Systematic Review: The effects of sports and physical activity interventions for at-risk and offending children and young people on behavioural, psychosocial, and offending outcomes: A mixed-methods systematic review and meta-analysis

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Abstract

Background

Participating in sports can promote positive youth development through building self-esteem, pro-social behaviour and social networks. Sports plus components can contribute to better life skills and academic achievement and improve access to services. In this review we assess the effectiveness of sports intervention programs for children and young people at risk of offending and those who have already offended.

Objectives

The review evaluates the effectiveness of sports intervention programs to build a child's personal, social and psychological assets, and so to reduce outcomes such as offending, anti-social behaviour or violence.

Search methods

We searched the completed and on-going studies from Medline, PsycInfo, PsycExtra, Social Policy & Practice, Scopus, Repec, ERIC, Econlit, CASE Engagement database (EEP, UCL), and the US National Criminal Justice Reference Service databases. We also searched relevant journals and websites. The journals searched were Journal of Sport and Social Issues, Journal of Applied Sport Psychology, Children and Youth Services Review, Sociology of Sports Journal, Journal of Early Adolescence, Journal of Aggression, Maltreatment & Trauma, and International Review for the Sociology of Sport. The database search was conducted in June 2021, and the journal and website search was completed in August 2021.

Selection criteria

The review includes sports and physical activity interventions targeted at children and young people who have already offended or who are at-risk of offending and young people aged 25 years or below. The review includes effectiveness studies (experimental and non-experimental studies with a comparison group), process evaluations 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

Sports interventions may have a large effect on the primary outcome of reducing offending (OR = 2.466; 95% CI: 1.200–5.065; p = 0.020), along with positive effects on secondary outcomes such as aggression, and both internalizing and externalizing behaviours. There is also evidence of a large positive effect on self-esteem (OR = 2.075).

However, the quantitative analysis shows small effects on having prosocial peers, social skills, and pro-social behaviours. There are no quantitative studies examining outcomes related to time use or relationships with an adult, although qualitative findings highlight these as important mediators.

Qualitative evidence also suggests that sports and physical activity programmes appeal to some, but not all young people. In general effects are larger for same sex groups and those with a majority of minority ethnic groups backgrounds. However, in all cases the number of studies is small, and many there is low confidence in study findings.

Summary of findings table

The summary of findings tables shows:

- Large or moderate significant positive effects on offending, aggression and both externalizing and internalizing behaviour. In all cases there are only a small number of studies, mostly with low confidence in study findings.[1]
- There are only small effects on social skills, prosocial peers and prosocial behaviour, none of which are statistically significant (at 10%) though in all cases there is a small number of studies.
- There is a large positive effect on self-esteem, though it is not statistically significant (possibly as a consequence of an outlier with a large effect rendering the overall effect insignificant.
- There is a large (but insignificant) effect on academic achievement from a small number of studies.
- There are no quantitative estimates on time use (diversion) and relationship with an adult, although both of these are identified as important in the qualitative data.

Table 1- Summary of Findings

Outcome	**Effect size OR (CI)** Positive effect is favourable to intervention	**Critical appraisal**	**Summary**
Offending	2.47** (1.20 – 5.07) n=6 k = 10	All 6 low confidence	Large effect with moderate number of studies and low confidence in study findings
Aggression	1.60* (0.92 – 2.76) n=6 k = 10	All 6 low confidence	Large effect with moderate number of studies and low confidence in study findings
Externalising behaviour	1.39* (0.95 – 2.03) n=8 k = 19	All 8 low confidence	Moderate effect with moderate number of studies and low

[1] The thresholds for effect sizes are those in the YEF Technical Guide (YEF, 2021), which is Harmful d<0 (OR<1), Low 0<=d<0.1 (1<OR<=1.20) , Moderate 0.1<d<=0.25 (1.2<OR<=1.57) ; and High d>0.2 (OR>1.57).

			confidence in study findings. Some evidence from qualitative studies.
Internalising behaviour	1.52** (1.09 - 2.12) n=5 k = 13	All 5 low confidence	Modrate effect with small number of studies and low confidence in study findings
Delinquent peers	N.a.	1 study low confidence	Unclear effect based on one study, some evidence from qualitative studies
Prosocial behaviour	1.10 (0.86 - 1.41) n=4 k = 11	All 4 low confidence	No effect from small number of studies
Social skills	0.88 (0.55 - 1.42) n=4 k = 8	All 4 low confidence	Harmful effect from small number of studies
Self-esteem	2.08 (0.42 - 10.33 n=3 k = 4	All 3 low confidence	Large effect from small number of studies.
Academic achievement	1.61 (0.50 – 5.25) n=3 k = 7	Two studies with medium confidence, one with low confidence	Large effect from small number of studies
Time use	n.a.	n.a.	Qualitative data strongly support this effect
Adult relationships	n.a.	n.a.	Qualitative data support this effect

Notes: *** significant at 1%, ** significant at 5%, and * significant at 10%

Abbreviations and acronyms

List any relevant abbreviations or acronyms used.

CYP	Children and Young People
ITT	Intention to Treat
PATS	Promoting Achievement Through Sports
RQ	Research Question
RCTs	Randomized Controlled Trials
ToT	Treatment of the treated
UK	United Kingdom
USA	United States of America
YOT-	Youth Offending Teams

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1. Background

The Issue

The last twenty years have seen substantial and sustained drops in youth crime across the developed world (McCarthy, 2021). Several reasons have been identified for this decline: in the United States the reasons include the reduced use of alcohol and substance abuse (Arnett, 2018), reduced time spent in unstructured socializing (Baumer et al., 2021), and increases in the use of medications which reduce aggression (Finkelhor and Johnson, 2017).In Japan unemployment has been a correlate of youth crime, as well as divorce though only for females (Hando, 2020), whereas in Spain, these socio-economic factors have been found to play little role, with the suggestion instead that public policies are the main reason (Fernández-Molina and Guitérrez, 2020). In the Netherlands both reductions in risk factors such as alcohol, as well as an increase in protective factors such as monitoring have played a role (van der Laan, et al., 2021).

In the England and Wales, recorded crime by children aged 10-17 has declined over the past decade—from around 90,000 proven offences in 2014 to around 35,000 by in 2022, though it has risen slightly in the last two years.[2] However, knife crime has been on the rise, being 20% high in 2024 than 10 years earlier. It has drawn significant media attention.[3] In October 2019, The Guardian reported that 'Knife crime hits record high in England and Wales: Police figures show a 7% rise in offences involving a sharp instrument over the past year' (17/10/19).[4] Stories of specific incidents are also common; "e.g. 'Two teenagers arrested after 16-year-old boy stabbed to death [5] (1/3/2020) 'Teenager killed on London street is capital's 11th fatal youth knife victim' (27/6/19),[6] and more recently 'Boy, 17, who stabbed his older sister to death pleads guilty to her murder'.[7] British actor Idris Elba is amongst those speaking out for action against knife crime. [8]

[2] https://www.gov.uk/government/statistics/youth-justice-statistics-2023-to-2024/youth-justice-statistics-2023-to-2024#proven-offences-by-children Figure 2
[3] https://researchbriefings.parliament.uk/ResearchBriefing/Summary/SN04304 (accessed 16/2/20)
[4] https://www.theguardian.com/uk-news/2019/oct/17/knife-hits-new-record-high-in-england-and-wales (accessed 19/8/20)
[5] https://www.independent.co.uk/news/uk/crime/coventry-stabbing-murder-arrest-police-west-midlands-knife-crime-victim-a9366996.html (accessed 19/8/20)
[6] https://www.independent.co.uk/news/uk/crime/shepherds-bush-stabbing-london-death-teenager-murder-knife-crime-hammersmith-a8977156.html (accessed 19/8/20)
[7] https://www.theguardian.com/uk-news/2025/mar/10/mali-bennett-smith-luka-stabbed-sister-to-death-pleads-guilty-to-her
[8] https://www.theguardian.com/uk-news/2025/feb/11/idris-elba-knife-crime-youth-violence-meetings-uk

The causes of crime an so rivers of change can be difficult to disentangle. But he country examples given above suggests that the following as being amongst the main drivers of change:

(1) general trends away from risk-taking behaviour such as reduced use of drugs and alcohol;

(2) the growing practice of diversion of children away from the justice system (Mendel, 2024) which has proven criminogenic effects (Petrosino et al., 2017, and Wilson et al, 2018). In England Youth Offending Teams (YOT), and others, may refer diverted youth to a variety of activities, including sports interventions, which are the subject of this review; and

(3) the adoption of interventions informed by a positive youth development perspective which may stop children from offending in the first place, or from reoffending if they have already done so (Roberts et al., 2019; and Bateman, 2020).[9]

Sports interventions

The Council of Europe's European Sports Charter states that "Sports means all forms of physical activity which, through casual and organised participation, aim at improving the mental well-being, forming a social relationship or obtaining results in competition at all levels."[10] Sports are defined to include 'all physical activity", hence activities such as dance, and yoga are included in this definition. For simplicity, we use the term 'sports interventions' throughout this report to refer to sports and physical activity.

A 'sports intervention' is defined in our review as a program that meets the following criteria:

- A specific sports intervention has been implemented. In other words, we exclude studies that compare young people who simply participate in sports anyway with those who do not do so.
- The main component of the program is participation in sports or physical activities, such as (but not limited to) football, rugby, dance, martial arts and hiking. This excludes after school program, or summer camps, which may have physical activity as one activity of many.

