A Meta-Analysis of Adventure Therapy Outcomes and Moderators

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Abstract: This study reports on a meta-analytic review of 197 studies of adventure therapy participant outcomes (2,908 effect sizes, 206 unique samples). The short-term effect size for adventure therapy was moderate (g = .47) and larger than for alternative (.14) and no treatment (.08) comparison groups. There was little change during the lead-up (.09) and follow-up periods (.03) for adventure therapy, indicating long-term maintenance of the short-term gains. The short-term adventure therapy outcomes were significant for seven out of the eight outcome categories, with the strongest effects for clinical and self-concept measures, and the smallest effects for spirituality/morality. The only significant moderator of outcomes was a positive relationship with participant age. There was also evidence that adventure therapy studies have reported larger effects over time since the 1960s. Publication bias analyses indicated that the study may slightly underestimate true effects. Overall, the findings provide the most robust meta-analysis of the effects of adventure therapy to date. Thus, an effect size of approximately .5 is suggested as a benchmark for adventure therapy programs, although this should be adjusted according to the age group.

Keywords: Adventure therapy, meta-analysis, program evaluation, treatment effectiveness.

INTRODUCTION

Adventure therapy programs utilise outdoor activities and experiential learning exercises to help participants to deal with their psychosocial problems. Adventure therapy is increasingly being used as a treatment approach with a range of clientele, including youth, adults and families [1, 2]. However, a systematic review of adventure therapy effectiveness is lacking and, in particular, a comprehensive meta-analysis is needed.

Adventure therapy is closely related to, or synonymous, with a variety of other terms, including wilderness therapy [3, 4], wilderness adventure therapy [5], wilderness experience programs [6], bush adventure therapy [7], adventure-based counselling [8-10], outdoor adventure intervention [1], therapeutic camping [11], and outdoor behavioral healthcare [12]. Gass *et al*. [2] suggested that adventure therapy involves prescriptive use of adventure experiences by mental health professionals. These experiences often occur in natural settings that kinaesthetically engage clients on cognitive, affective, and behavioural levels [2].

Adventure therapy programs are diverse, operating in many forms and settings around the world [13-17]. Adventure therapy predominantly takes place in the outdoors, however can also operate effectively indoors [18]. Activities often include ropes challenge courses, group games, trust activities and initiative experiences, residential camps, and wilderness-based expeditions [19]. Adventure therapy can be a primary method of treatment or an adjunct to other therapeutic interventions [13, 20]. Goals of adventure therapy often include developing psychosocial skills, reducing behavioural problems [2] (such as delinquent behaviour, substance abuse, and interpersonal problems within school, family and social settings), assisting with psychological problems (whether internalised or externalised), and enhancing psychological resilience.

Key elements that characterise adventure therapy and differentiate it from other psychotherapeutic treatment modalities include an emphasis on learning through experience (active and direct use of client participation and responsibility), presence of, and interaction with nature, use of perceived risk to heighten arousal and to create eustress (positive response to stress), meaningful engagement in adventure experiences, solution-based focus on positive change (present and future functional behaviour), ethic of care and support, holistic process and effect on participants, and group-based intervention such that psychosocial and group processes are often integral to the experience and treatment methodology [2, 21].

Program documentation, evaluation of outcomes, and analysis of factors that contribute to outcomes are needed to further inform the theory and development of adventure therapy programs. In addition, adventure therapy programs are increasingly expected to provide evidence of program effectiveness to stakeholders.

To date, a number of meta-analyses have been published in the areas of education [22], psychological training [23],

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psychotherapy [24, 25], and outdoor education [26-28]. However, a comprehensive meta-analysis of adventure therapy program outcome studies is lacking [29, 30]. Previous adventure therapy meta-analyses have had notable limitations. Staunton [31] and Baker [32] each conducted adventure therapy meta-analyses, however the number of included studies was small and they are unpublished. Wilson and Lipsey [33] and Bedard [34, 35] focused on wilderness therapy programs for juvenile delinquents. Hans [27] examined adventure therapy studies which measured locus of control outcomes. George [36] focused on Outdoor Behavioral Healthcare (OBH) programs for adolescents. Bunting and Donley [37] and Gillis and Speelman [26] focused on ropes course programs. Cason [38, 39] focused on adventure programs for adolescents. Hattie *et al.* [28] and Laidlaw [40] focused more broadly on adventure education programs. Finally, Marsh [41] conducted a meta-analysis of camping program self-concept and self-esteem studies. See Table **1** for a summary of previous adventure therapy and related meta-analyses.

Estimates of short-term effect sizes from previous adventure therapy and related intervention program meta-analyses range from .25 (small) to .55 (moderate), with a small-moderate positive average effect of .39 across all mentioned studies. Hattie *et al*. [28] completed the only previous related meta-analysis to investigate effects during the lead-in period and the longer-term. Hattie *et al*. found a very small negative non-significant lead-in effect (d = -.05, 316 effect sizes), a moderately positive significant short-term effect (d = .34, 1062 effect sizes) and a small positive non-significant long-term effect for adventure education studies (d = .17, 347 effect sizes). These effects are additive, so between baseline and follow-up, an overall adventure education effect of .46 could be expected. No previous meta-analytic studies have compared adventure therapy with alternative treatment or no treatment comparison groups.

The current study seeks to systematically identify empirical outcome studies about adventure therapy programs and analyse the short- and longer-term effects compared to alternative and no treatment groups. For the purpose of the current study, adventure therapy refers to intervention programs which utilise adventure-based activities for psychotherapeutic purposes. This study also examines the relationships between participant outcomes and possible sample, program, and participant moderators.

METHOD

Selection Criteria

The selection criteria for inclusion in this adventure therapy meta-analysis were adapted from Wilson and Lipsey [33] and George [36], and were:

1. The intervention program primarily used adventure-based activities for psychological and/or behavioural therapeutic purposes;

Table 1. Effects Sizes from Meta-analyses Related to Adventure Therapy[a]

Author/Year	Focus	Client Group	No. of Studies	No. of Effects	No. of Participants	ES Pre-Post
Baker [32]	Adventure Therapy	All	18	67	982	.42
Bedard; Bedard *et al*. [34, 35]	Wilderness Therapy	Juvenile Delinquents	23	37	2,042	.45
Bunting & Donley [37]	Challenge (Ropes) Course	All	15			.55
Cason & Gillis; Cason [38, 39]	Adventure Education	Adolescents	43	147	11,238	.31
George [36]	Outdoor Behavioral Healthcare	All	25	233	4,172	.45
Gillis & Speelman [26]	Challenge (Ropes) Course	All	44	390	2,796	.43
Hans [27]	Adventure Programming (Locus of Control)	All	24	30	1,632	.38
Hattie *et al*. [28]	Outdoor Education	All	96	1,062	12,057	.34
Laidlaw [40]	Outdoor Education	All	48	389	3,550	.49
Marsh [41]	Camping [Self-Concept & Self-Esteem)	Children/ Adolescents	22	37	1,139	.25
Staunton [31]	Adventure Therapy	All	17	95	~1,000	.42
Wilson & Lipsey [33]	Wilderness Therapy	Juvenile Delinquents	22	60	~3,000	.18
Total/Average[b]			397	3,213	43,608	.39

Note. [a]: Adapted from Neill [30, 42, 43]; [b]: There is sizeable overlap in studies used in these meta-analyses, hence the actual studies, effects and participants is less than this total. Additionally, the mean effect size is unweighted.

2. The study reported at least on pre- and post-program psychological and/or behavioural outcomes;
3. The study provided sufficient statistical information to allow calculation of standardised mean effect sizes (e.g., *M*, *SD*, and *n*);
4. The study was reported in 1960 or later, and in English.

Search and Coding

A systematic search of the following sources was conducted for relevant adventure therapy studies between February, 2012 and October, 2012:

1. Electronic data bases (including PsychInfo, Google Scholar, ERIC, ProQuest Dissertations & Theses (A&I)) using the search term (adventure OR outdoor OR wilderness OR nature OR eco* OR bush OR experien* OR recreation OR challenge OR rope* OR expedition OR school OR camp) AND (therap* OR psychotherap* OR treatment OR intervention OR counsel* OR healthcare OR program OR education OR course)
2. Specific journals (including Journal of Adventure Education and Outdoor Learning, Journal of Experiential Education, Journal of Therapeutic Wilderness Camping, Therapeutic Recreation Journal)
3. Specific websites and listservs (including http://wilderdom.com; http://leegillis.com/AT; ADV-THE-L; OUTRES)
4. Related meta-analyses [32, 33, 36, 38]
5. Direct emails to experts in the field
6. Bibliographies and reference lists

Identified and obtained studies which met the selection criteria were coded using a manual which was based on the manuals used by Lipsey and Wilson [44] and George [36], with care taken to avoid duplicate samples. The current study's coding manual is available from http://www.danielbowen.com.au/meta-analysis.

