



Adventure and Wilderness Therapy

Toolkit technical report

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This report is produced in collaboration with staff from the Campbell Collaboration Secretariat. It is a derivative product, which summarises information from Campbell systematic reviews, and other reviews, to support evidence-informed decision making’.

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Adventure and Wilderness Therapy Programmes: YEF Technical Report

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Plain Language Summary

The objective of this report is to provide a summary of the effects of adventure and wilderness therapy programmes on violence, offending, reoffending and related outcomes. It also contains evidence on implementation and costs. This technical report is based on the systematic review and meta-analyses of Mohan et al. (2022), which is restricted to studies where the intervention is targeted at young people who are at risk of offending or have already offended (i.e. secondary and tertiary interventions).

Adventure and wilderness therapy programmes are defined as follows. These programmes:

- (1) take place in a 'wilderness' or nature setting;
- (2) have an overnight stay element; and
- (3) have an interpersonal element which includes group activities, overcoming a challenge together, and may include work with counsellors and therapists.

Wilderness and adventure therapy programmes involve challenge-based activities in which children and young people, usually in a group, have to overcome a challenge. The challenge may be in an outdoor setting – but need not be wilderness, it could be a local park. Some additional activities may be undertaken indoors. The challenge is intended to bring about change at a meta-process level (behaviours, cognitions, and unconscious processes that impede or support therapeutic change) (Itin, 2001).

Adventure and wilderness therapy programmes differ in duration ranging from one day or a few days, to longer residential programmes that can last up to two years.

The primary outcomes in the Mohan et al (2022) review are violence, offending, and reoffending, as well as violent, anti-social and aggressive behaviour. The secondary outcomes are mental health and internalizing behaviour, self-control, pro-social behaviour and social skills, and educational outcomes.

Mohan et al. (2022) identify the following channels by which adventure and wilderness therapy may have positive effects: (i) developing self-worth through completing challenges; (ii) the benefits of the mentoring or counselling component which may happen formally or informally; (iii) group activities encouraging pro-social behaviour, including with family members; (iv) diversion (i.e. spending time away from circumstances which may lead to anti-social behaviour and offending), and (v) therapeutic effects of the wilderness (nature).

Mohan et al. (2022) included 46 studies of effectiveness and 23 process evaluations. There were four mixed methods studies which are included in both categories. The effectiveness studies include nine RCTs, with the remainder having a non-experimental design.

The majority of the studies are from North America, with 49 coming from the United States. There are three studies of programmes in New Zealand, two each from Canada, Israel and Australia and three from the UK. Where age was stated, programmes were mostly for children aged 10-14, followed by 15-17, with few studies outside of this age range. Programmes were mainly mixed sex (35 studies), though a sizeable number (20) were boys only, and six were girls only. Four programmes involved children and young people primarily from minority ethnic groups, and the remaining studies either did not report on ethnicity or included participants from a range of ethnicities.

Overall, adventure and wilderness therapy programmes had a desirable impact on offending, reoffending and violence. However, these effects are small, except reoffending which is a moderate effect. They are also marked by considerable heterogeneity. Mohan et al. (2022) report meta-regression results which show that the effects are not sustained, that is they decline the longer after the programme the effects are measured.

Qualitative evidence supports these positive effects, especially on self-esteem and pro-social behaviour, but also suggests that effects may not be sustained.

For most outcomes, mixed gender groups have better results than all male groups. All female groups perform best, although this finding is based on a small number of studies. Groups

which predominantly have ethnic minority participants perform better than mixed groups, but this finding is also based on few studies. Adventure and wilderness therapy are better than 'passive controls' (i.e. no treatment), and generally better than custodial or parole comparison groups, though not in all cases. Two studies demonstrate that wilderness programmes costs are low compared to the alternative treatments.

Further studies are needed to explore the relative effectiveness of different design choices, and what can help sustain the effects after the intervention.

Objective

The objective of this report is to provide a summary of the effects of adventure and wilderness therapy programmes on offending, reoffending and related outcomes. It also contains evidence of implementation and costs. This technical report is based on the systematic review and meta-analyses of Mohan et al. (2022).