[9] Reviews of positive youth development find significant short-run effects. The effects may not be sustained by the evidence base is weak (Melendez-Torres et al. 2016, and Bonnell et al. 2016).
[10] https://rm.coe.int/16804c9dbb

- Sports or physical activities are implemented in structured and supervised sessions, ideally by trained facilitators or coaches.

Therefore, our review distinguishes between 'normal sports participation' and sports interventions. The term sports participation is used to describe the act of being involved in sports, and this may occur naturally (e.g., playing football informally with friends) or can be organised (e.g., joining a sports club, or physical education classes). Such instances are excluded from our review unless they occur in the context of an intervention.

We assess the effectiveness of sports interventions, or formal intervention programmes, where participants have been recruited specifically to take part in sports activities and attend regularly scheduled sessions that are supervised by designated facilitators. We also include 'sports plus' interventions. These programs include sports activities but also have an additional component, for example, counselling to address externalizing behaviour, remedial education, increasing school engagement and performance, and connection to services. Hence, the 'plus' label.

We are interested in assessing the effectiveness of sports intervention programs for children and young people at risk of offending and those who have already offended. In contrast to approaches based on tackling 'problems' in the personality and behaviour of children and young people, sports offer a positive approach to building on their strengths. Sports interventions can align with child first principles. , and have the following principles: (1) see children as children, not offenders; (2) develop a pro-social identity; (3) encourage active participation in activities supporting positive youth development, such as sports; and (4) divert from the justice system (Case and Browning, 2021).

Child and Youth development

A child's development is affected by their experiences and the opportunities that they are provided. This fact has informed the strength-based approach to positive youth development (Holt and Neely, 2020). The strength-based approach seeks to give children experiences that can help contribute to the development of the beliefs, attitudes and skills for happy childhoods and growth as successful adults who are fully and constructively engaged in society. Support to the development of a child's strengths will reduce the likelihood of disruptive or anti-social behavior, and so decrease the chances of engagement in criminal activities in their teenage years. Sports and physical activity are seen as potential activities in which youth can be engaged to promote positive youth development (Holt & Neely, 2020, and Holt, 2017).

This mixed -methods review will assess the evidence regarding the implementation and effects of sports and physical activity interventions for children and young people who are at risk of or have already displayed, anti-social or criminal behavior.

Sports and physical activity to promote positive youth development

One way in which sports interventions can have a desirable effect on young people, is as a prevention strategy for offending and anti-social behaviour. Sports interventions programs have the potential to address several significant risk factors for risky and anti-social behaviour and offending.

The channels through which sports interventions may affect the development of a child's or young person's development, both positively and negatively, are more fully elaborated in the theory of change described below.

Sports interventions may act be any of a primary, secondary, or tertiary intervention programme (Nichols, 2007). Our review is concerned with the effectiveness of sports interventions as secondary and tertiary interventions. As such, only evaluations of interventions that implemented a sports intervention with children and young people at risk of offending(i.e., secondary) and/or young people who have already offended (i.e., tertiary) will be included. It is the intervention which must be targeted (which includes geographical targeting in disadvantaged areas) for the study to be included, not only the study population. A preliminary scoping by the study team determined that relevant sports interventions are captured by this approach.

The Intervention

Sports, Sports Plus and physical activity programmes for at-risk youth

Our review will evaluate sports intervention programmes and 'sports plus' intervention programmes for children and young people (CYP) considered at-risk for offending and those who have already offended. Sports interventions are intervention programmes in which participants are engaged in organized physical activities, for example, any workouts, training (drills, conditioning, and friendly matches), competitions, and coaching. Sports plus interventions are programmes in which participation in sports activities are used as a 'hook', or a means of engagement, to implement other interventions with participants (Nichols, 2007; Taylor et al., 1999), such as, social skills training, counselling, or education.

The sports element in these interventions may refer to a range of different sports, either individual sports (e.g., athletics, tennis, martial arts) or team sports (e.g., football, rugby, volleyball). We also include other physical activities in our definition of sports which is consistent with existing definitions. As such, activities where there is physical exertion (e.g., dance, yoga, hiking) are included, but activities where there is no physical exertion (e.g., chess, bridge, arts, and crafts) are excluded. Furthermore, we do not restrict our definition of sports to those that contain a competitive element, as many sports can be both competitive and non-competitive. For example, one can participate in dance to compete in local, national, and international competitions but can also dance just for leisure and fitness. Some activities, like hiking and yoga, are non-competitive.

We will include secondary interventions which are targeted at CYP considered 'at-risk for offending'. The targeting may occur through screening, referral, recruitment, geographical placement of the intervention or using a proxy targeting measure such as social-economic status or ethnicity. We will also include tertiary interventions for CYP who have offended, including those in custodial settings.

Primary interventions are not included. Hence, open access sports and physical activity interventions are not included unless they are targeted by geographical placement in areas with a disproportionate share of CYP at risk of offending, and so are classified as secondary intervention. For a study to be included it is the intervention that must be targeted, not the study population. Hence a study of CYP at risk of offending in a universal programme would be excluded.

Our review will exclude one-off activities but will include interventions that are described as 'time-bound', (e.g., summer sports camps). We exclude adventure activities where the focus on the challenge element, as these, are the subject of a separate review on wilderness and adventure therapy (Mohan et al., 2021). The sports interventions may take place in any setting, for example, in a school sports hall, community centres or local sports clubs, as well as custodial settings.

How the Intervention Might Work

There are several existing papers presenting a theory of change that explains how sports interventions may work to reduce youth offending (Coalter, 2012; Holt & Neely, 2020; Mason et al., 2020; Morgan et al., 2020; Nichols, 2007; and Segrave, 1983). In the present review, we have combined existing theories but we also supplement with some additional theories of change. We also identify 'counter theories' (see Carvalho & White, 2004) to explain how the

intervention may lead to adverse outcomes rather than positive ones. Table 2 presents a summary of these theories. Most were identified in previous research on sports interventions and we have added factors such as connection to services, as this is identified as a neglected area of analysis. The individual outcomes relevant to each theory of change are also presented in Table 2.

There has been a shift in thinking over time from the view that sports itself have a positive effect on youth development, to thinking that sports is a hook which provides an opportunity to engage youth, either through their relationship with the coach or more explicitly with sports plus programmes which provide additional activities alongside sport. For example, Mason et al. (2020) describes sports as a ''hook for change where young people can engage with others and start to engage'' (Mason et al., 2020, p. 7). There has also been a shift in the nature of the theories to reflect a more strength-based approach, also referred to as an asset-based approach and child first, which aligns with a positive youth development perspective. We refer to positive youth development as encompassing both strength-based and asset-based approaches.

Morgan et al. (2020) explicitly links sports participation to the different types of capital it will build: sports, physical, human, psychological and social. Both Nichols' (2007) personal growth and development model, and Holt and Neely's (2020) application of positive youth development to sports, emphasize the positive role sports can play, rather than the view of CYP who have problems to be addressed as implied in, for example, social control theory, the deficit model and the risk and protective factors framework. The theory of change proposed in this review encompasses all of these approaches in relation to sports, sports plus and physical activity interventions. Each approach has a variety of possible mechanisms or causal processes.[11]

Most of the previous research is oriented toward sports as an opportunity to engage CYPs; only Segrave (1983) considers theories supporting the effects of sports alone. Nichols' (2007) personal growth model, which is similar to positive youth development, stresses the role of the coach and the developmental opportunities sports programmes afford participants especially if they are given a coaching function themselves. Other causal processes come explicitly from the extra intervention activities in sports plus intervention programmes.

[11] 'Mechanisms' is the language used in realist evaluation, (e.g., Pawson, 2006), whereas mid-level theory approaches refer to 'causal processes' (e.g. Cartwright et al., 2020, and Merton, 1968).

The theory of change presented in this review is a mid-level theory. This means that the theory can be described as being between high-level theory, which is too abstract to be empirically testable, and a project-specific (or low-level) theory of change. The mid-level theory approach thus emphasizes testing causal processes rather than whether specific interventions work and examines the assumptions under which a causal process may or may not operate. Systematic reviews, which summarize evidence across studies for which the intervention varies by design and context, are thus well suited to using this approach (White, 2021), which fits under the broader heading of a framework synthesis (Littell, 2018; Kneale et al., 2018, and White, 2021).

The ordering of the theories is based on the papers we have reviewed. The ordering doesn't reflect any preference or relative importance, although there is an element of grouping of some theories which come from a common source.

The theories taken from Segrave (1983); concerns theories related to the effect of sports alone. The first theory Segrave lists is recapitulation theory. This theory, and surplus energy theory, both rest on the assumption that some children and youth need to 'let off steam'. Providing a channel to do this through play or sports will prevent this surplus energy emerging in disruptive or anti-social behaviour, and aggression. All of these outcomes are captured under the general heading externalizing behaviour.

Two possible moderators are suggested by these theories. If the causal process is 'letting off steam' then we should distinguish physically demanding sports from those which are less so. But if the mechanism is being a channel for aggression, then any behavioural effect will more likely come from contact sports such as American football, rugby and martial arts.

