
The effectiveness of wilderness and adventure therapy programmes in reducing anti-social and offending behaviour in children and young people at risk of offending: a mixed methods systematic review

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THE EFFECTIVENESS OF WILDERNESS AND ADVENTURE THERAPY PROGRAMMES IN REDUCING ANTI-SOCIAL AND OFFENDING BEHAVIOUR IN CHILDREN AND YOUNG PEOPLE AT RISK OF OFFENDING: A MIXED METHODS SYSTEMATIC REVIEW

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Abstract

Background

Wilderness and adventure therapy is defined as "a systematic experiential group intervention that occurs in a natural setting and employs therapeutic techniques and is processed within the context of activities and experiences that contain real or perceived risk (i.e., physical, social, and emotional) to facilitate improvements in the psychological and behavioural functioning of the participants." (Scaliatine 2004, citing by Weston and Tinsley. 1999).

This mixed-methods review assesses both effectiveness and implementation evidence of wilderness and adventure therapy interventions for children and young people who are already involved in, or are at risk of violence, anti-social or criminal behaviour.

Objectives:

The review aims to address the following:

1. What are the long- and short-term effects of wilderness and adventure programmes on anti-social behaviour and violent and other offending behaviour?
2. What are the long- and short-term effects of wilderness and adventure programmes on intermediate mental health and behaviour outcomes such as social skills and self-regulation?
3. What factors explain any heterogeneity in these effects? Which factors, such as setting (indoor/outdoor), quality of relationship with counsellors and the degree of the challenge element involved are important moderators of these effects, and help explain any observed heterogeneity across studies?
4. What are the barriers and facilitators affecting the successful implementation of wilderness and adventure programmes?
5. Are wilderness and adventure programmes cost-effective?

Search methods

We used the following strategies to identify completed and on-going potential studies.

A database search was conducted on Medline, PsycInfo, PsycExtra, Social Policy & Practice, Scopus, Repec, ERIC, Econlit, CASE Engagement database (EEP, UCL), and the US National Criminal Justice. The database searches were conducted in January 2021.

Selection criteria

The review includes wilderness and adventure therapy interventions targeted at youth offenders or at-risk children and young people aged 25 years or below. The review includes effectiveness studies (experimental and non-experimental studies with a comparison group), process evaluations and cost-effectiveness studies.

Data collection and analysis

Two review authors independently assessed studies for inclusion, extracted data, critically appraised the studies, and synthesized findings.

Main Results

Overall, the results from the meta-regression suggest that there are mostly small, positive effects from wilderness and adventure therapy programmes, but that they are not sustained over time.

Across nearly all outcomes, the exception being mental health, studies that included both male and female participants were associated with greater effectiveness of wilderness and adventure 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, but it appears that female-only programmes may be more effective than mixed-gender programmes. This may be explained by the theory of change (perhaps the presence of girls is a positive influence on boys, but not visa versa) similar to single and mixed gender schools on academic outcomes.

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

The findings are based on a limited number of studies for each outcome, with many of the studies assigned with low confidence in study findings.

The major themes that emerged from the qualitative analysis were: group cohesion and peer support, nurturing and supporting staff, feeling valued, relationship building, emotional maturity and cognitive abilities of participants, providing opportunities for family intimacy, self-growth and motivation, learning through experience, reflection and social engagement.

Plain Language Summary:

What is this review about?

Interventions to reduce anti-social and offending are increasingly focused on assets-based approaches, which seek to build on the strengths of children and young people to achieve positive development. Wilderness and adventure therapy programmes, which are the subject of this review, are one such approach.

Wilderness therapy programmes take place in a 'wilderness' or nature setting; have an overnight stay element; and have an interpersonal element which includes group activities, 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 – not always a wilderness setting, it could be a local park – but may also be 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).

How is the intervention meant to work?

Wilderness and adventure therapy programmes may have positive effects through the following channels: (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).

What studies are included in this review?

This review summarises the evidence from 46 studies of effectiveness and 23 process evaluations. These numbers include 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 a total of 49 in the United States. There are three studies of programmes in New Zealand, two each from Canada, Israel and Australia, and three from UK. Where age was stated, programmes were mostly for children aged 10-14 years, followed by 15-17 years, 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 just for girls. Programmes in the included studies mostly included children from a range of ethnicities, or this information was not stated, with just four in which the substantial majority are from a minority ethnic group.

What are the main findings of the review?

Overall, wilderness and adventure therapy programmes had small positive impacts on offending and violence outcomes and a moderate positive effect on reoffending.

They are also marked by considerable variation and the effects may not be sustained.

For most outcomes, mixed gender groups have better results than all male groups. Programmes involving all-female groups achieved the best outcomes, although this finding is based on a small number of studies. Groups which predominantly have ethnic minority participants achieved better outcomes than mixed groups, but this finding is also based on few studies. Wilderness and adventure therapy programmes produced better outcomes than 'passive controls' (i.e. no treatment), and generally outperformed custodial or parole comparison groups, though not in all cases.

Two studies demonstrate that wilderness programmes costs are low compared to the alternative treatments.

The qualitative findings describe barriers and facilitators to participation and achieving outcomes. The barriers to participation include not joining the programme or dropping out due to various reasons, behavioural difficulties displayed by the participants, physical and mental health challenges as well as bad weather faced by the participants.

The facilitators to participation are group cohesion and peer support, nurturing and supporting staff, family involvement, feeling valued and relationship building.

The barriers to outcomes include gender dynamics (males have difficulty in accepting female group leaders), inability to transfer learning, ethnic differences between the counsellors and participants and the short-term nature of some programmes.

The facilitators to outcomes include emotional maturity and cognitive abilities of participants, constructive use of time, empathy for others and providing opportunities for family intimacy.

Implications for policy and practice

The evidence suggests that wilderness and adventure therapy have small positive effects. However, these effects may not be sustained, suggesting that some sort of follow up would be useful, though the research is not sufficient to determine what sort of follow up, if any, would best sustain effects.

The evidence base is also insufficient to assess the relative effectiveness of different design features. So, there is also a need for further studies on wilderness and therapy adventure interventions which compare different design features such as combining multifamily group work with adventure therapy, mixed sex versus single sex groups, and the different types of therapeutic component.

Summary of findings

- Wilderness and adventure therapy interventions had small but statistically insignificant impact on offending outcomes. This finding was based on a large number of studies, although for all of them we had low confidence in study findings and there was substantial heterogeneity.
- There were large and significant effects on attitudes and beliefs, education and internalizing (including self-esteem) and externalizing behaviour outcomes. However, studies had low confidence in study findings. Qualitative evidence supports the effects on self-esteem and pro-social behaviour.
- Large and significant effects were also seen in mental health and social outcomes, however social outcomes had large number of studies but low confidence in study findings and mental health had small number of studies and low confidence in study findings.
- Both quantitative and qualitative analysis suggest that observed effects are unlikely to be sustained after the intervention.
- Mixed gender groups had larger effects for most outcomes than male only groups. Female only groups had the largest effect, but that finding is based on a very small number of studies and is not statistically significant.

Table 1 Summary of findings table

Quantitative

Outcome	Mean ES (OR)	95% CI	Confidence in study findings	Summary
Primary outcomes				
Offending	1.15 n=17, k=159 $I^2 = 93\%$	0.66, 2.00	H-0, M-1, L-16 Egger's test: $p = 0.75$	Small, statistically insignificant, effect based on a moderate number of studies but with low confidence and very high heterogeneity. Both quantitative and qualitative data suggest effect is not be sustained.
Reoffending	1.26 n=7, k=11 $I^2 = 44\%$	0.80, 1.99	H-0, M-0, L-7 Egger's test: $p = 0.39$	Moderate, but statistically insignificant, effect based on very small number of studies with low confidence and moderate heterogeneity.
Offending: Violence	1.13	0.76, 2.35	H-0, M-1, L-4	Small, statistically insignificant, effect

	n=5, k=12 $I^2 = 87\%$		Egger's test: $p = 0.82$	based on very small number of studies but with low confidence and high heterogeneity.
Externalising behaviour	1.69 n=11, k=36 $I^2 = 91\%$	0.63, 4.53	H-0, M-1, L-10 Egger's test: $p = 0.55$	Large, but statistically insignificant, effect based on a small number of studies but with low confidence and very high heterogeneity
<i>Secondary outcomes</i>				
Attitudes and beliefs (e.g. aspirations and attitudes to justice system)	2.02 n=10, k=37 $I^2 = 82\%$	1.19, 3.46	H-0, M-0, L-10 Egger's test: $p = 0.69$	Large, statistically significant, effect based on a small number of studies but with low confidence and high heterogeneity.
Education: educational attainment and knowledge	1.77 n=13, k=54 $I^2 = 75\%$	1.08, 2.92	H-0, M-0, L-13 Egger's test: $p = 0.88$	Large, statistically significant, effect based on a moderate number of studies but with low confidence and moderate heterogeneity
Internalising behaviour (total)	2.09 n=26, k=130 $I^2 = 75\%$	1.48, 2.97	H-0, M-0, L-26 Egger's test: $p = 0.02$	Large, statistically significant, effect based on a moderate number of studies but with low confidence and high heterogeneity and possible publication bias.
Self-esteem (Internalising)	2.05 n=15, k=53 $I^2 = 70\%$	1.41, 2.97	H-0, M-0, L-15 Egger's test: $p = 0.15$	Large, statistically significant, effect based on a moderate number of studies but with low confidence and high heterogeneity. Strongly supported by qualitative data.

Locus of control (Internalising)	1.21 n=12, k=27 $I^2 = 80\%$	0.70, 2.07	H-0, M-0, L-12 Egger's test: p = 0.12	Moderate, statistically insignificant, effect based on a moderate number of studies but with low confidence and high heterogeneity.
Mental Health	2.43 n=8, k=17 $I^2 = 92\%$	0.98, 6.05	H-0, M-0, L-8 Egger's test: p = 0.52	Large, but statistically insignificant, effect based on small number of studies with low confidence and very high heterogeneity.
Social (total)	2.03 n=17, k=68 $I^2 = 84\%$	1.29, 3.19	H-0, M-0, L-17 Egger's test: p = 0.39	Large, statistically significant, effect based on a moderate number of studies but with low confidence and high heterogeneity.
Pro-social behaviour (social)	2.35 n=11, k=20 $I^2 = 88\%$	1.16, 4.76	H-0, M-0, L11 Egger's test: p = 0.33	Large, statistically significant, effect based on a small number of studies but with low confidence and high heterogeneity.
<p>Notes: n= no. of studies; k = no of effect sizes X (total) refers to all outcomes for that outcome category, and Y(X) means that Y is an outcome sub-category being reported separately in that row, but which is also included in the X(total) effect size.¹ See Annex 7 for outcome descriptions.</p> <p>Terminology is selected to be consistent with YEF toolkit (Youth Endowment Fund, 2021): Effect sizes High $d \geq 0.25$, moderate $0.10 \leq d < 0.25$, small $0.05 \leq d < 0.10$, no effect $-0.05 < d < 0.05$, harmful $d \leq -0.05$. For number of studies more than 30 is large, 12-29 moderate, 8-11 small and 7 or less very small. Publication bias is indicated in the last column for $p < 0.05$ for Egger's test.</p>				

¹ An increase in the effect is desirable, so $OR > 1$ is improvement/increase e.g., reduction in crime.

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	<ul style="list-style-type: none"> • Disruptive and aggressive behaviour by even one participant can undermine whole group • Failure to manage group dynamic • Males don't accept female group leaders • Effects of the intervention are not sustained over time • Ethnic differences between counsellors and participants 	<ul style="list-style-type: none"> • Participant open to change • Constructive use of time • Empathy towards others • Providing opportunities for family intimacy • Reflection • Learning through experience

1. Background

1.1 THE PROBLEM, CONDITION, OR ISSUE

Large numbers of children and young people are involved in crime, serious violence, and anti-social behaviour. In response, policy has shifted from punitive interventions, which are at best ineffective, to assets-based approaches that emphasize resilience, skill-building, and positive development by drawing on young people's strengths (e.g., Nichols, 2007; Lerner et al., 2007). This review examines wilderness and adventure therapy programmes designed for youth who have offended or are considered at risk. The review assesses if these interventions reduce criminal behaviour and improve behavioural and psychosocial outcomes.

The use of challenge-based activities to support positive youth development dates back at least a century, with John Dewey advocating for learning through demanding and stressful tasks (Brendtro and Strother, 2007). Challenges are group-based activities with tasks such as a group climbing over a high wall with limited equipment, constructing a bridge crossing, or building an access ramp for wheelchairs and pushchairs. One form of challenge that has become common are outward bound courses and wilderness therapy in which unfamiliar outdoor locations are the setting for the intervention.

Outward Bound programmes originated in the United Kingdom in the early 1940s and were later implemented in Australia during the 1950s and the United States in the 1960s. These programmes were specifically designed for adolescents from disadvantaged backgrounds and those exhibiting behavioural problems. Wilderness therapy emerged in the 1960s and 1970s as an extension of the Outward Bound model to address the increasing need for rehabilitation services targeting children and adolescents with behavioural difficulties (Kelly & Baer, 1968; Stewart, 1978). Wilderness therapy offers a structured, non-clinical alternative for youth with complex psychosocial needs (Behar & Stephens, 1978). More recently, the term “adventure therapy” has been adopted to describe interventions that use structured challenge-based activities to develop behavioural, emotional, and social competencies in children and young people.² The addition of the word therapy captures the explicit inclusion of a therapeutic component in some interventions, the informal therapy which may occur through conversations with course counsellors and the therapeutic effects of challenge activities and being in nature.

These activities have three common components: group working, creating a safe space in which trusted relationships can develop, and overcoming a challenge. Some interventions have a fourth component of exposure to wilderness or nature. They may also include an explicit therapeutic or mentoring component, with, for example, goal setting, but that is not required for an intervention to be within the scope of this review. An example of a programme definition illustrating these components comes from Crisp et al (1997): “Wilderness therapy is broken into two intervention formats: (1) wilderness base camping, which establishes a base camp with minimal equipment in an isolated environment, and (2) expeditioning, which consists of small groups moving from place to place in a self-sufficient manner using different modes such as backpacking, rafting, canoeing etc”. Individuals or groups are placed in settings where they must use problem-solving to deal with the environment and the challenge at hand (Hans, 2000). The different forms of adventure therapy include wilderness treatment, adventure-based activity learning, and long-term residential camping (Gillis and Thomsen, 1996).

Several theoretical frameworks have been proposed to explain the impact of wilderness and adventure therapy on children and young people. These interventions provide structured exposure to excitement and perceived risk, which may appeal to the high stimulation needs often seen in youth who offend (Kelly & Baer, 1968), and breakdown barriers through the shared experience. The group-based format supports developmental needs by fostering peer interaction, cooperation, and skills such as trust, communication, and

² The term adventure therapy is also used to cover classroom-based interventions in which CYP participate online in a real-life expedition. These interventions are not targeted to at risk and offending youth, and their intended outcome is appreciation of different cultures and the environment, so they are not within our scope.

problem-solving (Zimring, 1983). Nature exposure has also been linked to improvements in physical and mental health, forming the basis for nature-based therapeutic models.

In addition, wilderness and adventure therapy is rooted in hands-on learning and draws from experiential education, that is "learning by doing" along with reflection (Gass, 1993). Experiential education is a philosophy of education that "informs many methodologies in which educators purposefully engage with learners in direct experience and focused reflection in order to increase knowledge, develop skills, clarify values, and develop people's capacity to contribute to their communities".³ Experiential education gives an immersive experience for the child, allowing them to realise for themselves the rewards and consequences of their actions.

For at-risk youth, wilderness and adventure therapy have been associated with gains in adaptive functioning and reductions in problematic behaviour (Shanahan, 2019). Key therapeutic outcomes include increased self-esteem, improved self-concept, and the development of pro-social behaviours through structured group engagement (Cook, 2008).

Wilderness programmes seek to reduce antisocial behaviour through two related dimensions of experiential learning. First, by mastering a series of incrementally challenging physical activities, the participant experiences a pattern of success and thereby builds confidence, self-esteem, and a more internalized locus of control, i.e. taking more responsibility for their actions (Wilson & Lipsey 2000). Second, the group-based structure of wilderness programmes requires effective group interaction and cooperation (Wichmann, 1993). Through these experiences, participants are expected to develop pro-social interpersonal skills that can be transferred to everyday social environments beyond the programme.

Wilderness and adventure therapy interventions are expected to affect psycho-social outcomes such as self-concept, self-esteem, or self-confidence (e.g., Kelly & Baer, 1969; Gaston, 1978; Gibson, 1981) and improve social attitudes and behaviour (e.g. Boudette, 1989; Kelly & Baer, 1969; Stewart, 1978). Through these intermediate outcomes wilderness and adventure therapies may affect the rate and seriousness of offending and reoffending among children and young people at risk of or who have already offended (e.g., Cyntrynbaum & Ken, 1975; Hileman, 1979; Kelly & Baer, 1968)

Existing studies suggest that outdoor and experiential education, wilderness therapy programmes and challenge activities increase participants' self-esteem (Bowen and Neill, 2013, and Wilson and Lipsey, 2000)), and the belief that they have control over events that affect them (Wilson and Lipsey, 2000, and Hans , 2000). The different causal mechanisms are discussed more fully below.

It was over twenty years since the publication of the last effectiveness review of wilderness therapy which considered offending outcomes (Wilson and Lipsey, 2000), with a considerable number of studies published since then. A new review that was published as we were completing this review, focuses only on more recent studies (Beck and Wong, 2022), but also includes before versus after studies, which we do not. There is also a more recent meta-analysis of outdoor challenge activities (Bowen and Neill, 2013), but it is not focused on children and young people at risk of offending and does not report offending outcomes. Given the continued interest in wilderness therapy, and the related area of adventure therapy, and the current focus on youth offending, we present here a new, integrated mixed methods review. This is an update of the effectiveness review conducted by Wilson and Lipsey published in 2000, with the scope expanded to include adventure therapy, and the addition of a qualitative review.

1.2 POLICY RELEVANCE

³ <https://www.aee.org/what-is-experiential-education>.

This review is relevant to decision-makers and who seek non-custodial alternatives for young people who have offended, and those working with young people at risk of offending. There is a continuing need for up to date evidence on the effectiveness of such interventions.

The review has been commissioned by the Youth Endowment Fund (YEF). YEF was set up in 2018 as a £200 million fund to identify and test programmes to prevent serious youth violence in England and Wales, and to make evidence available to policy makers and practitioners. This study is one of a number of reviews being commissioned by YEF to inform both their own programming and the evidence-based knowledge brokering products, notably the Toolkit. But the review may also be used for other evidence platforms mentioned above (crimesolutions.org and the College of Policing What Works in Crime Reduction) which also use Campbell Collaboration systematic reviews as the basis for their content.

1.3 THE INTERVENTION

The review will include wilderness and adventure therapy programmes.

These programmes are defined as follows:

- (1) wilderness interventions take place in 'wilderness' or nature setting, though adventure therapy may or may not do so;
- (2) have an overnight stay element; and
- (3) have an interpersonal element which includes group activities and may also include work with counsellors and therapists.

(4) involve challenge-based activities in which children and young people have to overcome a challenge, usually in a group. The challenge may be in an outdoor setting – but need not be wilderness, it could be a local park – but may also be 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).

The intervention must be targeted at young people who are at risk of offending, which includes those who have already offended. That is, we will include only secondary and tertiary interventions.

The intervention may take place in any setting (rural, outdoor, custody, community or school).

1.4. HOW THE INTERVENTION MIGHT WORK

The positive effects of wilderness and adventure therapy can operate through a number of channels. These are: (i) therapeutic effects of the wilderness (nature); (ii) group activities encouraging pro-social behaviour; (iii) developing self-worth through completing challenges; (iv) diversion (i.e. spending time away from circumstances which may lead to anti-social behaviour and offending), and (v) the benefits of the mentoring or counselling component which may happen formally or informally. Each of these potential causal mechanisms is now discussed in turn.

1.4.1 Therapeutic effects of the wilderness environment

There is a growing body of evidence that exposure to nature has positive therapeutic effects. Two recent systematic reviews report a positive association between nature-based recreation and mental health. (Lackey et al., 2019, and Tillman et al., 2018)

Hence, the outdoor setting of the wilderness program could offer restorative benefits from exposure to nature. It may also utilize adolescents' inclinations towards spontaneity and self-disclosure. (Hill 2007, and Russell and Farnum 2004)

This 'wilderness effect' suggests that activities based in natural settings may have stronger effects than otherwise similar programmes in an indoor setting, so that the setting (outdoor/indoor) may be an important moderator.

1.4.2 Group activities and safe spaces to encourage pro-social behaviour

Wilderness and adventure therapy programmes generally include group activities, which may include a challenge element such as finding their way back to base, rock climbing or using equipment to cross a river. Engaging in task-oriented adventure activities for groups to solve as a single unit may support pro-social behaviours and problem solving.

Young people may be more willing to open up about their emotions in a structured activity focused on a challenge. The design of wilderness and adventure therapy programmes addresses communication difficulties among young people in this way. (Fletcher and Hinkle 2002). Group engagement in a structured setting may be instrumental in overcoming adolescents' difficulties in sharing personal thoughts (Hill, 2007).

The cohesion of the group is believed to be reinforced by the challenging nature of the activity. (e.g., Glass and Benshoff, 2002). Being placed in an unfamiliar environment, combined with the challenge element, such as rock climbing, high ropes, and expedition travel, helps to break down individual barriers, with a focus on cooperation rather than competition, and so fosters opportunities for participants to develop group cohesiveness and pro-social behaviour. Successful behaviour may be observed by others and perceived as something to aspire to.

A relationship of trust may also develop with the group counsellor, who may be seen as a role model and provide either formal or informal advice and counselling.

Potentially important mediators suggested by this discussion are pro-social behaviour and self-worth. The quality of the relationship with the course counsellor may be an important moderator.

1.4.3 The challenge element develops self-worth from sense of achievement

Wilderness and adventure therapy programmes seek to tackle anti-social behaviour through the challenge element thereby building self-esteem and developing positive interpersonal skills, all of which may affect offending and reoffending.

New problem-solving situations, drawing on different skills, are introduced to participants in a sequence of increasing difficulty. The challenges are intended to help the group members draw on their mental, emotional, and physical resources. Completion of such tasks is expected to lead to feelings of personal and social accomplishment. Programme facilitators provide coaching, teaching, support, reinforcement, and encouragement supporting completion of the challenges during the course of the programme through goal setting which reinforces this positive self-development. In addition, the possibility to actively help another person via group work serves to increase one's self-efficacy and self-esteem. (Yalom, 2006)

Potentially important mediators suggested by this discussion are social skills and self-esteem (or self-worth). The inclusion of a challenge element, or the degree of challenge involved, in a programme is also a potential moderator.

1.4.4 Diversion

Many youth programmes such as sports or after school programmes have a diversion element since they provide the young person with something to do rather than spend time in places where they are at risk of being drawn into criminal activity. This effect may also be there for wilderness and adventure programmes, though their limited duration may limit or entirely obviate this effect.

Young people participating in wilderness and adventure therapy programmes are away from their regular day to day environment and hence this prevents them from getting in trouble. However, the courses are of limited duration (though there are programmes of up to a year or more) so this direct diversion effect will not be large. There may be a large indirect effect if the course leads them to develop an interest in an adventure sport, or even just hiking, and so they get diverted from high-risk criminal activity or environments that increase the risk of engaging in it. Some participants may decide to pursue an outdoor or counselling career, or volunteer on the programme they participated in. Some programmes have a follow-up component to keep young people engaged, which may also help sustain effects.

Adventure therapy interventions may be of a more sustained duration and so have a larger diversion effect, so duration is an important moderator.

Duration comprises three elements: session length, number of sessions and overall duration of the course. So, for example, a course may have full day sessions every weekend for two months. There are arguments both ways as to whether a more intense course (every day for two weeks) will have a larger or smaller effect. On the one hand, greater intensity may enhance social bonding, but a less intense delivery over a longer period gives more time for relationships to develop, and for participants to encounter experiences between sessions that they can later reflect on and discuss.

1.4.5 The benefits of the mentoring counselling component

Wilderness and adventure therapy is facilitated by qualified professionals who may provide mentoring or counselling support to participants either informally or through a formal mentoring or counselling component. Mentoring may include such activities as goal setting, whereas counselling may have a more therapeutic orientation. Both the presence of a mentoring or counselling element and the qualifications of the counsellor may be important moderators.

1.4.6. The theory of change diagram

The theory of change, shown in Figure 1, explains how therapeutic wilderness and adventure programmes are expected lead to the outcomes such as reduced anti-social behaviour, violence and offending behaviours.

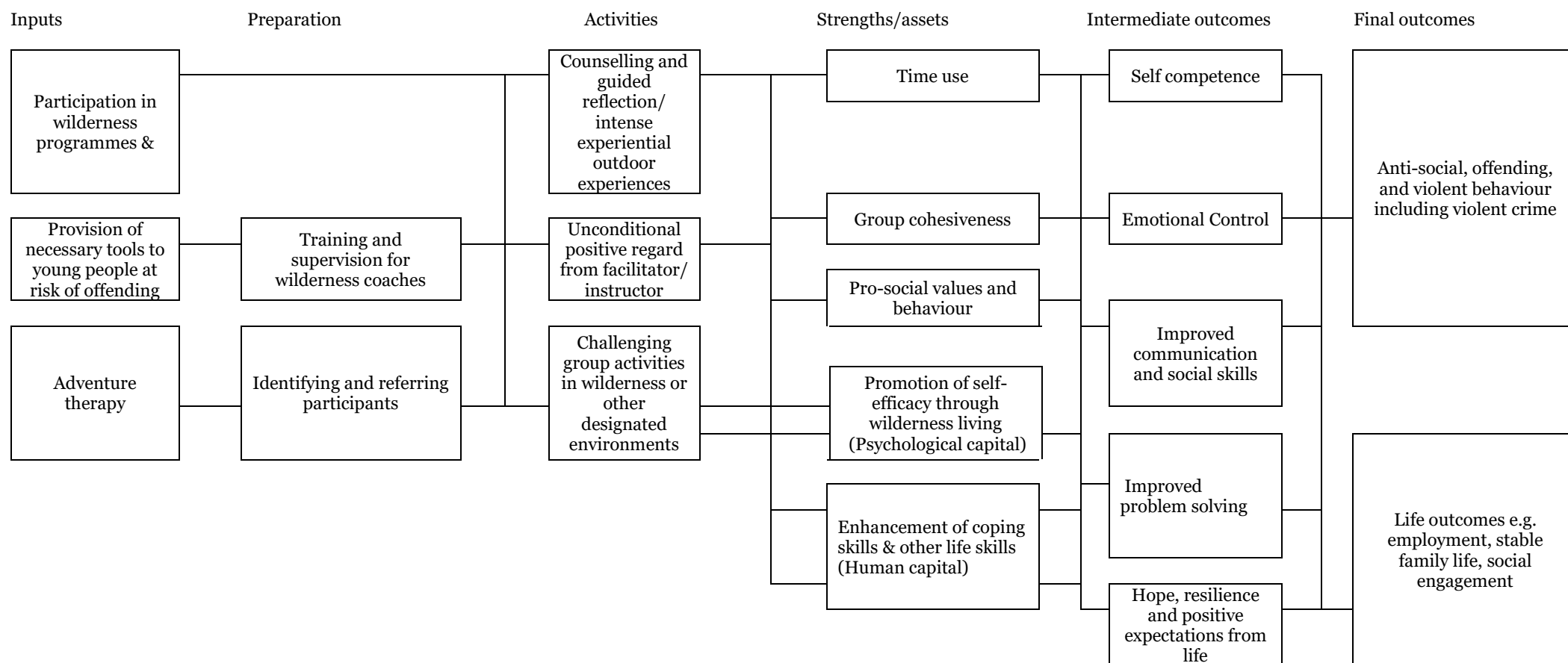
The wilderness or adventure instructor, facilitator, coach or counsellor also plays a significant role in the process. Instructors have a dual role of supervising challenge activities, and formal or informal counselling of participants. Hence their role is to assure that the intervention environment promotes growth by creating trust-based relationships which are genuine and congruent, and by providing unconditional positive regard.

The experience offered by wilderness interventions or challenge activities helps participants build key skills such as communication, cooperation, problem-solving, and emotional regulation. It provides the tools, support, and motivation needed to develop these abilities through guided reflection and shared challenges. Interpersonal problem-solving, in particular, may play a central role in reducing antisocial behaviour both during the programme and in everyday life.

This theory of change aligns with the asset /strength-based perspective. The strengths perspective pays attention to the resources of individuals that could potentially enable them to utilise these to cope with adversity rather than focusing only on the problems or deficits. (Saleebey, 1996)

The interventions aim to build and foster the assets and resources of children and adolescents (explained in Figure 1) and the helping process to support pro social behaviours. The discussion above suggests a number of potential moderators – such as the role and experience of the counsellors - which are shown in Table 2.

Figure 1 Theory of change



This review aims to test the strength-based theory and provide insight into the processes and factors which contribute to positive outcomes for young people at risk of offending through wilderness and adventure therapy interventions.

Until recently, the most recent published review of wilderness therapy that included offending outcomes was Wilson and Lipsey (2000), which is now dated.⁴ The review found that wilderness programmes had a positive effect on reducing offending. It also concluded that longer programme duration did not lead to stronger effects. In fact, shorter and medium-length programmes (under six weeks) were just as effective [*ibid*: 10]. The authors suggested that longer programmes might include other factors—such as lower intensity, weaker group dynamics, or less consistent facilitation—that could explain their reduced impact [*ibid*: 10]. That review was published over 20 years ago and so is in need of an update. Moreover, they combined offending with anti-social behaviour in their analysis.

There is a more recent review Fernee et al. (2017), but that is a qualitative review which explicitly excludes programmes intended for children displaying offending behaviour. The review of Bowen & Neil (2013) includes a meta-analysis for outdoor challenge activities that included 197 studies. They found a moderate short-term effect size on behavioural outcomes, but did not report offending, and the review was not restricted to secondary and tertiary interventions.

As this review was being completed, a new effectiveness review by Beck and Wong (2022) was published, assessing the impact of wilderness therapy programmes on self- and caregiver-reported delinquency. Their review focuses on more recent studies, but seven of the nine included used before–after designs without comparison groups, which do not meet the inclusion criteria for our review. While Beck and Wong (2022) suggest wilderness therapy may be a promising intervention for at-risk youth, our review takes a broader approach—examining a wider range of outcomes, applying a theory of change framework, including only studies with comparison groups, and using a mixed methods design.

Table 2 Moderators from the theory of change analysis

Characteristic	Moderators
Type of activity	Physically demanding/challenge activity versus other Group versus individual Indoor versus Outdoor
Mentoring or counselling component	Trained mentors or counsellors versus programme conductors Individual versus group counselling
Duration	Programme length
Programme intensity	Number of sessions per week Number of hours per week
Child risk category	High, medium or low

⁴ There is also a doctoral thesis a few years later (Beddard, 2004), which has fewer included studies than Wilson and Lipsey (2000).

Age group	Age ranges
Gender	All male
	All female
	Mixed
	Not known
Offending history	CYP who have offended (desistance) versus those who have not (prevention)
Ethnicity	All or predominately minority ethnic group (80%+)
	Substantial minority ethnic group (30-79%)
	No or minority of minority ethnic group (<30%)
Offending measure	Self-report versus administrative data
<i>Additional moderators</i>	
Critical appraisal	Confidence in study findings (high, medium, low)

1.5. OUTCOME MEASURES

1.5.1 Primary outcomes

The primary outcomes are offending, violent, anti-social and aggressive behaviour.

As pointed out by Farrington et al. (2003b), official records provide precise information (i.e. exact dates) about offenses. However, many of the specificities of offending can only be obtained through self-reports (e.g., co-offending, leaders and followers, motives, level of planning, etc.). Moreover, since not all crimes are detected, self-report may give a more accurate picture of crime levels. (Kazemian and Farrington, 2005). So, each measure has specific strengths, and a combination of both compensates for the other measure's weaknesses". (Huizinga and Elliott, 1986). In this analysis all measures of offending will be combined such as self-reported by young people and official records. Subgroup or moderator analysis will be conducted where possible. However, unlike Wilson and Lipsey (2020), we will keep anti-social behaviour - such as being loud in public places, public drunkenness and swearing, lying and bullying - and offending separate.

1.5.2 Secondary outcomes

Secondary outcomes are intermediate outcomes identified in the theory of change, which include mental health and internalizing behaviour, locus of control, pro-social behaviour and social skills, self-worth, problem- solving skills. The outcomes are listed in Table 3.

Table 3 Outcomes to be analysed

Outcome category	Analysed as
Offending Outcomes (Outcomes that refer to things that are against the law)	All offending Violent offending Reoffending ()
Externalising behaviour	Externalising behaviour (includes aggression and anti-social behaviour)
Internalising behaviour	Internalizing behaviour Self-esteem/self-worth Locus of control
Social behaviour	All social outcomes Pro-social behaviour Family relationships
Mental health	All mental health outcomes
Others	Attitudes and beliefs Education

1.6. COST EFFECTIVENESS OF WILDERNESS, CHALLENGE, AND ADVENTURE THERAPY PROGRAMMES

It is generally believed that prevention is more cost-effective than sending young people who offend to detention and correctional facilities (e.g. Taylor, 2016). In the United States, these costs are monitored by the Justice Policy Institute, which reports that some states spend US\$500,000 to incarcerate a young person for one year.⁵ To test the cost-effectiveness of wilderness and adventure programmes data are required on programme costs of alternative treatments as well as their benefits. We review existing studies of costs and cost effectiveness where available.

⁵ <https://justicepolicy.org/research/policy-brief-2020-sticker-shock-the-cost-of-youth-incarceration/#:~:text=The%20average%20state%20cost%20for,economic%20impact%20of%20incarcerating%20youth.>

2. Objectives

The review will address the following research questions:

1. What are the long- and short-term effects of wilderness and adventure programmes on anti-social behaviour and violent and other offending behaviour? What factors moderate (explain any heterogeneity among) these effects?
2. What are the long- and short-term effects of wilderness and adventure programmes on intermediate outcomes such as self-esteem, mental health and behavioural outcomes such as social skills and locus of control?
3. Which factors, such as setting (indoor/outdoor), quality of relationship with counsellors and the degree of the challenge element involved are important moderators of these effects, and help explain any observed heterogeneity across studies?
4. What are the barriers and facilitators affecting the successful implementation of wilderness and adventure programmes?
5. Are wilderness and adventure programmes cost-effective?

3. Methods

3.1 STUDY SELECTION CRITERIA

Studies were included in the review if they met the following selection criteria:

- The programme involved a wilderness or adventure therapy programme as described above
- The programme was an organized activity
- The programme was targeted towards children and young people who have offended or are at risk of doing so who are aged 25 years or below (i.e., secondary and tertiary interventions only). It is the programme which much be targeted not the study sample.. If the programme was not specifically targeted at at-risk or offending youth, the study was not eligible, even if it included at-risk participants.

3.2 TYPES OF PARTICIPANTS

Young people aged up to 25 years who have exhibited, or are deemed at-risk of, anti-social and offending behaviour. Young people who are at likelihood of not reaching educational goals, exhibiting behavioural difficulties, and/or delinquency due to environmental and social variables that are often beyond their control are classified as at-risk youth.

Children and young people (CYP) deemed at-risk may be identified for the purposes of the intervention or study by several means:

- Screening: Social workers or other professionals, or the research team, may apply an assessment tool prior to implementing an intervention (e.g., for disruptive behaviour), to a group of children and young people, and recruit only those with a high score into the study, for both experimental (or treatment) and control groups.
- Assessment: Many countries have assessment systems to identify children and young people as being medium- or high-risk of offending which may be used in various ways to recruit into the intervention.
- Referral: CYP may be referred to the wilderness intervention programme by social workers, youth workers, or police officers.
- Recruitment: CYP may be directly recruited, for example by project staff visiting schools to identify disadvantaged youth or youth having behavioural problems.
- Geographical targeting: The intervention may take place in, or recruit from, a neighbourhood with a disproportionate share of at-risk CYP.
- Proxy targeting of the intervention to reach CYP with characteristics correlated with the risk of anti-social and criminal behaviour such as social-economic status (e.g., eligible for free school lunches), and ethnicity.

3.3 TYPES OF INTERVENTIONS

This review includes studies of secondary or tertiary interventions, of wilderness and adventure therapy programmes. Primary interventions are not included. The intervention must be targeted at youth who are at risk of offending, which includes those who have already offended.

Secondary prevention strategies strive to reduce or eliminate the harm caused by established risk factors. They are aimed at those who show early indicators of having poor life trajectories, with the goal of assisting them in achieving a positive life trajectory. (Bowen 2016).

Tertiary preventive programmes are designed to minimize rather than reverse harm in the most seriously at-risk people who already have difficulties. They aim to reduce the likelihood of future issues occurring. (Bowen 2016).