Inclusion criteria

To be included in this report a systematic review must:

- Review the impact of adventure and wilderness therapy programmes on crime, antisocial behaviour, aggression, violence or related outcomes.
- Review evaluations involving children and young people who have offended or are at risk of doing so (i.e., secondary and tertiary interventions only) and are aged 25 years or below.
- Review evaluations of programmes using experimental or quasi-experimental methods with before and after outcome measures. Both randomised and non-randomised designs may be eligible for inclusion.
- Report findings in the English language and published in peer-reviewed journals or by other reputable sources (e.g., Campbell systematic reviews, Cochrane systematic reviews) within the past 10 years (i.e., since 2010). Reviews that were not published in peer-reviewed journals, such as doctoral dissertations on ProQuest dissertation

publishing and reviews in progress, were also considered for inclusion if they met other criteria satisfactorily.

Exclusion criteria

Reviews were excluded for the following reasons:

- The review was outdated or has been updated recently (e.g., Wilson and Lipsey, 2000).
- The review did not include outcomes related to antisocial behaviour, crime, aggression, offending or violence (e.g., Bowen and Neill, 2013).
- Beck and Wong (2022) is excluded since the majority of included studies in the review are before versus after studies with no comparison group.

Outcomes

The primary outcomes are offending, reoffending, and violent, anti-social and aggressive behaviour. The secondary outcomes are mental health and internalizing behaviour, self-control, pro-social behaviour and social skills, and educational outcomes.

Description of the intervention

Wilderness therapy programmes are defined as follows:

- (1) take place in 'wilderness' or nature setting;
- (2) have an overnight stay element; and
- (3) have an interpersonal element which includes group activities, overcoming a challenge together, and may also include work with counsellors and therapists.

Adventure therapy programmes involve challenge-based activities in which children and young people, usually in a group, have to overcome a challenge. The challenge may be in an outdoor setting – but need not be wilderness, it could be a local park. Some additional activities may be undertaken indoors. The challenge is intended to bring about change at a

meta-process level (behaviours, cognitions, and unconscious processes that impede or support therapeutic change) (Itin, 2001).

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Duration

Adventure and wilderness therapy programmes differ in duration ranging from a single shot intervention on one day or a few days, going to up to two years for long-term residential programmes. They can be self-contained or offer continual enrolment. Self-contained programmes have a defined start and end date and work with the same participants throughout. Continual enrolment models involve individuals joining when they are accepted into the programme, therefore new clients join at the beginning, middle, and conclusion of treatment (see Russell, 2000; and Gillis, 2008).

Examples of programmes of different duration are:

- Long-term residential (1 year or more) - Deschenes (1998) describes the Nokomosis challenge programme that was developed for youth who were committed to the Department of Social Services and placed in state training schools or private residential facilities. The average length of stay was between 15-16 months. Lambie (2000) reports findings a study of a wilderness therapy programme for juvenile sex offenders aged 13-19 years. The programme lasts between one and two years, depending on the individual and family's needs, with an average of 18 months. The programme included role play (psychodrama), caving, white water rafting, abseiling, tramping and camping.
- Short to medium term wilderness therapy (3-6 months) - Callahan (1989) describes the six-month Sierra 2 programme which includes activities such as a ropes course, backpacking, caving, mountain marathons, and canoeing. This programme is targeted towards young people who have offended.

- Short/medium term adventure-based therapy (Less than 3 months) - The spectrum programme is a 30-day adventure and wilderness programme with activities such as backpacking and canoeing (Castellano, 1992). Durbhan (2018) reports the effects of an eight-week adventure-based intervention called Challenge by Choice. Youth were given experiential, hands-on learning opportunities while interacting with outdoor adventure-based activities as part of this programme. Another example is the PCYC Catalyst programme is an outdoor adventure intervention with 15 programming days over a 10-12 week period.