Next is boredom theory which seem to be a relatively neglected aspect of quantitative sports intervention studies. As stated by Mason et al. (2020), 'offending is low-level, transitory (i.e., not permanent) and declines with age' (2020:2). Consequently, 'most young people require minimal necessary intervention and engagement with diversionary activities outside of the Youth Justice System' (Mason et al., 2020: 2).[12] That is, other activities, such as sports, which occupy youth prevent them from getting bored and so reduced the likelihood of engaging in anti-social and offending behaviour.

A potentially important mediator suggested by this theory is time use. Sports interventions directly engage CYP in the organized activity, but may also occupy more of the CYP's time if

[12] We do not use Mason's term 'diversion' since it is also used to refer to formal diversion interventions.

time is spent training for the sport outside of organised activities. Taking part in sports also has the effect of not hanging out with peers who encourage anti-social behaviour (subculture theory), although some sports may have a subculture which encourages undesirable behaviour (e.g., aggressive play; rivalries between different sports teams/clubs; and possibly as a venue for excessive alcohol consumption). For direct engagement in the intervention, both the duration of the programme (how many weeks or months a programme runs for) and its intensity (number of sessions or hours a week) are important moderators.

Personality theory relates to the long-held view that sports are character building. We include here Morgan et al.'s (2020) concept of sporting capital. Engaging in a regular sporting activity improves sporting performance, that is sporting capital. The desire to build and maintain that capital will require regular practice and hard work (self-control or self-discipline), with success building self-worth or self-esteem. These outcomes are all captured by what Morgan et al. (2020) call psychological capital. The esteem of others for success, or being a team player, can build social capital. The application of personality theory requires that the CYP has some success in the sport, as failure to perform well (e.g., if their team repeatedly loses matches) may have the opposite effect – reducing self-esteem rather than increasing it.

Table 2 Causal processes for sports programmes and youth behaviour

Theory (causal process)	Intermediate outcomes	Explanation and comments
Recapitulation theory / surplus energy theory	Externalizing behaviour	Most likely to apply in the most physically active or contact sports, which are potential moderators.
Boredom theory	Intensity and duration	Measures of intensity and duration (dosage) will be a moderator.
	Time use	Direct diversion: time spent in project activity Indirect diversion: time spent on sport (training, matches) outside of project
	Protection against criminal exploitation	Youth will spend less time with gangs and other anti-social peers
Personality theory	Sporting capital	Sporting capital is the skill and competence acquired by practice, which can bring other effects. Will not apply if the participant is not good at the sport, which may have adverse effects.
	Self-control / discipline	Dependent upon coaches enforcing rules and good 'sportsmanship'; countertheory: coach indulges or encourages cheating and rule breaking.
	Self-worth / esteem / aspirations (psychological capital)	Self-worth / self-esteem will develop as a result of sporting capital
	Social capital	Extended social connections, either made directly by CYP participants or facilitated by the coach.
Stimulus seeking behaviour	Risky behaviours	Will only apply for sports with extreme or risk-taking element, suggesting that type of sport is a moderator.
Subculture theory	Prosocial behaviour New social groups	Effect is both taking away from peers who encourage anti-social behaviour, as well as new social groups who encourage pro-social behaviour. Different sports have different subcultures (e.g. football and rugby versus golf and cricket).
	Gang membership Social capital	Countertheory: sports participation provides

		opportunity for encouraging anti-social theory, with some sports having a 'jock culture' which encourages bad behaviour. See above for these outcomes
Strain theory	Sporting capital Self-worth / esteem / aspirations (psychological capital) Social capital	Sports provide an outlet for CYP to achieve success and recognition, which manifests itself in the first instance in sporting capital, and then the other outcomes which follow from that.
Social bonds/ social control theory	Team attachment Duration and intensity Pro-social behaviour	The four elements of Hirschi's social bond theory – attachment, commitment, involvement, and belief, each operate through a separate causal process.
Deficit model	Self-control Empathy Cognitive skills Social skills (pro-social behaviour)	Sports may help address deficits in CYP - which may be either cognitive skills or social skills – which are associated with anti-social and criminal behaviour. Empathy may rise from supporting other team members, and indirectly as self-esteem is a foundation for developing empathy.
Risk / protection factors	Time use New social groups Sporting capital Social capital	Sports are a protective factor by providing safe environment with reduces boredom, reduces exposure to anti-social peers, and is and an opportunity to acquire status
Personal growth or development model	Self-esteem Self-control Pro-social behaviour and values	Sports provide an opportunity for personal growth, allowing growth in self-esteem, developing self-control, and the development of pro-social behaviour and values.
Role model	Values Aspirations	The coach acts as a role model, which can shape values and aspirations
Mentor / counselling	Self-worth / esteem / aspirations (psychological capital)	The coach acts as a mentor, supporting the youth in their personal development and so improving their self-worth and aspirations.
Advocate	Connection to services Social capital	The coach acts as an advocate helping with connection to services and providing access to a broader network of social contacts.

Connection to services	Use of services Mental health Accommodation	Connection to services may occur through service coordination in a Sports+ model or less formally through the support of the coach or use of club office facilities.
Remedial education	Human capital Academic performance School engagement	Remedial education may occur formally in a Sports+ model or less formally through the support of the coach or use of club office facilities.
Employment services	Human capital Job applications and interviews Employment status	Employment services may be provided formally in a Sports+ model or less formally through the support of the coach or use of club office facilities.
Positive youth development	Competence (Human capital) Confidence (Self-worth / esteem) Character (Values) Caring/compassion (Empathy) Connection (Social skills, social capital)	In the positive youth development model sports contribute the CYP's development in various spheres, captured by the 5Cs, which are here mapped onto indicators mentioned above.

Similar effects on self-esteem and social capital may be expected from strain theory. That is, some children and young people have few opportunities for being well regarded in the traditional sense (e.g., academic performance, behaviour in school) and so may turn to anti-social behaviour and offending to attain peer approval. Thus, sports interventions may provide an opportunity, possibly the first opportunity, for these CYP to experience recognition and reward. In a running club, people care how fast you can run, not about your school grades or your father's occupation. Clubs provide an opportunity to win esteem, as well as connect with people from different backgrounds, that is build social capital (Janssens and Verweel, 2016; Tacon, 2019).

However, sports programmes that target at-risk youth could also increase undesirable outcomes. There is a possible counter-theory: providing venues for groups of at-risk youth to interact may have iatrogenic effects, especially for sports with a more aggressive sub-culture (Welsh & Yohros, 2020). This discussion highlights a possible moderator since strain theory is more applicable to youth who do not have other outlets to earn prestige. However, this moderator cannot be applied in our case since we are restricting the analysis to secondary and

tertiary intervention that, by definition, will only include at-risk CYPs or those who have already offended. The present review will also consider the implication for potentially harmful effects (i.e., such as an increase in anti-social behaviour or offending).

In opposition to strain theory, in which disadvantaged youth cannot realise their aspirations, is social control theory in which social bonds support positive development and desistance. Hirschi (1969) proposed four mechanisms of social control, each of which have an obvious application to sport: (1) attachment, which can apply to the sports club and fellow team members can mean not wanting to let them down and so train and behave well; (2) commitment: which will operate if there is a risk to being thrown off the team from failure to turn up to training, or for bad behaviour, which increases the cost of anti-social behaviour if CYPs value the engagement in the sport: (3) involvement: which is a version of boredom theory, in which the involvement in conventional activities such as sports leaves less time for getting into trouble; and (4) belief, which is the view that engaging in sports can foster pro-social values through learning to work with others and by obeying the rules of the game.

Table 2 also identifies other mechanisms by which benefits may occur. Many of these benefits come through interaction with the sports coach, and so depend on the participant-coach relationship. A coach may have multiple roles: a coach, a mentor (advisor, counsellor, and advocate) and a role model. Coalter (2012) draws on Pawson's (2006) analysis of youth mentoring to suggest that there are four stages of the relationship: befriending, direction-setting (advisor), coaching (social skills as well as sports, i.e., counselling) and sponsoring (advocate, which can include connection to services and help with employment such as preparing CVs). Some may argue that we should expect 'sports alone' to have the same effect as is found in associational studies, that is, no effect. If there is a positive effect from sports programmes for at-risk youth one plausible explanatory factor is the role of the coach. Nichols (2007) emphasizes the central role of the coach as a role model and mentor, and so a conveyor of pro-social values. But it is also possible that coaches may play an adverse role if they encourage rule breaking to win or discourage youth who are not so skilled in the sport.

Sports interventions may also train the CYP to be a coach, which allows an approach which fits with flow theory as part of personal development theory (Nichols, 2007). The participant graduates from overseeing specific drills, running whole sessions, to planning and implementing a training programme for a group of children. As the participant is given more responsibility so their self-worth develops, as well as prosocial values such as wanting others to succeed.

Morgan et al. (2020) discusses how sports participation yields different sorts of capital, which we have spread over different causal processes. Similarly, Holt and Neely's (2020) discussion of sports and positive youth development focuses on outcomes rather than mechanisms. They mention both the development assets profile, and the "5 Cs": competence, confidence, character, caring/compassion, and connection, citing evidence of how sports can build each of these. In Table 2, we list these outcomes, mapping them to other outcomes already mentioned, which can be mapped back to causal processes.