This review also includes wilderness and adventure programmes which involve the young person's family.

We have excluded interventions solely focused on the therapeutic component and targeting mental health as the only outcome.

3.4 TYPES OF STUDIES

This is a mixed methods review that includes different study designs to address the different research questions (RQs). To evaluate the effectiveness of wilderness and adventure therapy interventions (RQ 1 & 2), we include:

- Experimental designs: randomized controlled trials (RCTs)
- Non-experimental designs: Designs with a non-randomly assigned comparison group or regression designs such as instrumental variables which included untreated observations.

We have not included before versus after studies with no comparison group.

We have used these evaluations to extract outcome data and conduct meta-analyses to evaluate the effectiveness of wilderness and adventure therapy programmes, as well as moderators which explain observed variation in effects.

To understand the success factors and possible barriers to participation in wilderness and adventure programmes (RQ 3) we have included:

- Process evaluations and qualitative studies of interventions: Any evaluation or study of an eligible intervention discussing design and implementation issues.
- Information on barriers and facilitators has also been extracted from effectiveness studies if reported.

To evaluate the costs and cost-effectiveness of wilderness and adventure therapy interventions (RQ 4), we include any other studies and reports presenting cost data, as well as extracting that information from effectiveness studies or process evaluations if available.

In the case of multi-arm studies (ii) if there is a 'no treatment arm', that is used as the comparison for all treatment arms; (ii) if there is an arm which is not eligible as wilderness/adventure programme that arm is designated as an active comparison condition; or (ii) if all arms are eligible treatments then the study is used for moderator analysis but not used for average effect size estimates across all studies.

3.5 SEARCH STRATEGY

3.5.1 Electronic searches

We used the following strategies to identify completed and on-going potential studies.

A database search was conducted on Medline, PsycInfo, PsycExtra, Social Policy & Practice, Scopus, Repec, ERIC, Econlit, CASE Engagement database (EEP, UCL), and the US National Criminal Justice.

Appendix A presents an example of the search strings used for publication databases and search engines, with terms for interventions, regions and methodologies. This also includes the search dates and month for each database.

3.5.2 Searching other resources

In addition to searching electronic databases, we also screened the bibliographies of included studies and existing reviews of wilderness intervention programmes for eligible studies. Issues of relevant journals have also been hand-searched for eligible studies. We also searched websites of relevant organizations for grey literature, as well as the UK government websites for England, Wales, Scotland and Northern Ireland. Google was also searched for grey literature. The grey literature search included 'website snowballing' where one website provides a link to another relevant website.

3.6 DATA COLLECTION AND ANALYSIS

3.6.1 Screening and selection of studies

The studies screening for inclusion/ exclusion was undertaken in two stages using EPPI Reviewer 4. The first stage was title and abstract screening and the second was the screening of the full text. Both stages of screening were done by teams of two independent researchers (AM, ML and SM) using the screening tool with a third-party arbitrator in case of disagreement (HW).(Appendix 3)

All screening of identified studies was done independently by three people (AM, SM and MN) with a third-party arbitrator in case of disagreement (HW).

3.6.2 Data extraction and management

For impact and process evaluations/qualitative studies, we used a standardized data extraction form (Appendix 4) to extract descriptive data from all the studies that met our inclusion criteria. All outcome data was coded, with different measures of the same outcome in the same study being combined in a multi-level meta-analysis. Data extraction from each study included context/geographical information, population, study design and method, intervention types and outcomes type, and subcategory. Two researchers (AM and SM) conducted the data extraction for each study. Both coders were trained on the tool before starting. Disagreements were resolved through discussion with a third reviewer consulted as needed (HW).

The coding tool included as Appendix 4 is a mixed methods tool with both quantitative and qualitative data extraction codes. These also include extraction of barriers and facilitators as well as cost and cost effectiveness of the studies.

For effectiveness studies, extraction of raw data from evaluations was conducted by (1) the Lanzhou team by Professor Kehu Yang, Professor Xiuxia Li, Jing Li, Zijun Li and Jieyun Li, and (2) Howard White and Hugh Waddington.

3.6.3 Assessment of risk of bias in included studies

The confidence in the study findings of all studies included in the review was assessed using a critical appraisal tool for primary studies developed by the Campbell Collaboration Secretariat. The tool covers both quantitative and qualitative studies (see Appendix 5). Critical appraisal assessment was completed by three reviewers (AM, SM and MN).

The tool contains critical dimensions of the evaluation. Each of these is marked as High, Medium, and Low. The overall score uses the 'weakest link in the chain' principle. Hence, the confidence in study findings can only be as high as the lowest rating given to the six critical items in effectiveness study and nine critical items in qualitative/process evaluation.

The tool includes six critical items for the assessment:

- Study design
- Intervention
- Outcomes
- Sample Size (Power Calculation)
- Attrition
- Baseline equivalence
- Evaluation Question

The qualitative tool includes nine critical items:

- Is the qualitative methodology described?
- Is the qualitatively methodology appropriate to address the evaluation questions?
- Is the recruitment or sampling strategy described?
- Is the recruitment or sampling strategy appropriate to address the evaluation questions?
- Are the researcher's own position, assumptions and possible biases outlined?
- Have ethical considerations been sufficiently considered?
- Is the data analysis approach adequately described?
- Is the data analysis sufficiently rigorous?
- Are the implications or recommendations clearly based in the evidence from the study?

3.6.4 Mixed method analysis (treatment of qualitative research)

Carvalho and White (1997) identify various ways in which qualitative data may be used in an analysis of quantitative data. Specifically, qualitative data can be (Carvalho and White (1997):

- *Integrated* with quantitative data to elaborate the causal chain, that is the different causal mechanisms within the theory of change. For example, there may be a large gap between intention to treat and treatment of the treated effect sizes on account of high attrition as youth fail to show up in the first place or drop out. Qualitative data are usually best placed to understand barriers and facilitators to participation.

- Used to *confirm*, *enrich* and *illustrate* the findings of the quantitative analysis. For example, wilderness and adventure programmes are expected to build self-worth, and direct quotes from participants can illustrate and confirm this finding, adding colour to the report.
- Used to *explain* study findings. In the case that there is heterogeneity, then qualitative data may shed light on why this may be, for example why youth may bond with a group or not.
- The previous point contains examples where qualitative data may contradict or *refute* the proposed causal mechanisms, possibly leading to a counter-theory (Carvalho and White, 2004), e.g., that programmes for at risk youth may have iatrogenic effects by bringing them into contact with other anti-social youth (Walsh et al., 2020).
- *Merged* with findings from quantitative analysis into a single set of implications for policy and practice.

These ways are similar to those identified in the Cochrane Handbook which states that ‘qualitative evidence synthesis (commonly referred to as QES) can add value by providing decision makers with additional evidence to improve understanding of intervention complexity, contextual variations, implementation, and stakeholder preferences and experiences’ (Noyes et al., 2019).

This review adopts that approach, that is combining qualitative data with a quantitative meta-analysis, within the framework of a theory-based systematic review, TBSR. (White, 2018). The TBSR approach, which has similarities with the framework synthesis approach (Booth, 2015; Carroll, 2013), takes the intervention as the unit of analysis, not the individual study. Different studies may contribute findings at different stages of the causal chain. For example, process evaluations and qualitative studies shed more light on implementation issues than do most effectiveness studies, such as the importance of a quality mentoring relationship and means of achieving it, which can help explain both the size of, and variations in, effect sizes.

The TBSR framework is shown in Table 4. Quantitative data are indicated as Qt and qualitative as QI. Quantitative data refers to both effect sizes and factual quantitative data such as participation rates.

Table 4 Stages of the causal chain with data to be examined at each stage	
Stage in causal chain	Data
Awareness of the programme amongst relevant service providers and target group	Know of programme, aware of eligibility criteria, purpose and how to access (Qt/QI)
Enter the programme	Attrition (Qt)
Stay with programme for whole duration	Reasons do not participate or remain in programme (QI)
Activities undertaken	Descriptive material (QI)
Informal mentoring role	Mentoring relationship (QI)
Diversion	Time use (Qt and QI)
Connection to services	Channels for service connection (QI)
Behavioural impact	Pro-social behaviour. Self-worth. Future outlook. (Qt supported by QI).

Anti-social behaviour and offending behaviour	Anti-social behaviour, aggression, and criminal behaviour. Police contacts. (Qt)
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Table 5 shows the TBSR framework which is used for both horizontal and vertical synthesis (White, 2018). In Table 5 an abbreviated version of the row headings from Table 4 are pivoted to become column headings. The data in Table 5 are subject to vertical, horizontal, and total synthesis.

Vertical synthesis involves summarizing the evidence across all cases, which is the way systematic reviews are usually performed, especially for quantitative analysis of effects. In the case of qualitative data, vertical synthesis is a thematic analysis, in which common themes are identified across studies.

Horizontal synthesis summarises across a case – which may be done in narrative reviews, but with the difference here that the data for an intervention may come from more than one study. The overall synthesis combines both, though may well contain separate overall synthesis by sub-group. The overall synthesis approach, drawing on both horizontal and vertical synthesis, ‘tells the story’ of if the intervention works, for whom, under what circumstances and why.

Table 5 Theory Based Systematic Framework

Age/gender	Settings	Activities	Barriers and facilitators	Causal processes	Recruitment and referral mechanisms	What CYP say	Moderators
Case 1							Horizontal synthesis
Case 2							

Case n							
	Vertical synthesis						Overall synthesis

3.7 META-ANALYSES

The following sections describe the procedure for conducting a meta-analysis of wilderness intervention programmes. Multiple meta-analyses were conducted for different outcomes domains and each meta-analysis followed the same procedure.

Our study includes some outcomes which are typically reported as dichotomous variables (e.g. offending behaviour), and some which more often reported on the scale (e.g. behavioural measures). To perform the meta-analysis we will use odds ratios for dichotomous variables and Hedge's *g* for continuous variables (as Hedge's *g* is preferred over Cohen's *d* for small samples which is expected to the case for this many studies included in this review).

Where an effect, which is predominately reported as a dichotomous outcome, is reported in a paper as a continuous or ordinal measure then the effect size will be calculated as *g*, and then converted to an odds ratio using $OR = e(g/\sqrt{3\pi})$.

3.7.1 Data extraction

Extraction of raw data from quantitative studies was conducted by (i) a team of authors at the Lanzhou University, China (Professor Kehu Yang, Professor Xiuxia Li, Jing Li, Zijun Li, Jieyun Li); (ii) Howard White and Hugh Waddington, all working independently of one another. All relevant information was extracted for all outcomes reported by the primary evaluations. Any disagreements were discussed and resolved.

Where primary evaluations reported descriptive information about continuous outcomes, the means, standard deviations, and sample sizes were recorded for both experimental and control groups. Ideally this information was recorded for both before and after intervention timepoints, but for some evaluations this information was not provided (e.g., Sachs 1992). Where information was reported as dichotomous outcomes or frequency data (e.g., the number of individuals in experimental and control groups who reoffended and who did not reoffend) were recorded. It was our preference that this information was recorded before and after an intervention was implemented, but this was not true for all evaluations (e.g., Connolly, 2012).

3.7.2 Estimation of effect sizes

The Campbell Collaboration online effect size calculator⁶ was used to compute effect sizes. Cohen's *d* effect sizes were estimated for evaluations that reported outcomes as continuous variables (e.g., Callahan, 1989) and odds ratios were estimated for evaluations that reported outcomes dichotomously (e.g. Kelly 1968).

An effect size for pre-intervention and post-intervention were recorded and used to calculate the intervention effect (i.e., the pre-post change). These computed effect sizes are indicative of the effectiveness of the intervention, or in other words, how the outcome of interest changed following implementation of the wilderness programme.

All effect sizes were transformed to an odds ratio for ease and consistency of reporting. Cohen's *d* effect sizes were transformed first to Hedge's *g*, and then to an odds ratio (on the natural logarithm scale, LOR) using the following formula: $LOR = g/0.5513$ (Lipsey & Wilson, 2001; p. 201).

It had been planned to adjust treatment of treated effects to intention to treat, but this was not possible based on the information provided. It was not even possible to identify many of the included studies as being either Intention to treat (ITT) or Treatment on treated (ToT, so we could not use that as a moderator.

3.7.3 Direction and comparability of effects

Before conducting the meta-analysis, we carried out rigorous checks that all outcomes were comparable and reported in consistent directions. Two authors conducted these checks independently of one another and any inconsistencies were resolved through discussion.

Outcomes were grouped using a theoretically informed outcome framework (see Table 3 above). We also recorded the instrument used to measure each outcome and the definition of the specified outcome to doubly ensure that outcomes grouped together for the meta-analysis were indeed comparable.

The majority of outcomes were reported in the expected direction, for example, higher values indicated greater self-efficacy (e.g., Margalit, 2014) or increased depression and anxiety (e.g., Norton, 2019). For outcomes whereby a decrease in the outcome, for example depression or anxiety, would indicate a desirable intervention effect, the effect size was multiplied by -1 to allow the numerical values to be interpreted in a consistent way with all other outcomes.

The result is that for all meta-analyses, odds ratios greater than 1 (or LORs greater than 0) represents a desirable intervention effect. It follows that odds ratios less than 1 (or LOR less than 0) represent an undesirable intervention effect and an odds ratio equal to one (or LOR equals to 1) suggests a null intervention effect. In other words, a mean odds ratio of greater than 1 (or LOR greater than 0) indicates, for example, a greater reduction in aggression in the experimental group relative to the control group and a greater improvement in prosocial behaviour in the experimental group relative to the control group.

⁶ <https://www.campbellcollaboration.org/research-resources/effect-size-calculator.html>

3.7.4 Meta-analysis: Methods section

We estimated weighted mean effect sizes for all outcomes using a three-level meta-analytical model to account for the dependency between effect sizes (Viechtbauer, 2010). This method allows for the inclusion of multiple effect sizes from the same evaluations for different outcomes, different types of report (e.g., self-report, parent-report, official records), and different groups (Hedges et al., 2010). We used the 'metafor' package and the `rma.mv` function in *R* was used to conduct these analyses (Viechtbauer, 2010). An example of the rscript used to run analysis is provided in Technical Appendix 6

We followed the decision-making flowchart presented by Pustejovsky and Tipton (2022) to choose a working model for our meta-analyses. In the present review, we use a CHE model (correlated hierarchical effects) with small sample adjustments. (Tipton, 2015) We used the `clubSandwich` package for *R* alongside the `metafor` package to undertake the analyses.

We aimed to compute one meta-analysis per outcome domain. Due to the number of effect sizes estimated we were able to compute separate meta-analyses for self-esteem, locus of control, reoffending, and violence outcomes.

4. RESULTS

4.1 DESCRIPTION OF STUDIES

The database search identified 6,032 studies out of which 92 were duplicates, leaving 5,940 studies for the title and abstract screening. These also included the 20 benchmarking studies that were found through hand searching. Of these, 930 studies were screened at full text stage. We have excluded 823 studies at the full-text screening stage. The journal and website search did not identify studies not already included in the database studies or in the benchmarking studies list.

Finally, we have included 107 studies for coding. From these we excluded 43 studies due to study methodology (primarily before versus after studies), intervention or target group at the coding stage. The final number of included studies in the review is 65 studies described below (Figure 2- PRISMA Diagram)

Focus of the study:

Effectiveness studies n= 42

Process evaluations n= 19

Studies covering both n= 4

Study design:

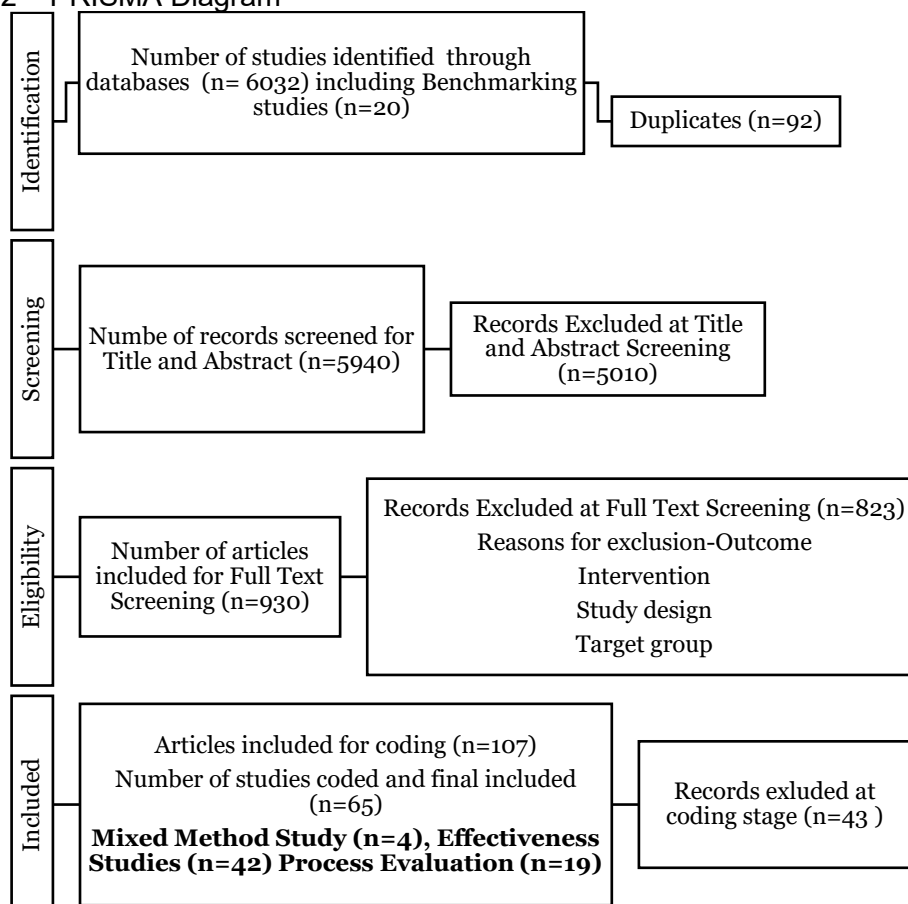
RCT n= 9

Non-experimental-effectiveness n= 33

Qualitative/descriptive n= 19

Mixed methods n= 4

Figure 2 – PRISMA Diagram

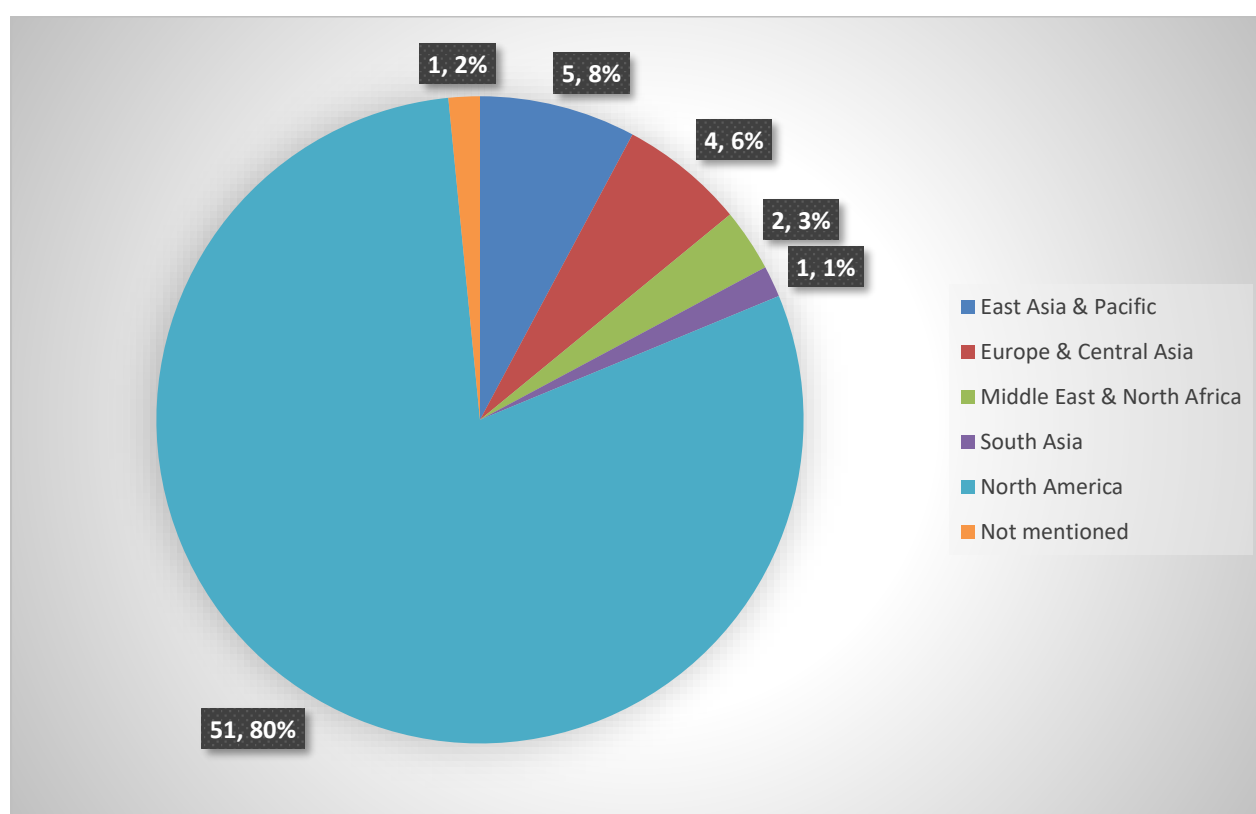


- 4 Mixed Method studies, of which
 - 3 Non-Experimental and PE
 - 1 Experimental and PE
- 42 effectiveness studies, of which
 - 33 are non – experimental effectiveness studies and
 - 9 are RCTs
- 19 Process Evaluations.

4.1.1 Geographical Area

The majority of the included studies are from North America (51 studies, Figure 3) with the others mainly from East Asia and Pacific (5 studies). We have found very few studies from Europe and Central Asia (4 studies). All studies are from high-income countries (65 studies) and there is 1 study where region or country is not mentioned.

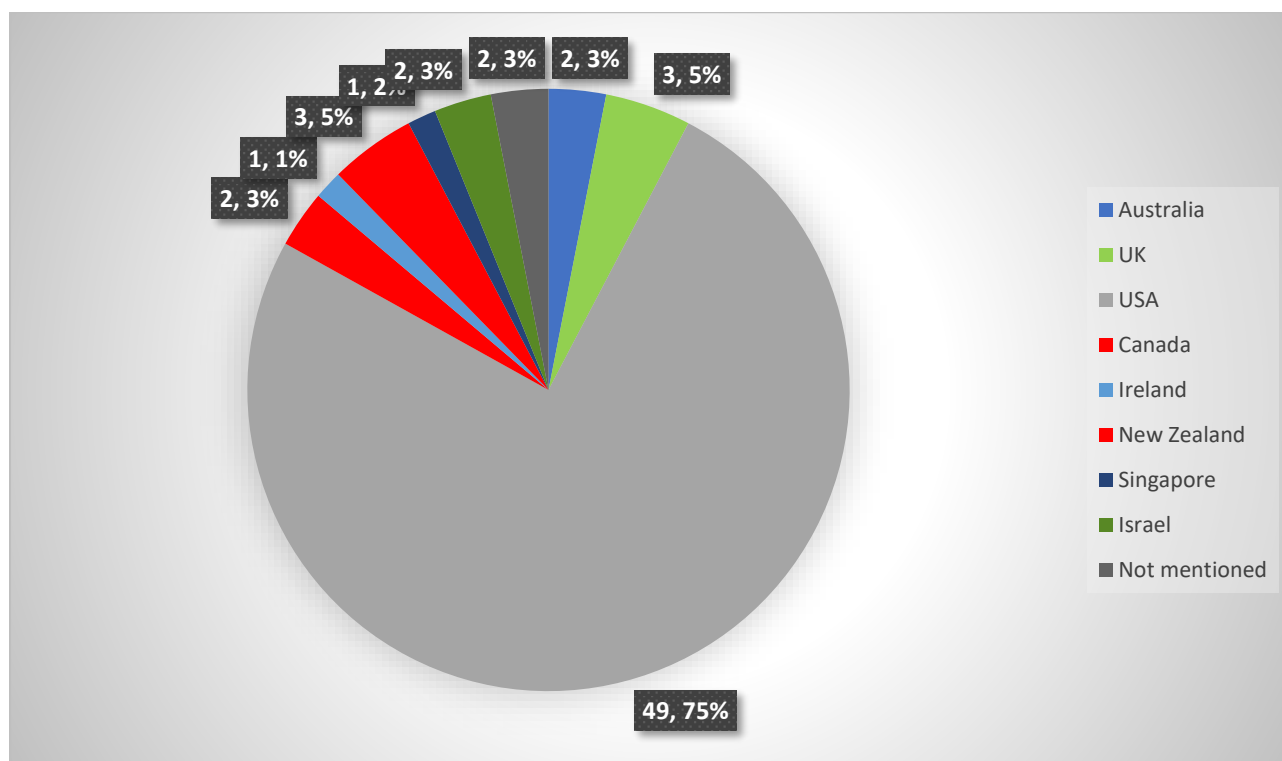
Figure 3 - Geographical area of studies included in the review



4.1.2 Studies classified by country

The majority of the studies are from the United States of America (49, Figure 4). This is followed by three from New Zealand, two each from Canada and Israel, Australia and three from UK. One study is from Ireland and one from Singapore.

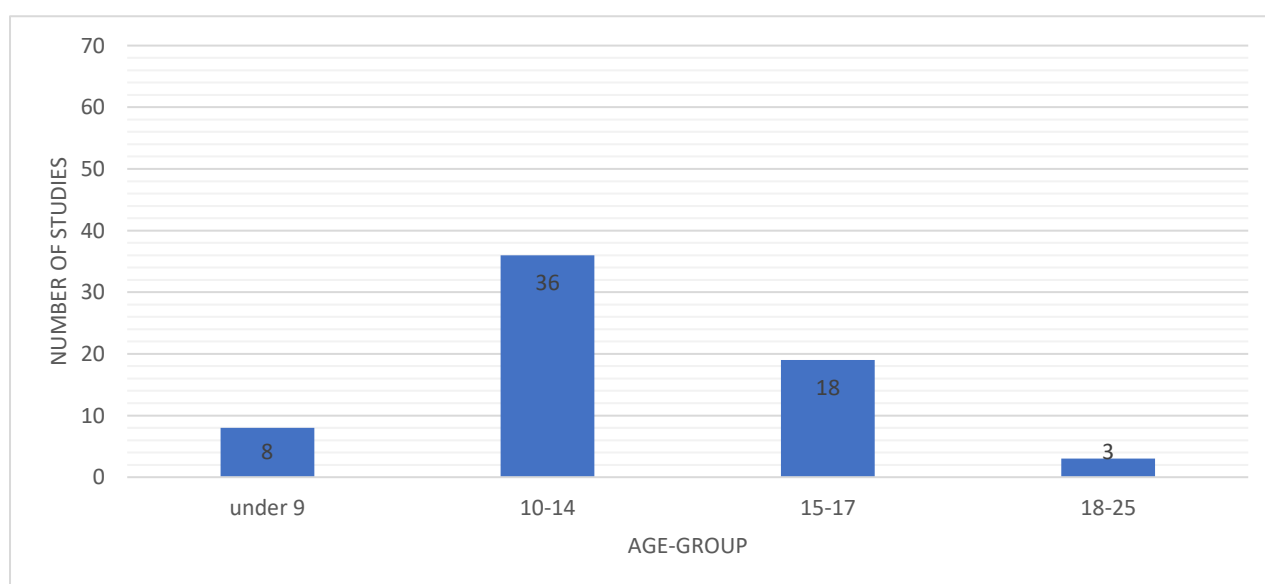
Figure 4 - Studies classified by country



4.1.3 Age of the Participants

The population in this review were children and young people (CYP) aged up to 25 years who have exhibited or are deemed at risk of, anti-social, violent, or criminal behaviour. The majority of included studies (36 studies) concern youth in the age group of 10-14 years, (18 studies) the age group of 15-17 years, 8 studies CYP under 9, and 3 studies come under the age group of 18-25 years (Figure 5).

Figure 5 Age of the Participants



4.1.4 Gender

There are 35 studies where the intervention included both genders, and 20 studies where intervention was exclusively focused on male participants for e.g. Action bound, USA-a one week outdoor programme consisting of activities such as mountain climbing, canoeing, rescue training, A.C.T.I.O.N (Accepting challenge through interaction with others and nature) based in Canada-a 21 day programme which includes Rock climbing, rappelling, kayaking, morning run, orienteering, backpacking etc (Winterdyk 1980, Lee 1969).

There are 6 studies where the interventions focused on female participants only, such as Project Challenge based in USA which is a 4-day programme including activities such as hiking, rock climbing, rappelling, camping, whitewater rafting and Catherine Freer Wilderness Therapy Expeditions (CFWTE) which is a 21 day trekking and camping programme. (Mann 2010, Marti 2007)

There are 4 studies where gender has not been reported.

4.1.5 Ethnic minority population

There are only four studies where the ethnic minority population is more than 80%.

There are 26 studies, where the ethnic minority population is partial and there are 25 studies where the ethnic minority population is not very clearly mentioned, for example. Zwart 1989 mentions that the sample was racially balanced but there are no more details on classification by race. There is no mention of ethnic minority population in 10 studies.

4.2 INTERVENTIONS

The included studies review 66 interventions that are characterized into wilderness and adventure therapy programmes and have overlaps in terms of a range of different activities such as rock climbing, ropes course (high and low), canoeing, hiking, camping and caving etc.

4.2.1 The design of wilderness and adventure therapy interventions

Wilderness and adventure interventions face a number of design choices, including: recruitment and referral mechanisms, pre-wilderness orientation, activities undertaken as part of the intervention, re-entry to normal life and post-intervention support. Each of these stages is described in turn.

4.2.2 Recruitment and referral

Participants may be actively recruited, especially in research studies rather than evaluations, or may come from referral. The programmes in the included studies report three recruitment or referral mechanism. The most common is service referral, which is found in 39 cases of the 66 for which data are available. This is followed by school-based recruitment (16 cases) and referral by parents (2) cases. Unlike the case of sports programmes (Malhotra et al., 2022), there are no cases of recruitment by outreach or geographical targeting by programme placement.

Service referral

In most of the interventions participants were referred to the programme by social service departments or probation officers. Examples are:

- i. Castellano (2008) describes a 30-day wilderness stress challenge programme with activities such as backpacking and canoeing for which the participants were children aged 13-17 years who had displayed pre-delinquent or delinquent behaviour. They were referred to the Spectrum program by the Illinois

Department of Children and Family Services (DCFS), United Delinquency Intervention Services (UDIS), and a variety of local probation offices and other social service agencies operating throughout Illinois.

- ii. Hunter (1996) reports findings of the effects of a 35-day outward bound wilderness therapy programme and had activities such as camping, canoeing and training for a ten-mile run. The participants were 97 young males aged 14-17 who had crepeated offending histories with 10 or more arrests for property crimes, interpersonal physical violence, drug charges, or a combination of these. All were in the custody of the State of Florida, and had been given the option of participating in a five- to six-week Outward Bound course followed by probation rather than serving the remainder of their sentences (sometimes several years) in a security prison. The young people were released into the community after successfully completing the course, under the supervision of a parole officer.
- iii. Margalit (2014) analyses a wilderness therapy programme which operates in an all-male boarding school in Israel. The participants, aged 14-16 years, are referred to the boarding schools by Social Services and come from low-income households. They are identified by Social Services as encountering social or educational challenges, and are at risk of poor developmental outcomes and involvement in delinquent behaviour.. The programme length is 4-5 days and includes activities such as camping, outdoor training, navigation, and constructing devices, backpacking
- iv. McNamra (2002) describes a five-day adventure therapy programme for boys aged 9-11 years. Boys who met the definition of children of abuse and neglect (as stipulated by the South Carolina Department of Social Services) were identified as potential participants for this intervention. They were also receiving treatment from the local mental health agency
- v. Nurenberg (1986) reports findings for a wilderness therapy programme for which young people aged 14-19 are referred through several channels, namely, social services, probation department, guidance counsellors, and school principals.

School based

In some case participants with behavioural problems are referred to by the teachers or school counsellors. Examples include:

- i. Glass (2001) describes an adventure-based counseling and low-element challenge course for young people aged 11–14 years. A group of 14 students from one class were referred by their teacher due to sustained disruptive behaviour. The teacher described the students as being angry with each other and showing signs of concern about their own wellbeing. Because of these behavioural issues, they were placed in a separate class. To improve collaboration, they took part in a low-element challenge course involving activities such as TP shuffle, shipwreck, the spider's web, king's ring, and the swinging log.
- ii. Langsner (1987) studied an intervention where the youth were identified by the participating school system as exhibiting behavioural difficulties and so had been placed in four self-contained elementary special education classrooms. This was a five-day outdoor challenge education programme for youth aged 9-13 years that included camping.
- iii. Burdsal (1980) describes a wilderness expedition running over six weeks for children aged 10-14 years at risk of offending. The children's teachers were the primary referral source for the program and they selected children who they felt would benefit most from the programme.

Parents

Bandaroff (1993) report on the Family Wheel programme - a wilderness survival programme for problem adolescents aged 13-18 years where the primary referral source were the parents. Parents referred their children to the programme due to substance abuse, behavioural difficulties, poor school performance, and delinquent activity

4.2.3 Pre-trip Orientation

Wilderness activities are generally preceded by a preparation or orientation stage which serves two purposes: (1) preparing participants for the activity, introducing them to the required skills and safety, and (2) to start to build relationships with counsellors and within the group. For example:

The four-day Project Challenge camping trip was preceded by four training sessions of one day each which included practicing activities such as climbing and whitewater activities, recording their experiences in a journal, and a facilitated discussion about the day. (Mann, 2010).

The five-day wilderness and adventure programme called "Adventure Challenge 2000" included an orientation 15 days before the trip which was attended by the participants and their parents. This exercise gave the participants a chance to get to know each other before hand and so to start to form bonds. The children were familiarised with the programme components and were given training on how to set up a tent. The presentation included the fact that the hiking would involve Llamas which is reported to have got the children really excited and looking forward to the trip. (McNamara, 2002).

Orientations are also an important component of wilderness programmes with the family component. For example, Pommier (1995) discusses a 4 week Outward bound school programme with a family training component (FINS). This consists of a two-day orientation phase in which participants are introduced to the programme objectives and camp procedures. While the students live in a local, rural area, their parents attend workshops. Conflict resolution, communication, Reality Therapy, goal setting, consequences vs. punishment, positive reinforcement, and behaviour contracting are among the topics covered by parents. At the end of this phase, parents and children discuss their goals and desired behaviour changes together.

In some cases, orientation is provided only immediately before the activity begins. Marti (2007) reports findings from her study of a 21-day wilderness programme called the Catherine Freer Wilderness Therapy Expeditions (CFWTE). The participants and their families had a pre-trip meeting with the programme staff. Families introduced themselves and discussed their anxieties and hopes for the next three weeks, and detailed the home setting and circumstances that led to their involvement in a wilderness treatment programme. It is reported that most of the parents deceived the children by giving them no information that they are being enrolled into the programme for the fear of the children lashing out and refusing to participate. There were separate sessions also with the parents and the children on their perceptions of the situations on why a wilderness treatment programme was needed and what are their expectations from the programmes.

And, in some cases, there is no orientation. Hunter (1996) describes a 35-day court-ordered Outward Bound program in Northern Florida attended by ninety-seven adjudicated male delinquent adolescents ages 14-18. Students are picked up from detention centres, given a brief introduction of the programme, course equipment is distributed, and the Outward Bound base camp is set up. The next few days are spent learning basic camping and canoeing skills, as well as participating in various experiential group activities.

4.2.4 Defining the wilderness and adventure therapy experience

Type of programme

Many of the foundations, and ideologies of these outdoor therapy programmes are based on experiential learning, which has been inspired by the use of "direct experience" as a tool for learning, behaviour change, and, more recently, therapeutic intervention. (Marti, 2007) Experiential therapy can be considered as an umbrella framework that includes different modalities such as wilderness therapy, adventure-based therapy, and adventure education and learning programmes. The setting and intensity of the programmes may differ but the basic principle remains the same.

Duration

Wilderness programmes differ in duration ranging from a few days to up to one year. They can also be structured to be self-contained or offer a continual enrollment format. Self-contained programmes have a defined start and end date and work with an intact group. Individuals are admitted when they are accepted into the programme, therefore continuous enrollment models will have clients at the beginning, middle, and conclusion of treatment in the same group (see Russell, 2001; and Gillis, 2008).