Interventions with a family component

Some programmes are designed to also include the families of the participants in specific aspects of the programme. For example, some programmes host parent seminars, encourage family counselling, and encourage family participation at graduation ceremonies (Scaliatine, 2004). Examples of interventions with family components are:

- Project Quest is an after-school community intervention with the objective to provide care for a population that is highly volatile and resistant to treatment (Maizell, 1988). Participants engage in experiential learning. The project also includes a parenting component called Active Parenting (AP), which is a six-unit program, with a two-hour session each week. The training follows a video-based format where suitable parenting approaches are modelled. Parents are encouraged to share their parenting experiences and techniques with one another leading them to analyze and reassess their thinking about the children's diverse needs and providing the necessary tools for family communication and cooperation.
- Norton (2019) describes the Family Enrichment Adventure Therapy (FEAT) programme that brings together family members while also allowing them to connect with nature and other families who are recovering from the impacts of child abuse and neglect. FEAT members travel, trek, and camp outside, among other adventure-based activities, in conjunction with counselling in individual, group, and family settings.

- An outward-bound school programme included a family component to help with an easier transition back into regular environment both at home and outside. While the students live in a local, remote area, their parents attend workshops. At the end of the programme parents and children discuss their goals and desired behaviour changes together (Pommier, 1995).
- Bandorof (1994) describes the Family Wheel programme where the family and children engaged in intensive experiential activities while camping and trekking in the wilderness. It was the responsibility of the adolescent who had learned skills during his or her wilderness experience to teach them to his or her parents. This aimed to illustrate the adolescent's competency, provide a venue for family role-play, and inform parents about their son or daughter's survival programme. The group psychotherapy was the final component, involving several families, which was utilised to integrate the theme and process the events of the day.

Theory of change/presumed causal mechanisms

Mohan et al. (2022) state that the following channels by which adventure and wilderness therapy may have positive effects: (i) developing self-worth through completing challenges; (ii) the benefits of the mentoring or counselling component which may happen formally or informally'; (iii) group activities encouraging pro-social behaviour, including with family members; (iv) diversion (i.e. spending time away from circumstances which may lead to anti-social behaviour and offending), and (v) therapeutic effects of the wilderness (nature).

First, self-esteem can be enhanced through completing challenging activities, such as long hikes, gives a sense of achievement and so provides a belief in the person's ability to perform difficult tasks (Sachs, 1992). Many programmes include explicit goal setting to achieve self-growth and motivation.

Second, wilderness activities often include opportunities for reflection and informal mentoring or counselling, which reinforce the personal development achieved through the

intervention. Reflections through retelling their stories on solo trips (Russell, 2002) and journal writing (Cross, 1998) gives the participants a chance to discuss their experiences. As participants hear diverse perspectives, reflection may progress into deeper understanding of their experiences and a deep introspection of behavioural patterns.

Third, learning new skills such as how to set up camp, communication, sharing, dealing with unpredictable events, and giving and receiving feedback are all group-based activities which develop the ability to work with other people and to trust other people. (Miramontes, 2007). Teamwork and achieving goals while taking part in group activities leads to reinforces pro-social behaviour, building trust, empowerment and a feeling of being valued among participants (Autry, 2001). Group work also enables participants to be able to speak about their anxieties, and to connect to their feelings of conflict, and so take increasing responsibility for how they behave and how others behave towards them. Groups act as an area of safety or safe space for this purpose. Interventions which engage family members may also directly improve family relationships.

Fourth, participation in programmes, particularly longer-term programmes, removes young people from the environment in which they have opportunities to offend and may be encouraged to do so by their peers. This effect may continue if they develop an interest in the activities they do in the wilderness or adventure therapy programme.

Fifth, there is a simple therapeutic effect of nature, which encourages a more reflective mood, and so may have positive effects on internalizing behaviour and mental health.

Evidence base

Descriptive overview

Mohan et al. (2022) included 46 studies of effectiveness and 23 process evaluations, these numbers included four mixed methods studies which are in both categories. The effectiveness studies include nine RCTs, with the remainder having a non-experimental design.

The majority of the programmes evaluated are from North America, with 49 coming from the United States. There are three studies of programmes in New Zealand, two each from Canada and Israel, Australia and three from the UK. Where age was stated, programmes were mostly for children aged 10-14, followed by 15-17, with few studies outside of this age range. Programmes were mainly mixed sex (35 studies), though a sizeable number were (20) boys only, and six just included girls. Programmes in the included studies are mostly mixed race, or race not stated, with just four in which the substantial majority are from a minority ethnic group.