Data Analysis

Meta-analysis combines quantitative results from multiple studies to summarise empirical knowledge on a given topic [45]. Meta-analysis results are expressed as effect sizes which indicate the magnitude of a relationship or treatment effect. An effect size is calculated for each study and the effect sizes from each study are combined to compute an overall effect size [46].

This study used Hedges' *g* [47], a standardised mean effect size, because it adjusts for studies with small sample sizes. Hedges' *g* was calculated as the difference between the means on two different occasions (e.g., pre- and post-program) divided by the population standardised deviation $[(\bar{x}_1-\bar{x}_2)/\sigma]$. As the population standard deviation was rarely available, the pooled sample standard deviation was used and calculated as $S_p = \sqrt{[(n_1 - 1) * s_1^2 + (n_2 - 1) * s_2^2] / (n_1 + n_2 - 2)}$. Cohen's commonly referred to rule of thumb for interpreting standardised mean effect sizes is 0.20 (small), 0.50 (medium), and 0.80 (large) [48].

This study followed the meta-analytic methods described by Borenstein, Hedges, Higgins, and Rothstein [49], as follows:

1. A random-effects model was used. Fixed-effects models assume that there is one true effect size and that all differences in observed effects are due to sampling error. Random-effects models assume that study outcomes vary across studies, not only because of random sampling effects, but also because there are real differences in effectiveness between the studies [50].
2. A single mean effect size for each sample was calculated for each treatment type, outcome and outcome

Table 2. Outcome Categories Used in Adventure Therapy Research

Outcome Category (No. of Outcomes)	Description	Examples
Academic (4)	Scholastic performance and perception of learning ability	Academic performance (e.g., English, Math, Reading), GPA
Behaviour (8)	Capability of a person to act within and adjust to their environment	Home behaviour, recidivism, substance use, truancy
Clinical (30)	Psychological state and level of mental functioning	Anxiety, locus of control
Family Development (2)	Capability of a family to interact with each other	Family functioning, parent-child relationship
Morality/Spirituality (2)	Moral and spiritual beliefs and values a person holds	Morality, spirituality
Physical (2)	Level of bodily functioning and health	Weight, somatic
Self-Concept (11)	Thoughts about and perceptions of self	Self-control, self-efficacy
Social Development (8)	Capacity to interact within social situations	Alienation, social skills

Note. See http://www.danielbowen.com.au/meta-analysis for a list of the 67 outcomes which were coded within these 8 outcome categories.

category (see Table **2**), and time comparison.

3. A 0.5 correlation between the measurements across time was assumed (since it was rarely reported).

There were three treatment groups: Adventure Therapy included participants who completed an adventure therapy program, Alternative Treatment included participants in alternative, non-adventure therapy programs, and No Treatment included participants from control groups who did not participate in any form of therapy. There were three time comparisons: Base-Pre (Prior to program (Base) compared with beginning of program (Pre)) which indicated changes leading up to the start of the program; Pre-Post (Beginning of the program (Pre) compared with the end of the program (Post)) which indicated the short-term effect of the program; Post-Follow-Up (End of the program (Post) compared with a subsequent time (Follow-Up)) which indicated the long-term effect of the program.

Comprehensive Meta-Analysis (CMA) Version 2 software [51] was used to calculate effect sizes, statistical significance (*z* score, *p* value and confidence intervals), variance, standard error, and heterogeneity for each effect. *z* indicates the magnitude of an effect in standard deviation units [46]. If the *z* score exceeds the critical value (±1.96), it can be concluded that the result is statistically significant at the $p < .05$ level [52]. *p* indicates the probability of obtaining the finding by chance, and is a measure of how much evidence there is against the null hypothesis (H_0) of no change or no effect [53]. The smaller the *p* value, the more evidence there is against H_0. However, the *p* value does not indicate the strength or magnitude of the effect [45]. Confidence intervals (CI) indicate the range of values likely to include the true effect, and thus express the level of certainty associated with standardised mean effect size estimates [45]. A wide confidence interval implies poor precision, while a narrow confidence interval implies good precision. If the interval excludes zero, then the mean effect size is considered to be statistically significant [46]. Ninety-five percent confidence intervals were calculated for this study.

Variance is a measure of effect size dispersion, indicating the extent to which values are spread around a mean or population parameter [45]. Standard error is an estimate of the precision of the mean effect size [52]. A smaller standard error indicates a more precise estimate of the mean effect size and narrower confidence interval. Conversely, a larger standard error is indicative of an imprecise estimate of the mean effect size and larger confidence interval [46].

Heterogeneity is the extent of variation between effect sizes, which includes differences between studies with regards to outcomes (statistical heterogeneity), populations (clinical heterogeneity) and methods (methodological differences) [45]. Assessing heterogeneity helps to address the question: Do the individual effect size estimates reflect a common population effect size? [46]. CMA provides two tests of heterogeneity, Cochran's *Q* and I^2. *Q* signifies the amount of heterogeneity in effect sizes, and assesses the null hypothesis of homogeneity versus the alternate hypothesis of heterogeneity [49]. *Q* is distributed as a chi-square statistic with *k* (number of studies) minus 1 degree of freedom. Thus, *Q* is sensitive to the number of studies and therefore should be interpreted cautiously if there is inadequate or very high statistical power [52]. I^2 is the percentage of variability among effect sizes that exists between studies relative to the total variability among effect sizes (i.e., the ratio of true heterogeneity to total variation in observed effects) [52]. It indicates how heterogeneous the effect sizes are (the degree of inconsistency across studies) and is not dependent on the scale used in the meta-analysis [45]. I^2 is a ratio with a range of 0% to 100%, with low (or zero) values suggesting little or no heterogeneity and larger values representing greater heterogeneity [49]. $I^2 \sim 25\%$ indicates a small amount of heterogeneity, $I^2 \sim 50\%$ is a medium amount of heterogeneity, and $I^2 \sim 75\%$ is a large amount of heterogeneity [54]. In summary, both *Q* and I^2 will be low (or zero) if the total dispersion is low relative to the error within studies, and higher if the total dispersion is high relative to the error within studies [49].

Publication Bias

Assessment of publication bias was performed using Duval and Tweedie's [55] Trim and Fill method in CMA. Publication bias occurs when the published research does not represent the entire population of completed studies [56]. Publication bias may occur because investigators, reviewers, and editors are more likely to submit or accept manuscripts for publication when results are positive, significant, interesting, from large well-funded studies, or of higher quality [57]. Although a systematic and inclusive search for studies was made, publication bias may still exist and pose a threat to the validity of this meta-analysis. However, if this potential bias is ruled out or shown to not effect the findings, the validity and robustness of results and conclusions are strengthened [56]. To detect the presence of publication bias, Duval and Tweedie's [55] Trim and Fill method was used. Through use of a funnel plot, which plots the standard error on the vertical axis as a function of effect size on the horizontal axis, the number of missing studies is estimated (via trimming). Once identified, estimated effect sizes for the missing studies are generated and an adjusted estimate of the overall effect size is obtained.

Meta-Regression

To examine possible causes of variation within short-term adventure therapy outcomes, a meta-regression was conducted. Meta-regression is used to determine whether variation (heterogeneity) among outcomes is related to particular characteristics of the studies [58]. The dependent variable is the effect size and the independent variables (predictors) represent sample, program, and participant characteristics [59]. Investigation into the sources of heterogeneity in meta-analysis is by nature exploratory and based on sample-level variation, not participant-level variation, thus results should be interpreted with caution [60].

Weighted generalised least squares regression was performed separately for sample, program, and participant predictors using a random-effects model and restricted maxi-

mum likelihood (REML). The random-effects model takes into account between-study variation [61], while REML is a method of parameter estimation for linear random-effects models which maximises the likelihood over a restricted parameter space [62]. A backwards elimination regression was conducted manually, so that only the most significant sample, participant and program characteristics were retained in a single meta-regression.