Examples of programmes of different duration are

- i. **Long-term residential (1 year or more)** Deschenes (1998) describes the Nokomosis challenge programme that was developed for youth involved in offending 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, with the participants engaging in boot-camp activities. Similarly, Lambie (2000) reports on a wilderness therapy programme for young people aged 13-19 years, who have committed a sexual offense. Most of them have engaged in various forms of assault against males and females, including inappropriate touching and oral sex, rape, and non-contact offences such as voyeurism, exhibitionism, and stealing underwear. The programme lasts between one and two years, depending on the individual and family's needs, with an average of 18 months,
- ii. **Short to medium term wilderness therapy (3-6 months)** Callahan (1990) describes the six-month programme Sierra 2 programme which includes activities such as ropes course, backpacking, caving, mountain marathons, and canoeing. This programme is targeted towards young people who have offended. The PCYC Catalyst programme is an outdoor adventure intervention with 15 programming days over a 10-12-week period. This youth prevention programme applies early intervention strategies to help young people make positive choices. (Bowen, 2016)
- iii. **Short/medium term adventure-based therapy-(Less than 3 months)** The spectrum programme is a 30 day wilderness and adventure programme with activities such as backpacking and canoeing. (Castellano, 2008) Durbhan (2019) reports the effects of an eight week adventure based intervention called Challenge by Choice. Young people were given experiential, hands-on learning opportunities while interacting with outdoor adventure-based activities as part of this programme.

Programme activities

Table 6 Types of wilderness/adventure activities

Wilderness activities	Adventure activities
Camping (27)	Rock/wall climbing (21)
Hiking (21)	Ropes course (high and low) (15)
Running (3)	Canoeing (15)
Caving (7)	Rafting (4)
Fishing (2)	Skiing (2)
Outdoor education (4)	
Note: number of cases with this activity in the included studies	

Additional activities: animal assisted therapy (2), role play (psychodrama) (1), archery (1), trust building exercises (2), survival skills (1), biking (1)

4.2.5 Tailor made interventions

Interventions with the family component

Some programmes are designed for both the young people and their families and in other cases family involvement is included 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:

- i. 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, 1989) 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 analyse and reassess their thinking about the children's diverse needs and providing the necessary tools for family communication and cooperation.
- ii. 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 Btalk treatment in individual, group, and family settings.
- iii. 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. Conflict resolution, communication, Reality Therapy, goal setting, consequences vs. punishment, positive reinforcement, and behaviour contracting are among the topics covered by parents. At the end of this phase, parents and children discuss their goals and desired behaviour changes together. Individual contracts are created to provide the student and the FINS personnel a focus. (Pommier, 1995)
- iv. Bendorof (1993) describes the Family Wheel programme where the family and children engaged in intensive experiential activities while camping and trekking in the wilderness. There were three structural components to the programme, as well as a daily theme that represented a crucial family resource. Exercises and structured experiential activities that acted as metaphors for family functioning were used to present and exemplify the concept. Survival skill training was one of the daily metaphors. It was the responsibility of the adolescent who had learned these abilities during his or her wilderness experience to teach them to his or her parents. This aimed to illustrate the young persons competency, provide a venue for family re-enactments, and inform parents about their son or daughter's survival programme. The multiple family therapy group was the final component, which was utilised to integrate the theme and process the events of the day.

Specialized programmes for juvenile delinquents as an alternative treatment In addition to programmes for young people with behavioural disorders, some preventive and diversionary interventions are specifically designed for youth involved in offending.

The Michigan Department of Social Services established the Nokomosis challenge programme, an innovative correctional programme for young people who are considered to be at low and medium-risk of offending. The programme was created as an alternative to 14-16 month residential stays, and it consisted of three months of residence and outdoor challenge programmes followed by nine months of intensive community-based aftercare. (Deschenes 1998)

Lambie (2000) describes the wilderness experience of young people who have committed a sexual offence through a community driven wilderness programme. Such community-based initiatives represent a recognition of the detrimental consequences of incarcerating young people in traditional detention centres. Wilderness experience programmes are also viewed as a more effective setting for the formation of healthy relationships between young people and professionals than typical therapeutic contexts such as institutions.

The time spent away from a dysfunctional family structure allows the young person to experiment with new behaviours in a safe setting. These programmes also provide advantages beyond those seen in typical group therapy.

Callahan (1990) in his study describes the Sierra 2 programme which was a probation diversion programme. The primary goal of the programme is to help referred adjudicated juveniles and their families to cease engaging in disruptive behaviour. The programme lasts six months, and participants must meet as a group at least twice a month. The Sierra wilderness experience consists of a series of physically, emotionally, and psychologically demanding exercises, with group discussions of the lessons learned at the end of each activity.

Young people were referred to the spectrum programme by the probation department serving a large suburban county in northern Illinois. Positive attitudinal and behavioural changes will be translated into responsible and competent behaviour in the face of difficult physical challenges in the wilderness, encouraged by the nurturing guidance of team leaders and supportive peers, and free of common social sources of alienation, fatalism, and negative identities. The Spectrum program's responsiveness to fostering personal responsibility and sensitivity to others among its clients is shown in a variety of ways. The "circle," a group problem-solving strategy that encourages open discussion of personal issues and results in resolutions through peer discourse and confrontations, with each participant being directly accountable to the entire group for his or her actions, is one such methodology. (Castellano 2008)

4.3 LEVEL AND SETTING

64 interventions took place in rural/outdoor settings, and 1 in urban settings (Table 6)

Table 7 – Setting of studies included in the review

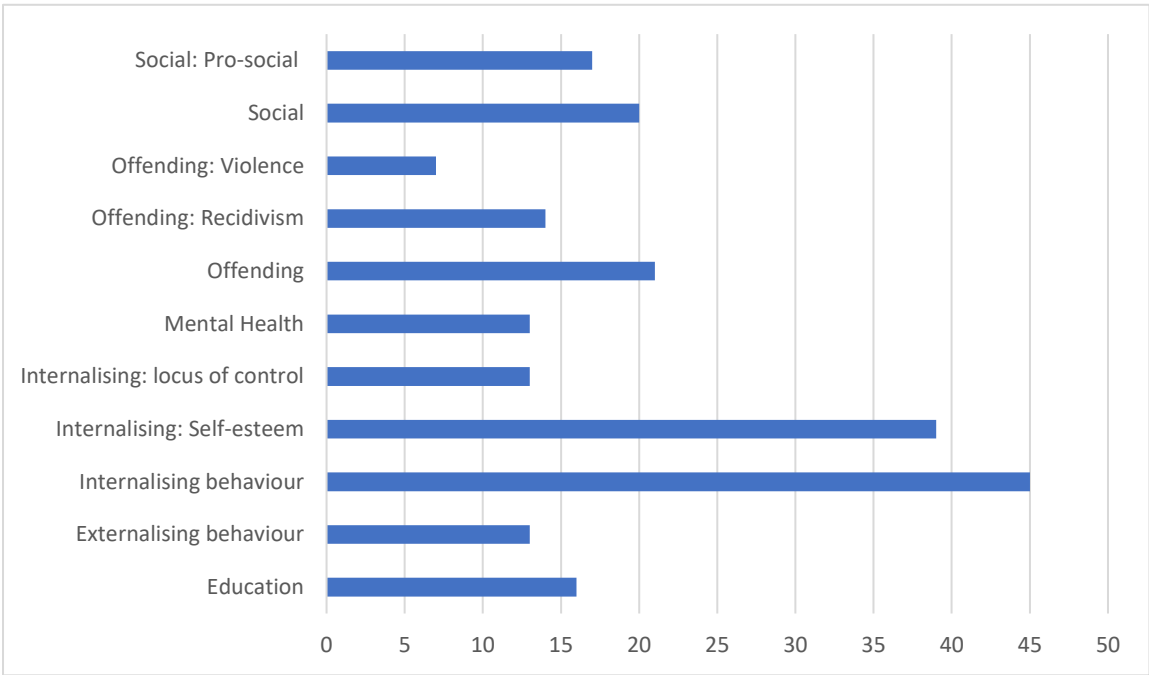
Intervention setting	Total
Urban/Outdoor	1
Rural/Outdoor	63
Not Clear or unstated	1

4.4 OUTCOME CATEGORIES

The review included the studies which evaluated the effects of wilderness and adventure therapy interventions in altering anti-social behaviour and offending outcomes.

In terms of primary outcomes, the review identified 21 studies with offending, violence and crime outcomes, 13 studies with outcomes such as mental health, internalizing behaviour and self-regulation, externalizing and risk-taking behaviour, anti-social behaviour, identity development as well as improved psycho-social functioning. The review included 32 studies that evaluated psychosocial and cognitive outcomes such as self-esteem, and locus of control. In addition, we identified 8 studies with skill development related outcomes, 11 studies with family and peer relations outcomes and 8 studies with academic performance related outcomes. There are 2 studies that present cost analysis. (Figure 6)

Figure 6 – Outcome categories for studies included in the review



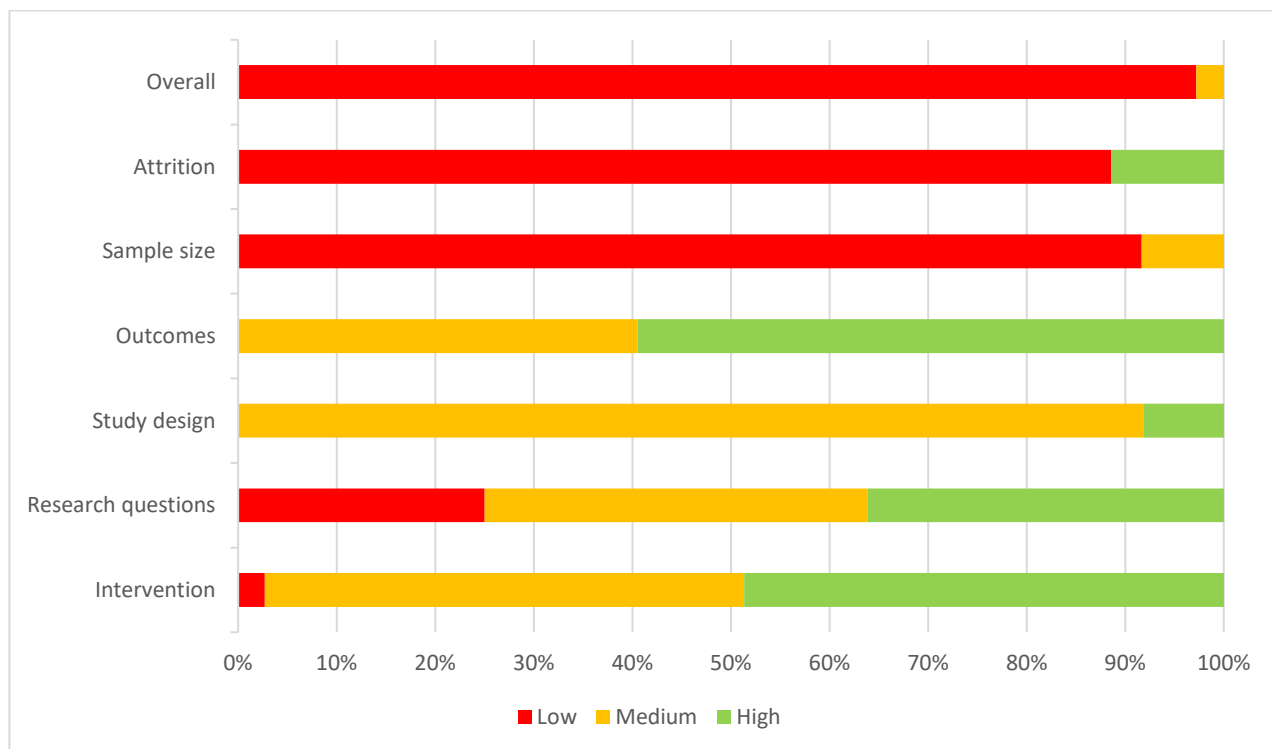
Given the range of outcomes encountered, we developed a more elaborate categorization of outcomes which is shown in Appendix 7. Meta-analysis was carried out according to the outcomes listed above, with separate analysis for the most commonly reported outcomes, notably self-esteem and locus of control, as well as disaggregation of offending.

4.5. CRITICAL APPRAISAL OF THE STUDIES

4.5.1 Effectiveness studies

Of 47 studies with full critical appraisal, 46 are rated as low confidence, and one as medium confidence. As shown in Figure 7, this overall low rating is driven by a combination of a low rating on attrition and sample size, which in both cases can also reflect either a lack of reporting of attrition rates or high attrition (notably differential notably) where it was reported, or power calculations respectively.

Figure 7 Critical appraisal of effectiveness studies

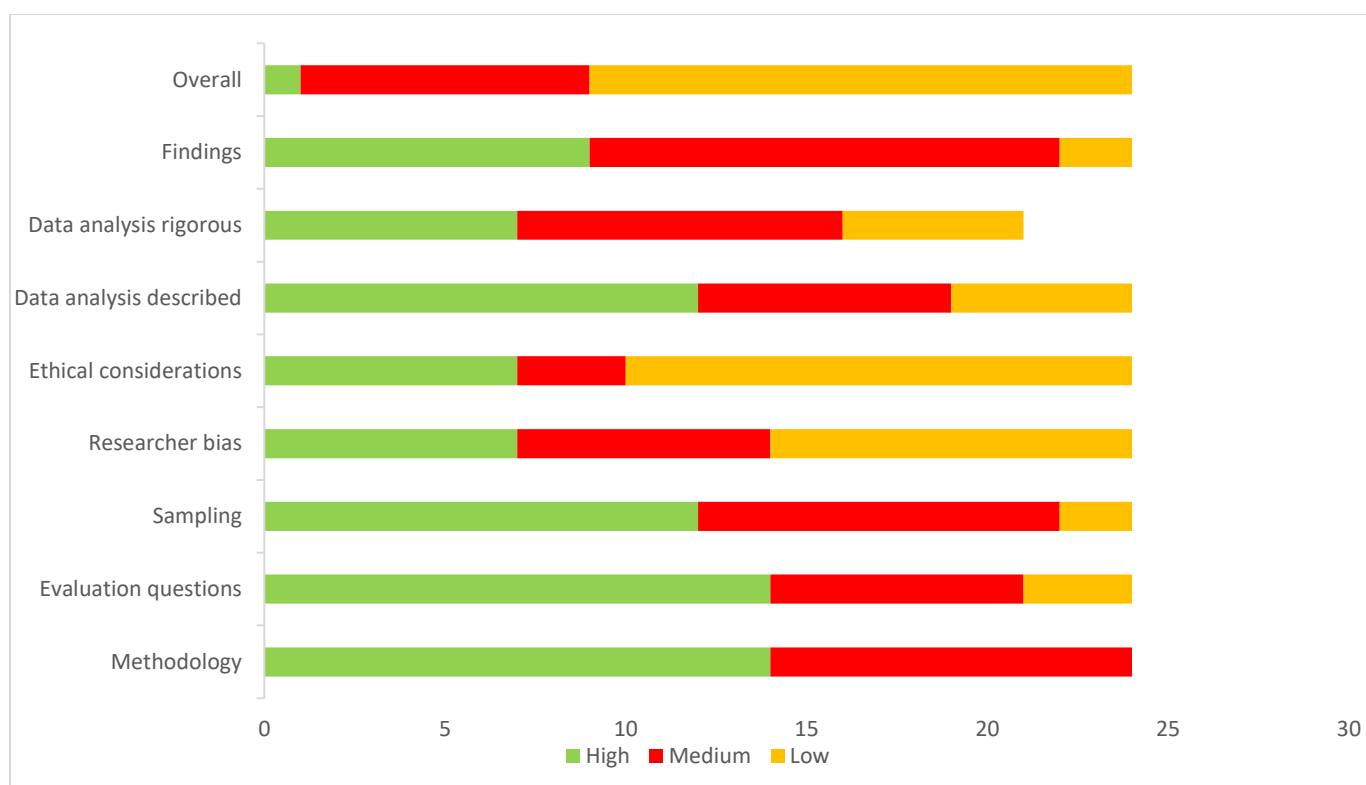


Source: Authors' critical appraisal of included studies.

Intervention and outcomes were clearly defined in over half of the cases, with near all the rest scoring medium on these criteria. Research questions being clearly stated were both rated high or medium stated for just under 40% of studies.

4.5.2 Process evaluations

Figure 8 Critical appraisal of process evaluations



Of the 19 studies with full critical appraisal, 13 are rated as low confidence, 5 as medium and 1 as high confidence as shown in Figure 8.

4.6. CHARACTERISTICS OF INCLUDED STUDIES-EFFECTIVENESS AND PROCESS EVALUATIONS

4.6.1 Effectiveness studies

The table below describes in detail the programme and design characteristics of all the included effectiveness studies. As the information provided is detailed, we have split the table in two parts- the first part contains author/year, location/settings, country/intervention name, type of activity, duration of intervention and age and the second part consists of study design, intervention, outcomes and comparison condition.

Table 8 Included studies-Effectiveness-Part 1-

Author and year	Location/Settings	Country/Intervention name	Type of activity	Duration of Intervention	Age
Ang (2014)	Urban-Indoor-Outdoor	Singapore/Outward bound Singapore intercept	Ropes course (high and low)	5 days	13-18 years
Burdsal (1980)	Rural/Outdoor	USA/Passport for adventure	Camping, backpacking, rock-climbing, hiking.	Three 2-week wilderness expeditions with 5 days between each trip	10-14 years
Birkenmayer and Polonoski (1976)	Urban/outdoor	USA/Development Through Adventure and Responsibility (DARE)	Challenge activities	13 weeks	15 years
Birkenmayer and Polonoski (1975)	Urban/outdoor	USA/Development Through Adventure and Responsibility (DARE)	Challenge activities	3 months	15 years
Brand (1998)	Rural/Outdoor	USA/The south-coast wilderness-enhanced programme	Bushwalking, canoeing, abseiling	10 days	11-13 years
Callahan (1989)	Rural/Outdoor	USA/Sierra 2 process	Ropes course, backpacking, caving, mountain marathons, canoeing	6 months	13-17 years
Castellano (2008)	Rural/Outdoor	USA/Spectrum	Backpacking, canoeing	30 days	13-17 years
Carter (1979)	Rural/Outdoor	USA/Eckerd wilderness programme	Camping	4 weeks	8-15 years
Connelly (2012)	Urban/Outdoor	USA/The ropes course at the Carol Joy Holling Centre	Ropes-course-high and low	1 day	13-16 years
Cross (1999)	Rural/Outdoor	USA/Outdoor adventure education programme	Rock climbing	5 days	12-19 years
Deschenes (1998)	Rural/Outdoor	USA/The Nokomis challenge program	Boot-camp activities	1 year	16-17 years
Durbahn (2019)	Rural/Outdoor	USA/Challenge by choice (CBC)	Hiking, rock climbing, kayaking, equine therapy, high ropes course,	8 weeks	9-15 years

			fishing and river boarding.		
Elrod 1992	Rural/Outdoor	USA/Project Explore	Ropes course, climbing	3 days	14.8 years
Gillis (2008)	Rural/Outdoor	USA/The Behavior Management through Adventure (BMtA), Outdoor therapy project (OTP), Youth development centre's specialized treatment programme	Challenge ropes courses, backpacking, rock climbing, and caving.	30 days	8-18 years
Gillis (2010)	Urban/Outdoor	USA/Legacy	Low and high challenge ropes course	1 year	8-18 years
Greenwood 1987	Rural/outdoor	USA/The Vision Quest Programme	Wilderness camp, wagon train, sailing, bicycling trip	56 weeks	16.3 years
Hunter (1996)	Rural/Outdoor	USA/Hurricane Island Outward Bound School, Florida Special Programs (HIOBS)	Camping, canoeing and marathon-running	35 days	14-18 years
Kelly (1971)	Rural/Outdoor	USA/Outward bound schools in Colorado, Minnesota and Hurricane Island	Mountain walking, high altitude camping, rock climbing, and rappelling	26 days	15-17 years
Langsner (1987)	Rural/outdoor	USA/Project explore	Camping	5 days	9-13 years
Larson (2007)	Rural/Outdoor	USA/Life adventure camp	Camping	5 days	9-18 years
Lee (1969)	Rural/Outdoor	USA/Action Bound	Mountain climbing, canoeing, rescue training	One week	16-18 years

Maizell (1989)	Rural/Outdoor	USA/ Project Quest	Canoeing, hiking, toss a name game, group juggling, moonball, rappelling practice, Ultimate Frisbee, Trust Sequence, Levi tation, Trust Fall, Hickory Jump, Course Tour, Electric Fence, B1ind Polygon	10 weeks	13-17 years
Mann (2010)	Rural/Outdoor	USA/Project Challenge	Hiking, rock climbing, rappelling, camping, Whitewater rafting	4 days	13-17 years
Margalit (2014)	Rural/Outdoor	Israel/Wilderness therapy	Camping, outdoor training, navigation, and constructing devices, backpacking	4-5 days	14-16 years
Minor 1988	Rural/Outdoor	USA/Project Explore	Maze, pine, and oak ropes courses located 15, 25, and 40 feet respectively above ground level, as well as a 50 foot climbing tower	3 days	15.4 years
Molof (1967)	Rural/Outdoor	Wilderness camp	Wilderness camp	28 weeks	18 years
Norton (2019)	Rural/Outdoor	USA/Family Enrichment Adventure Therapy (FEAT) program	Hiking, camping, kayaking, geocaching, archery, low and high ropes courses, rock climbing	2 days	8-17 years
Nunley (1984)	Rural/Outdoor	USA/Project B.O.L.D	Sailing, hiking, trust exercises, crafts and initiative games	5 days	12-16 years

Parker (1995)	Rural/Outdoor	Name of the intervention not mentioned	Ropes course, rock climbing and rappelling	2 days	12-18 years
Plouffe (1981)	Rural/Outdoor	USA/ Connecticut Wilderness School	Camping, canoeing, and rock climbing	19 days	13-19 years
Pommier (1995)	Rural/Outdoor	USA/ Outward bound school programme with a family training component (FINS)	Surviving skills in the outdoors, low impact camping, first aid, nutrition, and nature appreciation, canoeing, discussions on controlling anger and job applications	4 weeks	13-17 years
Ramirez 1975	Urban/Outdoor	USA/Operation Summit program/USA	Mountaineering, rock climbing, backpacking, and group problem solving	3 weeks	16.5 years
Romi (2004)	Rural/Outdoor	Israel/Wilderness programme	Hiking	6 days	15-18 years
Russell (2011)	Rural/Outdoor	USA/Wilderness Endeavours Program	Wilderness and adventure-based travel to remote environments	1 year	14-17 years
Sachs (1983)	Rural/Outdoor	USA	Camp setting and activities, hiking, Initiative games such as balance, island, rope walk, trust walk, caving	3 days	13-17 years
Sakofs (1991)	Rural/Outdoor	USA/Wilderness Alternative for Youth (WAY)	Camping, hiking, mountaineering, caving and rock-climbing	3 weeks	13-18 years
Tran (2021)	Urban/Outdoor	Gurnang Life Challenge (GLC)	Skills training, work ethics	16 weeks	18-25 years

Walsh (2009)	Rural/Outdoor	USA/Thistledeew Wilderness Endeavours Program.	Training Trek, reflection activities, camping	21 days	13-17 years
Wichmann (1991)	Rural/Outdoor	USA/Spectrum Wilderness Programme	Ropes course, rock climbing, caving, backpacking, canoeing, and group processing	30 days	13-18 years
Williams (1985)	Rural/Outdoor	USA/Therapeutic camping program	Canoeing, rock rappelling, backpacking, and orienteering	3 days	15-17 years
Winterdyk (1980)	Rural/Outdoor	Canada/A.C.T.I.O.N (Accepting challenge through interaction with others and nature)	Rock climbing, rapelling, kayaking, morning run, orienteering, backpacking	21 days	13-16 years
Wright (1982)	Rural/Outdoor	USA/ Appalachian school of experience	Backpacking, wilderness navigation, rock climbing, Whitewater canoeing	26 days	16.5 years
White (2007)	Rural/Outdoor	UK/Adventure Based Learning Experience (ABLE)	Initiative tasks, cultural studies, obstacle course, cross-country hike, canoeing, high ropes course, wall climbing	3 months	13 years
Willman 1973	Rural/Outdoor	USA/Homeward bound	Survival, circuit training, land and/or sea expeditions, navigation, first aid and firefighting, silviculture, logistics, ecology, search and rescue, ropes and knots, rock climbing and rappelling, hiking, running	6 weeks	16-18 years

Wood (2012)	Rural/Outdoor	UK/ TurnAround (TA)	Skills workshops and outdoor activity days, weekly one-to-one mentoring and two wilderness trails	10 months	17.7 years
Ziven (1988)	Rural/Outdoor	USA/Challenge Group treatment program	Problem solving, trust and challenge activities	5 days	15 years
Zwart (1989)	Rural/Outdoor	USA/ Wolf Creek Wilderness Youth Development Program	Rock climbing and rappelling, backpacking/hiking, Whitewater canoeing, solo expedition	26 days	14-17 years

Table 8 Included studies-effectiveness-Part 2-

Author and year	Study Design	Intervention	Outcomes	Comparison condition
Ang (2014)	A quasi-experimental design with a matched no-treatment comparison group was used and included pretesting, 1month post-intervention testing as well as testing at 3month follow-up. The intervention group comprised 76 adolescents (61 males, 15 females), and the matched comparison group comprised 60 adolescents (48 males, 12 females).	Outdoor experiential intervention aimed at addressing frequent deliberate truancy and absenteeism from school and within school extracurricular activities.	Academic/school related outcomes	The intervention group comprised 76 young people, and the matched comparison group comprised 60 young people The intervention group participants completed a five-day outdoor experiential program while the comparison group participants did not go through such a program.

Burdsal (1980)	(1) The experimental group—those who participated in the treatment starting in the summer of 1973 {the year that the program initiated year-round operation) who were contactable 6 months after termination of treatment; and (2) the control group—children who qualified for the program but were excluded due to space limitations and were contactable 6 months after the termination of the treatment program in which they would have participated.	Community based camping programme an early-stage intervention program for delinquent youth with three main components-(1) working with children in a quasi-institutional setting (quasi because the camping program is voluntary, of fixed duration, and seen as at least partly recreational by the children); (2) family therapy; and (3) working with the child's school	Mental health, internalizing behaviour and self-regulation, externalizing and risk-taking behaviour Social outcomes & emotional outcomes improvement in interpersonal relationships, communication, improved adjustment, family and peer related outcomes, academic/school related outcomes	The control group—children who qualified for the program, but were excluded due to space limitations and were contactable 6 months after the termination of the treatment program in which they would have participated.
Birkenmayer and Polonoski (1976)	Longitudinal study design	A high intensity 13-week wilderness program with no additional therapeutic component.	Self-esteem, socialization, social desirability, alienation, extroversion, delinquency	148 institutionalized, male adolescents were placed in the wilderness program or remained in the training school.
Birkenmayer and Polonoski (1975)	Longitudinal study design	A three-month wilderness program with no additional therapeutic component.	Academic, anti-social behaviour, externalising	166 institutionalized, male adolescents were placed in the wilderness program or remained in the training school.

Brand (1998)	Multi-phase pre and post treatment and control group design with a longitudinal follow up	A 10-day programme for boys aged 11-13 years with behavioural problems. The programme had two years follow up component	Self-concept, esteem, confidence, violent and anti-social behaviour, commitment to school	Total 190 subjects-73 participated in the intervention and 52 as controls with no intervention and 65 acted as a reference group
Callahan (1989)	A single control group was established in the same timeframe as the experimental group. Validated assessment instruments/tests were used to collect study data from both experimental and control groups	Adventure education programme implemented for adjudicated juvenile delinquents modelled on the components of Outward bound. This programme was considered as a catalyst for self-discovery and personal growth. In addition to physical skills each juvenile is counselled in regard to trust, compassion, self-concept, personal responsibility and leadership	Attitudes and belief self-concept, esteem, confidence Mental health, internalizing behaviour and self-regulation, externalizing and risk-taking behaviour Social outcomes & emotional outcomes improvement in interpersonal relationships, communication, improved adjustment Identity Development, skill development, academic/school related outcomes	70 delinquent boys and girls received either the wilderness program or probation.
Carter (1979)	Time series pre and post	A 4-week intervention for juvenile delinquents aged 8-15 years	Offending. Academic achievement	120 institutionalized males received either the wilderness program or treatment as usual in the institutional setting.

Castellano (2008)	A matched group quasi-experimental design was undertaken to test the effects of the Spectrum program on participant reoffending.	Wilderness stress challenge programme-The Spectrum program included a 30-day course of backpacking, white-water canoeing, a 3-day solo experience and a range of service projects.	Skill development, crime and anti-social related outcomes	56 delinquent males were assigned to the wilderness program or placed on probation.
Carter (1979)	Time series-pre and post	A 4-week intervention for juvenile delinquents aged 8-15 years	Offending. Academic achievement	120 institutionalized males received either the wilderness program or treatment as usual in the institutional setting.
Connelly (2012)	A pretest-post-test design with random assignment to experiment and control groups was used	The ropes course included multiple elements designed to challenge the participants to increase their individual and corporate thinking, and their decision-making ability and their ability to solve problems.	Attitudes and belief self-concept, esteem, confidence	36 participants were randomly assigned to either the experimental group which received the one-day ropes course (18) or the control group that did not attend the course (18)
Cross (1999)	Matched group design-each subject in the experimental group was matched on selected variables to a cohort in the control group. Criteria for matching included seven factors: gender, ethnicity, family living situation	Outdoor adventure programme-4-day rock climbing program with thirty-four at-risk adolescents to investigate the effects of program on perceptions of alienation and personal control	Mental health, internalizing behaviour and self-regulation, externalizing and risk-taking behaviour outcomes	Thirty-four at-risk adolescents served as participants. Seventeen received the treatment (intensive, outdoor, rock climbing program), while seventeen others served as controls

Deschenes (1998)	Before after with comparison group-the study was designed with intake, 12-month, and 24-month follow-up interviews for both experimental and comparison groups with youths and their families	An innovative correctional program for low- and medium-risk delinquents designed as an alternative to residential placements that average 14-16 months. The program combines three months of residence and outdoor challenge programming with nine months of intensive community-based aftercare	Attitudes and belief self-concept, esteem, confidence, family and peer related outcomes, cost effectiveness study	199 youths where 102 youth were assigned to the Nokomosis programme by the Michigan juvenile courts and the comparison group of 97 youth who were not placed in the programme (remaining in residential school)
Durbahn (2019)	Mixed methods-a mixed methods sequential design was used in which both the qualitative and quantitative strands were developed and executed independently. The quantitative strand encompassed a quasi-experimental design with a small convenience sample and quantitative measurement of outcomes at baseline and post-test. The qualitative strand aimed to understand staff's impressions of the outcomes, behaviors and participation in the CBC program, also the qualitative strand sought to help explain the quantitative results/trends	Positive youth development adventure-based intervention- an 8-week summer program focusing on providing youth experiential, hands-on learning opportunities while interacting with outdoor adventure-based activities	Social outcomes & emotional outcomes improvement in interpersonal relationships, communication, improved adjustment, skill development outcomes	The 57 intervention group (32) was youth who participated in the CBC program. Comparison group (32) youth were participants of programming at the day treatment and residential program but were not involved in CBC

Elrod 1992	Random assignment to experimental and control	A moderate intensity 3-day outdoor adventure program with no additional therapeutic component.	Offending	43 male and female probationers received either the outdoor adventure program or regular probation services.
Gillis (2008)	Comparison study	Adventure-based behaviour management program-Key elements of the intervention included the use of group process and experiential learning. Members of the group engaged in tasks requiring a high level of trust after gradually building that trust through carefully timed activities.	Offending related outcomes	A randomly selected group of male juveniles in all BmtA programs (n = 347) were compared with a randomly selected group of male juveniles from another outdoor residential treatment program operating in Georgia (n = 347) as well as a randomly selected group of male juvenile offenders participating in "treatment as usual" 90-day boot camp programs in state institutions (n = 347)
Gillis (2010)	Matched group design-youth in the legacy programme were matched one to one with male youth in other specialized treatment programs and male youth incarcerated in state-operated institutions. Matching was done on the basis of (a) age when the first offense was committed, (b) the most serious arresting offense type, and (c) race	The programme used a combination of group processes and therapeutic approaches to encourage positive transformation among young offenders who live and sleep in homes owned and operated by the programme within the community.	Offending and crime related outcomes	Youth participating in the LEGACY program were compared to male youth in other specialized treatment programs (OSP) and (b) male youth incarcerated in state-operated institutions (YDC)
Greenwood 1987	Nonexperimental	A very high intensity 56-week wilderness program with group therapy and family therapy.	Reoffending	266 seriously delinquent males were assigned to the wilderness program or an institution.