Assessment of the strength of evidence

A modified AMSTAR critical appraisal tool was used to evaluate the quality of the review used to inform the current report. The review by Mohan et al. (2022) was judged to of medium confidence in study findings, being marked down because data extraction was only partially doubled coded (see Annex 2).

The review adequately specified the research questions and the inclusion/exclusion criteria. The inclusion criteria included components relating to the population, intervention, comparison group and outcome of interest. Specifically, inclusion criteria referred to evaluations of adventure and wilderness therapy programmes for at-risk youth aged up to 25. Effectiveness studies, process evaluation and cost analysis were all eligible for inclusion.

Mohan et al. (2020) have registered their protocol with the Campbell Collaboration. The review team implemented a comprehensive literature search strategy including a number of different databases, designated keywords and search strategies. The review restricted inclusion criteria to only peer-reviewed publications. The review only included evaluations published in English.

Title and abstract screening, full text screening and coding were undertaken independently by two coders. However, data extraction for meta-analysis was partly completed by one person only.

The review included an analysis for publication bias, as well as an assessment of confidence in study findings. The study team declared their funding from YEF for the review and declared no known conflict of interest beyond that.

The review conducted a meta-analysis and reported detailed information on the synthesis and estimation of weighted effect sizes and adequately reported the heterogeneity between primary effects. Each of the meta-analyses reported separate weighted effect sizes for independent outcomes and assessed multiple moderators as possible explanations for heterogeneity between primary effect sizes.

Mohan et al. (2022) report separate effect sizes for offending, reoffending and violence based on 17, 7 and 5 studies respectively. There is high heterogeneity for all of these outcomes. These data translate to evidence ratings of 4, 2 and 2 respectively.

Impact

Overall, adventure and wilderness therapy programmes had a desirable impact on offending, reoffending and violence (Table 1). However, these effects are small, except reoffending which shows a moderate effect. They are also marked by considerable heterogeneity. Moreover, Mohan et al. (2022) report meta-regression results which show that the effects are not sustained, that is they decline the longer after the programme the effects are measured.

Table 1. Mean effect sizes for externalising behaviours and delinquency from Mohan et al. (2022)

Review	Effect size and no. of studies	CI (ES)	<i>p</i>	% reduction	Evidence rating on crime and violence outcomes

Violence	OR = 1.13 n=5, k=12 d = 0.07	0.76-2.35	0.46	10%	2
Offending	OR=1.15 n=17, k=159 d = 0.08	0.66-2.00	0.61	10%	4
Reoffending	OR=1.26 n=7, k=11 d = 0.127	0.80-1.99	0.28	12%	2

Note: ES = the weighted mean effect size; CI = 95% confidence intervals for the mean ES; p = the statistical significance of the mean ES; OR = odds ratio; g = Hedges' g reported under the random effects model of meta-analysis; d = Cohen's d reported under the random effects model of meta-analysis; SMD = standardised mean difference; t = t-test comparing g value with zero.

To translate the OR to a readily understandable effect, assume equal numbers in the experimental and control conditions (e.g., $N = 100$ in each condition) and that the prevalence of offending in the control condition is 25% (i.e., 25 delinquents out of 100), the odds ratio of $OR=1.15$ for offending corresponds to 22.5 delinquents in the experimental condition, a relative decrease of approximately 10%. This estimate is not greatly affected by different assumptions. Further explanation of this transformation and how the relative reduction changes depending on the assumed prevalence is provided in Annex 1.

Mediators

Mohan et al. (2020) also report on a range of mediating variables (Table 2), all of which show positive effects, some of which are quite large.