Sports plus components can provide their own sets of causal processes depending on the nature of the intervention activities that comprise the 'plus' element and are also outlined in Table 2. Whether a programme of sports or sports plus is thus an important moderator for outcomes in that part of the causal chain.

These causal pathways are captured in Figure 1, which shows the flow from inputs to activities and outputs, which lead to intermediate and final outcomes. It is important to emphasize that this is not an automatic process by which carrying out these activities achieves these outcomes. There are many assumptions, shown under Figure 1, which have to hold for these causal pathways to operate.

As mentioned above, there are separate causal pathways for sports and sports+, with sports+ of course include the sports pathways also. Each causal pathway listed in Table 2 may be traced through from left to right. The top three rows of the left-hand side (facilities, coaches, and participants) are common to all interventions. Coordinating with services may be more important for sports plus, but for most programmes services are likely to be a source of referrals. Even if the programme is geographically targeted and open to all, it is still useful for social workers, probation officers and so on to know about the programme so they can recommend young people to attend.

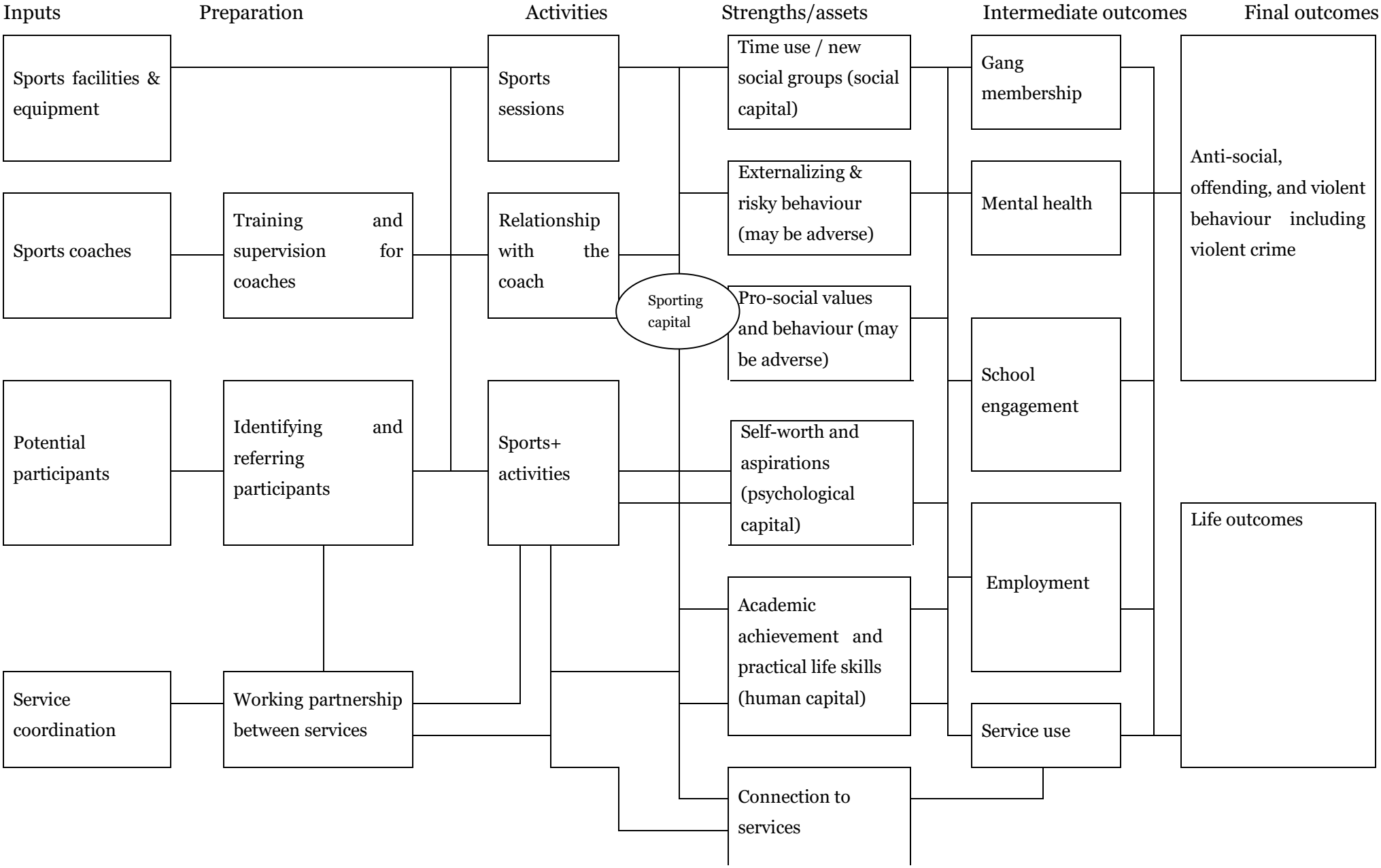
As one example of one causal pathway in Figure 1, the role model causal pathway starts with recruiting coaches, with the effect likely moderated by training and supervision of the coach. Having the coach as a role model will affect the youth's aspirations, and so possibly mental health and school engagement, and so eventually employment.

Assumptions

Under the theory of change, we list the assumptions. Assumptions are sometimes misinterpreted as things we assume to be true. The correct interpretation is that these are things which need to be true for the programme to work as intended.

Availability and accessibility of a venue is a key assumption. Sports-based activities which are not linked to a regular sports club may not have the required facilities (e.g., proper sports pitches) or equipment to engage seriously in the sport. Accessibility is not just about an accessible location (including public transport links if needed), close to where participants live, but also about 'turf' where gang membership is an issue. The activities also have to be at an appropriate time. As stressed by Mason et al. (2020) the venue also needs to have the right style or vibe, and coaches need both hard and soft skills and to be aware of the other service available for CYP in the program.

Figure 1 Theory of change for sports and sports+ interventions



Assumptions

Inputs	Preparation	Activities	Strengths/assets	Intermediate outcomes
Venue in right location and accessible, and at appropriate time Facilities available Coaches available	Referral agencies aware of programme Right groups are targeted Offered activities are attractive to target group Participants show up	Coaches have hard and soft skills Activities have the right style Participants remain engaged	Services engage with programme Coaches aware of services	

As mentioned, coaches need to be available, and they need both hard and soft skills. Hard skills are knowing the rules of the game and how to coach sport-specific techniques (preferably evidence-based; see Gamble, 2012). Mason et al. (2020) provides a list of the desirable characteristics of staff. Soft skills relate to the mentoring role that coaches play. It also includes practical help and information they can provide regarding local services and how to access them. If the programme is delivered by youth workers, they may have the soft skills but lack the hard skills, so young people can get frustrated at the lack of structured coaching and consequent improvement in the sport. But if the programme is delivered by qualified sports coaches, they may lack the requisite soft skills. Hence in either case, appropriate training and supervision can help to make up the coaches' skills deficit.

One key assumption underlying these interventions is that they successfully engage the young people at risk of offending. For the program to be effective, it must attract and retain the *right* participants. If it primarily involves youth who have no risk or anti-social or criminal behaviour, then the intervention cannot positively affect these outcomes. Ensuring the participation of appropriately targeted is therefore critical for having an impact on the desired outcomes.

. But studies show that young people at risk of offending are less likely to take part in organized sport activities than young people who are not at risk (Segrave, 1983). Nichols' (2007) study of the West Yorkshire Sports Counselling Programme found that of the 329 young people referred to the programme only 194 (59 percent) attended, with only 113 (34 percent) completing at least eight weeks. And only 29 – that is fewer than 10 percent – went on to get a certificate. As Nichols' notes: sports may be an attractive hook for some young people, but it is not for everybody.

Sports programmes for young people at risk of offending should thus consider how to engage their target group. Morgan et al. (2020) propose five considerations to encourage initial engagement: (1) the activity has popular appeal; (2) the activity has to be accessible, which can mean both that young people feel able to do it, and that any necessary kit is made available; (3) young people feel ownership and control; (4) the activity offers 'something different'; and (5) the venue is a safe or neutral space.

Careful consideration of these assumptions can help inform more effective programme design. Forexample, several activities might be undertaken to support connection to services. This can be as simple as having information posters and leaflets in the sports centre accommodation and employment services. But it might also involve (i) providing information about local services to the coach, (ii) including the coach in case meetings, or (iii) having representatives of services providers come and talk to the young personin a sports plus approach.

When interpreting a theory of change, it is important to recognize that visual representations—such as Figure 1—are models. By nature, models are abstractions designed to highlight key relationships; they cannot capture every aspect. As Joan Robinson famously noted, a model that attempts to reflect all elements of reality is as useful as a map with a scale of one-to-one. While theory of change models are sometimes critiqued for being overly linear or grounded in positivist assumptions, but these are invalid criticisms. As Davies (2018) points out, the 'arrows' in a theory of change can represent a variety of relationships—probabilistic links, threshold effects, or combinations of necessary and sufficient conditions. Moreover, these models are capable of incorporating feedback loops and synergistic interactions between outcomes, which may not be depicted in Figure 1 but are likely to exist.

The most obvious example of a feedback loop is that between academic achievement and school engagement. Academic achievement comes first in Figure 1 as it is affected by the remedial education component, which may be an explicit programme component in sports plus or may come informally from coaches or peers. Better academic performance is likely to improve school engagement, which feeds back to still higher academic attainment.