Table 3. Adventure Therapy Sample Characteristics

Characteristic	Sample *N* (%)		Participant *N* (%)	
Publication Year				
1960-1969	4	(1.9)	289	(1.6)
1970-1979	15	(7.3)	961	(5.4)
1980-1989	36	(17.5)	2,181	(12.3)
1990-1999	55	(26.7)	3,176	(17.9)
2000-2009	72	(35.0)	7,486	(42.2)
2010-2012	24	(11.7)	3,635	(20.5)
Publication Type				
Published (Article, Book, Report)	87	(42.2)	10,050	(56.7)
Non-Published (Thesis or Dissertation)	119	(57.8)	7,678	(43.3)
Study Sample Size				
≤ 50	104	(50.5)	2,565	(14.5)
51-100	60	(29.1)	4,248	(24.0)
101-150	16	(7.8)	2,000	(11.2)
151 +	26	(12.6)	8,915	(50.3)
Methodological Quality Rating Scale (MQRS)				
Study Design				
Single Group (Pre/Post)	115	(55.8)	10,907	(61.5)
Quasi-Experimental	75	(36.4)	6157	(34.8)
Randomisation with Control Group	16	(7.8)	664	(3.7)
Considered Replicable	193	(93.7)	15,554	(87.7)
Baseline Data Reported	206	(100.0)	17,728	(100.0)
Quality Control	206	(100.0)	17,728	(100.0)
Follow-Up Length				
0 ≤ 6 Months	178	(86.4)	14,555	(82.1)
6-11 Months	12	(5.8)	917	(5.2)
≥12 Months	16	(7.8)	2,256	(12.7)
Follow-Up Rate				
0 ≤ 70% Completion	187	(90.8)	16,169	(91.2)
70-84% Completion	4	(1.9)	501	(2.8)
>85% Completion	15	(7.3)	1,058	(6.0)
Collaterals Interviewed	16	(7.8)	892	(5.0)
Objective Verification of Self-Report Data	29	(14.1)	1,723	(9.7)
Dropouts Discussed	193	(93.7)	16,808	(94.8)
Appropriate Analysis	206	(100.0)	17,728	(100.0)

Moderator Analysis

In addition to the meta-regression, a break-down of effect sizes across sample (publication year, type of publication, sample size, methodological quality), program (funding type, use of adventure, program delivery, group structure, placement type, program type, program model, daily duration and program length) and participant (mean age, sample source, race, gender, population, issue) moderators is provided. Quality was examined using the Methodological Quality Rating Scale (MQRS). The MQRS contains 12 items for rating a study, including design, quality control, follow-up length, and attrition [45]. Ratings closer to 0 indicate poorer methodological quality, while ratings closer to 16 indicate better quality [63].

RESULTS

Descriptive statistics about the adventure therapy samples, programs and participant characteristics are presented, followed by overall effect sizes and effect sizes by time comparison and treatment group, publication bias analysis, and meta-regression.

Descriptive Statistics

Sample, program and participant characteristics are summarised in Tables **3**, **4**, and **5** respectively. Overall, there were 2,908 effect sizes from 206 unique samples within 197 studies of adventure therapy programs published between 1967 and 2012 (see **APPENDIX A** for a list of studies). There were three treatment types: Adventure Therapy (2,275; 78%), Alternative Treatment (335; 12%), and No Treatment (298; 10%) and three time comparisons: Base-Pre (55; 2%), Pre-Post (2,274; 78%), and Post-Follow-Up (579; 20%).

This study represents 17,728 unique participants (M = 86.1 per study; SD = 148.3), of whom 62% were male and 38% female. The average participant age ranged between 9 and 65 years (M = 17; SD = 7). The median program duration was 26 days (M = 64, SD = 148, min. = 1, max. = 534). The mean length of time between Base and Pre measures was 21 days (SD = 15) and between Post and Follow-up was 181 days (SD = 276).

There has been a steady increase in the number of adventure therapy studies since 1960 (see Table **3**). There were slightly more unpublished theses than published papers. Studies most commonly had 50 participants or less, utilised single group Pre-Post designs, and did not collect follow-up data. Methodological Quality Rating Scale (MQRS) scores ranged from 3 to 13 [45, 63]. The average MQRS score of 6.94 (SD = 1.76) for all 206 samples indicates moderate methodological quality.

Adventure therapy programs most commonly involved privately paying participants, utilised adventure therapy as the primary treatment, were delivered over a continuous period of time (rather than intermittently), and had a closed group structure with leaders and participants beginning and ending the program together. The programs typically involved participants who were placed in the program by parents or custodial authorities, used ropes challenge courses, and involved the participant group being together 24/7 for the duration of the program (see Table **4**). These programs ranged in length from 1 to 534 days, with 78% of programs running between 3 to 80 days in length.

Participants were most commonly between 10 and 17 years old, resided in the USA, were male, identified as at-risk (but did not have a clinical diagnosis and were non-delinquent), Caucasian, and participated in adventure therapy programs for a combination of reasons (see Table **5**).

Effect Sizes

Overall effect sizes by Treatment Group (Adventure Therapy, Alternative Treatment, and No Treatment) and Time Comparison (Base-Pre, Pre-Post, Post-Follow-Up) are summarised in Table **6**. There was a small, positive, non-significant effect for the Adventure Therapy group during the lead-in period (.09). The Pre-Post Adventure Therapy effect size was moderate, positive and significant (.47), and larger than the small positive significant effects for Alternative Treatment (.14) and No Treatment (.08). The longer-term effect for the Adventure Therapy group was very small, positive and non-significant (.03), indicating retention of the short-term gains. The Alternative Treatment group long-term effects were very small, negative and non-significant (-.03), whilst Alternative Treatment long-term effects were small, negative and non-significant (-.08). Fig. (**1**) presents a stem-and-leaf diagram of the Adventure Therapy Pre-Post effects, ordered from the smallest to the largest effect size.

Effect sizes for each Outcome Category, Treatment Group and Time Comparison, are presented in Tables **7** to **13**. Detailed breakdown of effect sizes by each of the 67 specific outcomes for the Adventure Therapy group can be obtained from http://www.danielbowen.com.au/meta-analysis.

The Base-Pre Adventure Therapy effect (see Table **7**) was small, positive, and not significant (.09). The only significant change was for Academic outcomes (.26). There was very little heterogeneity in the Base-Pre analysis, possibly due to the small number of studies in each category.

The short-term effects of Adventure Therapy, Alternative and No treatment groups for the eight outcome categories are shown in Tables **8** to **10**, respectively. Overall, Adventure Therapy outcomes were moderate, positive and statistically significant (47), ranging in size from small (Morality/ Spirituality, .17) to moderate (Clinical, .50) (see Table **8**), with significant change in all outcome categories except Morality/Spirituality. Cochran's Q and I^2 indicated a large amount of heterogeneity for the Adventure Therapy outcomes.

Overall, the short-term effect sizes for Alternative Treatment were positive, small and statistically significant (.14) and ranged in size from small negative (Family Development, -.19) to small positive (Clinical, .15) (see Table **9**), with significant changes for the Clinical, Self-Concept and Social Development outcome categories. Cochran's Q and I^2 indicated medium heterogeneity for the Alternative Treatment short-term effects.

Table 4. Adventure Therapy Program Characteristics

Characteristic	Sample *N* (%)		Participant *N* (%)	
Funding Type				
Private	157	(76.2)	15,055	(84.9)
Public	49	(23.8)	2,673	(15.1)
Therapeutic Mode				
Primary	141	(68.4)	12,039	(67.9)
Adjunctive	65	(31.6)	5,689	(32.1)
Program Delivery				
Continuous	133	(64.6)	12,185	(68.7)
Intermittent	73	(35.4)	5,543	(31.3)
Group Structure				
Closed Group	184	(89.3)	13,552	(76.4)
Open Group	22	(10.7)	4,176	(23.6)
Placement Type				
Private	174	(84.5)	15,777	(89.0)
Adjudicated	32	(15.5)	1,951	(11.0)
Expedition				
Contained	51	(24.8)	3,318	(18.7)
Continuous-Flow	4	(1.9)	287	(1.6)
Base-Camp	9	(4.4)	383	(2.2)
Residential	13	(6.3)	874	(4.9)
Mixed (Combination of these Types)	39	(18.9)	5,582	(31.5)
Not Specified/ None of the Above	90	(43.7)	7,284	(41.1)
Program Model				
Base Camp	10	(4.9)	606	(3.4)
Expedition	55	(26.7)	3,693	(20.8)
Residential	8	(3.9)	625	(3.5)
Outpatient	1	(0.5)	33	(0.2)
Multiple	44	(21.4)	5,638	(31.8)
Ropes/Challenge/Adventure-Based	88	(42.7)	7,133	(40.2)
Program continuity				
Residential	121	(58.7)	11,222	(63.3)
Outpatient	33	(16.0)	2,464	(13.9)
Mixed	52	(25.2)	4,042	(22.8)
Program Length (Days)				
1-2	17	(8.3)	843	(4.8)
3-7	27	(13.1)	1724	(9.7)

Table 4. Contd.....