Hunter (1996)	A convenient natural subject grouping into, randomly selected, paired cohorts, producing a natural cohort experimental design	A 35 day Outward Bound Special Programme that was divided into various phases namely-Orientation, training expedition, main expedition, solo expedition, final expedition and graduation activities.	Attitudes and belief self-concept, esteem, confidence	97 delinquent adolescent males were divided into 10 cohorts-5-treatment who participated and 5 control who participated at a later stage
Kelly (1971)	Matched comparison	Outward bound schools for adolescent delinquent boys having both group and solo components	Offending related outcomes	120 male delinquents were assigned to the wilderness program or a training school.
Langsner (1987)	An untreated control group design with pre-test and post-test, expanded to include two additional groups (experimental and control) without a pretest, was employed as a quasi-experimental non-equivalent control group design	The program consisted of six sequential stages: (a) Ignition Experience- This stage was designed to familiarize Project Explore staff with the teachers and students. (b) Mobile Outdoor Challenge Education Program where the Project Explore staff returned to the classroom to demonstrate specific activities related to outdoor challenge education. (c) One-Day Residential Inservice Training Program-designed to help teachers feel comfortable in the outdoor environment and help them develop	Non-significant findings on self-esteem	31 boys identified as exhibiting behavior disorders. The experimental group (14) participated in project explore and the control group students (17) did not participate in the programme

		<p>initial competencies in outdoor challenge activities;</p> <p>(d) Two-Day Residential Inservice Training Program that provided teachers with in-depth experience in developing competencies for conducting outdoor challenge programs; (e) Residential Outdoor Challenge Education Program- a 5-day, 4-night program which took place at Bradford Woods and was designed to integrate the concepts of outdoor challenge education into the total educational program of children with behavior' disorders; and (f) Post-Residential Experiences-To help ensure that the Residential Outdoor Challenge Education Program was not considered in isolation and included follow-up.</p>		
Larson (2007)	This study utilized a quasi-experimental non-equivalent control group design	A 5-day adventure camp program for adolescents with behavioral problems. The camp is based on a decentralized camping structure with small, self-	Attitudes and belief self-concept, esteem, confidence	61 CYP with behavioral problems-31 attended the adventure camp and 30 did not

		sufficient groups comprised of 8 to 10 campers and three counsellors.		
Lee (1969)	Matched control group design	A school-based program explicitly organized around Outward-Bound training principles where weekends were devoted to field exercises (mountain climbing, canoeing, rescue training, and community service). The members met daily in the high school to discuss principles demonstrated on expeditions, techniques of leadership, and salient, ego-relevant problems of an intra- and interpersonal nature. Each week, one evening was set aside for leadership development, and during the winter and spring breaks, challenging week-long outdoor adventures were conducted..	Attitudes and belief self-concept, esteem, confidence, Social outcomes & emotional outcomes improvement in interpersonal relationships, communication, improved adjustment, academic and school related outcomes	The basic experimental group was comprised of forty lower-class non-achieving urban high school students. Forty more students were selected as a control group on the basis of school records, each boy in the control group matching an Action Bound student with regard to age, written comments on deportment and motivation, year in school, and intelligence
Maizell (1989)	A removed treatment, quasi-experimental research design	In order to develop group and individual competence in the areas of trust, problem solving, cooperation, self-concept, self-esteem, and	Attitudes and belief, self-concept, esteem, confidence	A total of 31 young people participated in this study. The non-intervention group contained 12 participants. There were two treatment groups G1 consisted of 9

		responsible risk taking, the intervention comprises a variety of group games and group and individual initiatives, carefully sequenced.		participants and G2 consisted of 10 participants
Mann (2010)	Mixed methods-experimental cross-over design and participant interviews	The intervention was divided into four distinct phases with activities specific to each one. The first phase included pre-programme team training, followed by participant assessment and selection, course preparation (building safe and trusting relationships between team members and programme participants), a challenge trip that included a four-day camping adventure, and a final phase with activities to help participants apply what they learned on the challenge trip to their daily lives.	Attitudes and belief self-concept, esteem, confidence	35 subjects alternately assigned to treatment and control conditions. Each group received the treatment and control conditions at different times. Comparisons were made between groups based on the timing of their assignment to each condition
Margalit (2014)	The study used a non-randomized, pre-post design with a control group	The programme is based in a boarding school for boys and consists of ten pre-program meetings, a four-day backpacking trip, and two post-program sessions. In addition to therapeutic	Attitudes and belief self-concept, esteem, confidence	Sample was divided into 4 groups: intervention (n = 21), partial intervention (re-allocated) (n = 12), partial intervention (n = 31), and control (n = 29). Control participants attended the same boarding school and were at the

		components delivered by a mental health professional, the programme included behavioural components such as modelling, positive and negative reinforcement, and problem-solving.		same grade level as intervention participants
Molof (1967)	Non-experimental	A high intensity 28-week wilderness camp that included no therapeutic component.	Offending related outcomes	370 18-year old institutionalized males received either the wilderness camp or services as usual in an institution.
Minor 1988	Two-factor partially randomized-groups design.	A moderate intensity 3-day outdoor adventure program with no additional therapeutic enhancement.	Self-concept, esteem, confidence, Career /vocational guidance& support, Quality of family relationships and family functioning, reoffending	40 male and female probationers received either the outdoor adventure or regular probation services.
Norton (2019)	Mixed methods-This research project utilized a mixed-methods approach in which quantitative data were collected and analyzed via a quasi-experimental non-equivalent groups design, and qualitative data were collected via focus groups	Trauma informed adventure therapy-program connects family members with one another while, as a unit, they connect with the outdoors and other families healing from the effects of child abuse and neglect. In conjunction with talk therapy in individual, group, and family settings, participants travel,	Mental health, internalizing behaviour and self-regulation, externalizing and risk-taking behaviour, Social outcomes & emotional outcomes improvement in interpersonal relationships, communication, improved adjustment, family and peer related outcomes	A total of 32 children and their families participated in the study with 18 youth who participated in the intervention and 14 youth in the comparison group who did not participate in FEAT

		hike, and camp outdoors, among other adventure-based activities		
Nunley (1984)	Pre-test, post-test control group design	A therapeutic residential outdoor programme for CYP that fosters personal development through a variety of unstructured activities, social contact, stress challenges, and encouraging group support.	Attitudes and belief self-concept, esteem, confidence Mental health, internalizing behaviour and self-regulation, externalizing and risk-taking behaviour	Total 56 participants-28 participants attended the BOLD programme and 28 were selected as control group subjects who did not attend the programme
Parker (1995)	Pre-test, post-test control group design	Adventure program as an add-on to conventional counselling (consisting of one day at a ropes course facility and one day of rock climbing and rappelling).	Attitudes and belief self-concept, esteem, confidence	Participants were 84 boys who were randomly assigned within treatment and control conditions. There were 4 treatment groups (counselling and adventure interventions), counselling interventions, counselling only, adventure only, and a no intervention control group.
Plouffe (1981)	A multi-source design was used, collecting data from agency, parent, and Wilderness School staff, as well as from subject self-report questionnaires. These data were combined with data collected before and after the nineteen day course	Connecticut wilderness school programme	Attitudes and belief self-concept, esteem, confidence Mental health, internalizing behaviour and self-regulation, externalizing and risk-taking behaviour, offending related outcomes	The treatment group had 50 subjects that received the intervention The comparison sample of 50 subjects that did not receive the intervention
Pommier (1995)	Group (treatment, control) by Time (pre-test, four-week post-test, and four-	The FINS program consists of a 14-day intake period, followed by six	Attitudes and belief self-concept, esteem, confidence ,	107 participants out of which 61 were treatment who attended the programme and 46

	month post-test) repeated measures design	program phases: orientation, expedition, reunion, reinforcement, and facilitation phases. Leadership for each FINS program is provided by one instructor, an assistant instructor and an intern.	Mental health, internalizing behaviour and self-regulation, externalizing and risk-taking behaviour, family and peer related outcomes	control who were not exposed to the programme
Ramirez 1975	Pre-post evaluation design in addition to control and comparison groups where feasible	A very high intensity 3-week wilderness camp with no additional therapeutic enhancements.	Offending	86 delinquent males received either the wilderness camp or were placed on a waiting list.
Romi (2004)	Non- experimental design	The intervention was carried out with disengaged youth who arrived at the programme after a prolonged string of failures and moves between educational frameworks, and who typically quit school before the 10th grade. There were group tasks, hiking, and camping among the activities. The majority of the activities included teams, including bandaging teammates who had been hurt and providing a safe route through water. The participants had to use everything they had learnt throughout the week and face	Attitudes and belief self- concept, esteem, confidence	94 participants were divided into three groups: Wilderness Group: 36 participants, Alternative Group: 25 participants participated in a 6-day residential program aimed at revealing personal excellence among the participants, Contrast Group: 33 adolescents with no intervention

		personal challenges in a final exercise.		
Russell (2011)	Quasi-experimental, matched-pair design using pre-, post-, and follow-up assessments with a nonrandomized control group	Wilderness adventure programme	Attitudes and belief self-concept, esteem, confidence etc	Total 43 juvenile delinquents-treatment group participated in the programme and the control group were matched based on age, gender, ethnicity, and age of first offense
Sachs (1983)	Control group design with random assignment	Wilderness camping programme-The programme had a base camp in a forest with activities such as (1) hiking, (2) caving, (3) trail making, (4) environmental exploration, (5) setting up campsites, (6) initiation games, and (7) trust exercises. The basic premise of this programme is that the CYP will be placed in situations that demand that they go beyond their self-perceived limits. Thus, the environmental demands are the major change agent of the program, rather than the specific procedures used by the staff	Social outcomes & emotional outcomes improvement in interpersonal relationships, communication, improved adjustment	16 behaviourally disordered CYP were randomly assigned-8 to treatment and 8 to control (without intervention)

Sakofs (1991)	Random assignment to experimental and control	Wilderness programme-a three-week wilderness program which utilized adventurous activities, such as camping, hiking, mountaineering, caving and rock climbing, along with community service activities	Attitudes and belief self-concept, esteem, confidence Social outcomes & emotional outcomes improvement in interpersonal relationships, communication, improved adjustment Cognitive development- Social Cognition and pro social behaviour	115 CYP recommended by court counsellors-treatment group participated in the programme and control group did not
Tran (2021)	Quasi-experimental research design- 'Intention to treat' (ITT)	The GLC is a distinctive programme that combines intensive case management with adventure therapy, experiential and cognitive learning, personal development, and wellbeing.	Reoffending	Treated offenders in the ITT design were those who had participated in the GLC regardless of their completion status (N=593). Comparison offenders were those who met the GLC eligibility criteria at some point during their custodial episode yet did not participate in the GLC
Walsh (2009)	Quasi experimental, matched-pair design using pre-, post-, and follow-up assessments with a non-randomized control group	The programme has four phases-orienting the students, learning the hard wilderness survival skills needed during the expedition travel, eight-day expedition, four day solo expedition	Attitudes and belief self-concept, esteem, confidence	Treatment group (43) who participated in the programme and control group (43) who did not. CYP in the treatment group were matched up with anonymous control group members by the referring county probation officer

Wichmann (1991)	Pre-post with multiple regression	The wilderness course usually includes the seven phases of Immersion, Homebase, Expedition, Solo, Final Expedition, Service Project, and Transition. Typical activities include initiative problems, teams course, ropes course, rock climbing, caving, backpacking, canoeing, and much group processing via the Circle.	Social outcomes & emotional outcomes improvement in interpersonal relationships, communication, improved adjustment Cognitive development- Social Cognition and pro social behaviour	72 15-year old CYP who were delinquent or predelinquent were placed in either the wilderness program or received community-based advocacy services.
Williams (1985)	Post-test-Only Control Group with random assignment	A three-day physical challenge wilderness trip-CYP received an orientation and were then engaged in activities such as river trip, preparation, fire building, camp safety, and group cooking. Rock climbing and backpacking. Each day ended with group sessions focusing on the experiences of the day	Attitudes and belief self-concept, esteem, confidence	60 CYP randomly assigned to either a three-day experimental condition consisting of a physical challenge wilderness trip or to a no-treatment control condition
Winterdyk (1980)	Pre-test post-test control group design with random assignment	The intervention was a 21-day experiential high-risk high adventure programme involving 30 male probationers	Attitudes and belief self-concept, esteem, confidence, offending related outcomes	58 male delinquents received either the wilderness program or probation.

Wright (1982)	Delayed-entry control group design with random assignment	The wilderness experience consists of a series of progressively demanding challenges and problems which the CYP must overcome. The central activities of the course include backpacking, wilderness navigation, rock climbing, and whitewater canoeing. Participants live and travel in a small group of 8 to 10 peers (called crews) plus two instructors for 26 days. Instructors are responsible for implementing the goals of the program.	Attitudes and belief self-concept, esteem, confidence	Experimental CYP (35) participated in the 26-day wilderness treatment program. The control group CYP (12) were waiting for placement in the program.
White (2007)	Non-experimental design	The program 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 3 ½ day wilderness trip to the Brecon Beacons of Wales.	Social competence, family, academic	The experimental group were 24 CYP who participated in the adventure-based learning experience program, The control group consisted of 723 students enrolled at an Essex, England state comprehensive secondary school
Willman 1973	Non experimental	A very high intensity 6-week wilderness	Reoffending	253 male delinquents were assigned to the

		program that used no specific therapy in conjunction with the wilderness experience.		wilderness program or a training school.
Wood (2012)	Mixed method design	A 10-month programme that comprised of skills workshops and outdoor activity days, weekly one-to-one mentoring and two wilderness trails.	Mindfulness, total strengths and difficulties, self-esteem, overall well-being	12 CYP -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
Wichmann (1990)	Quasi-experimental, non-equivalent control group design	The wilderness course usually includes the seven phases of Immersion, Homebase, Expedition, Solo, Final Expedition, Service Project, and Transition. Typical activities include initiative problems, teams course, ropes course, rock climbing, caving, backpacking, canoeing, and much group processing via the Circle.	Social outcomes & emotional outcomes improvement in interpersonal relationships, communication, improved adjustment Cognitive development- Social Cognition and pro social behaviour	36 male CYP-at-risk were assigned to experimental group that received intervention and control group with no intervention
Ziven (1988)	Non-equivalent control group pre-test-post-test design	A 5 day programme for at-risk CYP with activities such as problem solving, trust and challenge activities	Attitudes and belief self-concept, esteem, confidence,	73 institutionalized male and female CYP were assigned to the challenge program or treatment as usual in the institutional setting.
Zwart (1989)	Non-equivalent Untreated random Control Group Design with pre-test and post-test	This 26-day, totally mobile, wilderness program was developed for the Division of Youth Services by Wolf Creek Wilderness	Attitudes and belief self-concept, esteem, confidence	Forty-three male juvenile offenders participated in the Wolf Creek Wilderness Youth Development Program and 47 male juvenile offenders detained at the Youth Development

		<p>School. The small group is the prime social unit, 10 members living together, acting as a team, needing to develop cooperative efforts and group decision-making abilities in order to succeed. Evening discussions and group sessions underline the purpose of the activities, emphasize the values and bring conflicts to the surface. Toward the end of the course a 3-day solo expedition was scheduled.</p>		<p>Center (YDC) in Atlanta, Georgia, provided comparison data</p>
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4.6.2 Process Evaluations

Table 9-Characteristics of included studies-Process evaluations

The table below describes in detail the programme and design characteristics of all the included process evaluations. The details of all the 19 included qualitative studies contains information about the author/year, location/settings, country/intervention name, type of activity, duration of intervention, age, study design, intervention and outcomes.

Author and year	Location/Settings	Region	Name of the country/Intervention name	Type of activity	Duration of Intervention	Age	Study Design	Intervention	Outcomes
Autry (2001)	Rural-Outdoor	North America	USA/Not mentioned	Back packing trips,high & low ropes course	4 days	13-18 years	In-depth interviews-All 9 of the girls were interviewed once with 7 girls participating in a follow-up interview	Three to four day backpacking/hiking trips in the mountains of North Carolina and experiential education sessions facilitated by a trained ropes course instructor on an accredited high and low ropes course available on the grounds of the main campus of the facility. The ropes course sessions lasted up to 4 hours and were commonly provided once a week depending on the cohesive and cooperative nature of the group	Attitudes and belief (self-concept, esteem, confidence etc) Social outcomes & emotional outcomes (improvement in interpersonal relationships, communication, improved adjustment etc)
Bandoroff (1993)	Rural/Outdoor	North America	USA/Family Wheel	Camping, hiking, trust building exercises, survival skills	25 days	13-18 years	A 15 item questionnaire was specially designed for evaluating this programme consisting of Likert-like scale responses. Also a variety of validated and normed measures were used to gather information from both participating and nonparticipating families	This four-day program required parents and their adolescent children to engage in an intensive experiential family therapy while camping and trekking in the wilderness	Mental health, internalizing behaviour and self-regulation, externalizing and risk-taking behaviour, family and peers related, crime and anti-social activities
Caulkins (2006)	Rural/Outdoor	North America	USA/A wilderness therapy programme member of the Outdoor Behavioral Healthcare Industry Council (OBHIC)	Cultivation of wilderness living skills, exercise through backpacking, a nutritious diet, individual therapy with a trained counselor, letter communication with parents/guardians , and social interaction with peers/field staff while in the wilderness	6-12 weeks	15-16 years	A case study design was used as it fit the exploratory, process-oriented nature of the research	A wilderness therapy program Treatment includes immersion in a remote desert environment for the entire duration of the program, with few modern conveniences. Therapeutic processes include cultivation of wilderness living skills, exercise through backpacking, a nutritious diet, individual therapy with a trained counselor, letter communication with parents/guardians, and social interaction with peers/field staff while in the wilderness	Attitudes and belief (self-concept, esteem, confidence etc), skill development outcomes

Conlon (2018)	Rural/Outdoor	Europe & Central Asia	Ireland/WT project	Rock climbing, hill/mountain walking, 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	10 weeks	12-18 years	In-depth interviews	CYP take part in one full day's activity a week and an overnight 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, 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).	Attitudes and belief (self-concept, esteem, confidence etc), Social outcomes & emotional outcomes (improvement in interpersonal relationships, communication, improved adjustment etc), Improved Psycho-social functioning & wellbeing, skill development outcomes
Eggleston (1998)	Rural/Outdoor	East Asia & Pacific	New Zealand/ The Whakapakari Youth Programme	Camping	1 month	13-18 yrs	Interviews and casual conversations in a field setting.	The programme was run under Maori principles of life and promoted CYP working together as a whaanau (extended family) in order to survive in their wilderness surroundings for the period of one month. Programme participants were given responsibility and challenges in an outdoor environment, learnt a range of technical and cultural skills, became socially involved in a closely-knit whaanau and were given the opportunity of confronting the problems of the past	Social outcomes & emotional outcomes (improvement in interpersonal relationships, communication, improved adjustment etc)
Glass (2001)	Urban/Outdoor	North America	USA/low-element challenge course (LECC)	TP shuffle, shipwreck, the spider's web, king's ring, the swinging log,	Few days to a couple of months	11-14 years	Case study design	The programs consist of a series of exercises, also known as elements. Various elements can focus on a number of issues, including leadership roles, cooperation, and trust, while all of the elements require the CYP to work together to solve problems or challenges	Attitudes and belief (self-concept, esteem, confidence etc), Social outcomes & emotional outcomes (improvement in interpersonal relationships, communication, improved adjustment etc)
Lambie (2000)	Rural/outdoor	East Asia & Pacific	New Zealand/Wilderness therapy programme	Role play (psychodrama), caving, white water rafting, abseiling, tramping and camping	18 months	13-19 years	Intensive structured interviews	An 18 month intervention for CYP aged 13-19 years with activities such as role play (psychodrama), caving, white water rafting, abseiling, tramping and camping	Attitudes and belief (self-concept, esteem, confidence etc), Mental health, internalizing behaviour and self-regulation, externalizing and risk-taking behaviour, Social outcomes & emotional outcomes (improvement in interpersonal relationships,

									communication, improved adjustment etc), family and peer related outcomes, offending related outcomes
Lan (2004)	Rural/outdoor	East Asia & Pacific	Australia/Project Hahn	Outdoor challenge activities	6 days	13-15 years	Cross sectional comparison (surveys at pre-post)	Project Hahn Wilderness Program is a 6 day programme for CYP aged 13-15 years. The program seeks to reduce participants' risk by providing opportunities for maturational gain and personal development through experiential group-based counselling techniques that use novel outdoor activities within the milieu of the wilderness	Attitudes and belief (self-concept, esteem, confidence etc), Improved Psycho- social functioning & wellbeing, Offending related outcomes
Loynes (2010)	Rural/outdoor	Europe & Central Asia	UK/Stoneleigh Project	Camping, walking, sailing, canoeing and coastal exploration	7 days	18-25 years	A hermeneutic inquiry focused on education and power	The Stoneleigh Project was developed for marginalised CYP 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.	Social outcomes & emotional outcomes (improvement in interpersonal relationships, communication, improved adjustment etc)
Marti (2007)	Rural/Outdoor	North America	USA/Catherine Freer Wilderness Therapy Expeditions (CFWTE)	Trekking and camping	21 days	14-17 years	Ethnographic qualitative design	This programme was a 21-day backpacking wilderness experience for 7 adolescent girls aged 14-17. The programme takes place in small groups with six to eight participants, and three to four staff members all of whom are clinically trained and bsupervised by licensed psychologists and certified drug and alcohol counselors	Attitudes and belief (self-concept, esteem, confidence etc), Social outcomes & emotional outcomes (improvement in interpersonal relationships, communication, improved adjustment etc)

McNamara (2002)	Rural/Outdoor	North America	USA/Adventure Challenge 2000	Camping, hiking	5 days	9-11 years	Case study methodology	This program consisted of seven days of therapeutic care provided by mental health professionals. Services consisted of group cooperative activities, group therapy, and animal assisted therapy (via the use of llamas). Services were provided over an orientation day, a five-day wilderness trip, and a debriefing/follow-up day after the trip	Attitudes and belief (self-concept, esteem, confidence etc)
Merenda (2020)	Rural/Outdoor	North America	USA/Adventure based programme	Hiking, building tents, rope climbing, and camping	Not mentioned	11-14 years	Semi-structured interviews within the framework of resiliency theory.	Adventure based programs-Key components of the intervention include an emphasis on learning through experience and interaction with nature while perceiving risk.	Attitudes and belief (self-concept, esteem, confidence etc), skill development outcomes, academic and school related outcomes
Miramontes (2008)	Urban/Indoor/Outdoor	North America	USA/Wilderness and Community Education Program (WCEP)	hiking, camping	10 days	15-19 years	ethnographic qualitative design	Wilderness and Community Education Program (WCEP) is a unique alternative high school program located in a large urban setting in California This is an alternative semester-long program designed to provide opportunities for students to become engaged with and learn from their environment, their communities, and other people. The 10 day wilderness trip is designed as an ignition phase of the semester	-Attitudes and belief (self-concept, esteem, confidence etc) -Cognitive development-Social Cognition and pro social behaviour

Nurenberg (1986)	Rural/Outdoor	North America	USA/Westfield Family and Children's Service's Wilderness group	Camping, skiing	3 years	14-19 years	This is a naturalistic panel study of a convenience sample. The study used a combination of formal measurements and semi-structured interviews administered to subjects at two points in time.	Thirteen CYP, between the ages of fourteen and nineteen, were involved in Wilderness group therapy.	-Attitudes and belief (self-concept, esteem, confidence etc) -Mental health, internalizing behaviour and self-regulation, externalizing and risk-taking behaviour -Improved Psycho-social functioning & wellbeing
Russell (2002)	Rural/Outdoor	North America	USA/Outdoor Behavioral Healthcare Industry Council (OBHIC)	Hiking, camping (solo)	38 days	13-17 years	A multisite case study approach	Program treatment length averaged 38 days in wilderness and was staffed with clinically trained professionals supervised by licensed psychologists. Master's-level counselors, social workers, or certified drug and alcohol counselors accompanied each group or provided clinical supervision through weekly visits to the field to carry out individual treatment plans.	Mental health, internalizing behaviour and self-regulation, externalizing and risk-taking behaviour, Social outcomes & emotional outcomes (improvement in interpersonal relationships, communication, improved adjustment etc), family and peer related outcome
Sammet (2010)	Rural/Outdoor	North America	USA/Camp courage	extended backpacking, kayaking, and rock climbing	Two weeks	12-13 years	Qualitative, descriptive case study	Camp courage is a two-week, all-girl course taking place in wilderness settings and teaching technical skill development in outdoor activities such as extended backpacking, kayaking, and rock climbing. In concert with technical skill development, Camp Courage prioritizes healthy relationship building as a means of promoting positive social and emotional development.	Mental health, internalizing behaviour and self-regulation, externalizing and risk-taking behaviour, family and peer related outcomes

Scaliatine (2004)	Rural/Outdoor	North America	USA/Sage project- Outervention programme	Backpackiiiig, rock climbing, sea kayaking, mountain biking, and ropes courses	6 days	14-16 years	Ethnography and semi-structured interviewing	Outervention offers wilderness experiences for adolescent girls and their parents. The challenging experiences are created so that girls are able to gain confidence, independence, and strength. The program encourages parent involvement or a significant adult in the adolescents' life whether it is a mother, father, foster parent, extended family, or a mentor	Attitudes and belief (self-concept, esteem, confidence etc), Mental health, internalizing behaviour and self-regulation, externalizing and risk-taking behaviour outcomes
Somervell (2009)	Rural/Outdoor	East Asia & Pacific	New Zealand/SAFE Network Inc.	Rafting and mountain biking, as well as group therapy, hiking	4-6 days	13-18 years	A qualitative methodology was chosen as it fitted the exploratory focus of the research	CYP attend Wilderness Therapy camps as part of group therapy. During their time at SAFE adolescents will typically attend two to three camps. Camps always have a stated therapeutic theme, which is usually either disclosure or victim empathy. Camps are usually four to six days long and involve activities such as tramping (New Zealand term meaning hiking), rafting and mountain biking, as well as group therapy work focusing upon the stated theme of the camp	-Attitudes and belief (self-concept, esteem, confidence etc) -Social outcomes & emotional outcomes (improvement in interpersonal relationships, communication, improved adjustment etc)
Ungar (2005)	Rural/Outdoor/ Indoor	North America	Canada/Winter Treasures,Choice s Wilderness Program	evening outings, day trips, three-day overnight excursions. Other events have included indoor climbing, day hikes, kayaking, canoeing, and community service activities. Earth education , leadership training	3 days	13-19 years	Case study design	A 3 day wilderness programme for CYP aged 13-19 years with activities such as evening outings, day trips, three-day overnight excursions. Other events have included indoor climbing, day hikes, kayaking, canoeing, and community service activities. Earth education , leadership training	Skill development and academic and school related outcomes

4.7 EXCLUDED STUDIES

Table 10-Excluded studies

Author	Title	Reason for exclusion
Baer (1975)	Instructors' ratings of delinquents after Outward Bound survival training and their subsequent reoffending	Intervention not described
Colvin (2015)	The effects of short-term missions on at risk female teenagers	Not wilderness or adventure intervention
Combs (2001)	The evaluation of adventure-based with at risk youth	Target population-children with learning disabilities were included-Asperger's Disorder, Pervasive Developmental Disorder
Dobud (2016)	Exploring Adventure Therapy as an Early Intervention for Struggling Adolescents	Design-no control group
Furness (2017)	Maximising potential: The psychological effects of the youth development programme Project K	Participants displaying delinquent behaviour were excluded
Hoag (2013)	Efficacy of wilderness therapy for young adults: A first look	Age group (18-34)
Horwood (1987)	Experiential Education in High School: Life in the Walkabout Program	Not at-risk of offending
Jeppson (2008)	Characterization and comparative analysis of adolescents admitted to Therapeutic Wilderness Programs and more traditional treatment settings	Methodology
Kraus (1983)	The effectiveness of wilderness therapy with emotionally disturbed adolescents	Full text not available
Mosher (2016)	Family involvement and wilderness therapy outcomes: Perspectives from program directors	Target population-5 clinical directors of wilderness programmes
Norton (2017)	Communication as a positive relationship outcome with families participating in a therapeutic wilderness program	Not wilderness or adventure intervention
O'Brien (1990)	Northland Wilderness Experience: An Experiential Program for the Youth of Taitokerau	No control group
O'Shea (2009)	Exploring the benefits of an outdoor adventure program for improving self-esteem and self-efficacy and reducing problem behaviors in adolescent girls	No control group
Orren (2004)	The effects of brief wilderness programs in relation to adolescent participants' ethnicity	Target population-not at-risk
Paisley (2014)	Considering Students' Experiences in Diverse Groups Case Studies from the National Outdoor Leadership School	Not at risk of offending

Pann (2000)	The effects of an adventure education intervention of self-concept and verbal academic achievement in inner-city adolescents	Not at risk of offending
Philipson (2014)	How a summer camp training program may foster resilience and self-efficacy in adolescent boys	Target group
Ray (2008)	The experience of adolescent girls participating in an adventure therapy program: A qualitative study	Target group
Rice (1989)	A study of the impact of long-term therapeutic camping on self-concept development among troubled youth	No comparison group
Richardson (2003)	Adventure-based therapy and self-efficacy theory: Test of a treatment model for late adolescents with depressive symptomatology	Not at risk of offending
Ritchie (2015)	Connecting to the Good Life through outdoor adventure leadership experiences designed for Indigenous youth	Not at risk of offending
Rizzo (2018)	Adventure-based activities and adolescent self-esteem	Not at risk of offending
Russell (2000)	Exploring How the Wilderness Therapy Process Relates to Outcomes	Duplicate
Schreuder (2014)	Exploring salutogenic mechanisms of an outdoor experiential learning programme on youth care farms in the Netherlands: Untapped potential?	Not wilderness or adventure intervention
Shirilla (2009)	Adventure-Based Programming and Social Skill Development in the Lives of Diverse Youth: Perspectives from Two Research Projects	Not enough info of activities and target group
Squires (2006)	Female juvenile offenders and adventure-based programming: A qualitative analysis of the experiences of mentoring, socialization, self-esteem and self-efficacy, and physicality	Not wilderness or adventure intervention
Stull (2021)	An exploratory study on adult survivors of the troubled teen industry's therapeutic boarding schools and wilderness programs	Not wilderness or adventure intervention
Vissell (2005)	Effects of wilderness therapy on youth at risk's concept of self and other: A deeper understanding of the journey	not at-risk
Wick (1997)	Improving self-esteem of elementary school children with adventure therapy	Intervention
Lewis (2013)	Examining changes in substance use and conduct problems among treatment-seeking adolescents	No control group
Russell (2018)	An Evaluation of Alaska Crossings: Comparison of the Client Status Review and the Youth Outcome Questionnaire	nNo control group
Tucker (2015)	The Role of Transport Use in Adolescent Wilderness Treatment: Its Relationship to Readiness to Change and Outcomes	No eligible outcome
Tucker (2016)	The Impact of Wilderness Therapy: Utilizing an Integrated Care Approach	No eligible outcome
Bowen (2016)	Effects of the PCYC Catalyst outdoor adventure intervention program on youths' life skills, mental health, and delinquent behaviour	No control group

Freed (1991)	Participation in an adventure-challenge programme and behaviour change in emotionally impaired students	No control group
Hagan (2002)	An Alternative Therapy for the Behaviorally Challenged Youth: The Efficacy of Wilderness Therapy Programs	No control group
Johnson (2020)	The Effectiveness of Trauma-Informed Wilderness Therapy With Adolescents: A Pilot Study	No control group
Newes 2001	Predicting reoffending among juvenile offenders participating in an adventure-based therapy intervention.	No control group
Turner 2009	Social support interactions in therapeutic adventure education programs	No control group
Bettmann (2012)	How Substance Abuse Recovery Skills, Readiness to Change and Symptom Reduction Impact Change Processes in Wilderness Therapy Participants	No control group
Deschenes (1996)	The Nokomosis challenge programme evaluation	Reports the same results as Deschenes 98 which is already included in the review
Kelly (1968)	Outward bound schools as an alternative to institutionalization for adolescent delinquent boys	Reports the same results as Kelly 71 which is already included in the review
Sachs (1992)	The Impact of a Wilderness Experience on the Social Interactions and Social Expectations of Behaviorally Disordered Adolescents	Reports the same results as Sachs 83 which is already included in the review
Wichmann (1990)	Interpersonal problem-solving and asocial behavior in a therapeutic wilderness program	Reports the same results as Wichmann 91 which is already included in the review

5. RESULTS OF THE QUANTITATIVE ANALYSIS

5.1. SUMMARY OF RESULTS

Overall, wilderness and adventure therapy programmes had a desirable impact on the outcome domains included in the present review. In total, 12 meta-analyses were computed and the mean effect sizes are summarised in Table 11. These findings are discussed below.

Table 11 Summary of weighted mean effect sizes for each outcome domain

<i>Outcome</i>	<i>n</i>	<i>k</i>	Mean ES (OR)	95% CI	<i>p</i>	<i>dfs</i>	<i>I</i> ² <i>within</i>	<i>I</i> ² <i>between</i>
Attitudes and beliefs	10	37	2.02	1.19, 3.46	.004	7.75	51.35%	31.11%
Education	13	54	1.77	1.08, 2.92	.014	11.6	17.97%	56.83%
Externalising behaviour	11	36	1.69	0.63, 4.53	.238	9.81	7.55%	82.84%
Internalising behaviour	26	130	2.09	1.48, 2.97	.001	23	46.66%	38.04%
Internalising: Self-esteem	15	53	2.05	1.41, 2.97	.001	11.5	53.73%	16.08%
Internalising: Locus of control	12	27	1.21	0.70, 2.07	.454	10.7	14.82%	65.44%
Mental Health	8	17	2.43	0.98, 6.05	.03	5.6	92.49%	> .001%
Offending	17	159	1.15	0.66, 2.00	.61	15.1	48.77%	46.41%
Offending: Reoffending	7	11	1.26	0.80, 1.99	.278	5.26	0%	44.43%
Offending: Violence	5	12	1.13	0.76, 2.35	.457	3.11	87.28%	0%
Social	17	68	2.03	1.29, 3.19	.001	15	26.78%	58.55%
Social: Pro-social	11	20	2.35	1.16, 4.76	.014	9.48	7.57%	80.21%

Note. *n* = number of studies; *k* = number of effect sizes; ES = effect size; OR = odds ratio; CI = 95% confidence intervals; *dfs* = degrees of freedom (RVE); *I*² *within* = variance within clusters of effect sizes; *I*² *between* = variance between clusters of effect sizes.

With respect to violence outcomes, the mean effect size reported in Table 11 includes only outcomes that reflect violent offending behaviours. We also identified a number of behavioural outcomes (i.e. non-offending outcomes) that may also be deemed to include violence, namely aggressive behaviour and aggression (e.g., Burdsal & Buel, 1980; Sachs, 1983; Winterdyk, 1980). When these outcomes were included in a meta-analysis of all violence outcomes (i.e., offending and non-offending), the mean effect size was OR = 1.36 (95% CI 0.89, 2.06, *n* = 8, *k* = 17; *Q*(df = 16) = 123.84, *p* < .001).

There was significant heterogeneity in each of the meta-analyses performed with the result of wide confidence intervals each mean effect size (Table 12).

Therefore, one must be cautious when interpreting the results. Whilst overall there is a desirable impact of wilderness and adventure therapy programmes, the magnitude of that impact varies substantially across evaluations for each outcome. This is particularly true for externalising behaviour, locus of control, mental health, offending (all outcomes), reoffending, and violent offending outcomes where the confidence intervals include the 'null intervention effect' (i.e., OR = 1). Holger et al. (2022) outline that when this is the case, we should remain sceptical on the validity of the findings. It is possible therefore, that wilderness and adventure therapy programmes do not have a desirable impact on these outcomes.

This variation between observed effect sizes is also evidenced in the forest plots (Figures 9 to 18). Given the large number of effect sizes for internalising behaviour and offending outcomes ($k = 130$ and 159 respectively) it was not possible to create a meaningful forest plot for these meta-analyses.

Table 12 Heterogeneity in each meta-analysis

<i>Outcome</i>	<i>Q</i>	<i>df</i>	<i>p</i>
Attitudes and beliefs	608.03	36	< .001
Education	233.83	53	< .001
Externalising behaviour	301.11	35	< .001
Internalising behaviour	1727.72	129	< .001
Internalising: Self-esteem	418.66	52	< .001
Internalising: Locus of control	147.66	26	< .001
Mental Health	533.47	16	< .001
Offending	3537.27	158	< .001
Offending: Reoffending	17.91	10	.06
Offending: Violence	109.83	11	< .001
Social	672.95	67	< .001
Social: Pro-social	139.11	19	< .001

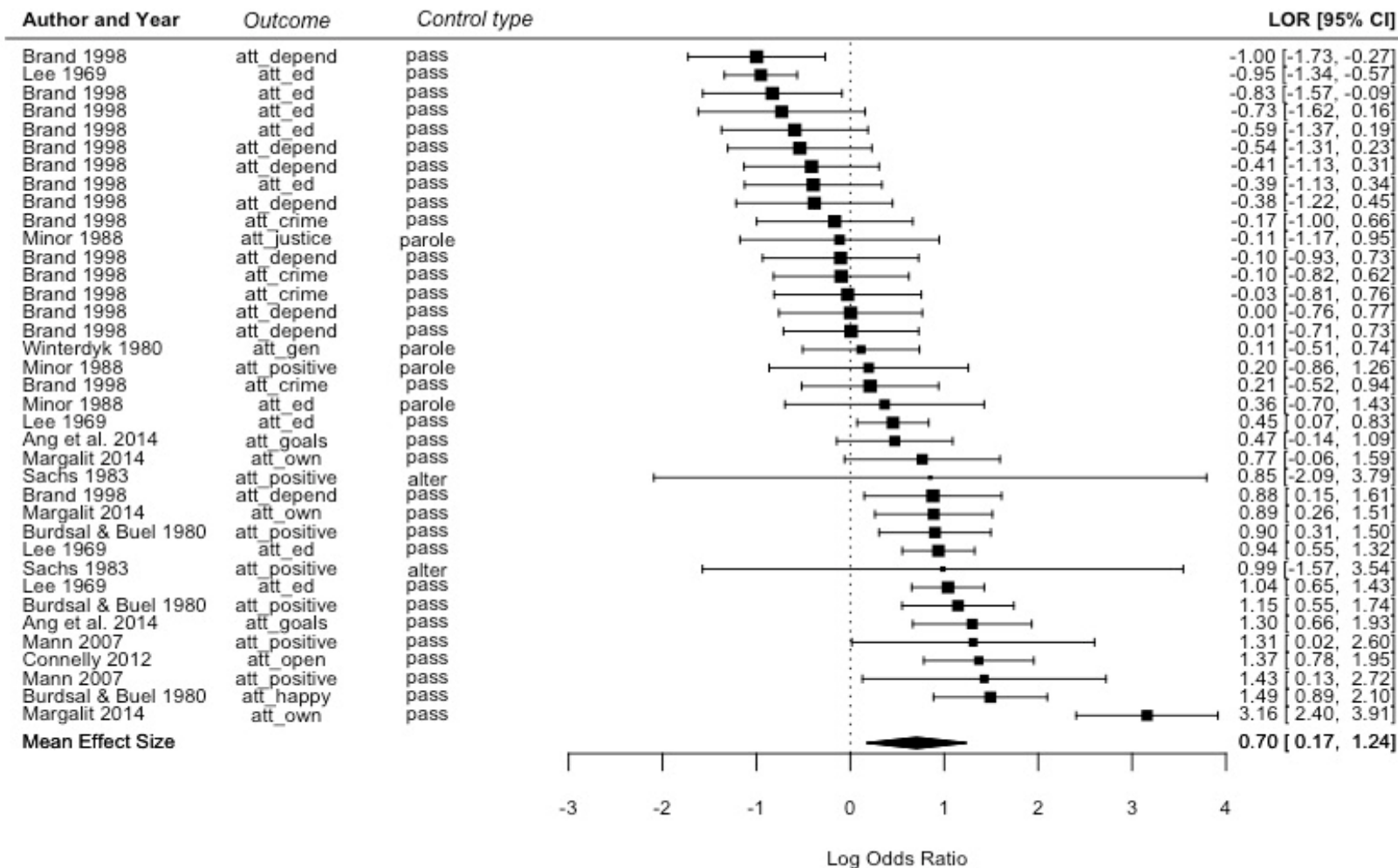


Figure 9. Forest plot of observed effect sizes for attitude and belief outcomes.