This theory of change, shown in Figure 1, is used to frame this review. Ideally, we would test the different theories listed in Table 2. The qualitative data may help in interpreting the most plausible causal pathways consistent with the evidence, rather than as proof of a particular theory. And sometimes there is overlap in the outcomes between different theories. And, finally, we re-emphasize that there is no automatic relationship between the inputs, activities, intermediate and final outcomes. These are probabilistic relationships, which are more likely to operate if the assumptions hold.

Why it is important to do the review

There is no systematic review on the effectiveness of sports interventions for children and young people at risk of offending, nor any published meta-analysis of sports interventions for these children.[13] Existing reviews are different in scope, geographical coverage, and methods. For example, there is a narrative review of 'sports-based interventions with specified violence and/or crime reduction as one of their aims and based in London' (McMahon and Belur, 2013: 7), which has a narrower geographical focus than our review, and does not conduct a meta-analysis.

[13] Whilst this review was at the draft stage a new review was published on sports interventions and offending, but it was not restricted to youth and include studies with no comparison group (Jugl, 2021).

The included studies in our review will be evaluations of interventions to children and young people and risk of offending in sports interventions and physical activity. This study will fill a gap in the literature.

The subject of the proposed review is different from studies that look at the association between sports participation and outcomes such as delinquency and anti-social behaviour. To our knowledge, there are two existing reviews that examine the association between sports participation and anti-social behaviour or delinquency.

Firstly, Spruit et al. (2016) conducted a meta-analysis of the relationship between young people's sports participation and juvenile behaviour[14]. It included 48 cross-sectional (n = 40) and longitudinal studies (n = 8). The cross-sectional studies examined the *association* between young people playing sports and reported juvenile delinquency [15].. Longitudinal studies examined the association between participation in sports during childhood/adolescence and later involvement in delinquency. Young people involved in sports, were involved of their own accord. Therefore, no formal sports interventions were implemented, and in fact, Spruit et al. (2016, p. 658) state that intervention studies were explicitly excluded.

The review of Sønderlund et al., 2014 is a systematic review of the relationship between alcohol consumption, sports participation, and violence (i.e.,). As was the case for the review by Spruit et al. (2016), these were associational studies, not intervention studies.

Both existing reviews are reviews of associational studies. They are not reviewing intervention studies, which were explicitly excluded. Therefore, our review addresses this gap in the literature. We aim to evaluate the effectiveness of sports intervention programs to reduce outcomes such as offending, anti-social behaviour or violence.

[14] The term 'juvenile behaviour' is outdated; it is retained here solely to accurately reflect the language used in the studies.
[15] The term 'juvenile delinquency; is outdated; it is retained here solely to accurately reflect the language used in the studies.

2. Objectives

Objectives

The review will address the following research questions:

1. What are the effects of organized sports and physical activity interventions for children and young people aged up to 25 years in changing anti-social behaviour and offending outcomes, including serious violence?
2. What are the effects of organized sports and physical activity interventions for at-risk children and youth aged up to 25 years on intermediate outcomes – such as time use and psychosocial outcomes?
3. What are the success factors and barriers that affect the implementation of organized sports and physical activity intervention programs for children and young people aged up to 25 years?
4. What is the cost-effectiveness of organized sports and physical activity interventions for children and young people aged up to 25 years?

3. Methods

Study Selection Criteria

Studies included in the review if they meet the following selection criteria:

- The program (or intervention) involves a sport or a physical activity
- The program is an organized activity (so simply providing sporting facilities is not included)
- The program is targeted at children and young people at risk of offending or who have already offended, aged 25 years or below

These criteria are elaborated below.

Types of participants

Children and young aged up to 25 years who have exhibited, or are deemed at risk of, anti-social, violent, or criminal behaviour. This includes children displaying disruptive or aggressive behaviour, which are risk factors for criminal behaviour in adolescence, children exposed to various adverse childhood experiences, (ACEs), and children from disadvantaged backgrounds and areas. For the sake of brevity we use the term 'children and young people at risk of offending', which also includes those who have already offended. Children who have already offended are a group at risk for further offending: in England and Wales, just under 40 percent of CYP re-offend within one year of conviction (Youth Justice Board/Ministry of Justice, 2021). Sports may thus play a preventive role for CYP who are at risk of a first offense and a desistance role for those who have offended: both are included in this review.

Children deemed at-risk of offending may be identified by several means:

- Screening: A research team may apply an assessment tool before implementing an intervention (e.g., for disruptive behaviour), to a group of children or young people, and recruit only those with a high score into the assessment , 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: Young people may be referred to a sports intervention programme by social workers, youth workers, or police officers.

- Recruitment: Young people may be directly recruited, for example by project staff visiting open spaces (e.g., parks) where youth deemed to be at risk of offending congregate and schools with disadvantaged young people.
- Geographical targeting: The intervention may take place in a neighbourhood with a disproportionate share of children and young people at risk of offending.
- Proxy targeting of the intervention to reach young people 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.

Children and young people who have already offended may be targeted by placing interventions in custodial settings, through referral on discharge, or referral as part of a diversion approach.

The age of 25 as the upper limit has been selected since the age-crime curve tapers off in the mid-20s (Loeber and Farrington, 2014), and since there may be lessons from interventions for young people aged 18-25 which are useful for interventions for those aged less than 18.

Types of Interventions

In this review, we only include studies of secondary or tertiary interventions sports and physical activity-based interventions. In other words, they are designed to be implemented with at-risk CYPs (as defined above) or CYPs who have already offended.

Sports and physical activity interventions open to all CYP are not included, primary intervention are excluded unless they are targeted by geographical placement in areas with a disproportionate share of at-risk youth, and they are classified as a secondary intervention. For a study to be included in the review, it is the intervention which must be targeted, not the study population. Hence a study of at-risk youth taking part in a universal programme would be excluded. We include both sports and sports+ interventions, Sports+ uses sports as a hook, providing also additional activities which may be social skills training, counselling, basic education etc.

The intervention provides the treatment group with access to a regular, organized sports or physical activity. It may be with an existing sports or youth club, a special group set up for this purpose or in school or a custodial setting. See the sections above for the definition of sports and sports plus.

The intervention has to be an organized activity. So, the simple provision of facilities – say skateboarding parks in low-income neighbourhoods – does not qualify for inclusion.

The review will exclude one-off activities, but interventions that are described as 'time-bound', (e.g., summer sports camps) are included. The sports interventions may take place in any setting, for example, in the school sports hall, community centres or local sports clubs, as well as custodial settings.

We are excluding sports for development programmes in post-conflict settings, for example, an evaluation of a football programme implemented in post-war Sierra Leone to promote reintegration (Dyck, 2011). Whilst these programmes, which often target ex-combatants (and therefore definitely considered at-risk CYPs/CYPs who have offended), have a similar objective of using sports to reduce violence, their context and target group are very different to sports interventions in non-conflict settings, and so would be more appropriately included in a separate review.

Types of Outcomes measures

Table 3 outlines examples of primary and secondary outcomes included in this review. Whilst Table 3 groups outcomes in broad categories, such as behavioural outcomes, the meta-analysis reports effects at a lower level of aggregation, e.g. self-esteem. In very broad terms the outcomes are:

- Primary outcomes: behavioural, psychosocial, and offending outcomes such as violent offending, substance abuse, reoffending, anti-social and delinquent behaviour,
- Secondary (intermediate) outcomes: values, attitudes and beliefs, sporting ability, attachment to the team/club/sport.
- Barriers and facilitators: Themes will be extracted from qualitative data. Any quantitative data related to barriers and facilitators, such as participation rates, will also be coded and reported.
- Cost-Effectiveness: costs (total and unit, average or marginal), cost-effectiveness, and cost-benefit analysis.

Table 3 Outcome categories, with examples of each outcome

Outcome category	Examples
Offending Outcomes (Outcomes that refer to	Violent offending (including weapon carrying), substance abuse, other offending and reoffending

things that are against the law)	
Behavioural Outcomes (Outcomes that refer to the way in which someone acts)	Aggression; alcohol use/misuse; anti-social and delinquent behaviour; externalising behaviour; gang involvement and anti-social peers; social skills and pro-social behaviour; group membership and participation in community-based activities (volunteering); time use
Psychosocial and cognitive outcomes (Psychosocial and cognitive)	Self-esteem and self-worth; mental health and resilience; self-control and regulation (impulsivity)
Attitudes and beliefs (An attitude refer to how someone thinks or feels about something whereas a belief is an acceptance that something is true)	Pro-social values: attitudes to aggression and use of violence; attitudes to crime and responses to crime (including drug use); attitudes to police and justice system and other authority
Protective factors	Sports or physical activity (e.g., dance) skills ('sports capital'); non-family adult relationships; access to services and service linkages; social cohesion; safe spaces; engagement in education and academic achievement; practical life skills.

Types of studies

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

- Experimental designs: randomized controlled trials (RCTs)
- Non-experimental designs: Designs with a non-randomly assigned comparison group.

We do not include before versus after studies with no comparison group.

We use these evaluations to extract outcome data and conduct a meta-analysis (or meta-analyses) to evaluate the effectiveness of sports interventions, as well as moderators which explain observed variation in effects.

To understand the success factors and possible barriers to participation in sports interventions (RQ 3) we will include:

- 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 will also be extracted from effectiveness studies if reported.

To evaluate the cost-effectiveness of sports 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.