Characteristic	Sample *N* (%)		Participant *N* (%)	
8-14	24	(11.7)	1651	(9.3)
15-21	27	(13.1)	1866	(10.5)
22-45	48	(23.3)	3681	(20.8)
46-80	34	(16.5)	2559	(14.4)
81-150	14	(6.8)	986	(5.6)
151+	11	(5.3)	2056	(11.6)
Not Specified	4	(1.9)	2362	(13.3)

Table 5. Adventure Therapy Participant Characteristics

Characteristic	Sample *N* (%)		Participant *N* (%)	
Average Age				
≤9 Years	4	(1.9)	178	(1.0)
10-14 Years	68	(33.0)	7,292	(41.1)
15-17 Years	81	(39.3)	6,616	(37.3)
18+ Years	28	(13.6)	2,010	(11.3)
Mixed (e.g., Families)	7	(3.4)	680	(3.8)
Not Specified	18	(8.7)	952	(5.4)
Location				
Asia	7	(3.4)	316	(1.8)
Australia	26	(12.6)	1457	(8.2)
Canada	7	(3.4)	536	(3.0)
Europe	2	(1.0)	150	(0.8)
New Zealand	3	(1.5)	145	(0.8)
USA	161	(78.2)	15,124	(85.3)
Race				
> 60% Caucasian	78	(37.9)	8,013	(45.2)
> 60% Minority	26	(12.6)	1,727	(9.7)
Mixed, No Race > 60%	15	(7.3)	1,152	(6.5)
Not Specified	87	(42.2)	6,836	(38.6)
Gender				
> 50% Female	37	(18.0)	2,565	(14.5)
> 50% Male	139	(67.5)	13,055	(73.6)
Not Specified	30	(14.5)	2,108	(11.9)
Target Group				
At-Risk	120	(58.3)	11,225	(63.3)
Clinical	54	(26.2)	4,552	(25.7)

Table 5. Contd.....

Characteristic	Sample *N* (%)		Participant *N* (%)	
Adjudicated	32	(15.5)	1,951	(11.0)
Identified Focus				
Abuse Victims (Physical, Emotional or Sexual)	4	(1.9)	216	(1.2)
Adjudicated Youth	32	(15.5)	1,951	(11.0)
Behaviour Disordered	19	(9.2)	1,161	(6.5)
Disabilities	5	(2.4)	255	(1.4)
Educationally Disengaged	21	(10.2)	1,391	(7.8)
Emotionally Disturbed	11	(5.3)	789	(4.5)
Families	6	(2.9)	708	(4.0)
Mental Health	30	(14.6)	2,471	(13.9)
Mixed	40	(19.4)	5,007	(28.2)
Physical (e.g., Brain Injury, Weight-Loss, Etc.)	12	(5.8)	1,656	(9.3)
Substance Abuse	12	(5.8)	1,199	(6.8)
Welfare	14	(6.8)	924	(5.2)

Table 6. Overall Effect Sizes for Treatment Group by Time Comparison

	Adventure Therapy			Alternative Treatment			No Treatment		
Time Comparison	***g***	***V***	***N***	***g***	***V***	***N***	***g***	***V***	***N***
Base-Pre	.09	.00	55						
Pre-Post	.47	.00	1785	.14	.00	244	.08	.00	245
Post-FU	.03	.03	435	-.03	.00	91	-.08	.01	53

Note. *g* = Hedges' *g*; *V* = Variance; *N* = Number of effect sizes; FU = Follow-Up.

Table 7. Base-Pre Adventure Therapy Effect Sizes by Outcome Category

Outcome Category	$N_{Samples}$	N_{ES}	*g* (*V*)	SE	95% CI	*z* (*p*)	*Q* (*p*)	I^2
Academic	3	8	.26 (.01)	.12	.02: .49	2.12 (.034)	0.43 (.808)	.00
Behaviour	2	5	-.10 (.02)	.13	-.36: .15	-0.78 (.436)	0.00 (.961)	.00
Clinical	6	8	.20 (.01)	.12	-.03: .43	1.68 (.093)	4.13 (.531)	.00
Family Development	1	1	.20 (.02)	.15	-.09: .50	1.35 (.179)		
Physical	1	1	.03 (.06)	.24	-.45: .51	0.13 (.896)		
Self-Concept	8	19	.05 (.01)	.07	-.09: .18	0.70 (.483)	1.38 (.986)	.00
Social Development	5	13	.10 (.01)	.07	-.04: .25	1.40 (.162)	0.49 (.974)	.00
Total	9	55	.09 (.00)	.07	-.04: .22	1.36 (.174)	1.48 (.993)	.00

14	≤-0.7	
9	-0.6	37&
13	-0.5	1258&
20	-0.4	023468&
30	-0.3	0125566789&
47	-0.2	0122334556677899
58	-0.1	00011223444566777889
82	-0.0	011112223334455566666778899
185	0.0	000000000000001111222222333333344445555566666677778888888999999
179	0.1	00000011111222222333333444445555566666666677777888888999999
200	0.2	000000111111222222223333334444444455555666666777777777888888899999
195	0.3	00000000011111112222222333344444555555666666666677777788888889999
154	0.4	0000001111222233444455555555566666777777888899999
130	0.5	000011122223334444455555555555666677778899 9
95	0.6	00001111122333445566667778888 99
83	0.7	001122233444555566677778889
45	0.8	00112234455677899
52	0.9	00112333444556789
40	1.0	0122334556789
28	1.1	1223345578&
19	1.2	0345679&
20	1.3	024569&
2	1.4	0
85	>1.4	

Frequency Stem & Leaf (each leaf = 3 case(s); & denotes fractional leaves)

Fig. (1). Stem-and-leaf diagram of all effect sizes for the Pre-Post Adventure Therapy programs.

Table 8. Pre-Post Adventure Therapy Effect Sizes by Outcome Categories

Outcome Category	$N_{Samples}$	N_{ES}	*g* (*V*)	SE	95% CI	*z* (*p*)	*Q* (*p*)	I^2
Academic	61	132	.41 (.00)	.04	.33: .50	9.38 (.000)	214.61 (.000)	72.04
Behaviour	84	223	.41 (.00)	.05	.31: .51	8.38 (.000)	545.87 (.000)	84.80
Clinical	137	595	.50 (.00)	.04	.42: .59	11.73 (.000)	1,274.59 (.000)	89.33
Family Development	33	106	.36 (.01)	.07	.23: .50	5.26 (.000)	173.60 (.000)	81.57
Morality/Spirituality	9	12	.17 (.01)	.09	-.01: .35	1.83 (.067)	15.93 (.043)	49.78
Physical	13	21	.32 (.01)	.11	.10: .55	2.84 (.004)	63.60 (.000)	81.13
Self-Concept	137	391	.43 (.00)	.03	.36: .49	13.60 (.000)	513.76 (.000)	73.53
Social Development	107	305	.42 (.00)	.04	.34: .49	11.03 (.000)	502.68 (.000)	78.91
Total	205	1,785	.47 (.00)	.03	.41: .53	15.11 (.000)	1,293.05 (.000)	84.22