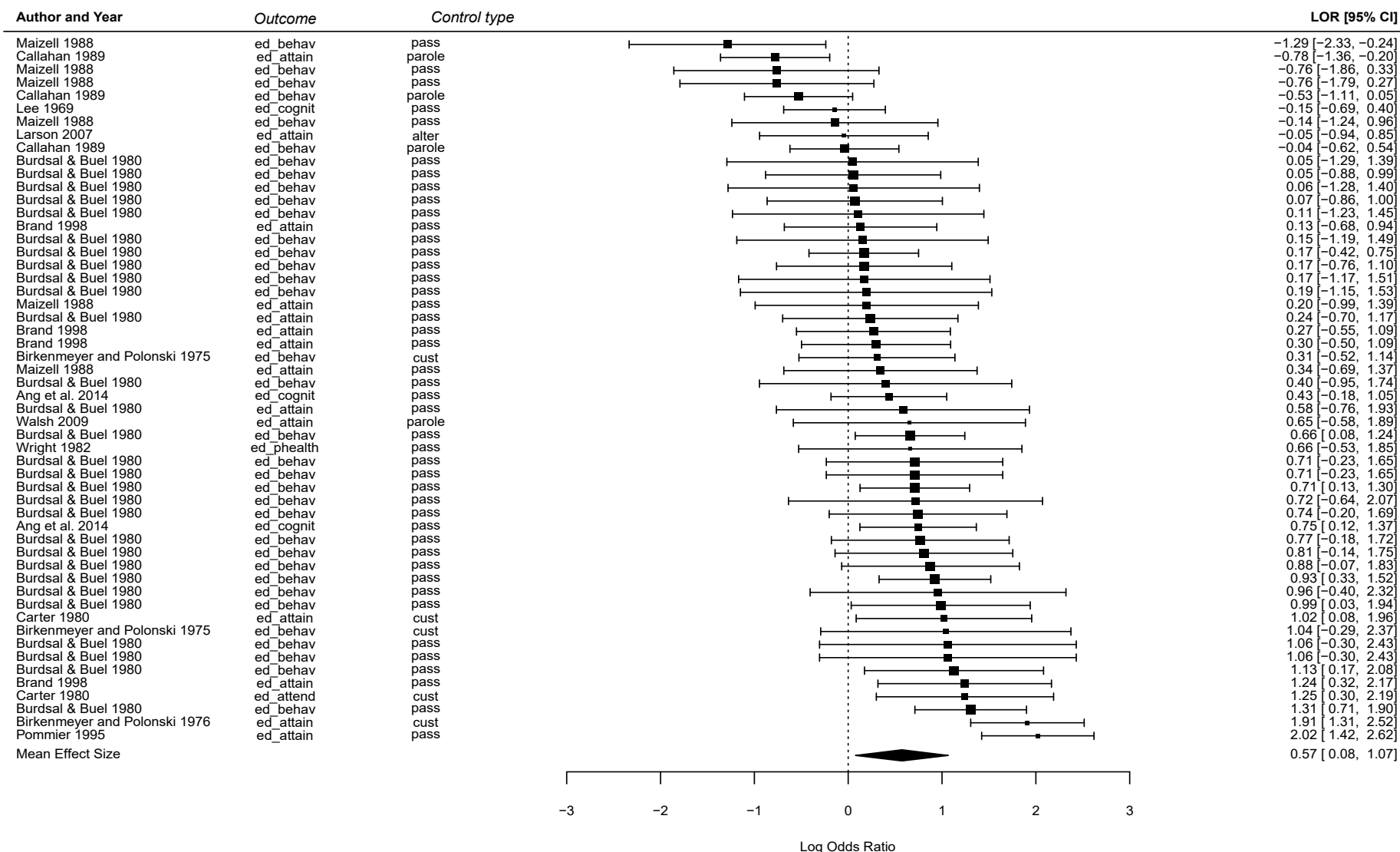


Figure 10. Forest plot of effect sizes for education outcomes.

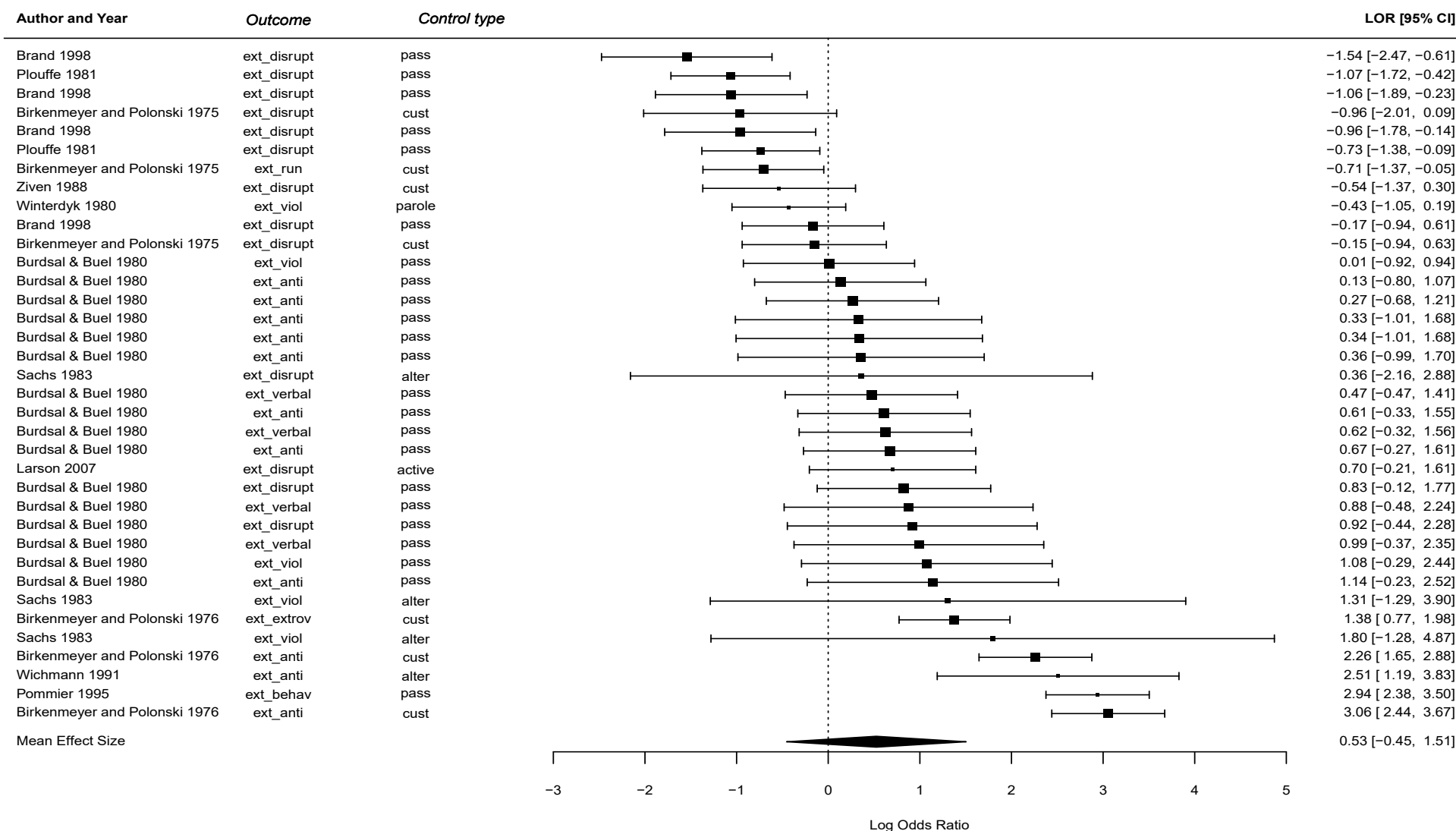


Figure 11. Forest plot of effect sizes for externalising behaviour outcomes.

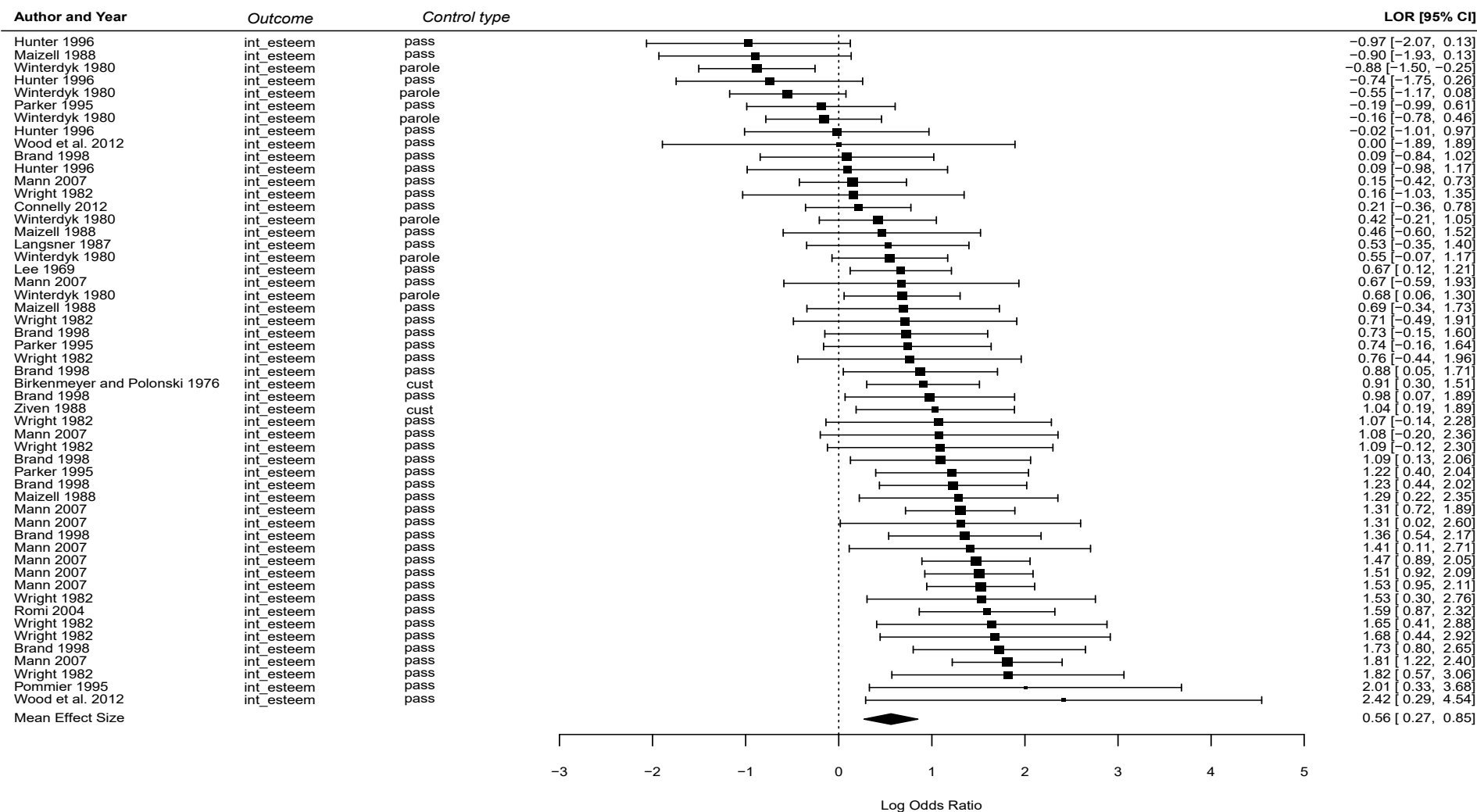


Figure 12. Forest plot of effect sizes for self-esteem outcomes.

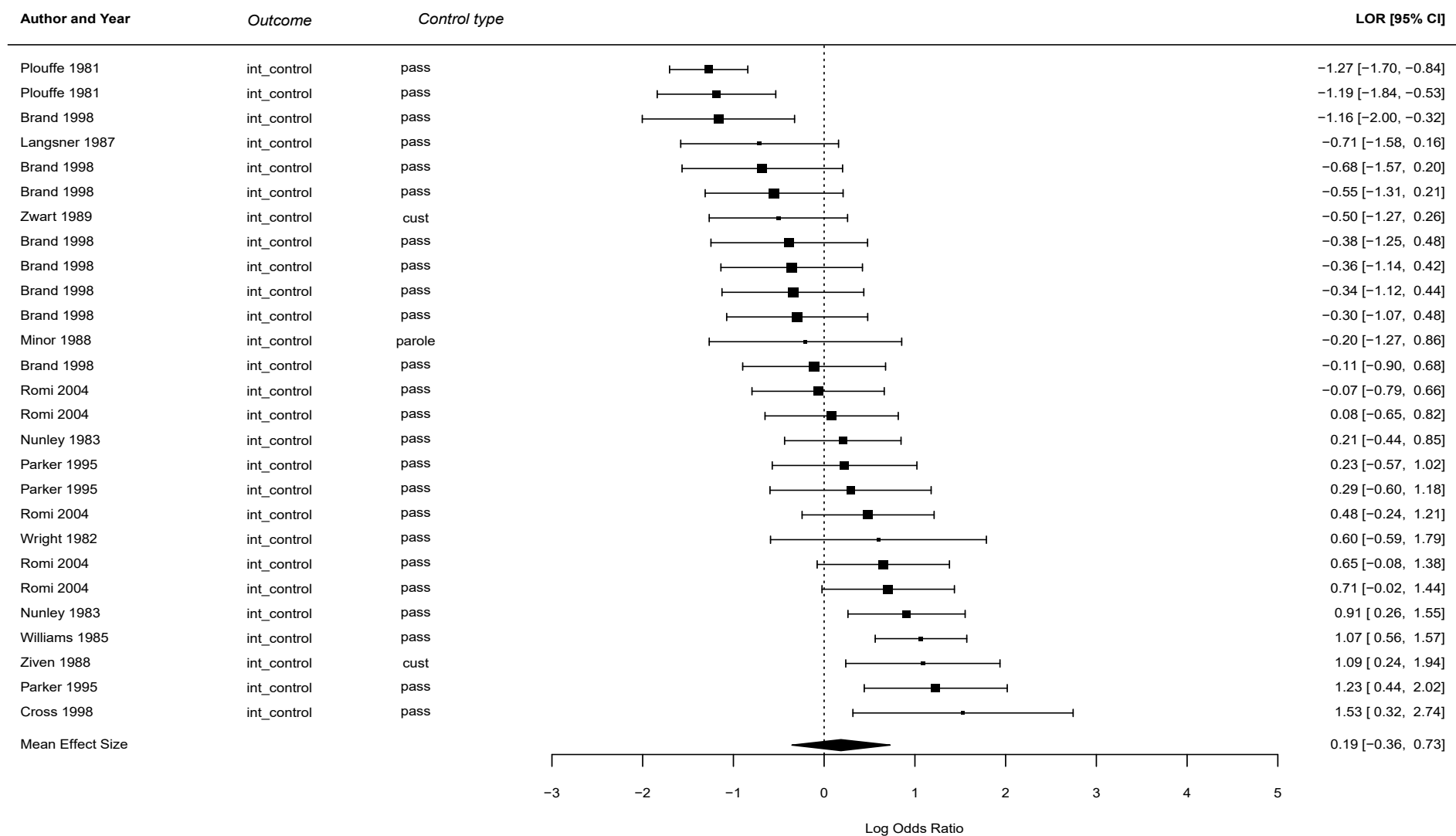


Figure 13. Forest plot of effect sizes for locus of control outcomes.

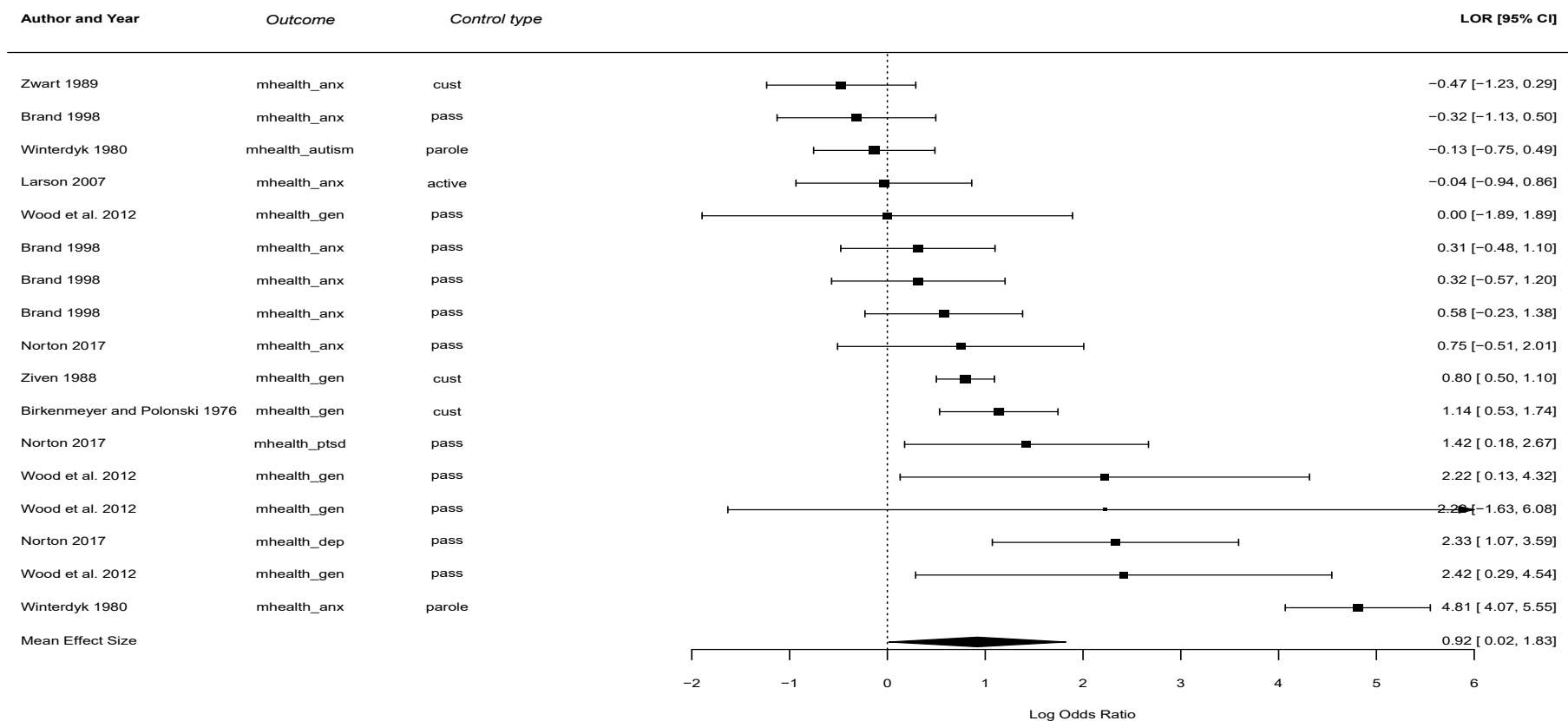


Figure 14. Forest plot of effect sizes for mental health outcomes.

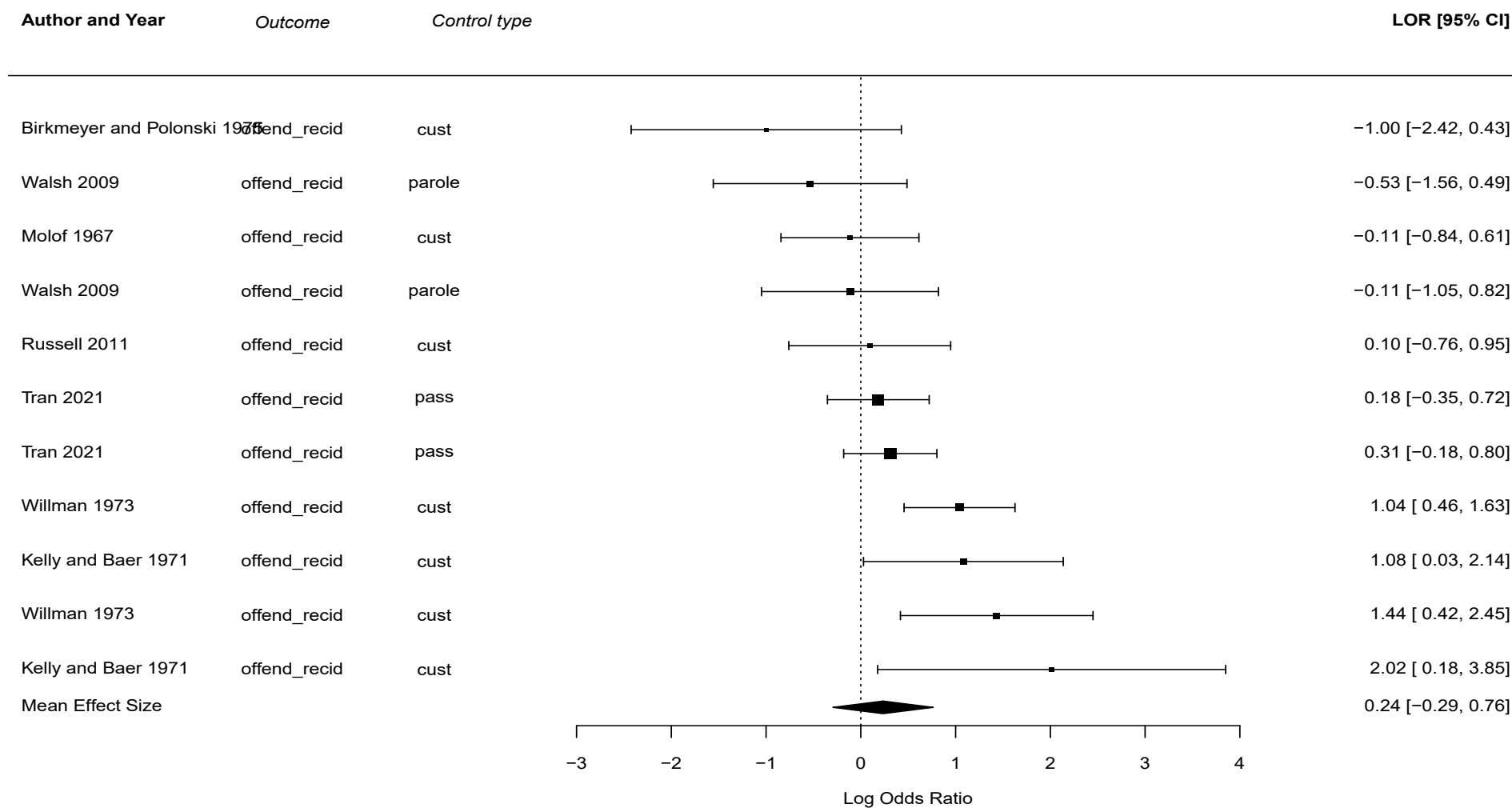


Figure 15. Forest plot of effect sizes for reoffending outcomes.

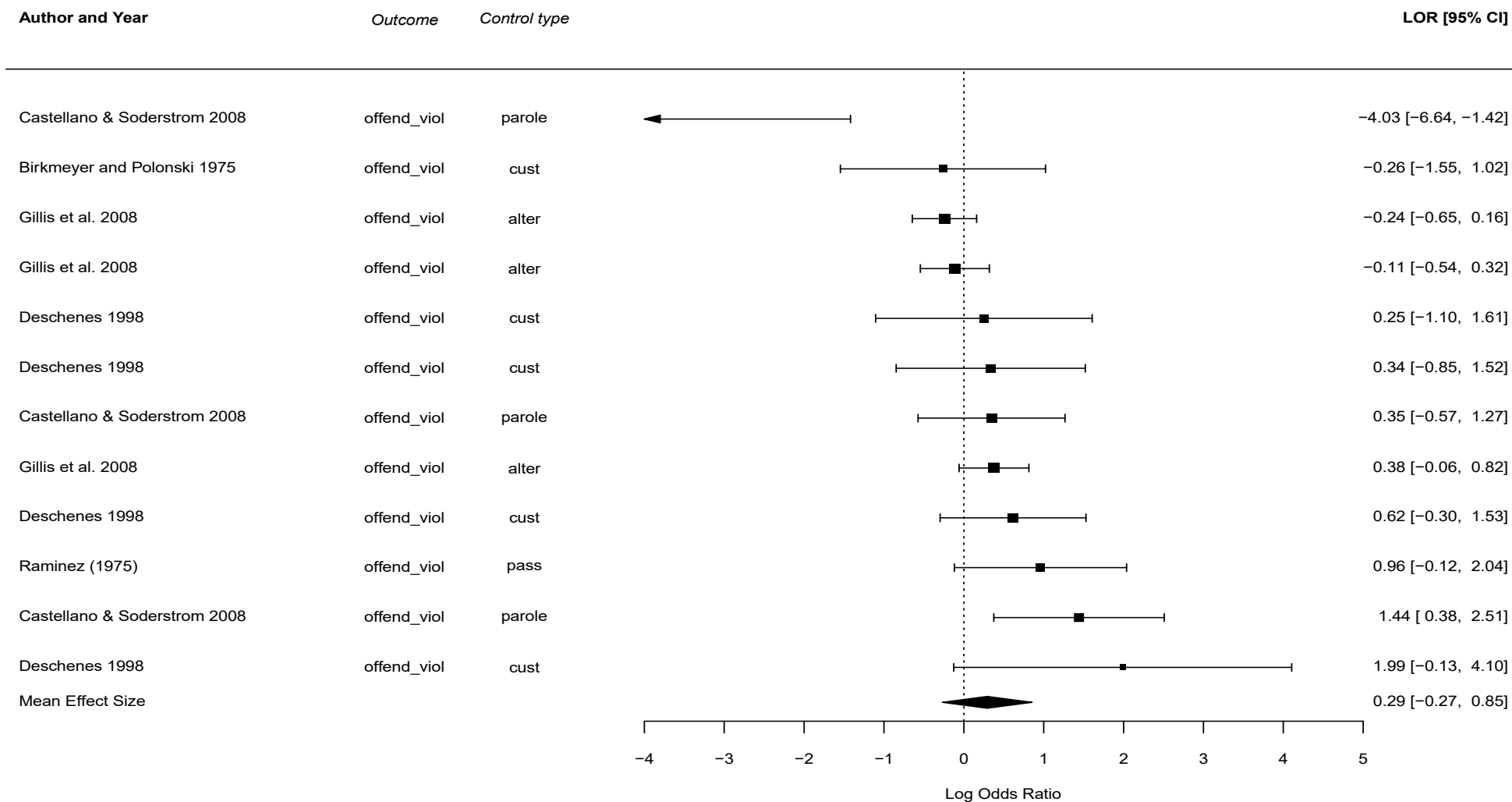


Figure 16. Forest plot of effect sizes for violence outcomes.

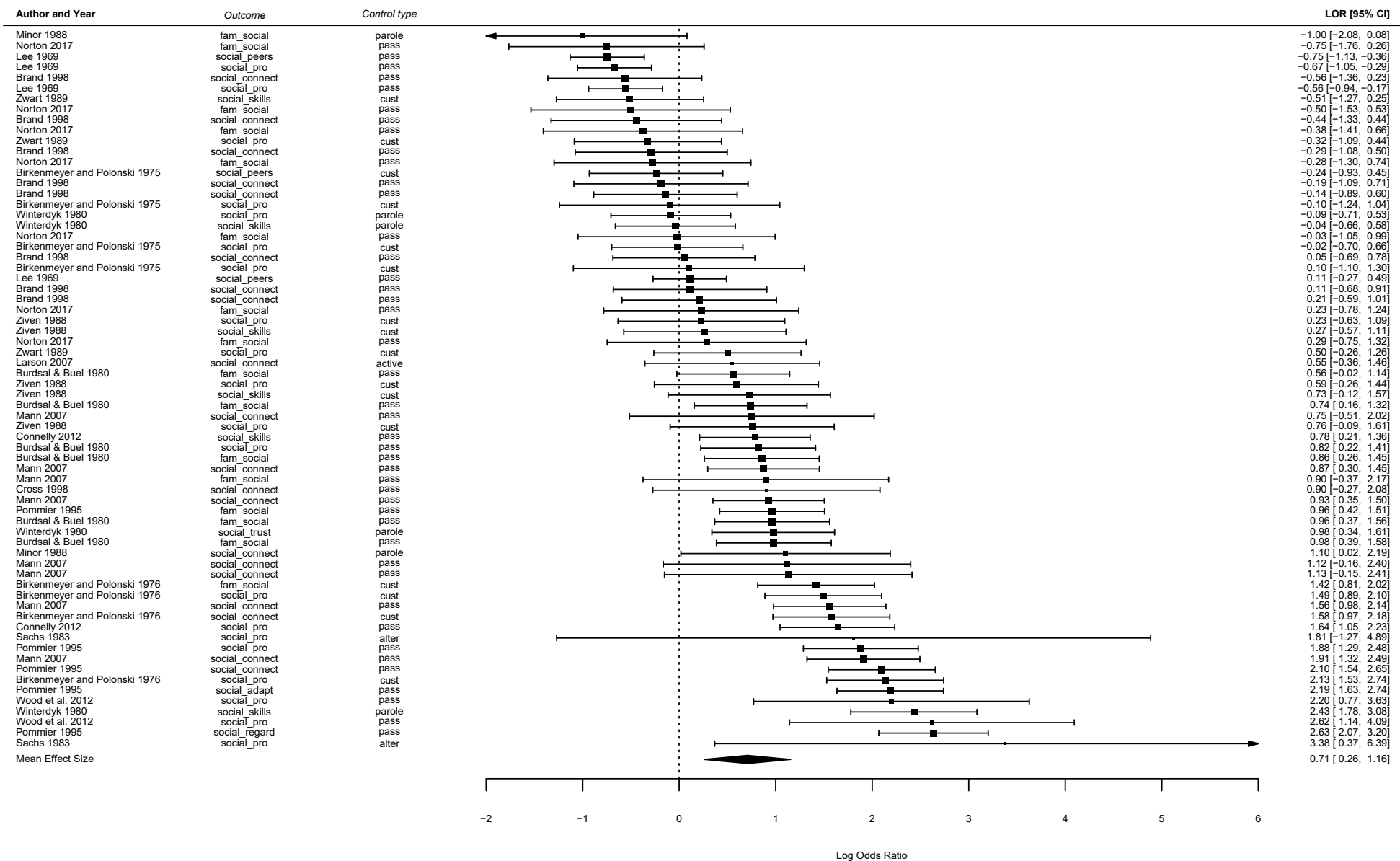


Figure 17. Forest plot of effect sizes for social outcomes.

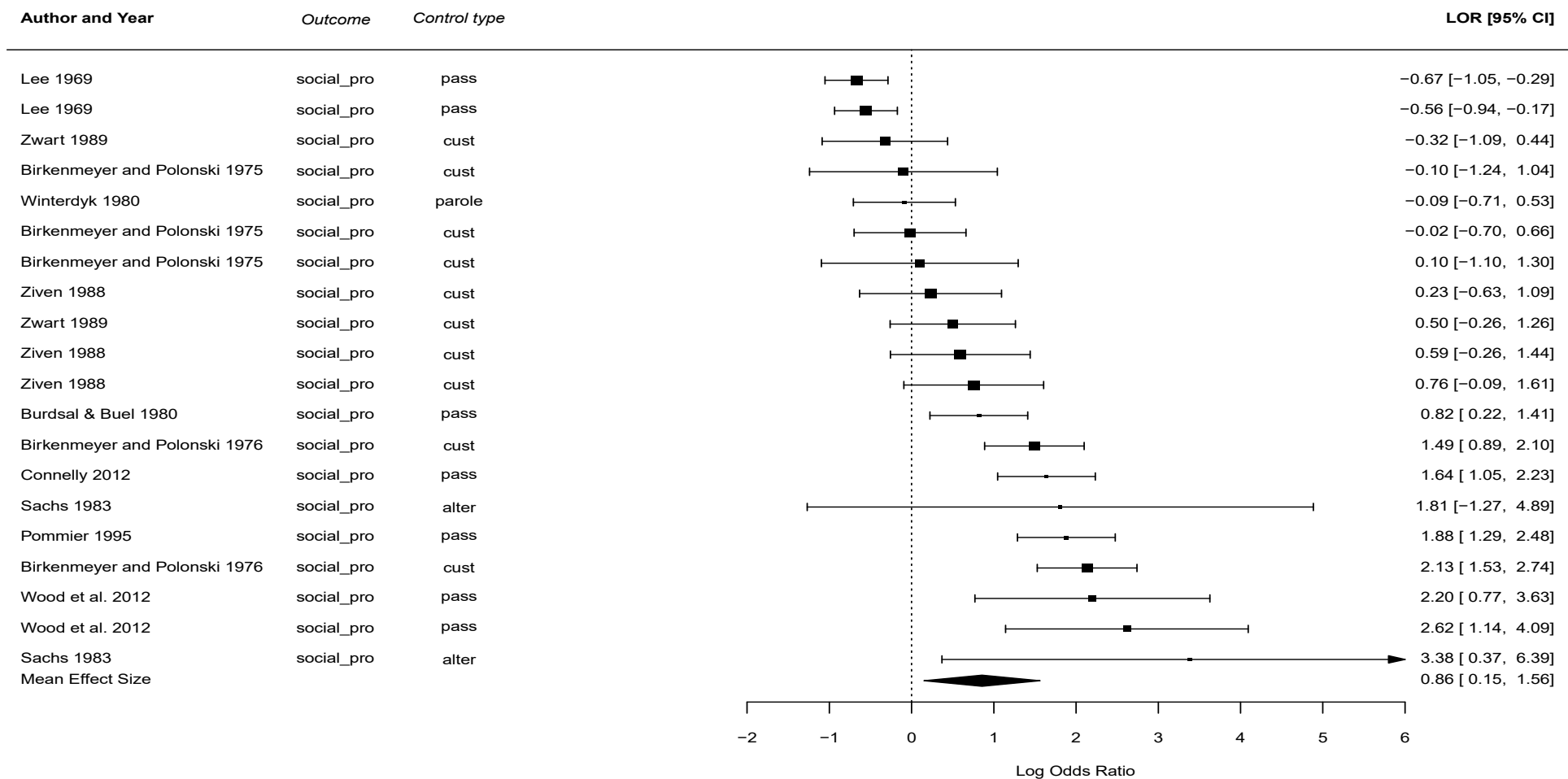


Figure 18. Forest plot of effect sizes for pro-social outcomes

5.1.2 Sensitivity analyses

Our meta-analytical model assumes the degree of correlation between dependent effect sizes (i.e., $\rho = 0.8$). Thus, we performed a sensitivity analysis to examine how the mean effect may change for different values of ρ .

We found that the mean effect size for most of the outcomes did not vary at when we adjusted the assumed value of ρ (i.e., $\rho = 0.4$ or 0.6). The results from sensitivity analyses for the meta-analyses where there was a change in the mean effect size are summarised in (Table 13).

Examining the changes with respect to the mean effect size when $\rho = 0.8$, the differences are marginal.

Table 13 Sensitivity analyses results

Meta-analysis	Mean ES		
	$\rho = 0.8$	$\rho = 0.6$	$\rho = 0.4$
Externalising behaviour	1.69	1.72	1.73
Internalising behaviour	2.09	2.09	2.08
Self-esteem	2.05	2.05	2.04
Offending	1.15	1.13	1.13

5.1.3 Moderator analyses

A number of moderators were coded to explore possible reasons for heterogeneity in each of our meta-analyses. These moderators included the time of follow-up, the gender of participants, the ethnicity of participants, and the type of control group used in the evaluation.

Due to the disparity in reporting standards for participant gender and ethnicity, we created categorical moderator variables to conduct a subgroup analysis for possible differences. Studies that included a single sex participant group (i.e., all male or all female) were categorised as 'gender_male' or 'gender_female'. If the study included a mixture of males and females, the study was labelled 'gender_mixed'.

It was more difficult to categorise studies according to participant ethnicity. However, if more than 85% of a study sample were identified as the ethnic group that is the majority in the country where the evaluation took place, we labelled these studies as 'ethnicity_majority'. Similarly, if more than 85% of a study sample were identified as an ethnic group that are considered an ethnic minority in the country where the evaluation took place, the study was labelled 'ethnicity_minority'. Where neither of these conditions were met, and a mixture of different ethnicities were represented in the study sample we labelled these studies as 'ethnicity_mixed'.

Evaluations included in our meta-analyses employed different types of control groups to examine the effectiveness of wilderness and adventure therapy programmes. We coded this information for each study, and each effect size, and performed a subgroup analysis to examine how the mean effect size may change. There were five possible types of control groups across primary studies included in the present review: (1) passive control (i.e., no treatment); (2) parole; (3) residential or custody; (4) alternative treatment; and (5) an alternative wilderness and adventure therapy programme. In the following sections we report the mean effect sizes for wilderness and therapy programmes when they were compared to these control groups.

The following sections present the results of the moderator analysis. When interpreting the results of moderator analyses, one must consider the number of studies (n) and the number of effect sizes (k). An effect size that is estimated on multiple effects from just one study may not be the most valid result. We report all results here for transparency but urge caution when interpreting results. However, if a subgroup contained only one study and one effect size, we have not reported the results here and the moderator will be missing for the respective table.

5.1.4 Time of follow-up

The time of follow-up was coded as a continuous variable in years, where time = 0 represented the immediate post-intervention data. Hence time = 0.5 represented a follow-up timepoint 6 months after the end of the intervention. We performed meta-regression analyses to examine the relationship between the time of follow-up and the mean effect size. The results in Table 14 show that offending outcomes were followed up on average for the longest amount of time, followed by externalising behaviour. The intercept only model shows the mean effect for the lowest time of follow-up (i.e., immediately after the end of the intervention). The estimate for the meta-regression model that includes time of follow up as a predictor shows that overall, the effects of wilderness and adventure therapy were not sustained. As the unit of time of follow up increased, the mean effect size for the impact of the intervention reduced. The exception to this finding was for attitude and beliefs and mental health outcomes. In all other cases there is a negative coefficient on the duration variable, although it is not statistically significant at the 5% level in any case. It is significant at 10% for pro-social behaviour, and very nearly so for mental health.