Search Strategy

Electronic searches

We used the strategies to identify completed and on-going potential studies mentioned in Appendix A. The search includes following databases: Medline, PsycInfo, PsycExtra, Social Policy & Practice, Scopus, Repec, ERIC, Econlit, CASE Engagement database (EEP, UCL), and the US National Criminal Justice Reference Service.

Appendix A presents an example of the search strings used for publication databases and search engines, with terms for interventions, regions, and methodologies.

Search methods and sources

The search strategy included 10 databases. All screening was done independently by two people (SM, AM) with a third-party arbitrator in case of disagreement (HW).

Searching other resources

In addition to searching electronic databases, we screened the bibliographies of included studies and existing reviews of sports intervention programmes for eligible studies. Issues of relevant journals also hand-searched for any possibly includable studies.

We also search 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.

Data Collection and Analysis

Screening and study selection

The screening of the studies was undertaken in two stages by two independent researchers in EPPI reviewer 4. The first stage is title and abstract screening, and the second stage involved the full text screening. The screening was done with the inclusion criteria for this review with a third-party arbitrator in case of disagreement (HW).

Data extraction and management

For impact and process evaluations/qualitative studies, we used a standardized data extraction form (Annexure 1) 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 (SM and AM) 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).

For effectiveness studies, extraction of raw data from evaluations was conducted by two authors (HG and SM) independently of one another. All relevant information was extracted for all outcomes reported by the primary evaluations and agreement between the coders was assessed. Any disputes were discussed and resolved.

Assessment of risk of bias in included reviews

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 C). Critical appraisal assessment was completed by two reviewers (SM and AM).

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
- Evaluation Question

The qualitative tools 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?

Meta- analysis

The following sections describe the procedure for conducting a meta-analysis of sports intervention programmes. Multiple meta-analyses were conducted for different outcomes that were reported by the primary evaluations, and each meta-analysis followed the same procedure.

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., Gatz et al., 2019). 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) was 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., Nichols, 2007).

Additional information or clarification was requested for five evaluations eligible for inclusion in the meta-analysis (i.e., Antonio & Shutt, 2016; Olive, 2021; Shachar et al., 2016; Terry et al., 2014; Zivin et al., 2001). The outcomes reported in this evaluation were unclear and the author did not respond to our request for clarification. We sought additional raw data for the evaluation by Shachar et al. (2016), as the authors reported disaggregated baseline data by gender and ethnicity (i.e., for Jewish girls and boys and Arabic girls and boys). When no response was received, we used the mean gain scores to estimate an effect size.

Assessment of heterogeneity

Heterogeneity between effect sizes studies is assessed by reporting the *Q*-value, degrees of freedom and the value of I^2. We reported on the variance components at each level of the three-level meta-analytical model, if such a model is used. Forest plots were generated for the visual representation of pooled effect sizes on both anti-social behaviour and youth offending. The causes of heterogeneity, if any, were identified by visual inspection and moderator analysis. Separate forest plots will be presented for important moderators.

Intention to treat (ITT) versus treatment of the treated (ToT) outcome measures

High attrition is a problem in many youth programmes. Differential attrition was reported during the coding stage for all quantitative studies where possible. Where attrition is high then it matters whether the reported effect size is ITT or ToT. The two should not be combined in a single meta-analysis. Where a study reports a ToT effect size it can be converted to ITT if the data are available to do so, so that the study can be used in the overall analysis of ITT effects.

Treatment of publication bias

Publication-selection bias was assessed for the primary outcomes of anti-social behaviour, youth offending and violence by constructing a funnel plot for each of the three outcomes (Higgins and Green, 2011). The funnel plot is used for a trim-and-fill analysis and the calculation of Egger's test.

Mixed method analysis (treatment of qualitative research)

In this review we have adopted the approach, that combined the qualitative data with a quantitative meta-analysis, within the framework of a theory-based systematic review, TBSR (White, 2018). In 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.

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. 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, sports programmes may have both direct and indirect effects on time use, which reduce opportunities for criminal behaviour, and so to reduced criminal behaviour and police contact. Quotes from young people or their parents supporting these causal mechanisms add colour to the report, strengthening confidence in the effect as one that does operate through the posited causal mechanism.
- Used to *explain* study findings. The TBSR approach uses the funnel of attrition to recognize the fact that effect sizes get smaller moving along the causal chain from outputs and intermediate outcomes to final outcomes. The relevant factors in sport may include lack of participation for various reasons, weak links in the causal chain (for example, qualitative studies highlight that young offenders may not lack self-esteem, so the causal mechanism through higher self-esteem through sports participation won't operate), the limited duration of programmes especially in the absence of opportunities for continued participation, and that sports may actually provide a channel for anti-social behaviour and aggression. See Appendix G or an illustration of the funnel of attrition.
- The previous point contains examples where qualitative data may contradict or *refute* the intended causal mechanisms, possibly leading to a counter-theory (Carvalho and White, 2004), e.g., that programmes for at risk youth may have iatrogenic effects but 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.

The TBSR framework is shown in Table 4. Quantitative data are indicated as Qt and qualitative as Ql. 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/Ql)
Enter the programme	Attrition (Qt)
Stay with programme for whole duration	Reasons do not participate or remain in programme (Ql)
Activities undertaken	Descriptive material (Ql)
Informal mentoring role	Mentoring relationship (Ql)
Diversion	Time use (Qt and Ql)
Connection to services	Channels for service connection (Ql)
Behavioural impact	Pro-social behaviour. Self-worth. Outlook. (Qt supported by Ql).
Anti-social behaviour and delinquency	Anti-social behaviour, aggression, and criminal behaviour. Police contacts. (Qt)

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 (e.g., for Sports and Sports+). 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

	Design	Implementation	Barriers & facilitators	Causal processes	Impact	
Case 1						Horizontal synthesis
Case 2						

Case n	Vertical synthesis	Overall synthesis

Cost analysis

For the cost analysis in the review, we extracted data relating to costs from impact evaluations, process evaluations and cost related studies (cost effectiveness, cost-analysis and studies that report cost estimates).

4. Results

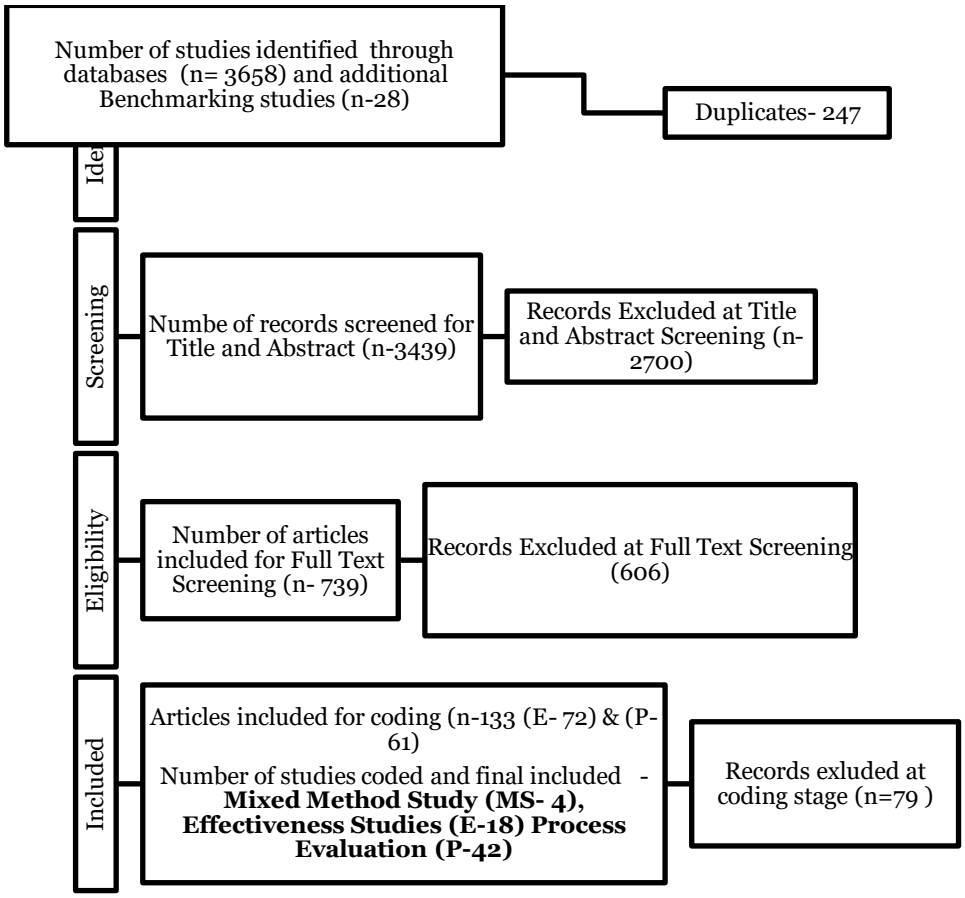
Description of studies

The database search identified 3,658 studies out of which 247 were duplicates, leaving 3,420 studies for the title and abstract screening plus an additional 19 benchmarking studies.[16] Of these, 739 studies were screened for full text. We have excluded 606 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 133 studies for coding. Among them, 72 were effectiveness studies and 61 were process evaluation. From these. we excluded 44 studies from the effectiveness 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 22 effectiveness studies and 42 qualitative and process evaluations from databases searches. (Figure 2- PRISMA Diagram) (of these four are mixed methods studies falling in both categories).