Table 9. Pre-Post Alternative Treatment Effect Sizes by Outcome Categories

Outcome Category	$N_{Samples}$	N_{ES}	*g* (*V*)	SE	95% CI	*z* (*p*)	*Q* (*p*)	I^2
Academic	12	14	.10 (.01)	.07	-.04: .23	1.40 (.162)	21.48 (.029)	48.79
Behaviour	17	24	.10 (.00)	.06	-.02: .23	1.63 (.104)	31.99 (.010)	49.99
Clinical	29	94	.15 (.01)	.07	.02: .29	2.17 (.030)	105.25 (.000)	73.40
Family Development	3	6	-.19 (.03)	.19	-.56: .17	-1.05 (.295)	5.51 (.064)	63.67
Physical	3	3	.03 (.02)	.13	-.22: .29	0.26 (.795)	2.52 (.283)	20.70
Self-Concept	29	62	.12 (.00)	.05	.01: .22	2.21 (.027)	61.26 (.000)	54.30
Social Development	20	41	.12 (.00)	.06	.00: .24	1.97 (.048)	41.96 (.002)	54.72
Total	42	244	.14 (.00)	.05	.05: .23	3.08 (.002)	88.31 (.000)	53.57

Table 10. Pre-Post No Treatment Effect Sizes by Outcome Categories

Outcome Category	$N_{Samples}$	N_{ES}	*g* (*V*)	SE	95% CI	*z* (*p*)	*Q* (*p*)	I^2
Academic	18	32	-.01 (.00)	.05	-.10: .09	-0.10 (.919)	10.00 (.904)	0.00
Behaviour	16	36	-.01 (.00)	.06	-.12: .11	-0.12 (.904)	22.20 (.103)	32.44
Clinical	20	41	.10 (.00)	.04	.03: .17	2.88 (.004)	18.11 (.515)	0.00
Family Development	10	19	.12 (.01)	.08	-.03: .27	1.60 (.109)	15.15 (.087)	40.60
Morality/Spirituality	4	5	.01 (.06)	.24	-.46: .48	0.04 (.968)	12.86 (.005)	76.68
Self-Concept	30	65	.02 (.00)	.05	-.04: .09	0.69 (.489)	28.20 (.507)	0.00
Social Development	22	47	.00 (.00)	.04	-.08: .08	0.05 (.962)	11.25 (.958)	0.00
Total	41	245	.08 (.00)	.03	.02: .13	2.72 (.007)	30.98 (.846)	0.00

Table 11. Post-Follow-Up Adventure Therapy Effect Sizes by Outcome Categories

Outcome Category	$N_{Samples}$	N_{ES}	*g* (*V*)	SE	95% CI	*z* (*p*)	*Q* (*p*)	I^2
Academic	16	28	.05 (.00)	.06	-0.07: 0.15	0.80 (.424)	21.63 (.118)	30.66
Behaviour	21	52	.21 (.00)	.05	0.12: 0.31	4.47 (.000)	25.81 (.172)	22.50
Clinical	34	122	.01 (.00)	.05	-0.08: 0.11	0.25 (.802)	65.96 (.001)	49.97
Family Development	11	21	-.05 (.00)	.06	-0.17: 0.08	-0.73 (.468)	14.55 (.149)	31.26
Morality/Spirituality	2	3	.11 (.20)	.45	-0.77: 1.00	0.25 (.804)	5.06 (.025)	80.23
Physical	3	4	.23 (.06)	.24	-0.24: 0.70	0.95 (.344)	6.93 (.031)	71.15
Self-Concept	41	115	-.03 (.00)	.05	-0.12: 0.06	-0.72 (.472)	99.11 (.000)	59.64
Social Development	26	90	-.06 (.00)	.06	-0.17: 0.05	-1.05 (.293)	53.53 (.001)	53.30
Total	55	435	.03 (.00)	.03	-0.04: 0.09	0.81 (.425)	96.18 (.000)	43.86

Table 12. Post-Follow-Up Alternative Treatment Effect Sizes by Outcome Categories

Outcome Category	$N_{Samples}$	N_{ES}	*g* (*V*)	SE	95% CI	*z* (*p*)	*Q* (*p*)	I^2
Academic	4	4	.00 (.01)	.10	-.20: .21	0.02 (0.983)	4.08 (.253)	26.54
Behaviour	6	11	.17 (.01)	.10	-.01: .36	1.81 (0.070)	8.12 (.150)	38.43
Clinical	9	33	-.11 (.01)	.11	-.32: .10	-1.01 (0.312)	16.55 (.040)	51.67
Family Development	2	3	-.06 (.01)	.11	-.28: .16	-0.53 (0.599)	0.30 (.584)	0.00
Physical	2	2	-.20 (.09)	.29	-.78: .37	-0.69 (0.492)	4.71 (.030)	78.78
Self-Concept	11	26	-.04 (.01)	.08	-.20: .11	-0.56 (0.579)	15.42 (.118)	35.14
Social Development	5	12	.00 (.01)	.12	-.24: .24	0.00 (1.000)	8.45 (.076)	52.69
Total	15	91	-.03 (.00)	.05	-.13: .07	-0.62 (0.537)	10.47 (.727)	0.00

The overall short-term effect size for No Treatment was small, positive and statistically significant (.08) and ranged from very small and negative (Academic, -.01 and Behaviour, -.01) to small and positive (Family Development, .12) (see Table **10**). The only significant short-term change for No Treatment participants was for the Clinical outcome category (.10). Cochran's *Q* and I^2 indicated a small to medium amount of heterogeneity for the No Treatment group Pre-Post effects.

The longer-term or follow-up effect sizes for each outcome category for the Adventure Therapy, Alternative and No treatment groups are shown in Tables **11** to **13**. Overall, the longer-term effect sizes for Adventure Therapy were very small, positive, and not statistically significant (.03),

indicating retention of short-term gains, and ranging in size from very small negative (Social Development, -.06) to small positive (Physical, .23) (see Table **11**). The only significant longer-term change for Adventure Therapy was small and positive for the Behaviour outcome category (.21). Cochran's *Q* and I^2 indicated a moderate to large amount of heterogeneity for the Adventure Therapy group long-term effects.

The overall longer-term effect size for Alternative Treatment was very small, negative, and not statistically significant (-.03) with effect sizes for the outcome categories ranging from small and negative (Physical, -.20) to small and positive (Behaviour, .17) (see Table **12**). There were no significant longer-term changes for Alternative Treatment. Cochran's *Q* and I^2 indicated a medium to large amount of heterogeneity for the Alternative Treatment group longer-term effect sizes.

The overall longer-term effect sizes for No Treatment were small, negative, and not statistically significant (-.08) and ranged in size from small and negative (Clinical, -.20) to small and positive (Family Development, .14) (see Table **13**). There were no significant longer-term changes for No Treatment. Cochran's *Q* and I^2 indicated little heterogeneity for the No Treatment group longer-term effect sizes, possibly due to the small number of effects.

Publication Bias

The Trim and Fill method (55) was used to test for publication bias. This suggested that 18 Pre-Post adventure therapy studies with higher than average effect sizes were missing (see Fig. **2**). Without these imputed studies, Hedges' *g* was .47 (95% CI: .41-.53). Using Trim and Fill, Hedges' *g* was estimated to be slightly higher (.52; 95% CI: .46-.58). For the Base-Pre and Post-Follow-Up time comparisons for the Adventure Therapy studies, the Trim and Fill method suggested that no studies were missing and thus the estimates of Hedges' *g* remained the same.

Meta-Regression

Meta-regression was used to investigate the extent to which sample, program and participant characteristics explain the variation in short-term Adventure Therapy effect sizes. Due to a large number of predictors, three separate meta-regressions were conducted, one each for sample, program and participant variables. Sample characteristics (publication year, type of publication, sample size, methodologi-

Table 13. Post-Follow-Up No Treatment Effect Sizes by Outcome Categories

Outcome Category	$N_{Samples}$	N_{ES}	*g* (*V*)	SE	95% CI	*z* (*p*)	*Q* (*p*)	I^2
Academic	2	4	-.14 (.02)	.13	-.41: .12	-1.06 (.290)	0.00 (.962)	0.00
Behaviour	3	10	-.08 (.01)	.12	-.32: .15	-0.71 (.480)	0.11 (.945)	0.00
Clinical	5	13	-.20 (.04)	.19	-.58: .17	-1.05 (.294)	10.53 (.032)	62.01
Family Development	1	2	.14 (.02)	.14	-.14: .42	0.97 (.331)		
Self-Concept	6	9	-.01 (.01)	.09	-.18: .18	-0.10 (.918)	2.02 (.846)	0.00
Social Development	3	15	-.04 (.01)	.12	-.26: .19	-0.32 (.753)	0.30 (.860)	0.00
Total	7	53	-.08 (.01)	.08	-.24: .09	-0.90 (.368)	5.34 (.501)	0.00