Table 14 - *Meta-regression results: Time of follow-up moderator*

Outcome	n	k	mean time of follow-up (years)	Intercept only		time of follow up		F test
				estimate (LOR)	se	estimate (LOR)	se	
Attitudes and beliefs	10	37	0.57	0.521	0.255	0.209	0.168	$F(1,35) = 1.566, p = .219$
Education	13	54	1.48	0.608	0.228	-0.089	0.118	$F(1,52) = 0.564, p = .456$
Externalising behaviour	11	36	1.34	0.701	0.544	-0.352	0.648	$F(1,34) = 0.378, p = .543$
Internalising behaviour	26	130	0.59	0.684	0.228	-0.158	0.294	$F(1,109) = 1.383, p = .242$
Internalising: Self-esteem	15	53	0.36	0.758	0.243	-0.117	0.155	$F(1,41) = 0.176, p = .677$
Internalising: Self-control	12	27	0.26	0.367	0.264	-0.360	0.109	$F(1,25) = 1.511, p = .230$
Mental health	8	17	0.09	0.553	0.319	2.963	1.143	$F(1,15) = 3.064, p = .101$

Offending	17	159	1.60	0.217	0.335	-0.065	0.067	$F(1, 157) = 0.309, p = .579$
Social	17	68	0.26	0.923	0.237	-0.766	0.293	$F(1, 66) = 2.235, p = .139$
Social: pro-social	11	20	0.26	1.251	0.292	-1.500	0.466	$F(1, 18) = 3.363, p = .083$

i. Attitudes and belief outcome

Table 15 presents the results of subgroup analyses for attitudes and belief outcomes. These include attitudes to the police and the justice system, aspirations and goal setting. For a full list see Annex 7. The mean effect sizes for studies that utilised an alternative treatment group, or that included mostly participants that identified as an ethnic majority, participants that identified as an ethnic minority or as female should not be trusted as these mean effects are estimated from multiple effect sizes from only one study. These effects are reported for transparency only and further research is needed to better understand the relationships between these moderators and effect sizes for the impact of wilderness and adventure therapy.

Studies that utilised a passive (i.e., no treatment) control group had a larger mean effect size (and a larger standard error) than programmes that compared the effect of wilderness and adventure therapy to a parole condition. However, there is a large discrepancy between numbers of studies and effect sizes in these two subgroups and the difference was not statistically significant.

It is not appropriate to compare the results for subgroups of studies based on participant ethnicity. Of the studies that reported information on participants' ethnicities, most included a mixture of different ethnicities. In total, 22 effect sizes ($n = 4$) did not report information on participant ethnicity.

These subgroup analyses also suggest that programmes that included both male and female participants are associated with greater increases in attitudes and belief outcomes in comparison to studies that included only male samples. The largest impact is for female-only groups, but that finding is based on just one study.

Table 15 subgroup analyses for attitudes and belief outcomes

<i>Moderator</i>	<i>Moderator code</i>	<i>n</i>	<i>k</i>	Mean ES (OR)	95% CIs	<i>dfs</i>	<i>F test</i>
Type of control group	control_alter	1	2	2.57	2.12, 3.10	1	$F(2, 34) = 0.633, p = 0.537$
	control_parole	2	4	1.14	1.10, 1.18	1.68	
	control_pass	7	31	2.28	1.32, 3.93	1.18	
Ethnicity	ethnicity_majority	1	2	2.42	2.37, 2.47	1	$F(3, 33) = 0.127, p = 0.943$
	ethnicity_minority	1	6	2.10	0.81, 5.17	1	
	ethnicity_mixed	3	7	2.44	1.25, 4.97	1.96	
Gender	gender_female	1	2	3.92	3.86, 3.98	1	$F(2, 34) = 0.791, p = 0.462$
	gender_male	4	24	1.54	0.72, 3.32	2.78	
	gender_mixed	5	11	2.45	1.61, 3.85	3.42	

ii. Education outcomes

Table 16 presents the results of subgroup analyses for education outcomes. A mean effect size for studies that compared the effectiveness of wilderness and adventure treatment compared to an alternative treatment programme (i.e., an active control group) was not computed as only one study (e.g., Larson, 2007) included this type of control condition. Similarly, the mean effect sizes for studies that included only participants identified as an ethnic minority are not reported here as there was only one study and one effect size (e.g., Lee, 1969).

The most common type of control group in the meta-analysis of education outcomes was a passive control group. However, the largest mean effect size was for evaluations that compared wilderness and adventure therapy to a residential/custody condition. Moreover, when wilderness and adventure therapy programmes were compared to parole condition, they are associated with an undesirable impact on education outcomes. However, the difference between the three subgroups was not statistically significant.

Of the studies that reported information on participants' ethnicities, most included a mixture of different ethnicities, but these were associated with a slightly lower mean effect size than evaluations that included a sample described as an ethnic majority. In total, 15 effect sizes ($n = 5$) did not report information on participant ethnicity.

None of the studies that were included in the meta-analysis on education outcomes included only female participants. The comparison between studies that included only male participants and those that included a mixture of males and females suggests that mixed gender programmes are associated with greater increases in education outcomes in comparison to studies that included only male samples.

Table 16 subgroup analyses for education outcomes

<i>Moderator</i>	<i>Moderator code</i>	<i>n</i>	<i>k</i>	Mean ES (OR)	95% Cis	<i>dfs</i>	<i>F test</i>
Type of control group	control_cust	3	5	3.29	1.44, 7.49	2	F (3, 50) = 1.23, $p = 0.308$
	control_parole	3	4	0.94	0.33, 2.62	1	
	control_pass	9	44	1.77	1.00, 3.11	5.76	
Ethnicity	ethnicity_majority	3	6	1.94	0.49, 7.68	1.99	F(3, 50) = 0.256, $p = 0.857$
	ethnicity_mixed	4	32	1.73	1.17, 2.57	4.59	
Gender	gender_male	5	11	1.66	0.82, 3.38	4.96	F (1, 52) = 0.072, $p = 0.789$
	gender_mixed	7	41	1.88	1.04, 3.41	10.54	

iii. Externalising behaviour

Table 17 represents the results of subgroup analysis for externalising behaviour outcomes. Mean effect sizes for studies that compared the effectiveness of wilderness and adventure treatment compared to an alternative treatment programme (i.e., an active control group) or compared to parole were not computed as only one study (e.g., Larson, 2007; Winterdyk, 1980) included these types of control condition. Similarly, a moderator analyses for ethnicity was not computed as only one study included (of those that reported information on participant ethnicity) in this meta-analysis included a sample that was not a mixture of different ethnicities. The mean effect size for the studies that included multiple ethnicities was OR = 1.59 (SE = 0.178; $n = 2$, $k = 17$).

Studies that compared the effectiveness of a wilderness and treatment programme on externalising behaviour outcomes were associated with the largest mean effect size but is based on the fewest number of studies and effects. When comparing studies that evaluated the impact of a wilderness and adventure programme compared to a custody condition and those that included a passive control group, the former was associated with a larger mean effect size. However, the difference between subgroups was not statistically significant.

Table 17 subgroup analysis for externalising behaviour outcomes

<i>Moderator</i>	<i>Moderator code</i>	<i>n</i>	<i>k</i>	Mean ES (OR)	95% Cis	<i>dfs</i>	<i>F test</i>
Control group	control_alter	2	4	5.79	1.13, 29.60	1	F (4, 31) = 0.313, <i>p</i> = 0.867
	control_cust	3	7	1.51	0.24, 9.55	2	
	control_pass	4	23	1.42	0.25, 8.11	3	
Gender	gender_male	3	11	1.13	0.27, 4.73	3	F(1, 34) = 0.503, <i>p</i> = 0.483
	gender_mixed	7	25	2.19	0.35, 13.58	6.65	

None of the studies that were included in the meta-analysis on externalising behaviour outcomes included only female participants. The results of the subgroup analysis based on participant gender suggests that mixed gender programmes are associated with greater reductions in externalising behaviour outcomes in comparison to studies that included only male samples.

iv. Internalising behaviour

Table 18 presents the results of subgroup analyses for all internalising behaviour outcomes. The mean effect sizes for studies that utilised an active control group (i.e., an alternative wilderness programme) should not be trusted as the mean effect was estimated from multiple effect sizes from only one study. Comparing the other subgroup mean effects based on type of control group suggests that evaluations that utilised a passive control group were associated with the largest mean effect and evaluations that utilised participants on parole were associated with an undesirable effect on internalising behaviour.

Table 18 subgroup analyses for all internalising behaviour outcomes

<i>Moderator</i>	<i>Moderator code</i>	<i>n</i>	<i>k</i>	Mean ES (OR)	95% CI	<i>dfs</i>	<i>F test</i>
Control group	control_active	1	3	1.08	1.07, 1.09	1	F (3, 130) = 1.051, <i>p</i> = 0.373
	control_cust	4	10	1.44	0.49, 4.22	1.85	
	control_parole	2	10	0.92	0.66, 1.27	1	
	control_pass	20	111	1.99	1.47, 2.70	17.24	
Ethnicity	ethnicity_majority	2	7	2.41	0.77, 7.56	1	F (3, 130) = 1.007, <i>p</i> = 0.392
	ethnicity_minority	3	22	2.85	0.75, 10.76	1.87	
	ethnicity_mixed	9	34	1.75	0.51, 6.00	1.51	
Gender	gender_female	2	15	3.98	2.88, 5.50	1.03	F(2, 131) = 2.12, <i>p</i> = 0.124
	gender_male	11	74	1.48	0.91, 2.40	1.39	
	gender_mixed	13	44	1.79	1.07, 2.99	1.47	

In relation to internalising behaviour outcomes, studies that included only participants identified as an ethnic minority were associated with the greatest reduction. However, all mean effect sizes suggest a desirable impact on internalising behaviour and the difference between the three subgroups was not statistically significant. In addition, information about participant ethnicity was missing from 14 studies ($k = 71$).

Programmes that included only female participants were associated with the greatest reductions in internalising behaviour, but this mean effect size is based on the fewest number of studies and effect sizes. Moreover, programmes that included mixed gender samples were associated with a larger mean effect than programmes that only included male participants. The difference between the three subgroups was not statistically significant.

v. *Internalising behaviour: Self-esteem*

Table 19 presents the results of subgroup analyses for self-esteem outcomes. The mean effect sizes for studies that employed only female participants or that compared the impact of a programme to a parole condition should not be trusted as the mean effect was estimated from multiple effect sizes from only one study.

Studies that compared the effect of a wilderness and adventure therapy programme compared to a residential/custody condition had the largest mean effect size but was also based on the fewest number of studies and effects. Similarly, studies that included participants identified as an ethnic majority gave the largest mean effect, but this result was estimated from the fewest studies and effect sizes. In total, 8 studies ($k = 26$) did not report information about participant ethnicity.

In relation to self-esteem outcomes, the findings of our subgroup analyses suggest that studies that included participants identified as an ethnic minority were more effective than programmes that included participants from a range of different ethnicities. However, the difference is not statistically significant. Moreover, programmes that included mixed gender samples were associated with greater increases in self-esteem compared to programmes that only included male participants. And, again, the largest effect is from female only but again this is based on one study only.

Table 19 subgroup analyses for self-esteem outcomes

<i>Moderator</i>	<i>Moderator code</i>	<i>n</i>	<i>k</i>	Mean ES (OR)	95% CI	<i>dfs</i>	<i>F test</i>
Control	control_cust	2	2	2.63	2.32, 2.99	1	F (2, 50) = 1.492, $p = 0.235$
	control_parole	1	6	1.01	0.89, 1.15	1	
	control_pass	12	45	2.19	1.51, 3.18	1.27	
Ethnicity	ethnicity_majority	2	2	5.58	3.85, 8.08	1	F (3, 49) = 2.034, $p = 0.121$
	ethnicity_minority	2	11	2.99	1.57, 5.70	1.68	
	ethnicity_mixed	3	14	1.39	0.49, 3.94	1.71	
Gender	gender_female	1	10	3.62	2.94, 4.46	1	F(2, 50) = 1.243, $p = 0.297$
	gender_male	8	25	1.71	1.05, 2.78	2.03	
	gender_mixed	6	18	2.26	1.38, 3.69	2.95	

vi. *Internalising behaviour: Self-control*

Table 20 presents the results of subgroup analyses for self-control outcomes. The mean effect sizes for studies that compared the impact of a programme to a custodial condition or that

included participants who were identified as an ethnic majority should not be trusted as the mean effect was estimated from multiple effect sizes from only one study.

The only other type of control group included in the meta-analysis of self-control outcomes was a passive control group but a comparison is inappropriate given the disparity in the number of studies and effect sizes. Similarly, a comparison based on the ethnicity moderator is inappropriate, but the findings do suggest that programmes that included participants from multiple ethnic backgrounds had a larger mean effect size than programmes that included only ethnic majority participants.

In relation to the gender of participants, subgroup analyses for self-control outcomes suggest that mixed gender programmes were associated with a greater increases in self-control in comparison to programmes that included only male participants.

Table 20 subgroup analyses for self-control outcomes

<i>Moderator</i>	<i>Moderator code</i>	<i>n</i>	<i>k</i>	Mean ES (OR)	95% CI	<i>dfs</i>	<i>F test</i>
Control	control_cust	1	2	1.32	0.28, 6.28	1	NA
	control_pass	9	24	1.23	0.23, 6.50	1.45	
Ethnicity	ethnicity_majority	1	5	1.45	1.37, 1.54	1	F (2, 24) = 1.341, <i>p</i> = 0.280
	ethnicity_mixed	4	4	2.14	1.08, 4.24	2.95	
Gender	gender_male	5	18	0.91	0.55, 1.52	3.96	F (1, 25) = 1.047, <i>p</i> = 0.316
	gender_mixed	6	9	1.51	0.60, 3.82	8.89	

vii. Mental health

Table 21 presents the results of subgroup analyses for mental health outcomes. The mean effect sizes for studies that compared the impact of a programme to a parole condition and studies that included only female participants should not be trusted as the mean effect was estimated from multiple effect sizes from only one study. We did not compute a subgroup analysis for mental health outcomes because most of the studies did not report this information (*n* = 6, *k* = 13). Furthermore, of the studies that did report this information only one study included a sample of participants identified as an ethnic minority and only one study included participants from multiple ethnic backgrounds.

Comparing the mean effect sizes for subgroups of studies based on the type of control group used is inappropriate due to the disparity in the number of effects and studies. However, the results suggest that when compared to a passive control condition, wilderness and adventure programmes are associated with a larger mean effect than when compared to a custodial condition.

In relation to mental health outcomes, our subgroup analysis suggests that programmes that included only male participants were associated with greater improvements in mental health compared to programmes that included both genders. However, the difference in mean effect sizes is marginal and not statistically significant.

Table 21 subgroup analyses for mental health outcomes

<i>Moderator</i>	<i>Moderator code</i>	<i>n</i>	<i>k</i>	Mean ES (OR)	95% CI	<i>dfs</i>	<i>F test</i>
Control	control_cust	3	3	1.53	0.59, 3.94	2	F (3, 13) = 0.967, <i>p</i> = 0.438
	control_parole	1	2	10.57	9.68, 11.54	1	
	control_pass	3	11	2.84	0.90, 8.92	1.73	
Gender	gender_female	1	3	4.49	4.40, 4.58	1	F (2, 14) = 0.223, <i>p</i> = 0.803
	gender_male	4	8	2.28	0.67, 7.72	2.41	
	gender_mixed	3	6	1.97	0.79, 4.92	1.98	

viii. Offending

Table 22 presents the results of subgroup analyses for all offending outcomes. The most common type of control group in studies that examined the impact of wilderness and adventure therapy on offending outcomes was an alternative treatment programme or a custodial condition. In contrast to other outcomes, the least common type of control was a passive control group but when compared to this type of control, programmes were associated with the largest mean effect size. When wilderness therapy programmes were compared to custodial conditions, they were associated with an undesirable impact on offending. However, the differences between the three subgroups were not statistically significant.

Comparing the results of the subgroup analyses based on participant ethnicity is inappropriate due to the large discrepancy between the number of effect sizes and studies. However, the findings suggest that programmes implemented with samples where all participants are an ethnic minority are associated with greater effectiveness in comparison to programmes that include a mixture of ethnicities.

Similarly, the majority of studies that reported the effectiveness of wilderness and adventure therapy programmes on offending outcomes included only male participants. However, the results suggest that programmes implemented with mixed gender samples are associated with a larger mean effect and that programmes implemented with only male samples are associated with an increase in offending. The difference between mean effect sizes for subgroups based on gender was not statistically significant.

Table 22 subgroup analyses for all offending outcomes

<i>Moderator</i>	<i>Moderator code</i>	<i>n</i>	<i>k</i>	Mean ES (OR)	95% CI	<i>dfs</i>	<i>F test</i>
Control	control_alter	2	60	1.05	0.67, 1.64	1	F (3, 155) = 0.522, <i>p</i> = 0.668
	control_cust	8	51	0.85	0.30, 2.40	1.79	
	control_parole	10	38	1.43	0.48, 4.30	2.54	
	control_pass	3	10	2.18	1.07, 4.43	2.61	
Ethnicity	ethnicity_minority	1	13	1.62	0.19, 13.99	1	F (2, 156) = 0.401, <i>p</i> = 0.670
	ethnicity_mixed	9	108	1.36	0.15, 12.22	1.44	
Gender	gender_male	10	102	0.91	0.37, 2.27	8.38	F (2, 143) = 0.259, <i>p</i> = 0.773
	gender_mixed	6	40	1.52	0.51, 4.50	9.71	

ix. Social outcomes

Table 23 presents the results of subgroup analyses for social outcomes. The results for studies that included an alternative treatment control group and participants identified as an ethnic majority should not be trusted as these are estimated from multiple effect sizes from only one study.

When the impact of wilderness and adventure programmes were evaluated in comparison to a passive control group, these studies were associated with the greatest mean effect size, followed by a custodial control group and a parole control group. However, the differences between mean effects for subgroups of studies based on the type of control group were not statistically significant.

In relation to social outcomes, programmes that included a mixture of ethnicities and genders were associated with greater improvements in social outcomes in comparison to programmes that included only ethnic minorities and only male participants. However, the differences in mean effect sizes were not statistically significant. In total, 7 studies ($k = 32$) did not report information on participant ethnicity.

Table 23 Subgroup analyses for social outcomes

<i>Moderator</i>	<i>Moderator code</i>	<i>n</i>	<i>k</i>	Mean ES (OR)	95% CI	<i>dfs</i>	<i>F test</i>
Control	control_alter	1	2	14.19	5.63, 35.79	1	F (4, 63) = 0.435, $p = 0.783$
	control_cust	3	5	1.67	0.71, 3.90	2.99	
	control_parole	2	6	1.59	0.77, 3.30	1	
	control_pass	9	43	2.25	1.19, 4.25	7.73	
Ethnicity	ethnicity_majority	1	5	6.99	5.80, 8.42	1	F (3, 64) = 1.29, $p = 0.284$
	ethnicity_minority	3	19	1.26	0.39, 4.02	2.23	
	ethnicity_mixed	5	12	2.08	1.36, 3.18	4.35	
Gender	gender_female	2	15	1.92	0.45, 8.16	1.01	F (2, 65) = 1.816, $p = 0.171$
	gender_male	5	27	1.32	0.27, 6.48	1.72	
	gender_mixed	9	26	3.00	0.65, 13.87	1.64	

x. Social outcome: Pro-social

Table 24 presents the results of subgroup analyses for pro-social outcomes. The results for studies that included an alternative treatment control group and participants identified as an ethnic minority should not be trusted as these are estimated from multiple effect sizes from only one study.

The most common type of control group for studies that examined the impact of wilderness and adventure therapy on pro-social outcomes was a passive control group. This subgroup was also associated with the largest mean effect size but the difference was not statistically significant.

It is inappropriate to compare the results for subgroup analyses based on participant ethnicity. Additionally, a total of 6 studies ($k = 15$) did not report information about the ethnicity of participants included in the programme evaluation. In relation to the gender of participants,

programmes that included both male and female participants were associated with a larger mean effect size than programmes that included only male participants. This difference was statistically significantly.

Table 24 Subgroup analyses for pro-social outcomes

<i>Moderator</i>	<i>Moderator code</i>	<i>n</i>	<i>k</i>	Mean ES (OR)	95% CI	<i>dfs</i>	<i>F test</i>
Control	control_alter	1	2	14.41	3.03, 68.59	1	F (3, 16) = 0.782, $p = 0.521$
	control_cust	3	10	1.86	0.32, 10.98	2.96	
	control_pass	5	7	3.09	0.47, 20.40	2.79	
Ethnicity	ethnicity_minority	1	2	0.54	0.05, 6.14	1	
	ethnicity_mixed	2	2	3.42	1.53, 7.65	1	
Gender	gender_male	4	10	1.26	0.54, 2.95	3.98	F (1, 18) = 5.219, $p = 0.03$
	gender_mixed	6	10	4.30	1.50, 12.32	8.37	

5.2. PUBLICATION BIAS ANALYSIS

In order to evaluate the impact of possible publication bias on our findings we report the funnel plots and the results from Egger's regression test for plot asymmetry. However, neither is a perfect test for publication bias and there may be other reasons for asymmetrical funnel plots.

In particular, when incorporating dependent effect sizes in a meta-analysis, the standard version of Egger's regression test is insufficient. If dependency is ignored, the risk of incurring a Type 1 error is increased (Rodgers & Pustejovsky, 2019). Thus, we followed recommendations by experts and used Egger's regression test with robust variance estimation (Rodgers & Pustejovsky, 2019). These results, and the funnel plots, should be interpreted with caution as these methods and it is possible that publication bias is present in our analyses.

The results of Egger's regression test for plot asymmetry are outlined in Table 25 using the robust variance estimation standard error of effect sizes as a predictor. A statistically significant coefficient suggests that publication bias is present in the findings. This is the case for the meta-analysis of the effect of wilderness and adventure therapy on internalising behaviour outcomes.

Table 25 Egger's regression test

Outcome	Egger's coefficient (b)	95% CI (b)	z	p
Attitudes and beliefs	0.33	0.034, 0.63	0.39	0.69
Education	0.47	0.22, 0.72	-0.15	0.88
Externalising behaviour	0.39	-0.02, 0.79	0.59	0.55
Internalising behaviour	0.42	0.26, 0.59	2.29	0.02
Internalising: Self-esteem	0.67	0.43, 0.91	1.43	0.15
Internalising: Self-control	-0.19	-0.59, 0.22	1.56	0.12
Mental health	0.83	0.08, 1.57	0.65	0.52
Offending	0.08	-0.11, 0.26	-0.31	0.75
Offending: Reoffending	0.22	-0.34, 0.78	0.85	0.39
Offending: Violence	0.40	0.03, 0.77	-0.23	0.82
Social	0.57	0.35, 0.80	0.85	0.39
Social: Pro-social	0.67	0.21, 1.14	0.97	0.33

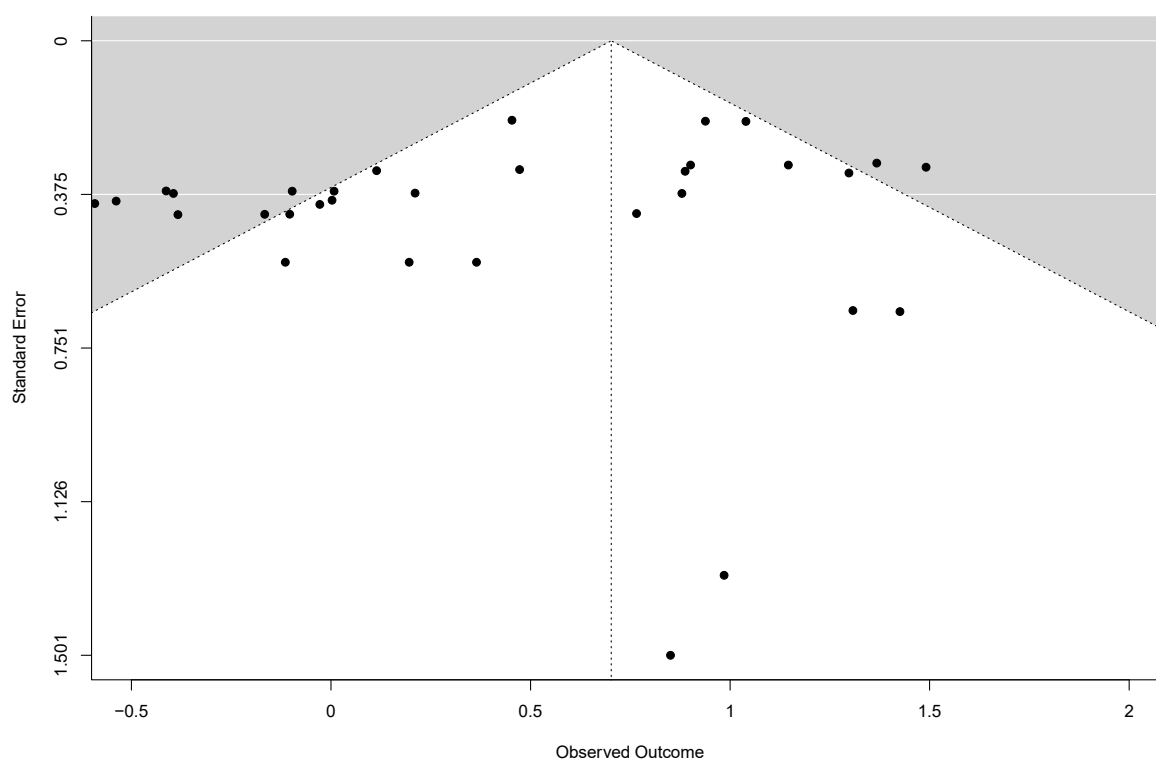


Figure 19. Funnel plot for observed effects sizes for attitude and beliefs outcomes.

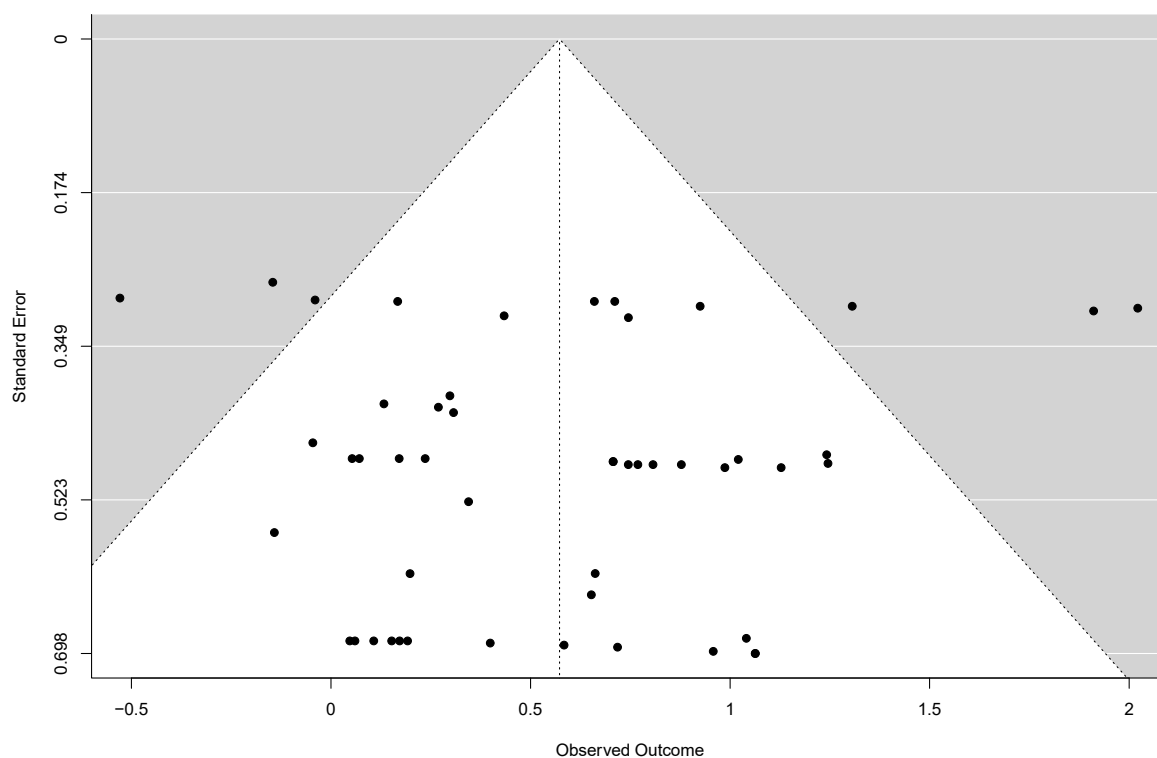


Figure 20. Funnel plot for observed effects sizes for education outcomes.

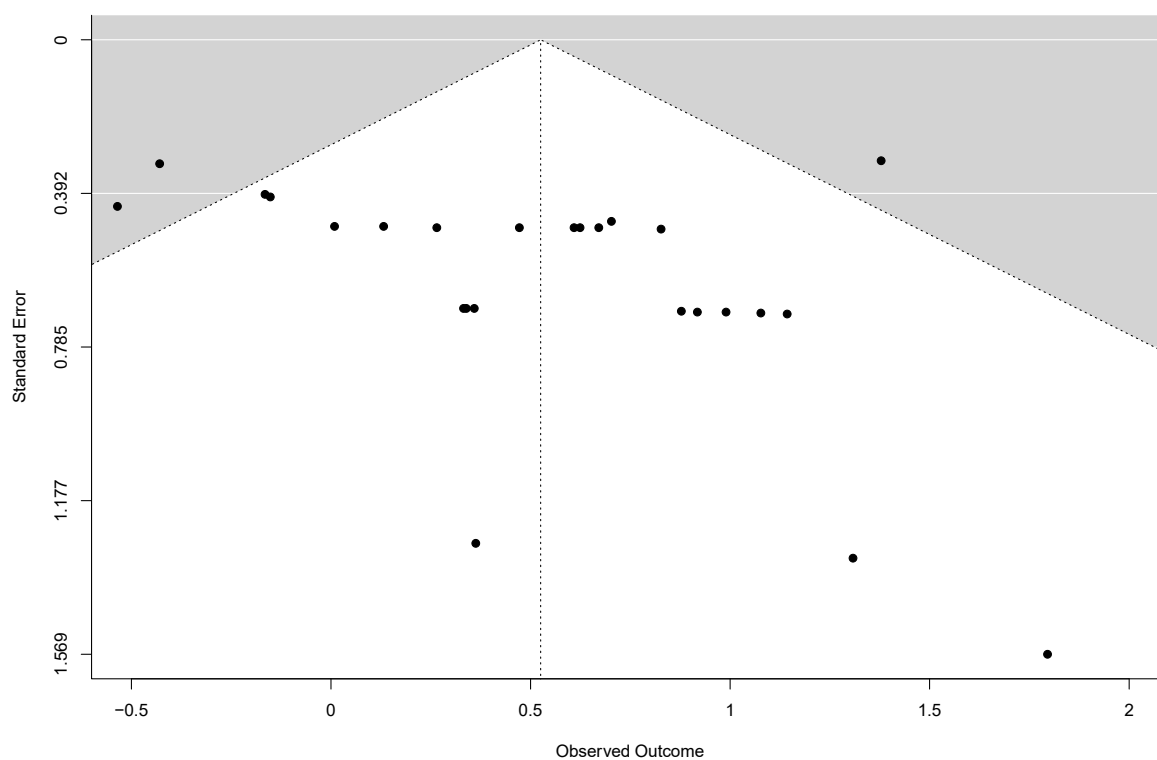


Figure 21. Funnel plot for observed effects sizes for externalising behaviour outcomes.

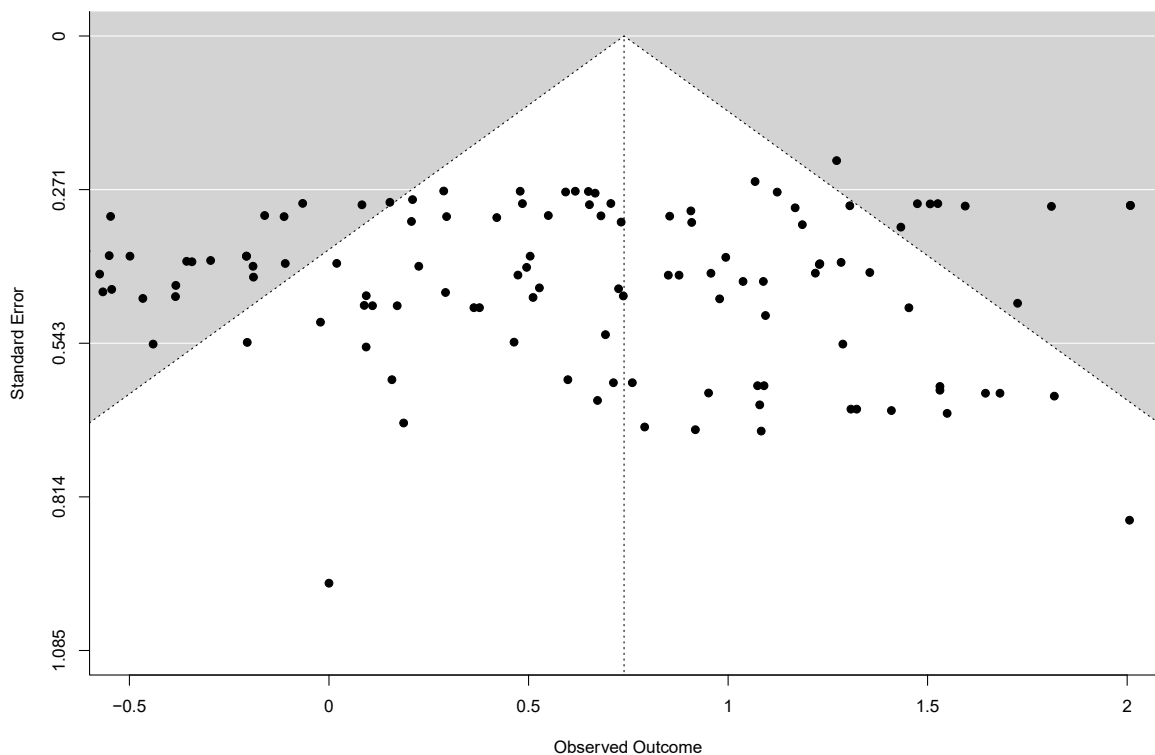


Figure 22. Funnel plot for observed effects sizes for internalising behaviour outcomes.

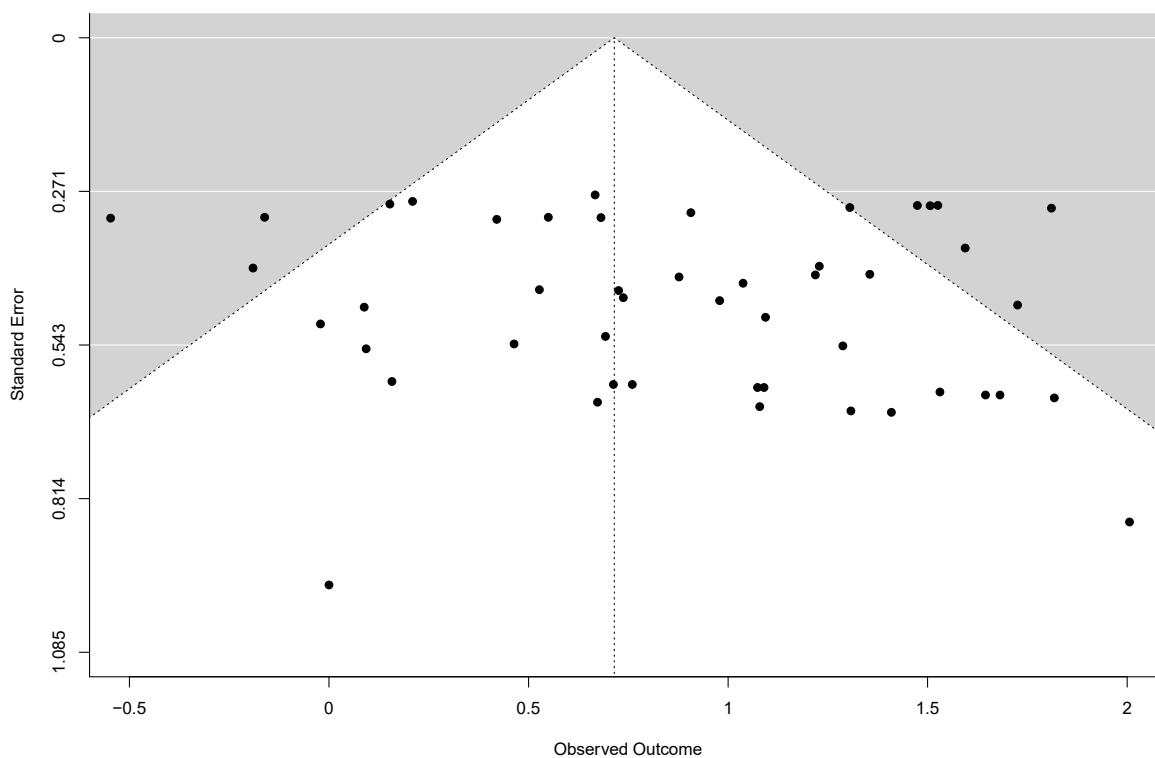


Figure 23. Funnel plot for observed effects sizes for self-esteem outcomes.