Table 2. Mediating outcomes

<i>Outcome</i>	<i>n</i>	<i>k</i>	Mean ES (OR)	95% CI	<i>p</i>	<i>dfs</i>	<i>I</i> ² within	<i>I</i> ² between
Attitudes and beliefs	10	37	2.02	1.19, 3.46	.004	7.75	51.4%	31.1%
Education	13	54	1.77	1.08, 2.92	.014	11.6	18.0%	56.8%

Externalising behaviour	11	36	1.69	0.63, 4.53	.238	9.81	7.6%	82.8%
Internalising behaviour	26	130	2.09	1.48, 2.97	.001	23	46.7%	38.0%
Internalising: Self-esteem	15	53	2.05	1.41, 2.97	.001	11.5	53.7%	16.1%
Internalising: Self-control	12	27	1.21	0.70, 2.07	.454	10.7	14.8%	65.4%
Mental Health	8	17	2.43	0.98, 6.05	.03	5.6	92.5%	> .001%
Social	17	68	2.03	1.29, 3.19	.001	15	26.8%	58.6%
Social: Pro-social	11	20	2.35	1.16, 4.76	.014	9.48	7.6%	80.2%

However, there is significant heterogeneity in each of the meta-analyses performed and the confidence intervals for each mean effect size are quite wide. Therefore, one must be cautious when interpreting the results. Whilst overall there is a desirable impact of adventure and wilderness therapy programmes, the magnitude of that impact varies substantially across evaluations for each outcome.

Moderator analyses

A number of moderators were coded to explore possible reasons for heterogeneity in each of Mohan et al.'s, (2020) meta-analyses. These moderators included the time of follow-up (reported above), the gender of participants, the ethnicity of participants, and the type of control group used in the evaluation.

For most outcomes, mixed gender groups have better results than all male groups (there were not enough studies to compare to all-female groups.) For offending outcomes, on average mixed gender groups showed a moderate reduction in offending (n=6, k=40, OR=1.52, 95% CI=0.51-4.50), whilst all-male groups showed a small increase in offending (n=10, k=102, OR=0.91, CI=0.37-2.27). Adventure and wilderness therapy are better than 'passive controls' (i.e. no treatment), and generally better than custodial or parole comparison groups, though not in all cases.

Cost analysis

Two studies demonstrate that wilderness programmes costs are low, and in one case also documented to be less than incarceration.

The Nokomosis challenge programme is an alternate placement for non-violent young offenders who would otherwise serve an average of 15-16 months in standard training institutions (Deschenes, 1998). The challenge programme is a 12-month programme that includes a three-month residential component and a nine-month community-based component. The expected cost is around US \$ 38,400 per year for one youth, which equates to a saving of around US \$ 17,600 per year compared to a placement in a correctional residential facility, which costs an average of US \$ 56,000 per year in Michigan. The cost saving mainly comes from the shorter duration of the challenge programme (outcomes were comparable in the two groups).

Sachs (1982) describes the modified wilderness experience which included an intensive 3-day camping program in an isolated section of the Shawnee National Forest. For the first trip, which involved eight participants, the total cost of all equipment, food, and overtime pay for the teachers was US\$3,500. Other costs were US\$150 in food and US\$225 in overtime fees. As a result, the original cost per student was around US\$437.50. However, because the initial investment has already been made, and only the cost of food and staff time would be added to the original investment, this amount per student lowers with each set of eight students who engage in the programme. For example, if three more groups of eight students are given the camping experience, the cost per student drops to \$141.10.

Implementation evidence

Qualitative process evaluations of 19 programmes included information about implementation.

Summary of findings from qualitative analysis summary

Issue	Barriers	Facilitators
Participation: joining	Lack of interest in intervention Timing clashes with another planned activity	Joining with friends Family engagement
Participation: dropping out vs staying on	Failure to complete introductory sessions Competing commitments Failure to bond Incarcerated Move away from area Medical reasons Removed for disruptive behaviour Bad weather	Enjoyment of activities Group cohesion and peer support Nurturing and supportive staff Feeling valued Building relationships Family involvement
Achieving outcomes and causal pathways	Disruptive and aggressive behaviour by even one participant can undermine whole group Failure to manage group dynamic Males don't accept female group leader Effects of the intervention are not sustained over time Ethnic differences between counsellors and participants	Participant open to change Constructive use of time Empathy towards others Providing opportunities for family intimacy Reflection Learning through experience

Findings from UK and Ireland

Mohan et al. (2020) include three studies from UK and one from Ireland. Below are the details of the studies, none of which reported outcomes related to offending:

- (i) Loynes (2010) conducted a process evaluation of the Stoneleigh Project in UK. This seven-day programme included activities such as camping, walking, sailing, canoeing and coastal exploration and involved participants aged 18-25 years. The Stoneleigh Project was developed for marginalised young people aged 18 to 25 years. It began with a preparation phase arranged between the young people and their mentors and held within the host organisation. This was followed by a collectively arranged, seven-day long outdoor retreat, a follow-up weekend and a mentored project back with the host. Each participant could follow the programme for as long as they were interested. This ranged from six months to four years.
- (ii) White (2007) evaluated the effectiveness of a three-month Adventure Based Learning Experience (ABLE). The programme included activities such as initiative tasks, cultural studies, obstacle course, cross country hike, canoeing, high ropes course, wall climbing. Participating youth were 13 years old. The programme is designed into three developmental stages. The first stage consisting of four 2-hour weekly sessions facilitated at the participating secondary school, The second stage involved a 5-day residential component at the Outdoor Education Centre. The third stage consisted of a 3½ day wilderness trip to the Brecon Beacons. The experimental group were 24 participants who participated in the adventure-based learning experience program. The control group consisted of 723 students enrolled at an Essex state school. The programme reported an impact on social competence, academic and family outcomes
- (iii) Wood (2012) evaluated the effectiveness of a 10-month programme that comprised of skills workshops and outdoor activity days, weekly one-to-one mentoring and two wilderness trails. The participants were youth aged 17 years.

The total sample consisted of 12 participants -6 treatment and 6 control- control group were youth who were also deemed to be 'at-risk' but were not actively involved in the TA3 project or any other intervention. The programme had an impact on self-esteem, overall wellbeing and mindfulness. The study from Ireland, Conlon (2018), conducted a process evaluation of the wilderness therapy project. Which ran for 10 weeks with participants aged 12-18 years. The programme conducted a camping trip once a fortnight. Weekly activities involved between one and four adolescents, with one to two leaders for every one adolescent, dependent on need. Fortnightly camping trips involved two groups. Activities included things such as rock climbing, hill/mountain walking, biking, assembling tents, collecting wood, and making fires during camps. There were also a range of educational programmes offsite (e.g. education around flora and fauna and safety in the wilderness); and onsite (e.g. drug and alcohol use, sexual health, and self-care). These educational programmes provided opportunity for group reflection on difficulties faced by participants

Evidence from qualitative studies

The qualitative evidence from the studies listed above supported the argument that wilderness programmes improve internalising behaviour such as self-esteem:

"I didn't have a lot of self-esteem before this, I really didn't. I had more of a, err, I dunno, I'd throw on tracksuit bottoms and trainers and I'd go out with a hoodie up so the whole world doesn't have to see me in a way... But now I feel more like, I'm worth something..." (male youth quoted in Wood, 2012)

"Going out there opens your eyes and opens your mind and you're kinda like wow, life ain't so bad...it kinda changed me for the better. If...I feel like giving up, I push myself that little bit more not to give up" (youth quoted in Conlon, 2018).

Support was also found for the effects of nature, building positive social relationships, being independent and in charge of one's own life. Challenges identified by Conlon (2018) were

insufficient attention to problem behaviours at the start of the programme and when participants missed the initial briefing they may feel left out.

What do we need to know? What don't we know?

Overall, the results from the meta-regression in the review suggest that the effect of adventure and wilderness therapy programmes are not sustained over time. Across nearly all outcomes, the exception was mental health, studies that included both male and female participants were associated with greater effectiveness of adventure and wilderness therapy. In particular, mixed gender samples were associated with larger reductions in offending outcomes, but all-male samples were associated with an increase in offending. There were not enough studies that included only-female samples to make a similar comparison. This may be explained by the theory of change (perhaps the presence of girls is a positive influence on boys, but not vice versa) similar to single and mixed gender schools on academic outcomes. This will be a barrier to implementation of tertiary programmes though. A further need is to conduct comparison studies looking at the impact of adventure and wilderness therapy programmes in relation to gender.

More studies need to report information on participant ethnicity – the lack of information may be a by product due to the fact that many of the evaluations were published decades ago. Multiple meta-analyses and multiple subgroup analyses increase risk of Type 1 errors.