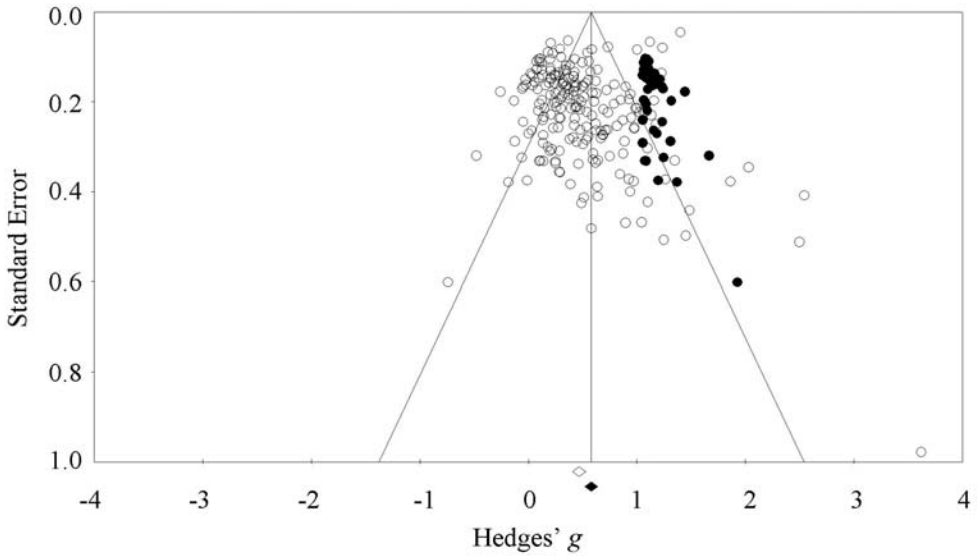

Fig. (2). Trim and Fill funnel plot for Adventure Therapy Pre-Post effect sizes: observed (circles) and imputed (solid black circles).

cal quality) explained 5.6% (Q (7) = 9.83, p = .20, n = 205) of the variance. Program characteristics (funding type, use of adventure, program delivery, group structure, placement type, program type, program model, daily duration and program length) explained 11.5% (Q (18) = 18.73, p = .41, n = 201) of the variance. Participant characteristics (mean age, sample source, race, gender, population, issue) explained 27.0% of the variance (Q (23) = 32.90, p = .08, n = 157).

Backwards elimination was conducted manually in order to concentrate on significant predictors. Only age was found to be a significant predictor, accounting for 6.8% of the variance (Q (1) = 8.28, p = .00; n = 157), indicating that larger effect sizes tended to be reported in studies with older age groups (β = .014, p = .004, n = 157, 95% CI = .004-.024).

Moderator Analysis

Although the meta-regression only identified participant age as a significant moderator of outcomes, breakdown of short-term Adventure Therapy effect sizes across all sample, program, and participant characteristics is provided in **APPENDIX B** (Tables **B1**, **B2** and **B3**, respectively), as it may be useful for future studies to make comparisons with and between specific sub-groups. For example, it is notable that effect sizes appear to have increased over time, doubling from .24 in the 1960s to over .50 since 2000. In addition, adventure therapy studies with participants aged 9 years or younger yielded a small effect (.24), 10 and 14 years a small-to-medium effect (.37), 15 to 17 years a moderate effect (.50), and 18 years and over a moderately large effect (.66).

DISCUSSION

This study offers a comprehensive meta-analytic review of empirical adventure therapy participant outcome studies. Outcomes for three treatment groups (Treatment, Alternative Treatment, No Treatment) were compared and, where available, three time comparisons were reported (Base-Pre, Pre-Post, and Post-Follow-Up). The study also examined variation across different outcomes, studies, programs, and participants.

Outcomes and Publication Bias

Overall, there were moderately positive, significant short-term changes in measured outcomes between the beginning and end of adventure therapy programs (.47), whereas there were no significant short-term changes for the alternative (.14) and no treatment groups (-.03). Furthermore, the short-term adventure therapy participant changes were sustained in the longer-term.

There was little change during the lead-in period for adventure therapy participants, consistent with Hattie *et al.*'s [28] meta-analysis of adventure education studies. Adventure therapy programs often establish more contact with participants during the lead-in period than do adventure education programs, perhaps contributing to the slightly beneficial effects (.09 compared to -.05).

For short-term program outcomes, adventure therapy groups reported greater change (.47) than the alternative (.14) and no treatment groups (.08). Based on a Fisher z transformation, a short-term effect size of .47 is equivalent to an increase of 23.5% in the measured outcomes. For adventure therapy, short-term outcomes were significant for seven of the outcome categories (but not Spirituality/Morality) and were reasonably consistent across the outcome categories, with the strongest outcomes for clinical and self-concept measures. Assessment of publication bias for the adventure therapy group estimated that .47 is a conservative estimate of short-term adventure therapy program effects. No studies appeared to be missing for lead-in and follow-up time comparisons.

The overall effect size of .47 is reasonably consistent with previous adventure therapy meta-analyses (mid .4: 31, 32, 36), and slightly higher than for outdoor education program outcomes which are typically between .3 and .4 (mid .3: 27, 28, 38). Adventure therapy outcomes, however, for the most part are not as strong as for one-on-one psychotherapy (see 23). There are several noteworthy differences between adventure therapy and more traditional forms of psychotherapy, including group- versus individual-based, duration of treatment, and quantity of therapeutic contact. Alternative treatment short-term overall effects were small, positive and not significant (.14), as were the no treatment group effects (.08). Thus, the outcomes for the adventure therapy group compared favourably with the negligible effects of the alternative treatment and no treatment groups (< .1). Clearly, there were more beneficial outcomes associated with participating in adventure therapy programs.

The longer-term (Post-Follow-up) effect sizes for adventure therapy were very small, positive and not significant (.03), indicating retention of short-term changes. This finding is lower than Hattie *et al.*'s [28] small positive non-significant long-term effect for adventure education (.17). The follow-up effect was not significant for all outcome categories except Behaviour, for which there were additional, significant positive effects following the program completion (.21). Alternative treatment longer-term follow-up effects were negligible (-.03), as were the no treatment longer-term effects (-.08). Overall, these findings indicated that adventure therapy is effective in facilitating short-term change compared to alternative and no treatment, and that these changes are retained over the longer-term.

Meta-Regression, Moderators, and Benchmarking

Meta-regression analyses found that sample, program and participant variables, in general, did not explain heterogeneity in the effect sizes of adventure therapy programs. Participant age was the only significant moderator, accounting for 6.8% of the variance in short-term adventure therapy program effects. Stronger outcomes were evident for older participants, thus age-based benchmarks should be used for program evaluation. Older participants are more likely to voluntarily participate, whereas younger participants are more likely to be forced, coerced or otherwise influenced to participate. In addition, older participants tend to have greater cognitive capacity for decision-making, problem-solving, abstract thinking, reasoning, and self-regulation [64]. Other sample, program and participant characteristics explained little variance, although adventure therapy effect sizes appear to have increased since the 1960s. It seems

likely that there has been a general improvement over time in the quality of adventure therapy programs and the measures used to evaluate programs.

In summary, this meta-analytic review of empirical studies of adventure therapy program effectiveness found moderate, positive, significant short-term effects, with maintenance of the short-term gains in the longer-term. Age appeared to moderate the effectiveness of adventure therapy programs, with stronger outcomes for adult-aged participants. In addition, adventure therapy studies since the 1960s have tended to report larger effect sizes. These findings suggest that adventure therapy offers a moderately effective treatment modality for improving psychological and/or behavioural functioning, and can be a beneficial counterpart to already established treatments.

As the most comprehensive meta-analysis of adventure therapy studies to date, the findings from this study can be recommended for use in benchmarking and monitoring program effectiveness. A program's relative efficacy can be determined by comparing its outcomes with relevant meta-analytic findings. Adventure therapy programs with an overall effect size between approximately .4 and .6 are within the expected range, with values below indicating weaker effects and values above indicating stronger than expected effects. However, effect sizes between .3 and .5 are more typical of programs for 9 to 17 year olds, whilst effect sizes between .5 and .7 are more typical for participants aged 18 years and over. For more detailed benchmarking of results, comparisons should be made with specific outcome categories and/or specific outcomes, although this should be done with caution as sub-samples may be small and heterogeneous.