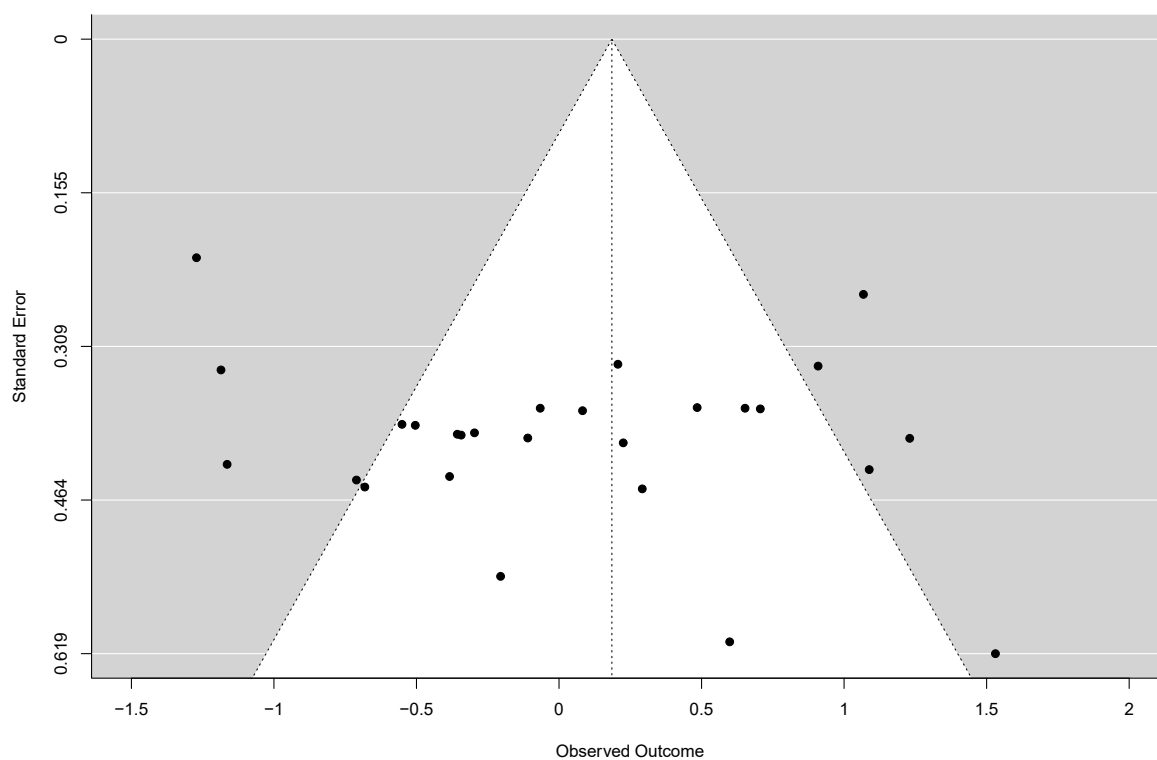


Figure 24. Funnel plot for observed effects sizes for self-control outcomes.

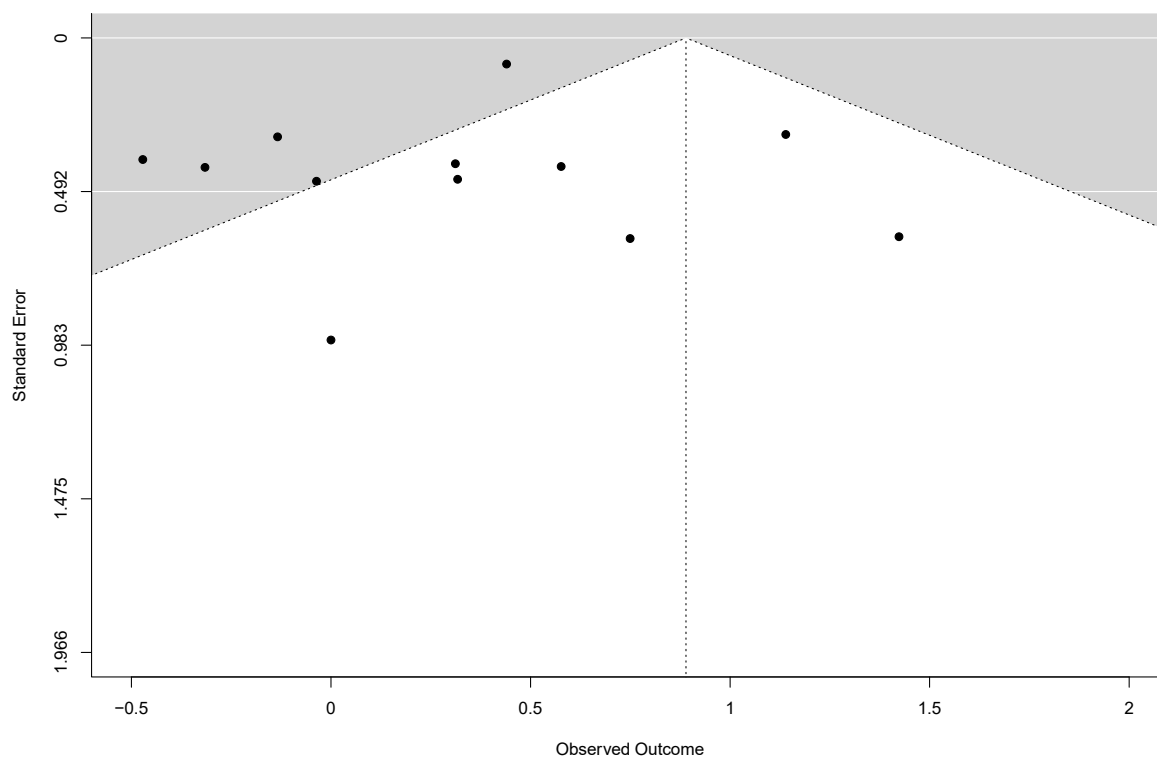


Figure 25. Funnel plot for observed effects sizes for mental health outcomes.

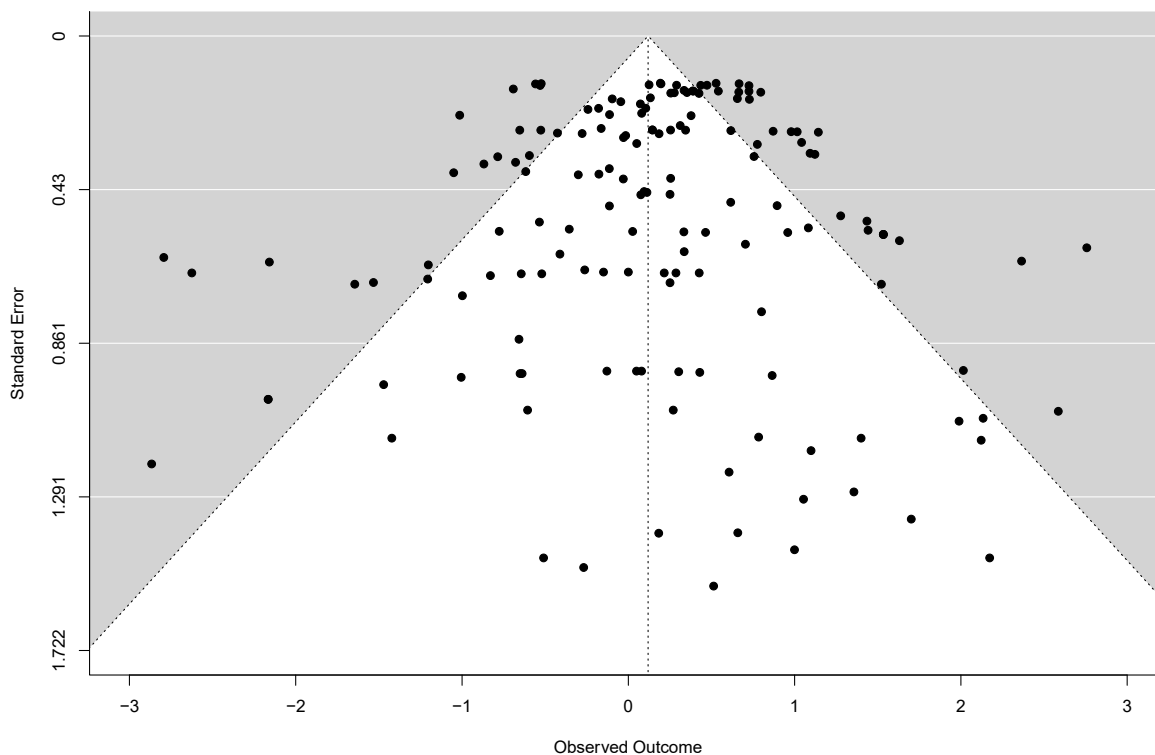


Figure 26. Funnel plot for observed effects sizes for offending outcomes.

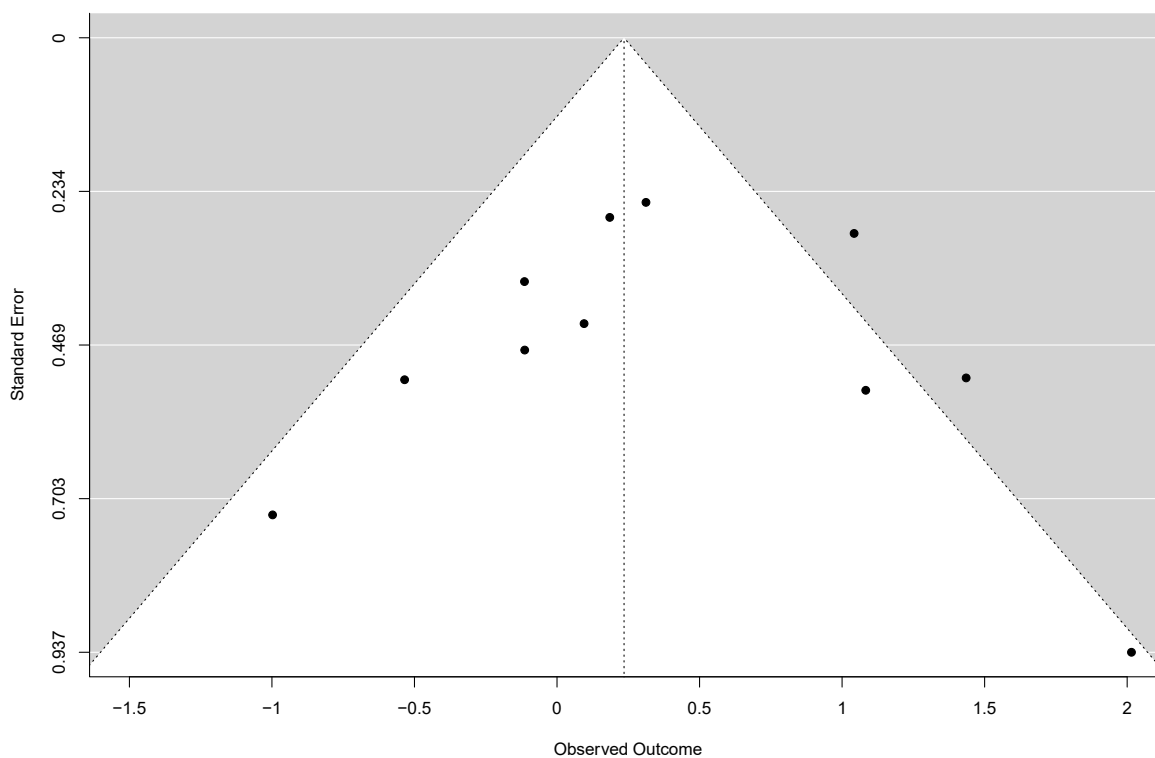


Figure 27. Funnel plot for observed effects sizes for reoffending outcomes.

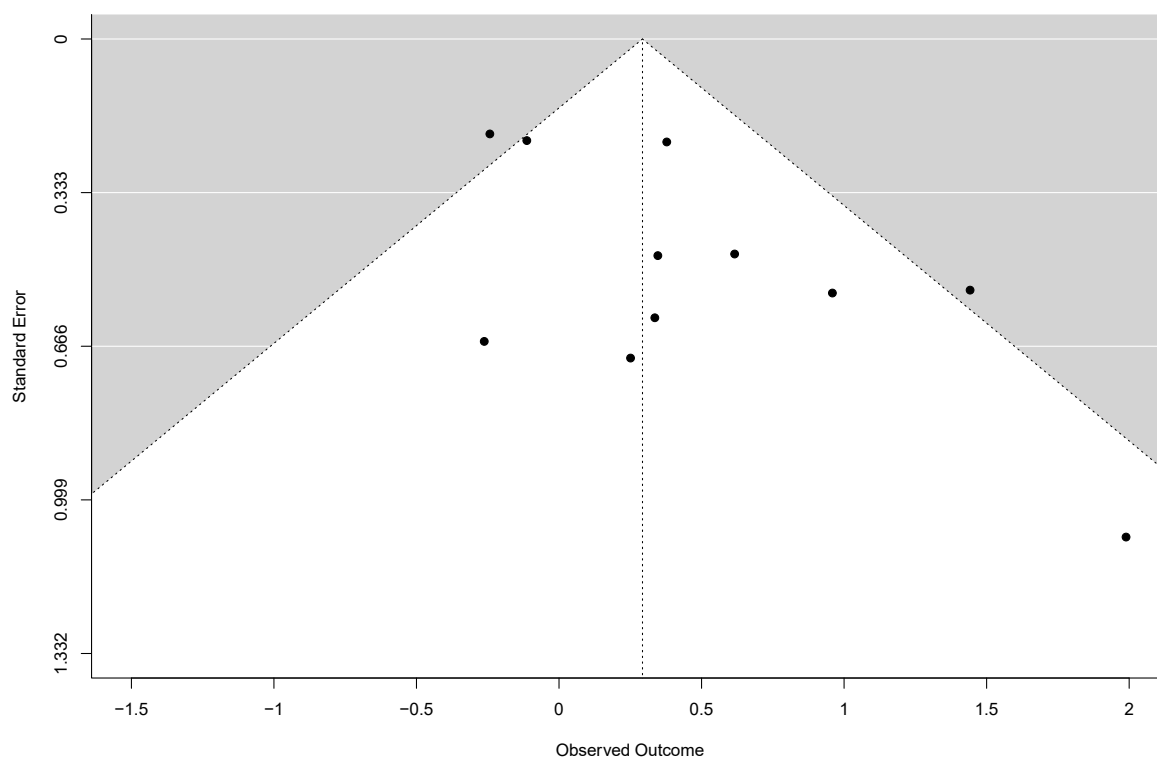


Figure 28. Funnel plot for observed effects sizes for violent offending outcomes.

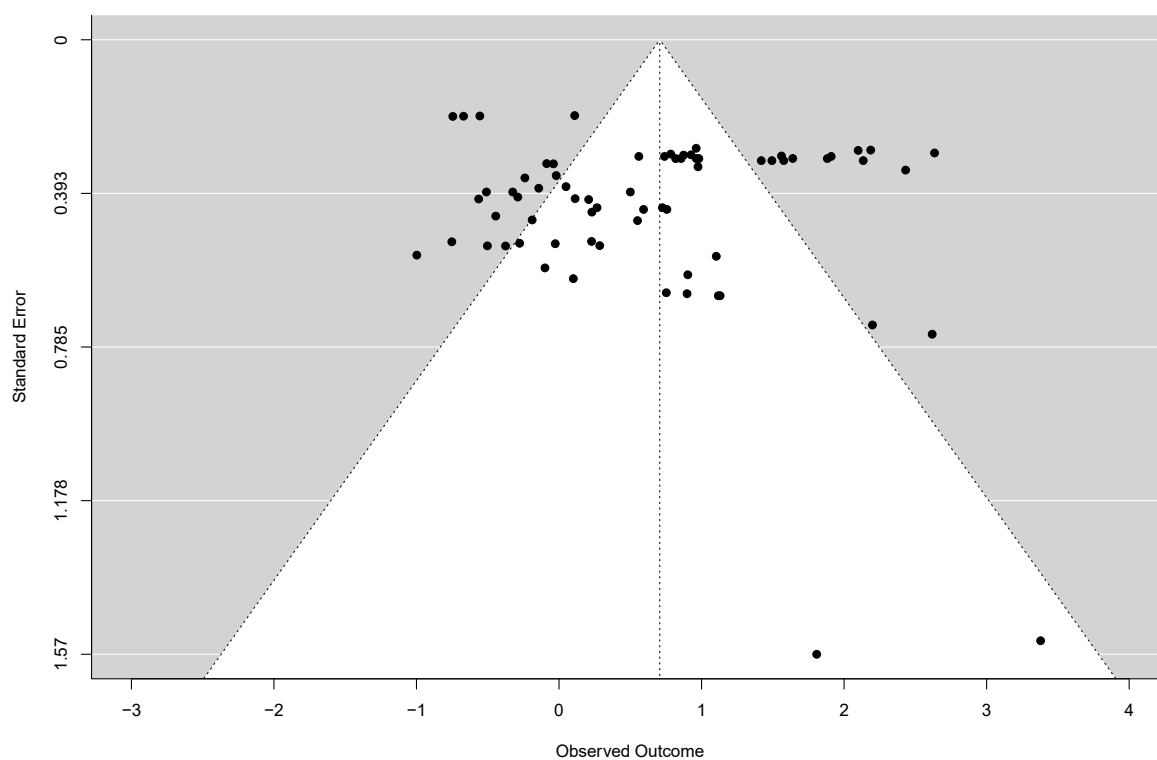


Figure 29. Funnel plot for observed effects sizes for social outcomes.

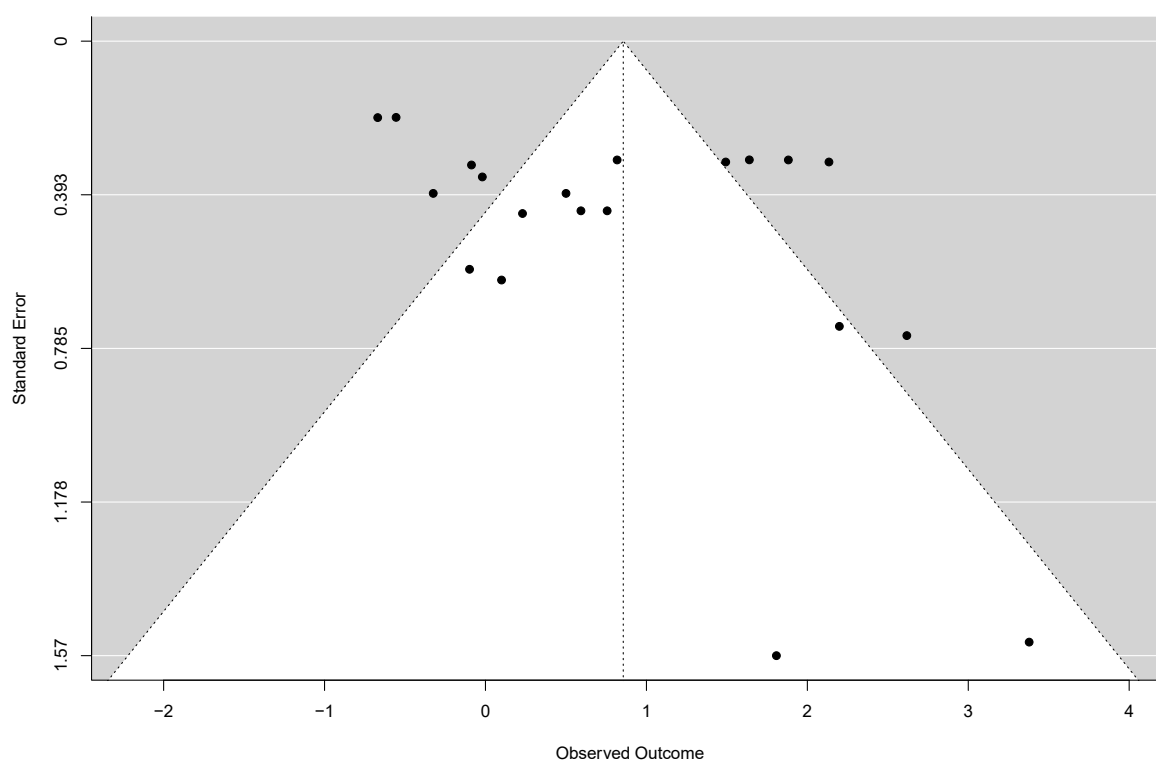


Figure 30. Funnel plot for observed effects sizes for pro-social outcomes.

5.3 EXCLUDED STUDIES FROM THE META-ANALYSIS

Table 26 – Studies excluded from the meta-analysis

Study	Reason for exclusion
Sakofs, 1991	Inadequate data
Wright, 1982	Inadequate data
Walsh 2009	Inadequate data
Williams 1985	Inadequate data
Wichmann, 1991	Inadequate data
Pommier,1995	Inadequate data
Durbahn, 2018	Inadequate data
Cross, 1998	Inadequate data
Sachs 1992	Inadequate data
Russell, 2011	Inadequate data

6. RESULTS - Qualitative Analyses

In this section we present the findings from the qualitative synthesis of the 19 process evaluations included in the review. The synthesis used a framework based on a theory-based method to conduct a qualitative thematic synthesis, with thematic synthesis within each of the framework categories.

The framework categories are (i) design (target group, referral mechanism, type of settings and activities, and post-intervention activities), (ii) barriers and facilitators to participation, including factors affecting retention or dropping out, (iii) barriers and facilitators to achieving outcomes, and (iv) illustrating causal processes from these studies. These data were also captured from effectiveness studies where they were reported. The 'TBSR matrix' was created using the qualitative data extracted manually from the studies. Under each of these categories, key themes/features were identified, which are summarised in this section. Coding was done by two people (AM and MS) for a selection of studies, and then AM once a consensus was reached.

6.1 BARRIERS AND FACILITATORS TO PARTICIPATION

6.1.1 Barriers to participation

Not joining or dropping out

CYP referred to the programme may not take part if (i) the intervention dates clash with another activity, (ii) they cannot get permission from parents or officials (e.g. probation officers) or (iii) there is a lack of interest from the young person themselves. They may initially join the programme but then drop out if they move away, are incarcerated, suffer health problems or are removed from the programme because of disruptive behaviour.

For example, in one study, some referred participants were also expected to attend a remedial summer school the dates of which conflicted with the intervention field trip dates, and one participant was unable to obtain consent from her probation officer, therefore none of these participants took part (Scaliatine, 2004). In another case, one participant personally did not want to participate in the program, and the other non-participant indicated her parent or guardian did not want her to participate as punishment for behaviour problems at home (Mann, 2010). And in another case, participants were lost due to change in placements (Nunley, 1984).

CYP who have joined programmes may drop out for a variety of reasons. These include moving out of the area, competing work commitments, incarceration, failure to bond with the group or disruptive behaviour, and failure to attend the introductory pre-fieldtrip sessions. For example, Maizel (1989) reports that two participants left the intervention group because of trust issues and the need to work full-time. In the case of Project Challenge, one participant left the programme due to incarceration, two were forced to move unexpectedly, and one failed to attend program safety sessions and was rescheduled for a future programme. (Mann, 2010) In another case some subjects dropped out of the program due to medical reasons (Pommier, 1995). Finally, Castellano (1992) states that six participants in the experimental group did not complete the course due to disruptive and improper behaviour. Several of these reasons (such as incarceration and being removed from the programme because of disruptive behaviour) mean the treatment of the treated estimates will over-estimate impact.

Behavioural difficulties

Although young people may be physically present, they may not actively participate, or may do so in a way which undermines rather than contributes to the exercise. Manipulative behaviour was displayed in the form of one participant dampening the enthusiasm of the entire group by making other members silent and

unwilling to participate in challenges, initial scepticism, and displaying aggressiveness towards each other (Glass, 2001) and another study noted discord between some participants (Miramontes, 2008). One study highlights trust issues with the female group leader in terms of commitment to the group as well as gender dynamics in terms of male participants having difficulties in accepting a female group leader (Nurenborg, 1986).

Physical and health issues

Young people faced physical, social & mental health challenges during the programme Bowen (2016), bad weather Miramontes (2008) and some participants could not take part due to illness (Nunley, 1984).

6.1.2 Facilitators to participation

Group cohesion and peer support

Attributes such as teamwork, trust, empowerment, personal value (Autry 2001) as well as peer support, development of victim empathy through psychodrama, co-operating and sharing in group activities (Lambie 2000) encouraged participation and motivation to stay in the programme.

“[The hiking trip] was really a time when the group joined together and showed their best. We pulled together and worked together as a team, and were really supportive of each other more than we usually are and it was a successful trip.” (Autry 2001: 299).

“The people that you never thought you’d get along with because they were just jerks, and just because you’re out for ten days and they had no one else around them but you and maybe a couple of other people, changed that person or changed me in the sense where hey, you know this person isn’t such a bad guy and if it ever came down to it, yeah I wouldn’t mind if you had my back at a ropes course or you know, I could put responsibility on that person knowing now in confidence that they would succeed and they would pull through for me, I guess you could say, or trust issue . . . myself not having a father, or basically a father figure in my life, have very big trust issues, so trust is a very big factor in all of this is what it made me realize and learn. . . . Having these experiences under my belt has meant a lot to me. Students at an average high school almost never hang out with a different clique than their own, and I’ve spent ten days of my life helping and being helped by people I wouldn’t have even given a second glance at my old high school. It really makes you realize that there is more to a person than you could have ever imagined. Also, I know now that I can rely on myself to get through tough times, and that I am capable to accomplish anything I set my mind to” (Miramontes 2008: 170, 171).

These findings lend support to, that is confirm, the importance of pro-social behaviour.

Nurturing and supportive staff

Well-trained counselors generated interest of the group in challenge activities, and also on the group rules on how to behave with each other, sharing ideas, trust exercises, problem-solving without outside help, positive reinforcements through group challenges, peer support, positive encouragement by leaders. (Glass, 2001). Marti (2007) emphasizes that clinically trained counselors, guided reflection, aftercare programme, family involvement, unstructured interactions between the researcher and participants which made them willing to share their experiences.

As shared by a staff of the challenge by choice programme (Durbhan 2019)

“I think that they have a higher tolerance for the staff. I think that they trust the staff more and listen to them. Like really feel that these staff are here for me, or like, I can talk to them. I don’t think that dynamic is always present like during the summer school months with the other children.” (Durbhan 2019: 73).

This was an aspect of the theory of change which could not be captured in the quantitative analysis, but the finding here lends support to the importance placed on the counselling relationship.

Family involvement

Family intimacy and relationship skills training were enhanced by the utilisation of relatable information combined with experiential activities (Bandoroff, 1993).

Feeling valued

Positive associations seem to be generated from participation in the various activities of the adventure therapy programmes. The participants recognised their personal value and gained confidence in their abilities to take on challenges in life just as they had overcome the challenges of the ropes course (Autry, 2001).

“[The ropes course makes you feel good] because you're surprising people, making them proud of something that you wouldn't normally do. And not really proving them wrong, like proving yourself right.” (Autry 2001: 299).

Another participant shared

“I've learned to push myself more and set higher expectations 'cause I had to do that at ropes course and on the hiking trip. I had to keep on pushing myself to get to the top of those hills. And at ropes course [Mr. Smith] says you get out of it what you put into it. And I mean, that helped me a lot.” (Autry 2001: 300).

These findings support the quantitative finding of improvements in internalizing behaviour, notably self-esteem.

Relationship building

In the Camp Courage programme, friends are encouraged to attend the programme together. Friends attending the programme together can encourage participation, and deepens their bond and they also further engage in relationship-building activities and conflict resolution (Sammet, 2010).

6.2 BARRIERS AND FACILITATORS TO OUTCOMES

Whilst barriers and facilitators are most commonly reported with respect to participation, there may also be barriers and facilitators which affect the achievement of outcomes (although some of these will overlap with themes for participation and outcomes).

6.2.1 Barriers to Outcomes

Gender dynamics

Marti (2007) mentions the need for more understanding of the necessity of a single gender wilderness therapy programme. He further discusses that one participant attending the Catherine Freer Wilderness Therapy Expeditions (CFWTE) wilderness programme stated that she would not be comfortable in a mix gender trek as she would be hesitant to discuss her experiences of sexual assault, she also stated that being in an all-girls group facilitated shared experiences and more comfort around disclosure.

“I wouldn't want to be on a mix trek because I wouldn't be comfortable around guys and I wouldn't be able to share the things that I have shared. I've never been able to share with guys the things that have happened to me because the things that have happened to me are because of a guy. I would not want to talk about my rape experience with guys present” (Marti 2007 Pg 110).

This evidence lends support to (confirms) the quantitative finding that there is a larger effect for all-girls groups than mixed gender groups.

Inability to transfer the learning

No matter how empowering and impactful a wilderness experience/intervention is, if the learning and insights are not applied in the home setting, integrated with the development of self-identity, or adopted outside the wilderness environment, the meaning will not be as readily applied (Marti, 2007). Some studies indeed provide evidence of reflect at the participant's inability to transfer the values to the center (Autry 2001) and the inability to transfer learnings to an academic environment (Miramontes 2008).

"We accomplished . . . the ropes course most of the time . . . but we never bring it back here . . . because I guess it is just harder because there is a lot more like, structure here . . . The day after [the hiking trip] was . . . kinda still with us you know, and it was kinda hard to transitionin' back, so it was kind of confusing. And like a week after, like it kinda didn't stay with us that much, um, it should've and it could've!" (Autry 2001: 300).

This evidence supports the quantitative finding that effects are not sustained.

Attitude of youth

Attitude of youth is seen both as a barrier and facilitator depending on the context (Eggleston, 1998). As mentioned in the barriers to participation section, one participant dampened the enthusiasm of the group by making other members silent and unwilling to participate in challenges. There was also initial scepticism and aggressiveness towards each other (Glass, 2001).

Sustainability of outcomes

Although behaviour may improve after the intervention, these changes may not be sustained. This may be because short programmes can't expect long-run impact, especially as any benefits may soon be eroded once the participants return to a unfavourable environment. As discussed in the design section, some programmes may include post-intervention activities to preserve benefits.

Short-term programmes can't expect long-run impact

Freed (1991) says that there seems to be insufficient evidence to suggest that short-outdoor outings can be expected to influence positive change, and that student-teacher relationships also are not always benefitted by participation in these programmes. He describes the TCAPS' Bay Area Adventure School (BAAS) where the duration of the programmes was 9 program days with 4 overnight experiences, which may be too short to achieve an impact.

Gains offset by returning to unfavourable environment

Durbahn (2019), describing the eight week Challenge by Choice programme, says that youth seemed to struggle with the transition back into the structure and routine of the traditional programming, lack of focus on relationships, lack of transferability of skills. Life barriers e.g.. family dynamics, complex trauma histories, and ongoing life events that triggered an increase in adverse behaviors and responses by the youth lead to a lack of sustained behavioral change.

As highlighted by one staff member in the programme

"And some kids have so much going on in their lives that is a barrier. I think with our kids, and especially the really difficult cases we have there is always going to be some of those barriers. It's hard to identify what's helping and what's not helping. It like, I think this helped, but then we are seeing all these behaviors." (Durbahn 2019: 81).

Similarly a participant from the sage/outervention programme-a six day wilderness adventure programme described by Scaliatine (2004) stated

"The trip allowed me to be who I was inside and it kind of helped me get over a couple issues that I was worried about, but it also brought me a lot of tears when I was getting ready to leave because it was peaceful out there, made me think about things that other people don't have and I, got a, chance to experience. For me growing up where I grew up it's really hard to go out there and come back and then I didn't want to come back. The tears were about coming back to the city knowing that anything is possible, for me to fall off track." (Scaliatine 2004: 115).

As already noted above, this finding confirms the qualitative finding that effects are not sustained.

Follow-up programmes

The interventions also face challenges in terms of low follow-up. In most of the programmes follow-up is not possible due to money constraints (Miramontes 2008) or non-availability of participants for post-intervention follow-up (Scaliatine 2004).

Counsellors and staff

Although there are some programmes where counsellors are trained to provide positive support to the participants there was little control and training in how the subjects supported each other, as there was also evidence of youth bullying their peers to defend their own image in free time (Nunley 1984). Ethnic differences between instructors and participants also pose as a problem in terms of perspective and sharing freely.

6.2.2 Facilitators to Outcomes

Participant openness to change

Participants openness to change, which may emerge in the programme, supports positive effects. This can come through endeavours to express emotional turmoil and associate feelings to conflict by completely immersing themselves in the programme. Relationship-centered benefits of participation in activities are highlighted among youth in terms of trust, respect, discipline and work culture (Eggleston 1998).

"I didn't really respect parents, teachers, police... That has totally changed. I've got respect for my parents. This has changed quite a lot. Police Youth Aid officer in town, Jim, he was really neat; I like him. He talked to ya not like other police officers" (Eggleston 1998: 17).

The participants develop abilities such as constructive use of time, empathy for others through experience sharing and looking forward to setting and achieving certain life goals. They also gain the ability to reclaim one's self-esteem while being threatened by others in hostile situations. Assertiveness is also accomplished through group work and making one's point.

The wilderness environment also helps create positive atmosphere for disclosure (Somervell 2009). Experiential learning provides a platform for personal growth with nature as a recreational setting.

*"Yeah thinking about doing it back at SAFE I still would have been hypo and in a different mood. You sort of have to be in the right mood to do a full disclosure*which I did . . . It is probably a good time, when you're tired and wet and grumpy and hungry, because then you know it is not a joking, laughing type of mood, it's fully serious."* (Somervell 2009: 168)

Sammet (2010) describes a two-week wilderness programme where participants indulged in activities such as backpacking, rock climbing and kayaking. The structure and culture of the course encouraged girls to develop authentic relationships with their peers and to reject engaging in relational aggression

"We had long discussions during the trip where everyone would sit down and talk and let out their feelings, and Camp Courage helped girls tell other girls everything to let them know when something was bugging

them, or when they were sad, or when they were happy. I think Camp Courage helped do that for me, so now I tend to tell people more about myself and what I think.” (Sammet 2010: 160)

Once the participants see a positive effect in their own behaviours, there is a desire to help others achieve the same breakthroughs. They start valuing their relationships with family and peers more (the ones they took earlier for granted).

“Ever since I got back, I like been workin' better, well actually, I got it from the hiking trip and I'm like, workin' a lot better with my group, like helpin' everybody out more and you know, tryin' to get them, their spirits up, so that they'll work and like themselves better. And every time I go to the ropes course, I come back and it like, always gets me in a good mood, so I can get other people in a good mood and I just like helping people out!” (Autry 2001: 299)

The multidisciplinary approach of the wilderness programmes combining challenge activities and a therapeutic element is seen as one of the agents facilitating change and the recreational therapists play a major role in bringing about this change. Interventions that involve trained therapists have a greater success rate than the ones that simply employ programme conductors. Therapists bring about a positive outlook by bringing difficult issues to the forefront and helping the participants figure out coping mechanisms to increase accountability and produce behaviour change.

These findings support the quantitative finding of improvements in mental health outcomes

Providing opportunities for family intimacy

The relationships most likely to be affected from attending wilderness therapy programmes will be family, school and peers. The wilderness programmes that involve the families as an extended component have reported positive evidence in terms of behaviour change of their children. The attendance of the families in the programmes sensitizes them on how to be flexible and supportive while their children go through the transition

The interventions that involve families as well incorporate elements such as emotional expressiveness and problem solving in complex family situations through confronting each other in tasks and addressing emotional breakouts.

6.3 RELATIONSHIPS WITHIN THE WILDERNESS AND ADVENTURE THERAPY EXPERIENCE THAT SERVE AS AGENTS OF CHANGE

Wilderness and adventure programmes can provide young people with strategies to help build resilience to better cope with and manage adverse effects in their lives (Merenda, 2020). There are several mechanisms through which this can occur, which can be grouped as (i) personal development (self-growth and motivation, learning from experience and opportunities for reflection); and (ii) social engagement (provision of safe spaces, and a chance to improve relationships with family members).

