	75 (18.5%)
The entire year or most of it	41 (10.1%)
Screen time per day	$n=163$
0–2 h	30 (18.4%)
3–5 h	74 (45.4%)
6–8 h	44 (27.0%)
9–12 h	15 (9.2%)
12 + hours	0 (0.0%)
Hours online for school	$n=169$
0–2 h	34 (20.1%)
3–5 h	57 (33.7%)
6–8 h	71 (42.0%)
9–12 h	7 (4.1%)
12 + hours	0 (0.0%)
Interactions with friends in person	$n=169$
Once a month or less	5 (3.0%)
A few times a month	20 (11.8%)
Once or twice a week	17 (10.1%)
Every day, about once a day	57 (33.7%)
Every day, two or more times a day	70 (41.4%)
Interactions with friends online	$n=169$
Once a month or less	16 (9.5%)
A few times a month	15 (8.9%)
Once or twice a week	35 (20.7%)
Every day, about once a day	45 (26.6%)
Every day, two or more times a day	58 (34.3%)
New friends in person	$n=169$
0	15 (8.9%)
1–3	51 (31.2%)
4–6	35 (20.7%)
6–8	23 (13.6%)
9 or more	45 (26.6%)
New friends online	$n=171$
0	68 (39.8%)
1–3	63 (36.8%)
4–6	16 (9.4%)
6–8	6 (3.5%)
9 or more	18 (10.5%)

Characteristics of Participants Who Reported a Decrease in Negative Emotion

Participants reporting decreased Negative Emotion over time differed significantly ($p<0.05$) from the cohort whose Negative Emotion subscale scores either increased or were unchanged. Boys who self-reported decreased Negative Emotion from T1 to T2 tended to

Table 5 RYDR emotion scores at T1 and T2, by individual item and subscale

Emotion	T1 score	T2 score	*p*-value	Cohen's *d*	95% CI[a]
Individual item scores					
Happy	8.22 (1.5)	8.40 (1.4)	.04*	0.18	[0.02, 0.30]
Sad	1.55 (2.0)	1.95 (2.0)	<.001*	0.28	[− 0.01, 0.27]
Worried	1.60 (2.1)	1.26 (2.0)	<.001*	− 0.23	[− 0.34, 0.10]
Excited	7.99 (2.2)	7.91 (2.0)	.31	− 0.05	[− 0.12, 0.16]
Afraid	0.94 (1.7)	0.66 (1.5)	.003*	− 0.13	[− 0.27, 0.00]
Relaxed	6.50 (2.4)	6.93 (2.4)	.002*	0.25	[0.00, 0.28]
Homesick	2.43 (2.7)	2.07 (2.5)	.08	− 0.20	[− 0.25, 0.03]
Down	0.87 (1.8)	0.98 (1.7)	.21	0.09	[− 0.09, 0.19]
Lonely	0.90 (1.9)	0.83 (1.8)	.42	− 0.05	[− 0.21, 0.07]
Calm	6.53 (2.4)	6.72 (2.4)	.08	0.11	[− 0.07, 0.20]
Cheerful	7.39 (2.4)	7.64 (2.1)	.09	0.16	[0.01, 0.28]
I miss my family	3.98 (3.3)	4.48 (3.3)	<.001*	0.21	[0.03, 0.31]
Peaceful	6.56 (2.6)	6.74 (2.6)	.11	0.10	[− 0.09, 0.19]
Nervous	1.73 (2.2)	1.46 (2.1)	.04*	− 0.18	[− 0.28, 0.00]
I want to be home	2.15 (2.8)	3.92 (3.1)	<.001*	0.85	[0.42, 0.70]
Comfortable being yourself	8.13 (2.0)	8.44 (1.9)	<.001*	0.22	[0.06, 0.34]
Comfortable interacting with others	8.33 (1.8)	8.61 (1.8)	.002*	0.22	[0.03, 0.31]
Confident things will go well for you	8.19 (1.9)	8.21 (2.2)	.75	0.01	[− 0.14, 0.14]
Subscale scores					
Positive emotion	7.19 (1.8)	7.38 (1.5)	.01*	0.16	[0.02, 0.26]
Negative emotion	1.26 (1.4)	1.19 (1.3)	.61	− 0.07	[− 0.22, 0.06]
Homesickness	2.84 (2.6)	3.48 (2.5)	<.001*	0.35	[0.11, 0.39]
Self-confidence	8.18 (1.7)	8.41 (1.7)	<.001*	0.19	[0.04, 0.30]

*$p < 0.05$

[a]CI = Confidence Interval

be younger (71.0% in the younger three division vs 57.9% of boys reporting increased/unchanged Negative Emotion), have fewer siblings (51.4% without siblings vs 46.9%), and report less religious affiliation (37.7% with a religious affiliation vs 42.7%).