Limitations and Recommendations for Future Research

Although this meta-analytic study demonstrated that adventure therapy programs are, on the whole, an effective intervention, several limitations should be considered, including availability of studies, heterogeneity, generalisability, type of data provided by empirical studies, and the methodological quality of studies.

Considerable effort was made to obtain the entire population of completed studies, however publication bias analyses indicated that the identified studies may have slightly underestimated the true adventure therapy effects.

Effect sizes exhibited considerable heterogeneity which was not well explained by the moderators in the current study. There was often a sizable discrepancy in effect sizes between different studies which measured the same outcome. Thus, more needs to be done to help understand and explain the apparent diversity in adventure therapy outcomes. More detailed program descriptions in adventure therapy participant outcomes could be helpful.

Only a small percentage of adventure therapy programs undergo empirical program evaluation (Neill [30] indicated less than 1%). In addition, only studies reported in English were included, although adventure therapy programs are increasingly being utilised in non-English cultures [13-17]. Thus, findings from this meta-analysis may be limited in their cross-cultural generalisability.

Although the methodological quality of adventure therapy studies was often limited, methodological quality was not a significant moderator. A substantial number of studies did not provide matched samples when reporting outcomes (i.e., there was a discrepancy between pre *N* and post *N*), thus the smaller *N* was used in order to be conservative. Empirical outcome studies should provide matched sample results, with details of drop outs.

Many potential studies did not provide sufficient information to calculate effect sizes. Researchers should provide means, standard deviations and sample sizes for each outcome at each measured time point. Where possible, baseline and follow-up data should be provided in addition to pre-program and post-program data, based on a range of outcome measures. In addition, a substantial proportion of studies did not provide relevant study, program, and participant information for use in moderator analyses.

It is worth noting that there are two different kinds of standardised mean effect sizes commonly used in meta-analytic studies. A standardised mean effect size can be calculated as the difference between scores at two different times for a treatment group. Alternatively, a standardised mean difference effect size can be calculated as the difference between post-treatment means for a treatment group and a comparison group. Both methods involve subtracting means and then dividing by the standard deviation, but the Pre-Post standardised mean effect size indicates the degree of change over time in a single group, while the standardised mean difference effect size provides an indication of the differences between two separate groups. It is not appropriate to combine these two types of effect sizes into one aggregate mean effect size [44]. Although a number of previous meta-analyses in this area of research have combined these two types of effect sizes, this study only used the standardised mean change effect size. This meant that studies which only reported post-test results for the treatment and control groups were not included (N = 50; see http://www.danielbowen.com.au/meta-analysis for a list of these studies). Because of this approach, findings may not be representative of all outcomes (e.g., many recidivism studies were not included in the current study).

The average MQRS score was moderate, with only nine studies achieving a high rating. Although MQRS scores were not related to findings, high quality research is needed to strengthen the reliability, validity, and usability of adventure therapy research. Future research on adventure therapy programs could utilise resources such as the MQRS when designing research studies. Gass *et al*. [(2; Appendix D)] also provided a useful rubric for evidence-based research on adventure programs. The majority of studies utilised psychometrically validated assessment tools and reported the tools' psychometric properties, however several studies used less well developed assessment tools which are likely to limit the reliability and validity of findings. Psychometrically validated assessment tools should be used and the psychometric properties of instrumentation should be reported.

Conclusion

This study provides the most comprehensive and robust meta-analysis of adventure therapy program outcomes to

date. This study compared adventure therapy outcomes with alternative and no treatment groups and analysed changes over multiple time points. The results indicate that adventure therapy programs are moderately effective in facilitating positive short-term change in psychological, behavioural, emotional, and interpersonal domains and that these changes appear to be maintained in the longer-term. Participant age positively predicted outcomes, however little variance was explained by other moderators. These meta-analytic results can be used as comparative benchmarks in adventure therapy program evaluation studies. However, further investigation is needed to better understand the considerable variability in adventure therapy outcomes.

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CONFLICT OF INTEREST

The authors confirm that this article content has no conflicts of interest.

APPENDIX A

List of Studies Included in Meta-Analysis of Adventure Therapy Outcomes and Moderators

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APPENDIX B

Pre-Post Moderator Effect Sizes for Adventure Therapy Across Sample, Program, and Participant Characteristics

Table B1. Pre-Post Moderator Analysis for Adventure Therapy: Sample Characteristics

Variable	$N_{Samples}$	N_{ES}	*g* (*V*)	SE	95% CI	*z* (*p*)	*Q* (*p*)	I^2
Publication Year								
1960-1969	4	51	.24 (.01)	.07	.10: .37	3.41 (.001)	2.48 (.479)	0.00
1970-1979	15	160	.31 (.00)	.04	.24: .39	8.68 (.000)	13.59 (.481)	0.00
1980-1989	36	271	.50 (.00)	.06	.38: .61	8.69 (.000)	101.01 (.000)	65.35
1990-1999	54	422	.39 (.00)	.04	.30: .40	8.82 (.000)	131.81 (.000)	59.79
2000-2009	72	721	.50 (.00)	.06	.38: .62	7.96 (.000)	697.46 (.000)	89.82
2010-2012	24	160	.56 (.01)	.09	.42: .77	6.49 (.000)	193.16 (.000)	88.09
Publication Type								
Published	87	698	.53 (.00)	.06	.43: .64	9.64 (.000)	849.92 (.000)	89.88
Non-Published	118	1,087	.42 (.00)	.03	.36: .47	13.69 (.000)	351.82 (.000)	66.74
Study Sample Size								
≤ 50	103	789	.49 (.00)	.04	.42: .57	12.25 (.000)	252.82 (.000)	59.66
51-100	60	582	.39 (.00)	.05	.30: .48	8.26 (.000)	279.64 (.000)	78.90
101-150	16	156	.38 (.01)	.07	.25: .51	5.62 (.000)	56.53 (.000)	73.47

Table B1. Contd....

Variable	$N_{Samples}$	N_{ES}	*g* (*V*)	SE	95% CI	*z* (*p*)	*Q* (*p*)	I^2
151 +	26	258	.55 (.01)	.10	.37: .74	5.85 (.000)	569.19 (.000)	95.61
MQRS Rating								
Low (1-5)	14	101	.60 (.02)	.14	.32: .89	4.20 (.000)	141.28 (.000)	90.80
Moderate (6-11)	182	1,616	.46 (.00)	.03	.40: .52	14.15 (.000)	1,099.13 (.000)	83.53
High (12-16)	9	68	.43 (.02)	.14	.16: .70	3.16 (.002)	37.38 (.000)	78.60

Table B2. Pre-Post Moderator Analysis for Adventure Therapy: Program Characteristics

Variable	$N_{Samples}$	N_{ES}	*g* (*V*)	SE	95% CI	*z* (*p*)	*Q* (*p*)	I^2
Funding Type								
Private	156	1,247	.48 (.00)	.04	.41: .55	13.26 (.000)	1,043.27 (.000)	85.14
Public	49	538	.43 (.00)	.06	.31: .55	7.26 (.000)	239.59 (.000)	79.97
Use of Adventure								
Primary	140	1,174	.43 (.00)	.03	.36: .49	13.61 (.000)	626.97 (.000)	77.83
Adjunctive	65	611	.56 (.00)	.07	.43: .70	8.15 (.000)	578.46 (.000)	88.94
Program Delivery								
Continuous	133	1,112	.49 (.00)	.03	.42: .55	14.71 (.000)	669.49 (.000)	80.28
Intermittent	72	673	.43 (.01)	.07	.30: .57	6.43 (.000)	616.22 (.000)	88.48
Group Structure								
Closed group	183	1,630	.44 (.00)	.03	.38: .49	16.39 (.000)	632.91 (.000)	71.24
Open group	22	155	.63 (.01)	.12	.40: .85	5.36 (.000)	442.57 (.000)	95.26
Placement Type								
Private	173	1,480	.48 (.00)	.04	.41: .55	13.90 (.000)	1,114.32 (.000)	84.57
Adjudicated	32	305	.40 (.01)	.07	.27: .54	5.86 (.000)	177.19 (.000)	82.50
Expedition Program Type								
Contained Expedition	51	523	.35 (.00)	.03	.29: .42	10.77 (.000)	85.71 (.001)	41.66
Continuous-Flow	4	21	.74 (.08)	.28	.20: 1.29	2.67 (.008)	24.62 (.000)	87.81
Base-camp	9	49	.60 (.03)	.17	.26: .93	3.47 (.001)	34.05 (.000)	76.51
Residential	13	108	.44 (.01)	.08	.29: .59	5.73 (.000)	25.69 (.012)	53.29
Mixed (Combination)	39	531	.49 (.01)	.08	.34: .64	6.57 (.000)	325.87 (.000)	88.34
Not Specified/ None of the Above	89	553	.50 (.00)	.05	.39: .61	9.23 (.000)	713.60 (.000)	87.67
Program Model								
Base Camp	10	51	0.61 (.02)	.14	0.33: 0.89	4.21 (.000)	44.55 (.000)	79.80
Expedition	55	538	0.37 (.00)	.03	0.31: 0.44	10.87 (.000)	110.01 (.000)	50.91
Residential	8	67	0.39 (.01)	.09	0.21: 0.56	4.37 (.000)	17.02 (.017)	58.88
Outpatient	1	12	1.45 (.25)	.50	0.48: 2.43	2.91 (.004)		
Multiple	44	567	0.48 (.01)	.07	0.34: 0.63	6.64 (.000)	349.76 (.000)	87.71