However, these conclusions are based on a limited number of studies for each outcome, many of which are low quality studies.

One of the limitations of this review is the small size of the evidence base assessing long-term impact of adventure and wilderness therapy interventions on anti-social behaviour and offending. However, the studies included in this review suggest that, in the short-term, adventure and wilderness therapy programmes can produce positive results.

There is a need for further studies on adventure and wilderness therapy interventions, particularly ones incorporating different design features such as combining multifamily group

work with adventure therapy, and to test the effectiveness of follow up support to sustain effects.

More research on the various components of wilderness programmes, particularly the adventure-based approach to treatment, is needed in the long run to verify its usefulness as a sustainable behaviour management programme for adolescents in educational, custodial, and other therapeutic settings.

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Annex 1: Effect size calculation

This annex shows the calculation based on the results and assumptions given in the text. We assume 200 youth, evenly divided between treatment and comparison groups. That means there are 100 youth in the control group and 100 youth in the treatment group. Assuming that 25% of youth in the control group were likely to offend for secondary interventions, and 50% likely to reoffend for tertiary interventions, then the mean effect sizes from both reviews can be easily transformed to a percentage reduction in the outcome.

If the odds ratio for the effect on offending is 1.15 (i.e., Mohan et al., 2022), then using Table 1a and the formula for an OR, we can calculate the value of X. The odds ratio is estimated as: $A*D/B*C$, where A is the number of non-offenders in the treatment group, B is the number of offenders in the treatment group, C is the number of non-offenders in the control group, and D is the number of offenders in the control group. Therefore, the value of X is 22.5 in the case of Mohan et al. (2022).

Table 1a. Calculation for offending

	Non-offenders	Offenders	Total
Treatment	100-x	x	100
Control	75	25	100

Therefore, the relative reduction in offending is $(25 - 22.5)/25 = 10.6\%$.

For the case of reoffending, with the 50% control reoffending rate and $OR=1.26$, then X is 44.2, and the reduction in reoffending is $(50-44.2)/50 = 11.5\%$.

For violent offending, with a control base rate of 25%, and $OR=1.13$, the reduction is 8.9%.

The prevalences of offending and reoffending are likely to vary considerably between studies and can be influenced greatly by the type of report (e.g., self-report or peer-report), or the questions asked (e.g., frequency of offending in the past couple of months versus the

frequency of offending in the past year, or ever). If we were to adjust our assumption that 25% of the control group will offend, the overall relative reduction in the intervention group is not greatly affected. For example, if we assume that 10% of the control group will offend, the 2x2 table would be as shown in Table 1b and the value of X is 8.8 (for the Mohan et al., 2022 review). Therefore, the relative reduction is 11.9% (i.e., $(10 - 8.8)/10 \times 100$).

Table 1b. Sensitivity analysis

	Non-offenders	Offenders	Total
Treatment	100-x	x	100
Control	90	10	100

Similarly, if we assume that 40% of the control group will offend, the value of X would be 36.7 (for the Mohan et al. 2022 review) and the relative reduction in offending is 8.3%. Given the dramatic difference in the assumed prevalence of offending, the percentage relative reduction does not vary in a similar fashion. Table 2 shows this further.

Table 2

Variation of the relative reduction in offending and reoffending depending on various estimates.

	Mohan et al. (2022)		
	<i>Offending</i> OR = 1.15	<i>Reoffending</i> OR = 1.26	<i>Violent offending</i> OR = 1.13
Assumed prevalence	Relative reduction		
10%	11.9	..	10.5
25%	10.1	..	8.9
40%	8.3	13.5	7.2
50%	..	11.5	..
60%	..	9.4	..