[16] Studies identified before the search to test the search. There were 28 of these, but nine were duplicates with studies identified in the database search. The benchmark studies came from the YEF Evidence and Gap Map and supplementary scoping studies.

Figure 2- PRISMA Diagram



Characteristics of the Included Studies (Effectiveness)

The included studies include:

- 4 Mixed Method studies, of which
    - 1 Non-Experimental, Process Evaluation and Cost Analysis
    - 2 Non- Experimental and PE
    - 1 Experimental and PE
- 18 effectiveness studies, of which
    - 3 are randomized control trials,
    - 15 are non – experimental effectiveness studies
    - 1 study with the cost- analysis.
- 38 Process Evaluations.

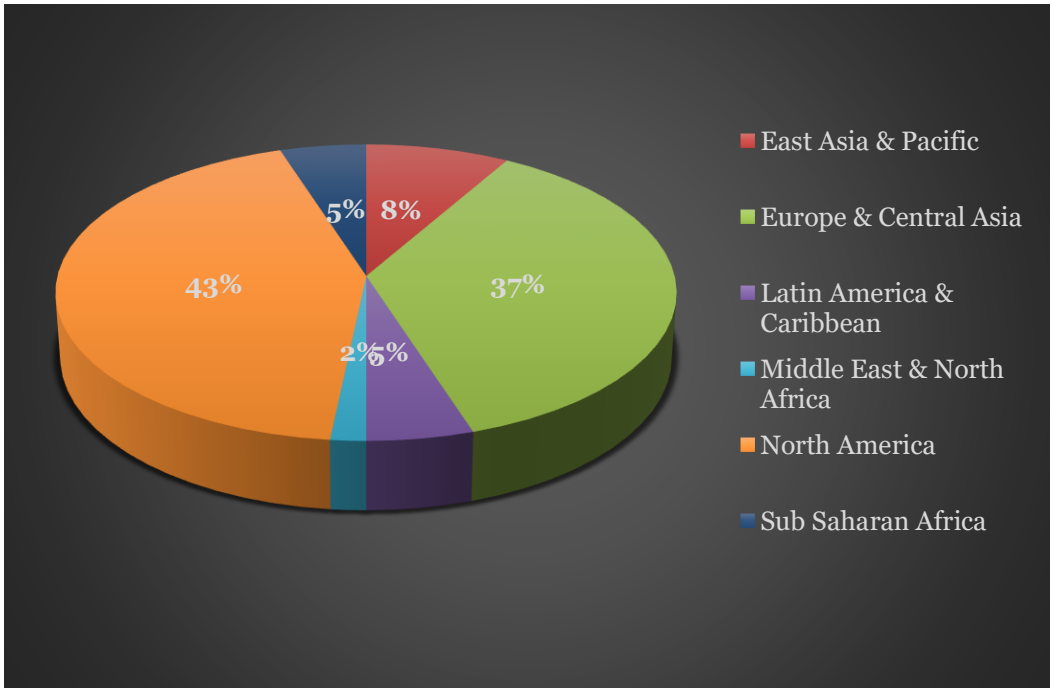
There are only two studies with cost- analysis, one is mixed method study, and one is effectiveness study

Most of the studies excluded at the coding stages due to the study design and they have no comparison group (see the characteristics of the excluded studies table). Others reason for exclusion are population are not at risk. There were some studies for which the full text not obtained.

Geographical Area

The majority of the included studies are from North America (26 studies, Figure 3) with the others mainly from Europe, especially the UK. We have found no studies from South Asia. The studies are mostly from high-income countries (54 studies) and only 6 studies are from upper-middle-income countries.

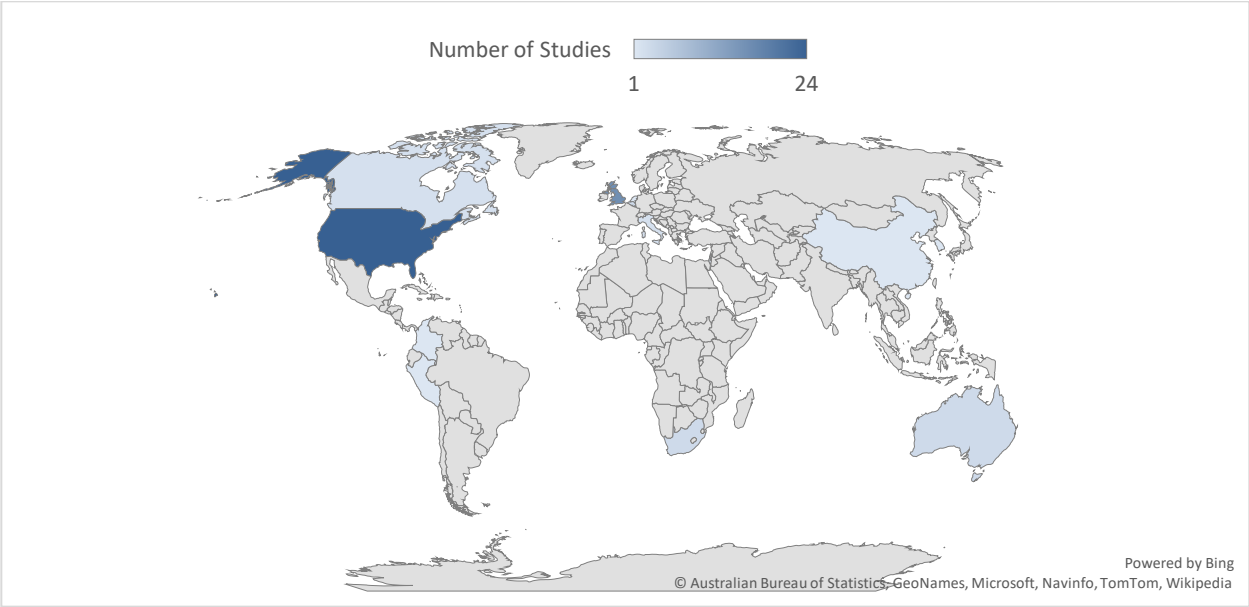
Figure 3 – Percentage of total studies as per the region



Studies classified by country

The majority of the studies the United States of America and the United Kingdom (24 and 16 respectively, Figure 4). This is followed by three from Australia, Belgium and South Africa. Two studies are from Canada and Italy, other than that only one studies from the following countries (China, Colombia, Israel, Netherlands, South Korea, St. Lucia and Peru)

Figure 4 – Country Wise representation of the included studies

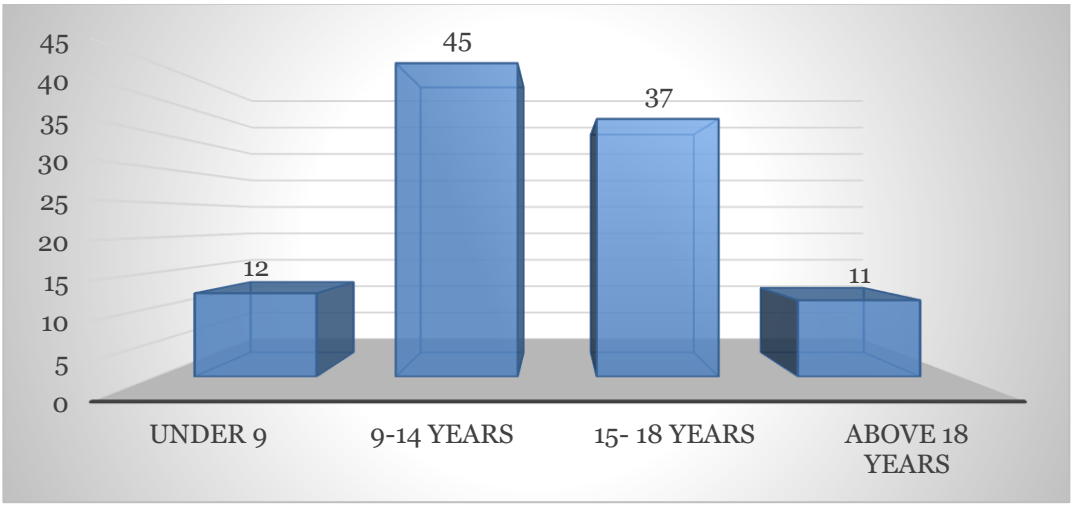


Study Populations (Effectiveness and Process Evaluation)

Age of the Participants

The population in this review were children and young people 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 (45 studies) concern youth in the age group of 9-14 years, 37 studies the age group of 15-18 years, 12 studies children under 9, and 11 studies have a population above 18 years (Figure 5). Some studies have CYP from more than one age category.

Figure 5 Age of the Participants



Gender

There are 31 studies where the intervention included both genders. But there were 14 studies where intervention was exclusively focused on males such as the Martial Arts program in the UK, Promoting Achievement Through Sports (PATS) – Soccer Program in USA, Gentle Warriors in the USA, 'Get Onside' sporting intervention program for young offenders (Rugby Sport Intervention) in the UK and Traditional Martial Art in the USA.