Table B2. Contd....

Variable	$N_{Samples}$	N_{ES}	*g* (*V*)	SE	95% CI	*z* (*p*)	*Q* (*p*)	I^2
Ropes-/Challenge-/Adventure-Based	87	550	0.50 (.00)	.06	0.39: 0.61	9.09 (.000)	694.14 (.000)	87.61
Daily Duration								
Residential	121	1,042	0.49 (.00)	.03	0.41: 0.54	14.68 (.000)	527.98 (.000)	77.27
Outpatient	51	305	0.50 (.01)	.09	0.32: 0.68	5.54 (.000)	484.26 (.000)	89.68
Mixed	33	438	0.38 (.01)	.07	0.24: 0.53	5.20 (.000)	196.38 (.000)	83.71
Program Length								
1-2 Days	17	122	0.44 (.01)	.09	0.26: 0.63	4.78 (.000)	55.63 (.000)	71.24
3-7 Days	27	162	0.53 (.01)	.08	0.38: 0.69	6.83 (.000)	95.90 (.000)	72.89
8-14 Days	24	161	0.41 (.01)	.08	0.26: 0.56	5.34 (.000)	84.35 (.000)	72.73
15-21 Days	27	280	0.35 (.00)	.03	0.28: 0.41	10.41 (.000)	30.06 (.265)	13.50
22-45 Days	48	418	0.42 (.00)	.05	0.32: 0.53	7.99 (.000)	189.63 (.000)	75.21
46-80 Days	33	458	0.39 (.00)	.06	0.28: 0.51	6.51 (.000)	93.83 (.000)	65.90
81-150 Days	14	50	0.62 (.03)	.16	0.31: 0.93	3.90 (.000)	162.42 (.000)	92.00
151+ Days	11	99	0.71 (.01)	.10	0.52: 0.91	7.27 (.000)	30.39 (.001)	67.09
Not Specified	4	35	0.93 (.13)	.36	0.24: 1.63	2.63 (.009)	209.55 (.000)	98.57

Table B3. Pre-Post Moderator Analysis for Adventure Therapy: Participant Characteristics

Variable	$N_{Samples}$	N_{ES}	*g* (*V*)	SE	95% CI	*z* (*p*)	*Q* (*p*)	I^2
Mean Age								
≤9 Years Old	4	36	.24 (.01)	.10	0.04: 0.44	2.38 (.017)	2.08 (.555)	0.00
10-14 Years Old	68	686	.37 (.00)	.04	0.30: 0.44	10.06 (.000)	216.53 (.000)	69.06
15-17 Years Old	80	720	.50 (.00)	.05	0.41: 0.59	10.69 (.000)	416.78 (.000)	81.05
18+ Years Old	28	191	.66 (.02)	.13	0.40: 0.92	5.00 (.000)	317.30 (.000)	91.49
Mixed (e.g., Families)	7	34	.66 (.03)	.18	0.31: 1.00	3.75 (.000)	19.02 (.004)	68.45
Not Specified	18	118	.45 (.01)	.09	0.29: 0.62	5.35 (.000)	73.86 (.000)	76.98
Sample Source								
Asia	7	35	.54 (.03)	.18	0.19: 0.88	3.05 (.002)	20.80 (.002)	71.15
Australia	26	438	.30 (.00)	.04	0.21: 0.38	6.76 (.000)	31.90 (.161)	21.64
Canada	7	55	.32 (.02)	.14	0.05: 0.59	2.35 (.019)	21.82 (.001)	72.50
Europe	2	9	.22 (.03)	.17	-0.12: 0.55	1.27 (.204)	1.72 (.189)	41.96
New Zealand	3	13	.55 (.03)	.16	0.23: 0.86	3.42 (.001)	2.84 (.242)	29.46
USA	160	1,235	.49 (.00)	.04	0.42: 0.56	13.69 (.000)	1,141.03 (.000)	86.07
Predominant Race								
> 60% Caucasian	78	845	.43 (.00)	.04	0.36: 0.50	11.47 (.000)	261.88 (.000)	70.60
> 60% Minority	26	160	.34 (.00)	.06	0.22: 0.47	5.42 (.000)	77.48 (.000)	67.74
Mixed, No Race > 60%	15	80	.40 (.00)	.07	0.27: 0.53	6.06 (.000)	42.20 (.000)	66.83

Table B3. Contd....

Variable	$N_{Samples}$	N_{ES}	*g* (*V*)	SE	95% CI	*z* (*p*)	*Q* (*p*)	I^2
Not Specified	86	700	.56 (.00)	.06	0.44: 0.67	9.45 (.000)	746.13 (.000)	88.61
Predominant Gender								
< 50% Male	36	298	.54 (.01)	.11	0.32: 0.76	4.84 (.000)	448.92 (.000)	92.20
> 50% Male	139	1,307	.44 (.00)	.03	0.38: 0.50	14.74 (.000)	542.23 (.000)	74.55
Not Specified	30	180	.50 (.01)	.08	0.34: 0.67	6.10 (.000)	199.31 (.000)	85.45
Identified Population								
At-Risk	119	892	.47 (.00)	.05	0.38: 0.56	10.54 (.000)	917.09 (.000)	87.13
Clinical	54	588	.50 (.00)	.05	0.41: 0.60	9.97 (.000)	192.65 (.000)	72.49
Adjudicated	32	305	.40 (.01)	.07	0.27: 0.54	5.86 (.000)	177.19 (.000)	82.50
Identified Focus								
Abuse Victims	4	18	.86 (.05)	.22	0.44: 1.29	4.02 (.000)	9.29 (.026)	67.71
Adjudicated Youth	32	305	.40 (.01)	.07	0.27: 0.54	5.86 (.000)	177.19 (.000)	82.50
Behaviour Disordered	19	153	.25 (.00)	.04	0.17: 0.33	6.33 (.000)	14.99 (.660)	0.00
Disabilities	5	15	.54 (.03)	.19	0.18: 0.91	2.92 (.004)	14.12 (.007)	71.68
Educationally Disengaged	21	152	.32 (.00)	.05	0.22: 0.41	6.44 (.000)	30.70 (.059)	34.86
Emotionally Disturbed	11	105	.55 (.02)	.15	0.25: 0.85	3.63 (.000)	59.39 (.000)	83.16
Families	6	35	.75 (.02)	.16	0.44: 1.05	4.77 (.000)	12.39 (.030)	59.66
Mental Health	30	394	.50 (.01)	.07	0.36: 0.64	7.00 (.000)	89.63 (.000)	67.64
Mixed	39	355	.49 (.01)	.07	0.36: 0.63	7.22 (.000)	261.42 (.000)	85.46
Physical	12	46	.63 (.05)	.23	0.19: 1.08	2.81 (.005)	245.57 (.000)	95.52
Substance Abuse	12	124	.58 (.00)	.06	0.46: 0.71	9.03 (.000)	14.77 (.193)	25.51
Welfare	14	83	.29 (.00)	.05	0.19: 0.39	5.67 (.000)	16.25 (.236)	20.00

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