Annex 2 Evidence rating for Mohan et al. (2022)

Table A.2.1 Assessment against AMSTAR items

Modified AMSTAR item		Scoring guide	Wilderness
			Mohan 2022
1	Did the research questions and inclusion criteria for the review include the components of the PICOS?	To score 'Yes' appraisers should be confident that the 5 elements of PICO are described somewhere in the report	Yes
2	Did the review authors use a comprehensive literature search strategy?	At least two bibliographic databases should be searched (partial yes) plus at least one of website searches or snowballing (yes).	Yes
3	Did the review authors perform study selection in duplicate?	Score yes if double screening or single screening with independent check on at least 5-10%	Yes
4	Did the review authors perform data extraction in duplicate?	Score yes if double coding	Partial yes
5	Did the review authors describe the included studies in adequate detail?	Score yes if a tabular or narrative summary of included studies is provided.	Yes

6	Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?	Score yes if there is any discussion of any source of bias such as attrition, and including publication bias.	Yes
7	Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?	Yes if the authors report heterogeneity statistic. Partial yes if there is some discussion of heterogeneity.	Yes
8	Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?	Yes if authors report funding and mention any conflict of interest	Yes
	Overall rating		Medium

Table A.2.3 Evidence strength decision rule for offending outcomes in Mohan et al. (2022)

	No. of included studies			
	1-4	5-7	8-11	12 or more
No review or empty review *				
Low confidence in review				
At least moderate confidence in review	$I^2 > 60\%$: ** Reoffending Violece			$I^2 > 60\%$: **** Offending
High confidence in review				

Annex 3

Summary of issues from process evaluations:

Overview of process evaluations				
	Intervention	Success factors	Challenges	Young people's views
Loynes (2010)	<p>The Stoneleigh Project was developed for marginalised young people aged 18 to 25 years. It began with a preparation phase arranged between the young people and their mentors and held within the host organisation. This was followed by a collectively arranged, seven-day long outdoor retreat, a follow-up weekend and a mentored project back with the host.</p> <p>Each participant could follow the programme for as long as they were interested. This ranged from six months to four years.</p>	<ol style="list-style-type: none"> 1. Safe space for retelling their stories 2. Use of narratives to express new identities 3. Transformation of self using the retreat experience 		<p>Participants said that the outdoor retreat experience gave them a lot of time to reflect and put their lives back in perspective. They became aware of their thoughts and developed courage to deal with their problems.</p> <p>The retreats allowed the participants to discover and articulate a new sense of self. The innovative chances for them to narrate their identity in an embodied way were a significant component of the retreat activities for them.</p>

Wood (2012)	A 10 month programme that comprised of skills workshops and outdoor activity days, weekly one-to-one mentoring and two wilderness trails.	<ol style="list-style-type: none"> 1. Participants enjoyed time in nature which gave them time to think about their future 2. Independence 3. Relating positively to others 4. Relating positively to self 5. Generalising change to other situations 		<p>Participants talked about how this programme helped them build their self-esteem</p> <p><i>"I didn't have a lot of self-esteem before this, I really didn't. I had more of a, err, I dunno, I'd throw on tracksuit bottoms and trainers and I'd go out with a hoodie up so the whole world doesn't have to see me in a way.....But now I feel more like, I'm worth something...."</i></p> <p>Participants improved their communication and problem-solving skills, grew in self-awareness and confidence, became more optimistic, and displayed a readiness for change.</p>
Conlon (2018)	Ireland/Wilderness therapy project- Camping trip once a fortnight. Weekly activities involve between one and four adolescents, with one to two leaders for every one adolescent, dependent on need. Fortnightly camping trips typically involve two groups. Activities include such things as rock climbing, hill/mountain walking,	<ol style="list-style-type: none"> 1. Sense of achievement 2. Trust in the relationship 3. Choice and control 4. feeling valued and respected by the leaders 	<ol style="list-style-type: none"> 1. Initial lack of focus on problematic behaviours of the participants 2. Relationship issues-participants who missed the 	<p>Young people were positive about the interactive effects of the programme. They experienced a reduction in negative behaviour</p> <p><i>"Going out there opens your eyes and opens your mind and you're kinda like wow, life ain't so bad...it kinda changed me for the better. If...I</i></p>

	<p>biking, assembling tents, collecting wood, and making fires during camps. There are also a range of educational programmes offsite (e.g. education around flora and fauna and safety in the wilderness); and onsite (e.g. drug and alcohol use, sexual health, and self-care). These educational programmes provide opportunity for group reflection on difficulties faced by participants</p>		<p>introduction meetings felt left out</p>	<p><i>feel like giving up, I push myself that little bit more not to give up.</i></p>
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