Regarding pandemic-related experiences, boys who self-reported decreased Negative Emotion from T1 to T2 also reported increased screen time (57.3% less than 5 h per day vs 64.6%), decreased online school hours (59.7% less than 5 h per day vs 52.9%), less frequent interactions with friends online (55.5% more than once a week vs. 65.8%), fewer new friends in person (59.7% more than 4–6 new friends vs 67.1%), and fewer new friends online (19.0% more than 4–6 new friends vs 28.2%).

Discussion

The last twenty years have seen a notable rise in mental health concerns in the United States among children and adolescents. Feelings of sadness and hopelessness, national suicide rates, and mental health-related pediatric emergency department visits have all increased (Bommersbach et al., 2023). Current estimates suggest 1 in 5 children in the United States experience mental illness; however, half never receive appropriate treatment (Whitney & Peterson, 2019). These findings were intensified by the particularly detrimental effects of the COVID-19 pandemic on youth mental health and social functioning, with studies suggesting further increases in anxiety and depression (Jones et al., 2021).

The increase in post-pandemic mental health symptoms in children and adolescents has prompted the search for therapeutic supports and opportunities. The results of Study One and Study Two illustrate the potentially therapeutic effects of attending overnight summer camp, both by increasing positive mood states and self-confidence and decreasing negative mood states. The meta-analysis offers the first summative evidence that participation in traditional overnight summer camps may have anxiolytic benefits for young people. As such, camps are promising milieus for the population-wide treatment of young people's increased anxiety, whether or not its etiology is pandemic-related. However, these results should be interpreted with caution. A Cohen's *d* value of 0.25 represents a small effect size, and variability in study quality, participant characteristics, and anxiety measurement tools may influence this pooled estimate. Four studies used the State-Trait Anxiety Inventory for Children, two used the Revised Children's Manifest Anxiety Scale, one employed the Physiological Hyperarousal and Positive and Negative Affect Scale for Children, and another used the Social Phobia Inventory. Thus, our effect size includes conceptually different outcomes of anxiety. Despite the heterogeneity of validated anxiety measures, standardizing effects as Cohen's *d* allows for a quantitative synthesis despite differences in scales, and the direction of effect was consistently in favor of anxiety reduction across all included studies. The negative valence of each study's effect suggests that camp stays are associated with a reduction in anxiety; the variable magnitude of each study's effect suggests the need to better understand which factors—perhaps prominent in certain camps—are associated with stronger anxiolytic benefits.

Six of the eight camps (75%) that met criteria for this meta-analysis in Study One served youth with specific medical needs, but not necessarily any identified mental health needs, potentially limiting the generalizability of our findings to the broader youth population. These camps included on-site, specialized staff trained to respond to the physical challenges

the campers were facing, in addition to general counselors and camp staff. Moreover, these camps included physical, educational, and group bonding activities along with emotional exercises designed to boost participants' self-confidence and increase their comfort living with their particular medical condition. In some instances, these guided exercises included forms of cognitive-behavioral therapy. On the surface, these camps may seem different from traditional summer camps (i.e., those who do not recruit a specific camper population). However, medical specialty camps still include the same combination of characteristics unique to all summer camps: community living, time away from home, a beautiful natural setting, and a recreational program. Therefore, it is reasonable to hypothesize that the results seen at these specialized camps could extend to all well-run overnight summer camps. Until more granular research is done, these findings should be considered preliminary. Future research should compare the effects of cognitive-behavioral treatments conducted in traditional, clinical settings to the effects of these treatments administered in a camp setting. Such findings could help to distinguish whether common elements of overnight camps or specific psychological therapies account for self-reported decreases in anxiety.

While publication bias was assessed, no formal risk of bias evaluation was performed for individual studies. The absence of this evaluation may limit the ability to fully capture methodological quality when interpreting pooled results. However, two authors independently assessed the methodological quality of each included article using predefined criteria tailored to the study's design. These criteria addressed key sources of bias such as selection and measurement. This process allowed for a structured evaluation of study quality, consistent with the principles of PRISMA. Next, only one reviewer conducted the initial article screening process, which may have introduced selection bias. To minimize this bias, we applied clearly defined inclusion and exclusion criteria established before the study was conducted, and any uncertain cases during full-text review were discussed with a second author until consensus was reached. Moreover, while our methodology followed PRISMA guidelines, the review protocol was not registered in advance. While no similar meta-analyses exist to our knowledge, the lack of protocol registration may reduce transparency and reproducibility. Lastly, this meta-analysis may be limited by sample size variability. While larger sample sizes will inherently have a larger impact on the data and conclusions, this meta-analysis provides the first comprehensive synthesis of the association between summer camp and levels of anxiety.