6.3.1 Personal development

Self-growth and motivation

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). For example, a participant in a wilderness programme based in the southwestern United States said that

"I always thought I couldn't run a mile. I was always the girl who walked in P.E. [physical education]. I can guarantee you that if you put me on a track, I can run a mile now. I mean, I hiked 53 miles, I can run a mile I don't doubt myself as much and ... from the hiking, I've set like really high goals for myself when I come back home. Because I never thought I could do it. And I can do it, so why can't I do other things?" (Caulkins, 2006: 29).

And another from a wilderness therapy programme located in Ireland said

"Up on that mountain, I feel proud of myself and I shout in the air and turn myself around I feel so happy and proud and that lasts for a long time. I remember that for the rest of my life" (Conlon, 2018: 12).

And another from a wilderness programme in the United States:

"I learned that I could push myself a lot farther than I thought I could push myself and I thought, or, I learned that I can get pushed a lot farther than other people have ever pushed me before" (Miramontes, 2008: 180).

Many programmes include explicit goal setting to achieve self-growth and motivation. For example, a participant in the Outervention programme in the United States stated

"Yeah. I felt like more self-controlled and also when we was walking those miles it was like for me I thought about it as, as being strong and being able to knock down anything that comes my way and that's what I did, I knocked them hills out of the way I knocked all those miles out of the way. That I didn't know I was capable of doing, but when I'm out on the street: I walk a lot not even noticing that I walk like a mile or two a. day. It was fun to set a goal and accomplish it" (Scalitane, 2004: 117).

Learning through experience

Wilderness and adventure programmes operate within the experiential learning framework and are used to encourage cooperation, build trust, manage anger and frustration, and develop self-confidence, leadership, and problem-solving skills (McNamara, 2002). He illustrates the point with this quote from a participant

"Today we climbed, we had, we took the llamas and climbed the mountains. It made me feel good, it made me feel like I was better at climbing. I helped other people, I helped put up the tents, it really made me feel good on helping, on helping others. I learned to be helpful, help pick up trash, and um help be honest and truthful. It made me think that I was better, that I've never been that good my whole entire life." (McNamara 2002: 66).

Reflection

Reflections through retelling their stories, solo trips Russell (2002) and journal writing Cross (1999) 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. Russell (2002) gives this example

"And I just had so much time to think and before then I had been really anxious and really everything was still running through my head, I was still panicking. Trying not to deal with my problems. And then on the solo I had, you know, me and 20 square feet or whatever and that was all I had was my problems, so I faced them, dealt with them." (Russell 2002: 427).

"The first day was filled by my walking within my spot and thinking. The first day I had to let go of the feelings that I had bottled up, which felt really good. The second and the third day I wrote in my journal about the things that I had cried about. I was okay with being by myself at first and just spacing out and watching things like watching the deer come by and I would talk to them and drink water with them. Then it got really difficult in the second day. I couldn't just sit there anymore. Everything was getting to me. And then I cried really loud, I was wailing, because I could. And after that even though I was incredibly alone, I was not as lonely. The letters were the biggest part for me, they made me think about things harder, made

me realize that I have hurt my parents and that I have regret for my actions. My mom's letter was so observant and accurate, and for the first time I really heard her words" (Marti 2007: 121-22).

6.3.2 Social engagement

Group activities are safe spaces which build social skills

Group work 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.

Teamwork and achieving goals while taking part in group activities leads to trust, empowerment and feeling of being valued among participants (Autry 2001). One study highlights the cultural context where participants recognised the cultural understanding of Maori (helping each other). Having daily themes in camps helped bring out the learning experience. For example, on the rock-climbing day the daily theme was barriers, and on ropes course day the daily theme was support systems (Walsh, 2009).

The role of groups is illustrated by a quote from a participant in the SAFE Network Inc wilderness therapy intervention in New Zealand

"You can do it because you've got the support . . . you're doing it around guys you can trust and they're all going through the same thing . . . you don't have to be scared about what they're going to think of you. The hardest thing is definitely being able to know that you can trust them, and really that is just built up through getting to know each other going on a tramp is probably the perfect way to do that because you can help each other, through river crossings and stuff like that" "If you were mucking around you could put someone's life in danger. No-one mucked around. You had your joking parts, but it wasn't in river crossing or doing something dangerous" "That's probably the biggest thing that I took away from the camp. Just teamwork and thinking about others. It's part of life, you've got to do it. Without camp I wouldn't have learnt it that quickly or that intensely. It's something I could have picked up over years but definitely, this is a big way to take it in. The reason we are all here is that we only thought about ourselves. I think that's the biggest thing I could have taken away from that camp" (Somervell 2009: 167-68).*

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, 2008). Miramontes (2008) reports that many participants had said they previously did not get along anyone at school, and could not follow instructions, but in the programme "by combining the importance of working as a group and allowing students to understand and share experiences with their classmates and instructors, they were able to build trust and become dedicated to following others, learning to lead, and forming a community in order to achieve what was expected of themselves and other students in the class" (Miramontes 2008; 211).

Participating in groups can also increase individual confidence, as shown by this quote from a participant in an adventure-based programme in the United States

"Yeah because I'm like every time we go there, we would sometimes raise your hand, and they will ask you questions, and there were a lot of people there, and you get used to answering questions in front of a lot of people it helps your confidence and such, so you talk to bigger groups" (Merenda, 2020: 14).

Groups were also considered as safe space for retelling their stories (Loynes, 2010). In some cases, levels of participation higher as this was a single-gender (all female) programme (Scaliatine, 2004).

These findings support the quantitative finding of improvements in social outcomes

Improved relations as family involved

There are various ways in which the families get involved in the wilderness family therapy programmes. These are:

- i. Pre-trip orientation of the programme that their children are attending
- ii. participation in the actual wilderness programme and
- iii. post-trip parent seminars and programme graduation ceremonies as well as monitoring behaviour once back home

Bandarof (1993) describes the Family Wheel wilderness intervention that includes a family component where the adolescent's families participate in take part in activities. The families participated for 4 days, after a 21-day wilderness programme for the young people. Each day had a different theme focussed on behaviour management and building relationships. After attending the programme most of the families wrote to the programme expressing their gratitude in terms of seeing a positive effect on family relationships. One participant from the families wrote:

"Without Family Wheel as a transition period for my daughter and I, we never would have made it past the anger and guilt and distrust" (Bandarof, 1993: 187).

Another shared

"We have made real progress at our house in implementing some of the principles for constructive approaches to conflict, successful negotiation, and expres-sion of feelings." (Bandarof, 1993: 187).

And another

"This programme helped our family to reach out and rebuild slowly" (Bandarof, 1993: 186).

Presenting evidence from another wilderness programme in the United States, Norton quotes a participant as saying

"I think the rock climbing helped me trust my mom again and reminded me that shes there to help me to make sure I dont get hurt and stuff like that. The overall working together as a family and the different activities really helped. You work together as a family and not only do you have fun but you have to, like we learned with kayaking, we have to work together and talk through things" (Norton 2019: 7).

Even if parents are not directly involved, the programme may encourage participants to reflect on family relationships, as shown by this quote from a participant in a wilderness therapy programme in the United States

"So I wrote a letter to my mother explaining my feelings, telling her in detail the reasons why I wanted to come home and what I would do to make that possible and how I would work to do it. It basically, I had to come out of my shell for that, I had to really make some decisions and really start working. And that kind of got me going a little more" (Russell 2002: 430).

Similarly, a participant from the Stoneleigh project in UK stated,

"Cae Mabon really helped me to see things in my life that I had been blocking out. It gave me the courage to be me and to see who I really am, I may not have faced up to who I am but at least I am half way there. . . . This made me realise that I had to make more of an effort with my family and get them to make more of an effort with each other" (Loynes, 2010: 137).

Family relations post trip

A new way of looking at things post attending the wilderness trip is generally expected of participants. It is hoped that the sub-systems such as family, peers and schools be prepared for it and help the youth during this transitional phase of adapting the values and skills learnt in everyday life (Marti, 2007). Positive connections between youth and their families, increased communication, learning to trust each other through doing activities together, relational involvement, and self-reflective information processing were all observed as a result of participation in the wilderness programme (Norton 2019). Significant parental

involvement in the wilderness follow-up programmes was positively related to an increase in young people's internality score (Plouffe, 1981).

6.4. SUSTAINING IMPACT OF THE WILDERNESS AND ADVENTURE THERAPY PROGRAMMES

Some studies highlight long-term behaviour change aspects in terms of, desire to be a better person and discontinue habits such as drugs and alcohol consumption, having goals and building stronger relationships with their families (Russell 2002). In one study youth expressed a personal interest to continue participating in outdoor pursuits even as adults (Freed, 1991).

"It helped me to keep off drugs, alcohol and glue. I realised that taking those things fucks up your life, I don't wanna be a cabbage eh (Johnny). Gives you time to think of what you've done, what you're gonna do when you get back and how you are going to get out of your troubles (Tawhai). What was it at Whakapakari that made the difference for you? The people there, it was like another family for a month.... The spirit of the whaanau (Clive). Did Whakapakari help you in any way? I communicate with people; I just think that they are all whaanau (Tawhai)." (Eggleston 1989: 9).

Internal growth occurred as a result of the students' increased confidence and belief in their own capabilities, as well as the establishment of personal goals relevant to both the wilderness programme and their daily lives, and the development of a more positive sense of self (Miramontes 2008).

"I dont like public school. . . I just had bad grades, and I just dont like that many people . . . [wilderness school has] more hands on. It's a lot better. I like the hands on, you know, you just. . . especially out here you can be yourself around these people, and they're just like you . . . they expect what you can do ... they don't expect a certain amount, they just expect what you can give The trip, it teaches me how to get along with people better, be a part of society, just get a long and uh, its just like an experience . . . working as a team and stuff and making sure like everything gets done so everybody can have a good time and everybodys comfortable. You all have to know what needs to get done and work together to make sure that we're all comfortable. I kinda liked being an older student and teaching the new students stuff. That's another part about wilderness, too, its not all the teachers that are teaching. The students teach each other. A lot. Like, thats basically what happens, the older students teach the new students." (Miramontes 2008: 83, 84, 85).

Russell (2002) talks about a wilderness intervention where one of the components was solo camping (for reflection). Using a non-confrontive and caring approach, wilderness therapists were able to successfully build a therapeutic alliance with the participants, which was a key process variable in generating a desire for change.

A participant shared

"It's like they're human, they're not these machine people that are like getting paid some good money to talk to you when you know they don't care. Yeah, they talk in realistic terms. Like the other ones will just be like, "you need to fix this." Then I am sitting there and I'll be like "how the hell am I supposed to fix that," or "why should I." These people tell me how I can, why it would help me" (Russell 2002: 423).

A therapist shared

"I just sat and talked with him and waited for him to open up to me. I let the wilderness do most of the work in the beginning and he slowly started to open up to me about his relationship with his father. We would just sit and skip rocks and talk, I had to be very patient with him because he was so resistant to authority" (Russell 2002: 423).

Gillis (2008) talks about an adventure-based behavioral-management model as a residential treatment for juvenile offenders that proves effective in terms of reducing reoffending. This raises hope that wilderness and adventure therapy programmes can be used as an alternative to traditional residential placements for juvenile offenders (Deschenes, 1998).

7. 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 (1983) 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.

8. Discussion and Implications

8.1 DISCUSSION

Overall, the results from the meta-regression suggest that the effect of wilderness and adventure 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 wilderness and adventure 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, but it appears that female-only programmes are more effective than mixed-gender programmes. 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.

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 the studies of having shortcomings so that we have low confidence in study findings.

The major themes that emerged from the qualitative analysis were: group cohesion and peer support, nurturing and supporting staff, feeling valued, relationship building, emotional maturity and cognitive abilities of participants, providing opportunities for family intimacy, self-growth and motivation, learning through experience, reflection and social engagement.

The qualitative findings revealed that while participating in wilderness interventions, youths took steps to overcome hardship, faced adversity, experienced personal and social growth, were driven to act for change, and acquired a more positive outlook on the future. Although many studies state that positive effects may not be sustained, especially if participants return to unfavourable environment.

The qualitative findings also emphasise the importance of developing relationships and self-worth through difficult tasks in the wilderness programmes. From the participant's perspective, the current study extends and builds on existing research by demonstrating significant effects in the development of self-worth.

There is very little evidence that suggests that cost of wilderness and adventure programmes is substantially lower per participant than incarceration (2 studies).

8.2. IMPLICATIONS FOR RESEARCH

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

The evidence pool for the review is insufficient. There are few studies measuring long run follow up. And confidence in study findings is low because of attrition and lack of power calculations or small sample size. It was not possible to conduct meaningful moderator analysis because of low

number of included studies in the meta-analysis because of lack of reporting of relevant statistical information or information on programme design elements.

There is a need for further studies on wilderness and adventure 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.

A further need is to conduct comparison studies looking at the impact of wilderness and adventure therapy programmes using female versus male subjects as it would be useful to see more evidence in terms of impact on gender.

8.3. IMPLICATIONS FOR POLICY AND PRACTICE

The evidence suggests that wilderness and adventure programmes are effective interventions for reducing offending, and improving a range of intermediate outcomes, for youth who have offended or are at risk of offending. It also costs less than incarceration. However, effects may not be sustained, so implementing and funding agencies should work with researchers to explore if follow on activities address this issue.

Single sex programmes may work better for girls, but mixed sex groups are better for boys.

School-based adventure therapy programmes are an effective way of reducing problem behaviours which are associated with later offending.

The evidence base is not sufficient to draw clear conclusions on many aspects of design.

8.4. COMPARISON WITH PREVIOUS REVIEWS

There are five previous reviews of wilderness therapy, two of which report wilderness outcomes. All reviews report positive effects on behavioural outcomes and delinquency.

The effects on anti-social behaviour are large: Bowen and Neill (2013), $d=0.41$, and Gillis et al. (2016) $d=0.75$ from self-report and 1.38 from parent reports. These results are similar to ours for pro-social behaviour ($OR=2.35$ equates to $d=0.47$) and somewhat larger than ours for externalizing behaviour ($OR=1.69$ equates to $d=0.29$).

Wilson and Lipsey (2000) report the effects from 22 reviews, finding that both treatment and control groups experience a reduction in anti-social behaviour and delinquency but it is larger for the former, yielding an overall positive and significant effect of $d=0.18$. This effect is not comparable with our effect on offending since Wilson and Lipsey (2000) combine anti-social behaviour and delinquency, whereas we separate the two, finding a significant effect on the former but not on the latter. Some of the studies included in this analysis by Lipsey and Wilson do not

have a delinquency outcome, and these generally have a larger effect than average effect size (e.g. Callahan (1988), $d=0.20$, Ziven (1988), $d=0.31$, and Wichman (1990) $d=0.55$).

Beck and Wong (2022) report an effect size on offending of $d=0.832$ from a meta-analysis of nine studies. However, seven of these nine are before versus after studies, and so not eligible for our review. They also report the effect for the before versus after studies alone as $d=1.077$. An approximate estimate of the effect of the two studies eligible for our review is $d=-0.03$.⁷

⁷ This is an approximate estimate as the calculation assumes equal weights, not the inverse weights used in meta-analysis.

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ROLES AND RESPONSIBILITIES

- Ashima Mohan: Project lead responsible for project management, report writing, search, and screening and coding. Ashima will lead the qualitative analysis under the guidance of HW.
- Monisha LaxmiNarayanan: Screening and coding
- Suchi Kapoor Malhotra: Screening and coding

- Hannah Gaffney-meta-analyses and quantitative analyses
- Jhing Li: Effect size extraction for effectiveness studies.
- Zijun Li: Effect size extraction for effectiveness studies.
- Hugh Waddington: Effect size extraction for effectiveness studies.
- Howard White: Howard will provide technical and strategic support for conducting the review, and lead on the mixed methods component. He will provide overall intellectual direction for the review.

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POTENTIAL CONFLICTS OF INTEREST

Howard White was CEO of the Campbell Collaboration when this review was started. As CEO he had no role in the editorial process.

PLANS FOR UPDATING THE REVIEW

The review will be updated after three years subject to availability of funds.

Appendix 1

1. APA PsycInfo (Ovid) <1806 to January Week 3 2021> Searched 28th January 2021

- 1 (((wilderness or nature or outdoor or adventure*) adj3 (therap* or challeng* or program* or expedition* or experience* or adventure or camp or camps or camping)) or "outward bound").ti,ab. (7360)
- 2 "wilderness experience"/ or "adventure therapy"/ or therapeutic camps/ (796)
- 3 1 or 2 (7722)
- 4 "Adolescent Psychology"/ or exp Adolescent Attitudes/ or exp Early Adolescence/ or exp Adolescent Psychopathology/ or exp Adolescent Psychiatry/ (35678)
- 5 (adolescen* or teen* or youth or youths or juvenile* or "young people" or "young person*" or child* or delinquen* or anti-social or antisocial or "young offender*" or "young addict*" or ((disruptive or externali*) adj2 behavio*)).ti,ab. (930902)
- 6 behaviour change/ or exp behaviour disorders/ or exp aggressive behaviour/ or exp antisocial behaviour/ or exp behaviour problems/ or exp criminal behaviour/ or exp juvenile delinquency/ or juvenile justice/ (313314)
- 7 or/4-6 (1114059)
- 8 3 and 7 (2319)

2. APA PsycExtra (Ovid) <1908 to December 09, 2020> Searched 28th January 2021

- 1 (((wilderness or nature or outdoor or adventure*) adj3 (therap* or challeng* or program* or expedition* or experience* or adventure or camp or camps or camping)) or "outward bound").ti,ab. (397)
- 2 "wilderness experience"/ or "adventure therapy"/ or therapeutic camps/ (72)
- 3 1 or 2 (437)
- 4 "Adolescent Psychology"/ or exp Adolescent Attitudes/ or exp Early Adolescence/ or exp Adolescent Psychopathology/ or exp Adolescent Psychiatry/ (2442)
- 5 (adolescen* or teen* or youth or youths or juvenile* or "young people" or "young person*" or child* or delinquen* or anti-social or antisocial or "young offender*" or "young addict*" or ((disruptive or externali*) adj2 behavio*)).ti,ab. (56591)
- 6 behaviour change/ or exp behaviour disorders/ or exp aggressive behaviour/ or exp antisocial behaviour/ or exp behaviour problems/ or exp criminal behaviour/ or exp juvenile delinquency/ or juvenile justice/ (27889)
- 7 or/4-6 (73305)
- 8 3 and 7 (155)

3. Social Policy and Practice (Ovid) <202010> Searched 28th January 2021

- 1 (((wilderness or nature or outdoor or adventure*) adj3 (therap* or challeng* or program* or expedition* or experience* or adventure or camp or camps or camping)) or "outward bound").ti,ab. (451)
- 2 ecotherapy.de. (91)

3 or/1-2 (510)

4 (adolescen* or teen* or youth or youths or juvenile* or "young people" or "young person*" or child* or delinquen* or anti-social or antisocial or "young offender*" or "young addict*" or ((disruptive or externali*) adj2 behavio*)).ti,ab. (101142)

5 ("young people" or children).de. (50327)

6 or/4-5 (107917)

7 3 and 6 (225)

4. Web of Science (Social Sciences Citation Index & Arts & Humanities Citation Index) – Searched 28th January 2021

Also Web of Science Conferences & Proceedings (SSCI/AHCI) - Searched 29th January 2021 - 172

3 1,558

#2 AND #1

Indexes=SSCI, A&HCI Timespan=1970-2021

2 893,929

TS=((adolescen* or teen* or youth or youths or juvenile* or "young people" or "young person*" or child* or delinquen* or anti-social or antisocial or "young offender*" or "young addict*" or ((disruptive or externali*) NEAR/2 behavio*))

Indexes=SSCI, A&HCI Timespan=1970-2021

1 15,640

TS=((((wilderness or nature or outdoor or adventure*) NEAR/3 (therap* or challeng* or program* or expedition* or experience* or adventure or camp or camps or camping)) or "outward bound")

Indexes=SSCI, A&HCI Timespan=1970-2021

5. ERIC (Ebsco) – Searched 28th January 2021

S7 S5 AND S6

Database - ERIC **2,175**

S6 S3 OR S4

388,721

S5 S1 OR S2

9,078

S4 (DE "Early Adolescents" OR DE "Late Adolescents" OR DE "Youth" OR DE "Disadvantaged Youth" OR DE "Out of School Youth" OR DE "Rural Youth" OR DE "Urban Youth") OR DE "Delinquency" OR DE "Delinquency Prevention" OR DE "Delinquent Rehabilitation" OR DE "Juvenile Gangs" OR DE "Juvenile Justice" OR DE "Recidivism" OR DE "Youth Problems")

38,864

S3 TI ((adolescen* or teen* or youth or youths or juvenile* or "young people" or "young person*" or child* or delinquen* or anti-social or antisocial or "young offender*" or "young addict*" or ((disruptive or externali*) N2 behavio*))) OR AB ((adolescen* or teen* or youth or youths or juvenile* or "young people" or "young person*" or child* or delinquen* or anti-social or antisocial or "young offender*" or "young addict*" or ((disruptive or externali*) N2 behavio*)))

379,737

S2 DE "Field Experience Programmes" OR DE "Adventure Education" OR DE "Resident Camp Programmes"

7,224

S1 TI ((((wilderness or outdoor or adventure*) N3 (therap* or challeng* or program* or expedition* or experience* or adventure or camp or camps or camping)) or "outward bound")) OR AB ((((wilderness or outdoor or adventure*) N3 (therap* or challeng* or program* or expedition* or experience* or adventure or camp or camps or camping)) or "outward bound"))

3,108

6. Repec from Ebsco Discovery – Searched 21st January 2021

S3 S1 AND S2

Database - Discovery Service for 3ie, Inc.

16,311 – Limited to Repec - 93

S2 TI (((((wilderness or outdoor or adventure* or nature) N3 (therap* or challeng* or program* or expedition* or experience* or adventure or camp or camps or camping)) or "outward bound"))) OR AB (((((wilderness or outdoor or adventure* or nature) N3 (therap* or challeng* or program* or expedition* or experience* or adventure or camp or camps or camping)) or "outward bound"))) OR SU (((((wilderness or outdoor or adventure* or nature) N3 (therap* or challeng* or program* or expedition* or experience* or adventure or camp or camps or camping)) or "outward bound")))

114,558

S1 TI (((adolescen* or teen* or youth or youths or juvenile* or "young people" or "young person*" or child* or delinquen* or anti-social or antisocial or "young offender*" or "young addict*" or ((disruptive or externali*) N2

behavio*)))) OR AB (((adolescen* or teen* or youth or youths or juvenile* or "young people" or "young person*" or child* or delinquen* or anti-social or antisocial or "young offender*" or "young addict*" or ((disruptive or externali*) N2 behavio*)))) OR SU (((adolescen* or teen* or youth or youths or juvenile* or "young people" or "young person*" or child* or delinquen* or anti-social or antisocial or "young offender*" or "young addict*" or ((disruptive or externali*) N2 behavio*))))

13,547,295

Appendix 2 – List of journals and websites hand-searched

List of the Journals

- 1 Journal of Experiential Education
- 2 Journal of environment and behaviour
- 3 Journal of Research and Practice in Children's Services
- 4 Journal of creativity in mental health
- 5 Journal of child and Family studies
- 6 Child and youthcare forum
- 7 Journal of therapeutic schools and programmes
- 8 Journal of Contemporary Psychotherapy
- 9 Journal of Therapeutic Wilderness Camping
- 10 Journal of Youth and Adolescence
- 11 Journal of Leisurability
- 12 Journal of Mental Health Counseling
- 13 Journal of Adventure Education & Outdoor Learning
- 14 Journal of offender Rehabilitation
- 15 International Journal of offender Therapy and Comparative Criminology
- 16 Journal of offender Counseling, Services, and Rehabilitation
- 17 Therapeutic Recreation Journal
- 18 Canadian Journal of Criminology
- 19 Journal of emotional and behavioural disorders
- 20 Journal of experimental criminology
- 21 The open psychology journal
- 22 Australian journal of outdoor education
- 23 Journal of Behaviour Technology Methods and Therapy
- 24 Journal of Child and Adolescent Group Therapy
- 25 Journal of Personality and Social Psychology
- 26 Juvenile and Family Court Journal

List of websites

S. No	Webpage
1	The pine project https://pineproject.org/about/about-pine/
2	The Office of Juvenile Justice and Delinquency Prevention (OJJDP) https://ojjdp.ojp.gov/evidence-based-programs
3	Outward Bound https://www.outwardbound.org/about-us/history/
4	Wilderness Foundation UK https://wildernessfoundation.org.uk/
5	Aspiro adventure therapy https://aspiroadventure.com/about-us/mission/
6	Trails Carolina https://trailscarolina.com/
7	Blue ridge therapeutic wilderness https://blueridgewilderness.com/
8	Wingate Wilderness therapy https://www.wingatewildernesstherapy.com/
9	Bluefire Wilderness therapy https://bluefirewilderness.com/
10	True North Wilderness Programme https://truenorthwilderness.com/
11	Mountain Wise Wilderness Programme http://mountainwise.co.uk/wilderness-therapy.html

Appendix 3

Screening Tool

Q1	Language	Is the paper in english	No-exclude
			yes-include
Q2	Publication Date	Published after 1970	No-exclude
			Yes-include
Q3	Population	Is the population eligible for the intervention youth up to the age of 25 who display, or at are risk of displaying, anti-social or offending behaviour	No-exclude
			Yes-include
Q4	Intervention	is the intervention (a) involving a physical challenge in the wilderness and (b) with an overnight component	Yes-include
			No-exclude
Q5	Outcomes	is the main outcome of the study anti-social behaviour and offending behaviour?	No-exclude
			Yes-include
Q6	Types of Studies	Are the studies Experimental and non-experimental designs with comparison group, instrument variables and interrupted time series?	No-exclude
			yes-include

Appendix 4 Coding Tools

Category	Sub Category
Publication Status	<ul style="list-style-type: none"> ● Ongoing ● Completed
Region	<ul style="list-style-type: none"> ● East Asia & Pacific ● Europe & Central Asia ● Latin America & Caribbean ● Middle East & North Africa ● South Asia ● Sub Saharan Africa ● America ● Not mentioned
Country	
Countries by income	<ul style="list-style-type: none"> ● Lower- Middle Income Countries ● Low- Income Countries ● Upper- Middle Income Countries
Settings	<ul style="list-style-type: none"> ● Rural ● Urban ● Rural and Urban (Both) ● Indoor ● Outdoor ● Not clear
Name of the project/ intervention	
Type of activity	
Funding agency	
Duration of Intervention	<ul style="list-style-type: none"> ● Less than 6 months ● 6 months-1 year ● 1-2 years ● 2-3 years ● More than 3 years ● Not mentioned
Frequency of meetings	<ul style="list-style-type: none"> ● More than once a week ● Once a week ● 2-3 times a month ● Once a month ● Less than one a month ● Not clear
Length of meetings	<ul style="list-style-type: none"> ● Less than one hour ● Approximately one hour ● 1-2 hours ● Over 2 hours ● Not clear
Unit of delivery	<ul style="list-style-type: none"> ● Individual-One to one ● Group
Age	<ul style="list-style-type: none"> ● under 9 ● 10-14

	<ul style="list-style-type: none"> ● 15-17 ● 18-25
Gender	<ul style="list-style-type: none"> ● Male ● Female ● Non-Binary ● Both ● Not reported
ETHNIC MINORITY	<ul style="list-style-type: none"> ● Mainly/exclusively (80%) ● Partly ● None ● Not clear
Study Design	<ul style="list-style-type: none"> ● Experimental design ● Non- experimental design ● Process evaluation or qualitative intervention study ● Mixed method ● Cost analysis
Sample Size	<ul style="list-style-type: none"> ● Less than 100 ● 100-300 size ● More than 300 ● Not mentioned
Costs involved	<ul style="list-style-type: none"> ● Training ● Infrastructure ● Salary ● Monitoring & supervision ● Other ● Not mentioned
Intervention category	Intervention sub-category (for structured approaches)
Behavioural interventions	<ul style="list-style-type: none"> ● Mental health & therapeutic interventions ● Social and emotional interventions ● Alcohol and drug related interventions
Skill development/teaching	<ul style="list-style-type: none"> ● Academic support/Remedial coaching ● Skill development (communication skills, leadership skills, social skills, coping skills, life skills etc) ● Career /vocational guidance& support ● Providing other desired information & guidance
Outcome Domain	Outcome Sub-domain
Offending related outcomes	<ul style="list-style-type: none"> ● Violence ● Crime/ anti-social activities ● Gang membership ● Reoffending
Child-centred	<ul style="list-style-type: none"> ● Attitudes and belief (self-concept, esteem, confidence etc) ● Mental health, internalizing behaviour and self-regulation, externalizing and risk-taking behaviour ● Substance use

	<ul style="list-style-type: none"> • Social outcomes & emotional outcomes (improvement in interpersonal relationships, communication, improved adjustment etc) • Cognitive development- Social Cognition and pro social behaviour • Identity Development • Improved Psycho- social functioning & wellbeing.
Family & Peers	<ul style="list-style-type: none"> • Quality of family relationships and family functioning • Improved interpersonal relationship with peers
School related outcomes	<ul style="list-style-type: none"> • Improvement in interpersonal relationships in the school environment. • Improvement in academic performance • Improvement in school engagement
Cost Effectiveness	Open coding

Effect size coding

Effect size	Numerical entry
Outcome name	Open coding
Outcome domain	For each outcome coded
Type of effect	Difference in means Difference in proportions Regression coefficient Odds ratio Risk ratio
Sub group analysis	Whole sample Sub-group (name)
Duration	Endline Post endline (duration)
Sample sizes	For each effect coded, and corresponding control sample size
Standard deviations	For each outcome coded

Treatment effect	Intention to treat Treatment of treated
------------------	--

Appendix 5 Critical appraisal tool for primary studies: effectiveness

<i>Item</i>	Description	Key	Notes
<i>Intervention</i>	Is the intervention clearly named and described, including all relevant components. See examples below.	High: full and clear description, so that the main components and how they are delivered are clear Medium: Partial description Low: Little or no description	
<i>Evaluation questions</i>	Are the evaluation questions clearly stated?	High: full and clear description, so that the main components and how they are delivered are clear Medium: Partial description Low: Little or no description	
<i>Study design</i>	Use the study design coding	High: Experimental Medium: Non-experimental Low: Before versus after	
<i>Outcomes</i>	Are the outcomes clearly defined? Where appropriate do they use an existing, validated measurement tool? See examples below.	High: full and clear definition using validated instruments where available (a researcher wishing to use these outcomes would have sufficient information to do so) Medium: Partial definition. May use validated instruments but without	

		<p>sufficient references to source.</p> <p>Low: Little or no definition</p>	
<i>Sample size (power calculation)</i>	Do the authors report a power calculation as the basis for sample size?	<p>High: Power calculation report and sample size meets necessary sample size</p> <p>Medium: Power calculation mentioned and sample size meets necessary sample size</p> <p>Low: No mention of power calculation.</p>	
<i>Attrition</i>	<p>Reported for endline and longest follow up.</p> <p>Calculate overall attrition and differential attrition (see example below). It is often necessary to calculate from table of results. If sample size varies by outcome calculate for highest attrition.</p>	<p>High: Attrition within IES conservative standard</p> <p>Medium: Attrition within IES liberal standard</p> <p>Low: Attrition outside IES liberal standard</p>	
<i>Baseline Equivalence</i>		<p>High: baseline balance on 90% or more of reported indicators</p> <p>Medium: baseline balance on 80% or more of reported indicators OR RCT with</p>	

		<p>randomization over at least 20 clusters or 50 individuals and no baseline balance table reported.</p> <p>Low: Baseline balance not reported OR balance on less than 80% of reported indicators OR ex-post single difference design with significant difference in baseline outcomes.</p>	
<i>Overall (including questions for all studies)</i>	The overall score uses the weakest link in the chain principle i.e., is the lowest score on any item	<p>High: High on all items</p> <p>Medium: No lower than medium on any item</p> <p>Low: At least one low</p>	

Questions for process evaluations (apply to implementation sections) [used for any study coded as having implementation evidence]

		High	Medium	Low	Low	
1	Is the qualitative methodology described?	Yes		No	>> 3	
2	Is the qualitatively methodology appropriate to address the evaluation questions?	Yes	Partially	No		Insufficient detail
3	Is the recruitment or sampling strategy described?	Yes		No	>> 5	
4	Is the recruitment or sampling strategy appropriate to address the evaluation questions?	Yes	Partially	No		Insufficient detail

5	Are the researcher's own position, assumptions and possible biases outlined?	Yes	Partially	No		
6	Have ethical considerations been sufficiently considered?	Yes	Partially	No		Insufficient detail
7	Is the data analysis approach adequately described?	Yes		No	>>9	
8	Is the data analysis sufficiently rigorous?	Yes	Partially	No		
9	Are the implications or recommendations clearly based in the evidence from the study?	Yes	Partially	No		
10	Overall (including questions for all studies- The overall score uses the weakest link in the chain principle i.e., is the lowest score on any item	High: High on all items Medium: No lower than medium on any item Low: At least one low				

```
##example code for offending outcomes##
#impute covariance matrix for sampling errors with clubSandwich#
off_var <- impute_covariance_matrix(vi = roffend1$var,
                                   cluster = roffend1$study,
                                   r = 0.80)

#estimate three-level meta with metafor#
offend <- rma.mv(yi = LOR,
                V = off_var,
                random = ~1 | study/es.id,
                test = "t",
                data = roffend1,
                method = "REML")

offend
#apply adjustments to confidence intervals for RVE and small sample#
clubSandwich::conf_int(offend, vcov = "CR2")
#separate i^2 with dmetar#
offend_i2 <- var.comp(offend)
offend_i2
#estimate moderator models with metafor, gender as an example#
offend_mods <- rma.mv(yi = LOR,
                     V = off_var,
                     mods = ~ gender,
                     random = ~1 | study/es.id,
                     test = "t",
                     data = roffend1,
                     method = "REML")

offend_mods
clubSandwich::conf_int(offend_mods, vcov = "CR2")
#run publication bias analyses#
funnel.rma(offend,
           xlim = c(-3,3),
           studlab = TRUE,
           title = "Funnel Plot Offending outcomes")
regtest(roffend1$LOR, sei = roffend1$se,
        model = "rma")
```

Appendix 7 – Outcome codes

Attitudes and beliefs (att_)	Aspirations (att_asp) Attitudes to anti-social behaviour and offending (att_crime) Self report attitudes to independent behaviour (att_depend) Self report commitment to school, interest in/importannce of college (att_ed) Value orientation (att_gen) Goal setting (att_goals) Open thinking (att_open) Attitude to justice system (att_justice) Cognitive autonomy (att_own) Happiness (att_happy) Positive attitude, enthusiastic, employment expectations (att_positive)
Education: educational attainment and knowledge	Educational attainment, includes grades (ed_attain) Education attendance (ed_attain) Behaviour in school, including motivation, suspension and truancy (ed_behav) Cognitive skills, problem solving ability (ed_cognit) Physical fitness (ed_phealth)
Externalizing behaviour	Anti-social behaviour, inc delinquent or psychopathic personality, cheating and lying (ext_anti) Externaling behaviour composite measures (ext_behav) Disruptive behaviour, behaviour problems, acting out (ext_disrupt) Extroverted behaviour (ext_extro) Swearing, verbal abuse (ext_verbal) Aggressive behaviour (ext_viol)
Family	Family relationships and functioning (fam_social)
Internalizing behaviour	Anger (int_anger) Inner turmoil or feelings of isolation (int_angst) Physical appearance (int_appear) Self concept, including perceptions of physical appearance and intellctual abilities (int_concept) Self control (int_scontrol)

	Locus of control (int_lcontrol)
	Denial (int_denial)
	Self efficacy (int_efficacy)
	Self esteem (int_esteem)
	Self identity (int_identity)
	Independent behaviour (int_independent)
	Easily led (int_led)
	Maturity or immaturity (int_mature)
	Implusiveness and self regulation (int_regul)
Mental health	Anxiety, self-reported and assessed (mhealth_anx)
	Autism (mhealth_autism)
	Depression (mhealth_dep)
	Mental health general, includes neuroticism and mental wellbeing (mhealth_gen)
	PTSD (mhealth_PTSD)

Offending

Abjudicated (offend_abjud)
Arrest (offend_arrest)
Court contact (offend_court)
Criminal petitions (offend_criminal)
Custody (offend_cust)
Drug offenses (offend_drug)
Any other or undefined offending (offend_other)
Property offences (offend_property)
Re-offending (offend_recid)
Sexual offences (offend_sex)
Status petitions (offend_status)
Violent offending, inc offences against person
(offend_viol)
Sentenced for offending (offend_sent)

Social

Adapt (social_adapt)
Social support and connections, includes popularity and
alienation (social_connect)
Social skills (social_skills)
Pro social and cooperative behaviour (social_pro)
Pro-social peers (social_peers)