The longitudinal results from Study Two help to characterize the pandemic-related experiences of children and youth attending a traditional overnight summer camp. The boys who attended this camp in 2021 reported significant social isolation and disruption. Of all respondents, 58.2% reported remote schooling for at least half the academic year and 46.1% reported spending at least six hours online for school each day. Therefore, this group was most at risk for experiencing the negative mental health effects of electronic technology use and concomitant social isolation.

Analysis of RYDR scores illustrates the effects of summer camp on levels of positive mood, negative mood, homesickness, and self-confidence along with their longitudinal trajectories over a 2-week span. On average, campers saw a statistically significant increase in Positive Emotion and a non-statistical, but perhaps clinically significant decrease in Negative Emotion. Furthermore, of RYDR respondents, 88.0% reported an increase in a positive mood score, 71.6% experienced a decrease in a negative mood score, and 64.4% experienced both an increase in a positive mood score and a decrease in a negative mood score. Although

standardized effect sizes of Cohen's *d* for Positive Emotion and Self-Confidence were small (<0.20), this pattern is to be expected for a brief, universal, non-clinical program in which baseline scores for these two subscales were higher at T1. Importantly, Study Two was powered to detect the minimal detectable mean change, which was observed for both the Positive Emotion and Self-Confidence subscales, and coherent, item-level improvements were widespread across campers as evidenced by the proportion of respondents reporting changes in positive and negative mood scores. While small, our Cohen's *d* subscale estimates for Positive Emotion and Self-Confidence were stable with the lower bound of the 95% CI exceeding 0.00, suggesting reliable albeit modest improvement. Study One's Cohen's *d* of − 0.25 for anxiety provides external convergence of these results, indicating small, reliable changes in the therapeutic direction. When benchmarked against individual studies included in the meta-analysis, the Cohen's *d* values of Positive Emotion and Self-Confidence show comparable magnitudes (Briery & Rabian, 1999; Simons et al., 2007; Gant, 2009, Table 2). While other relevant literature is limited, a recent mixed-methods study evaluating mental health benefits of a nature summer camp for urban children with psychosocial difficulties also reported small effect sizes in the therapeutic direction for improved self-reported positive state ($d=0.24$) and positive outlook ($d=0.31$), providing further convergent validity (Nagi et al., 2025). In terms of population-health, small, reliable gains from a low-intensity, scalable setting such as overnight summer camp can be meaningful. Given the modest effect sizes, appropriate caution is warranted, pending controlled replications.

This prospective cohort study, in combination with our meta-analysis, support the potential of summer camp to decrease levels of anxiety and depression while promoting happiness and calmness. On examination of individual item scores, significant increases were seen in happy and relaxed scores while significant decreases were seen in worried, afraid, and nervous scores. Interestingly, boys experienced an average increase in sad levels which varied based on age quintile. The oldest campers reported an increase dramatically higher than the other four divisions, thus skewing the data. By their final years, the oldest and most experienced campers have developed relationships both with the camp and their fellow campers. Increased sad scores may represent apprehension for leaving camp, an environment in which boys feel more comfortable and less pressure compared to schools (LaLiberte, 2019). As the observed trend in sad scores is not consistent with other constructs of negative mood or the negative emotion subscale, this increase is likely not representative of an increase in depressive symptoms.

Additionally, the results of this study may reproduce and affirm summer camp's potential benefits for self-confidence, findings with powerful implications for well-being. A stronger sense of self has been tied to stronger relationships, more positive mental health, and increased sentiments of happiness (Gander et al., 2013; Seligman et al., 2005; Sutton et al., 2015). Furthermore, self-confidence has been associated with resilience and the ability to persevere through stress and conflict (Shoshani & Slone, 2016). Heightened self-confidence can help youth in mitigating anxiety and depression by adopting positive coping styles known to combat anxious and depressive symptoms along with an optimistic outlook on life (Li et al., 2023). Self-confidence may serve as an important protective factor of well-being by providing youth the ability to overcome hardships such as the isolation and distress forced by the COVID-19 pandemic.

Lastly, RYDR analysis demonstrated unexpected trends and discrepancies between the Homesickness subscale and individual homesickness item scores. From T1 to T2, boys

experienced an average increase in the Homesickness Subscale. This trend was mirrored by increases in the "I miss my family" and "I want to be home" item scores. However, boys reported decreased "I feel homesick" scores. These trends were consistent even when stratified by 1st year campers and returners. Prior research has shown that during a 2-week camp stay in a nearly identical camper sample, levels of homesickness increase continuously through day 13 (the day the second RYDR surveys were administered) before a sharp decrease on day 14 (Thurber, 1999). However, in previous use of RYDR, homesickness was associated with a combination of depressive and anxious symptoms (Thurber, 1999). In the current study, the change in Homesickness Subscale scores showed an inverse relationship to the Negative Emotion Subscales while only the "I feel homesick" item decreased. This pattern may indicate differences in how campers interpret or respond to the "I feel homesick" item compared to items about missing family or wanting to go home. This potential subconscious dissociation between feeling homesick and missing one's family/wanting to go home could warrant further exploration.

Differences between the subcohort of campers that experienced decreased negative mood levels and the subcohort that experienced increased or unchanged negative mood levels may help identify populations for which the summer camp experience is most effective. Campers reporting decreased negative mood levels were younger, had fewer siblings, and less religious affiliation. Siblings and religious affiliation can serve as social and community support. During the COVID-19 pandemic when social interaction was limited, children with these sources of support may have entered camp impacted less by isolation protocols and their associated mental health effects. Conversely, for children without siblings or a religious community, summer camp may have provided interpersonal connection and a community feel they had been lacking at home. Younger children's relative lack of social skills and coping mechanisms may have made them particularly vulnerable to pandemic-related factors, thereby making them the highest priority group for whom inclusive, immersive, and joyful environments, such as overnight camps, should be provided. With regards to pandemic-related risk factors, campers that experienced decreased negative mood levels reported increased screen time, decreased online school hours, less frequent interactions with friends online, fewer new friends in person, and fewer new friends online. Those campers with increased technology use and media consumption combined with a lack of healthy relationships and meaningful interactions were particularly susceptible to the pandemic's negative impact on social and emotional well-being. Their subsequent decrease in negative emotion further substantiates the notion that the introduction of social connections and a supportive community are integral to summer camp's mental health benefits.

Limitations exist in the results of the empirical data in the reliability of self-report questionnaires, particularly in the responses of younger campers. To increase accuracy, answers to questions in the AES were simplified to ranges rather than requiring exact percentages. As a further check on self-report reliability, data analysis evaluated the participants' comprehension of written survey questions based on completeness of the surveys and the determination of misalignment between responses. Any questionnaire judged to have been misunderstood by a participant was excluded from the data analysis. Additionally, the confounding effect of homesickness, particularly in younger campers and campers attending summer camp for the first time may affect results. Homesickness has been shown to heighten anxiety and depression scores on the RYDR (Thurber, 1999), however, the inconsistencies observed between Homesickness subscale and positive and negative mood constructs, suggests this effect was

minimal. Furthermore, there is selection bias innate to voluntary, survey-based research which could lead to participants in the research differing systematically from non-participants. This bias is also likely minimal due to high response and participation rates. Next, our study design was powered to detect differences in Homesickness and Self-Confidence, according to minimal detectable mean change estimates. However, the observed change in positive emotion was 0.02 below the 80% powered threshold. While conclusions regarding positive emotion should be interpreted more cautiously compared to homesickness and self-confidence, given the small difference of 0.02 below the 80% estimate, we present our interpretations with confidence. Moreover, this study did not systematically monitor or record adverse psychological events. While RYDR subscale scores may indirectly capture distress or severe homesickness, the omission of a monitoring system limits the ability to assess potential iatrogenic effects of camp participation. Future studies should incorporate systematic monitoring strategies, such as structured incident reports or standardized adverse event checklists, to ensure that both positive and negative psychological impacts of camp participation are adequately documented. Additionally, the absence of a control group limits the capacity to draw causal inferences about the observed changes in mood and self-confidence. Without a control condition, it is not possible to definitively attribute changes solely to the camp experience, as other confounding factors may have contributed. As such, time-related adaptation cannot be ruled out—for example, initial worry on arrival to camp followed by habituation to the new routine and peers may be a non-specific driver of mood improvement across the camp stay. Future study designs should consider the use of a control or comparison group as well as intensive repeated measures (e.g. collecting data pre-arrival and at a higher frequency) to evaluate potential habituation and strengthen causal interpretation. Another limitation is the absence of a formal protocol registration within a public platform such as ClinicalTrials.gov or OSF. Subsequent research should prioritize protocol registration through these types of platforms to minimize reporting bias and strengthen transparency and reproducibility.

While the present findings support the therapeutic capabilities of overnight summer camps, the specific mechanisms driving these benefits remain unclear. It is plausible that improvements in mood and reductions in anxiety are mediated by a combination of factors such as enhanced peer bonding, structured activities, exposure to natural environments, and reduced screen time. These components may work synergistically to foster resilience, self-efficacy, and emotional regulation. Identifying and quantifying these pathways would be valuable for translating research into actionable guidelines for camp programming design. Future studies could incorporate mediation analyses to account for whether changes in these pathways account for the observed improvements in mental health.

Finally, the demographic homogeneity of the participants with regards to gender, race, and home life may limit the generalizability of the results. The demographic composition of the reporting camper population was entirely male, and predominantly White and from two-parent households. This lack of diversity may limit the applicability of the results toward youth from different racial, ethnic, cultural, socioeconomic, gender, and family backgrounds. Differences in cultural values, lived experiences, and access to resources may impact how children engage with camp activities, perceive social support, and respond to extended time away from home. The all-boys setting also fails to capture gender-related differences in emotional and anxiety responses to traditional overnight summer camps. However, the evenly distributed responses of pandemic-related experiences make this sample appropriate

for investigating the effects of summer camp in relation to the COVID-19 pandemic. Future research is needed on camp participants from more diverse backgrounds, particularly those underrepresented in previous studies. This will allow for examination of whether the therapeutic benefits of camp differ by demographic subgroup. In addition to the demographic homogeneity of the campers, other contextual factors may limit external validity. First, the camp's geographic location in New Hampshire, with most participants residing in the northeastern United States, may limit generalizability to other regions with different cultural and environmental contexts. Second, the camp's staffing model, which relies on college-aged counselors and a long-standing leadership structure, may not reflect practices of camps with different staffing ratios, turnover rates, or training programs. Third, the camp's cultural context emphasized outdoor, technology-free, communal living, an experience that may not align with the norms or expectations of youth and families from other cultural or socioeconomic backgrounds. These contextual factors suggest that the observed benefits may not extend equally to all camp settings. Future studies should aim to replicate these findings in more diverse settings to better establish the generalizability of camp-based mental health benefits. Lastly, while summer camps can serve as accessible settings for anxiolytic and therapeutic benefits, potential barriers must also be acknowledged. Participation may be limited by financial cost, geographic distance from camp locations, and availability of relevant programming. Additionally, not all campers may benefit equally from attendance, with the potential for iatrogenic effects, such as exacerbation of homesickness or anxiety in certain individuals. Continued efforts to expand the reach and effectiveness of these summer camps will help to reduce these potential barriers to participation.

Conclusion

The findings of these studies are especially meaningful from a public health perspective, given that the camps in the study, like the estimated 7000 in the United States, offer experiences that last just a few weeks, are less expensive than inpatient or outpatient treatment for anxiety and depression, do not carry any stigma associated with mental health care, and are accessible to a wide range of young people. The increase in post-pandemic mental health symptoms in children and adolescents has prompted the search for additional support. The meta-analysis provides preliminary evidence that overnight summer camps may be associated with a reduction in self-reported anxiety. Therefore, they should be considered a promising environment for combatting the increase in anxiety symptoms in children and adolescents following the COVID-19 pandemic. The prospectively collected, empirical data provide further evidence of the therapeutic potential of summer camp attendance in benefiting positive mood, negative mood, and self-confidence, suggesting that creating social support and connections could be vital in helping children hindered from social isolation. Despite the pandemic's conclusion, technology use and social isolation remain ubiquitous problems facing children and adolescents. These studies show that summer camp may provide meaningful social, emotional, and mental support for youth.

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tion, study design, initial manuscript preparation, manuscript revision), C.T. (study design, initial manuscript preparation, manuscript revision). Z.T. confirms full access to all data included in this study and takes responsibility for its integrity and accuracy of data analysis.

Declarations

Conflict of interest The authors have no known conflict of interest to disclose. No external funding was present for this research.

Ethical approval This research meets ethical guidelines.

Informed consent Informed consent was gathered from parents or legal guardians of participants with the approval of YMCA Camp Belknap.

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