There are only four studies about interventions for females only, such as "Do the Good" (DtG) in the USA. The intervention is for traumatized girls in residential treatment which is based on sports-themed therapeutic goal modules. It also includes sports sessions on basketball, soccer, and softball. The enrolment is voluntary, and girls participate in a once-weekly hour-long basketball game against a competing residential treatment facility team over a 5-month season. Three games are held each night and once every 6 weeks they attend a skills clinics.

Ethnic minorities There are only eight studies where the ethnic minority population is more than 80%. An example is 'Promoting Achievement Through Sports (PATS) – Soccer Program' in the USA. The PATS began as an afterschool soccer program at schools in California. The school serves predominantly low socioeconomic and ethnic minority populations. The program was held on two days (Wednesdays and Fridays) from 3-5 pm and games were usually played on Saturdays.

There are 19 studies, where the ethnic minority population is partial and there are 5 studies where the ethnic minority population is not very clearly mentioned. Overall, 45% of the studies included in this review have some ethnic minority participants.

Overview – Interventions and Outcomes

Type of the Intervention

The included studies study 47 sports-based interventions, 7 sports plus intervention and 7 physical activity interventions. The included studies have a range of different sports. In team sports basketball has the most studies (17 studies), followed by American football and football (soccer) (Table 6). Examples of each are:

- Basketball was one of five sports offered weekly by the Sports Club in Project Effort, an afterschool program for elementary students (Martinek et al., 2001). Basketball was also one of the sports offered in a summer camp which ran daily on week days for six weeks in the southwest United States in an area with a largely Hispanic population (Yang, 2016), Midnight Basketball programmes are, as the

name suggests, organized basketball sessions held on community basketball courts at midnight in cities across the United States (Hartmann and Depro, 2006).

- A girls-only soccer programme for at risk girls of offending behaviour in a residential facility in St. Lucia in which a certified coach offered weekly sessions (Zipp, 2017). The Sky Sports Living For Sport (SSLfS) programme in the UK included soccer and other sports in a school-based programme for children with problem behavior (Armour, 2013).

For individual sports Martial Arts is most common with 11 studies (Table 6). Glanz (1994) presents findings from a martial arts program built into the school curriculum for children who are involved in gangs or thought likely to join them. Gentle Warriors is a martial arts program in schools in Kansas with high suspension rates and problems with student aggression (Smith et al., 1999).

In physical activities there is just one study, which is for yoga and other aerobic exercises.

Table 6- Number of the studies included as per the intervention

Type of Sports	Sports Intervention	Sport Plus	Physical Activity
Basketball	15	2	
Football	14	1	
Soccer	13	2	
Martial Arts	10	1	
Boxing	4	2	
Volleyball	4		
Tennis	2		
Swimming	2		
Hockey	2		
Baseball	2		
Cricket	1		
Badminton	1		
Karate	1		
Rugby	1		
Squash		1	
Yoga		1	1

Aerobics			1
Other	**14**	**3**	**3**

Sports plus components

Sports programmes for CYP at risk usually comprise more than just sports, containing either formal or informal additional components to support positive youth development. The 'plus' elements in the different interventions varied widely, but can be broadly classified as:

- *Education and vocational courses*: these included after school programmes which combined academic and sports components (e.g. Abuga, 2007) or sports academies in custodial settings which similarly combine sports and academic work (e.g. Andrews, 2014), as well sports-club based programmes with an educational element – the Squash Smarts programme had three weekly sessions each of which was 90 minutes of squash and 90 minutes of homework help (Green, 2010) – and the Fairbridge programme included a wide range of sporting activities but also vocational and life skills training (Nichols, 2007). In the case of Promoting Achievement Through Sports (PATS), a programme for low socio-economic status middle school children in California, additional tutoring was provided for those whose grade point average was not satisfactory (Freitag, 2006).

- *Life skills:* are provided in examples such as the five-month Do the Good (DtG) programme of competitive sport for females in residential setting (D'Andrea, 2013), a sports and education programme for young people who are disadvantaged and aged 15-18 years (Cowan, 2012) and the PATS programme mentioned above (Freitag, 2006). The martial arts programme which included teaching the moral philosophy of martial arts also falls into this category (Fung, 2018) and the Buddhist Martial Arts programme, *Chuan Fa*, which included study of dharma teachings (Mendenhall, 2006).

- *Psycho-social interventions*: such as social-emotional learning as part of the daily Physical Activity and Learning (PAL) Program for young children with behavioural problems (Olive, 2021), mindfulness in the Integra Mindfulness Martial Arts for adolescents (studied by Mexiner, 2018 and Milligan, 2017), as well as meditation in the *Chaun Fa* programme (Mendenhall, 2006).

- *Mentoring*: which is both formal – such as the sports and mentoring programme Project Effort (Martinek, 2001), the sports and music intervention in New York (Cohen, 2018) and it is listed as one of the activities in Sports Academies in a custodial setting (Andrews, 2014) – and informal – for example, in a one-on-one programme to develop interest in sports and work toward a coaching qualification, in which the assigned counsellor gave general advice and support and maintained contact after the programme.

- *Social skills* including team building activities: the LiFEsports Summer Camp program combines educational activities and sport-based programming session which includes basketball, football, health and fitness, lacrosse, running, soccer, social dance, softball, swimming, tennis, ultimate frisbee, and volleyball with the development of four life skills known as S.E.T.S. (i.e., self-control, effort, teamwork, and social responsibility) (Newman, 2020), and other interventions had team building around challenge activities such as rock climbing (e.g. Armour, 2013).

- *Coaching*: some programmes provide the opportunity for participants to acquire coaching qualification (e.g. Nichols, 2007), or to take part in coaching within the programme (e.g. Football United – Nathan, 2013), which teaches useful skills, adds to their CV, and may lead to employment.

- *Offending and substance abuse-oriented interventions*: midnight basket programmes in the United States required a police presence to help build community relations, but some cases of the programme also included conflict resolution and drug prevention interventions (Hartmann, 2006), and another project provided advisory services regarding drugs and safe sex (Crabbe, 2015)

- *Connections to service*: sports academies in prison include discharge support including accommodation and dealing with the Youth Offending Team (Andrews, 2014), and in another case the sports coach made appointments for services including accommodation (Nichols, 2007).

- *Other leisure activities* such as music (e.g. Cohen ,2018), and movies (Kim, 2018).

Level and setting

Roughly equal numbers of interventions took place in community and school settings (28 and 23 respectively), with just three in custodial settings and three in non-custodial residential settings such as summer camps. The review included 54 secondary interventions, targeted to CYP who are at risk of offending and 6 tertiary interventions with CYP who have already offended (Table 7).

Table 7- Number of studies by intervention setting

Intervention Setting	Total
Sports or youth club	3
School	23
Community	28
Custodial setting	3
Non- Custodial Residential (Summer Camps etc)	3

Six tertiary interventions are included. These are:

- 'Get Onside' rugby sports intervention attempts to involve the young offenders aged 18-21 years in custody at HMP YOI Feltham, UK. The participants were selected by the coordinator based on the criteria. In this study, 24 young offenders participated in a ten-week course and 72 hours of rugby session. The study measured the self–reported measures of aggression, self-esteem, and impulsivity (Williams (2015)
- West Yorkshire Sports Counselling, UK. The project involved 329 probationers aged 16- 25 years who participated in 12 weeks of sports-based activities. The youth are referred by the probation officer. The study analyzed the reconviction rate among the treatment and control groups. (Nichols (2017- titled West Yorkshine Sports Counselling').
- A multisports' initiative in a Young Offender Institution in the South of England. The programme is for 12 weeks duration, it was structured around series of sports -based 'academies' included sporting activity such as football, boxing, rugby or cricket. The sports academics included sports coaching, sport education qualifications, life-skills mentoring, community placements, community/industry-related guest events and pre-release resettlement support, providing assistance to young people in their negotiations with caseworkers and issues surrounding family reengagement. Andrew (2014).

- Fight with Insight, Johannesburg, South Africa, twelve-week programme offered boxing as an alternative treatment. The programme also provides the cognitive – behavioural group therapy session. Draper (2013)
- A twelve – week Buddhist Martial arts training program in Mill Creek Youth Center (Utah's largest Division of Juvenile Justice Services secure care facility). The 12 selected participants in age from 16-21 practiced Chuan Fa (a form of Buddhist martial arts), it helps to resolve emotional problems, curb aggressive tendencies, develop self-awareness, and cultivate a strong moral foundation Mendenhall (2006).
- The Summit Program which involved sporting activities taken part in one-to-one basis with a sports leader. The youth aged 14-17 years a lot, involved in 3-hour session appropriate for one activity and 1 hour for another. The programme is designed as per the client's need (Nichols (2017- Summit).

Intervention targeting and recruitment mechanisms

Recruitment approaches vary by setting. In a school and custodial settings, there is a 'captive population', though for schools CYP at risk need to be identified. In a community setting different approaches are needed to identity and reach those CYP.

***School-based programmes*:** In some cases, interventions were schools in areas with a disproportionate share of high risk CYP, such as the after-school programme studied by Agbuga (2007) which served at risk children in third to sixth grade who were mostly from African-American and Hispanic-American backgrounds. Other school-based programmes identified childrenwith behavioural difficulties either by formal testing or by identification by school staff. An example of the former is a martial arts programme in Hong Kong identified children with aggressive behaviour using a screening questionnaire (Fung, 2018). And an example of the latter is a twenty-week Aerobic Fitness Program for 11-14 year old girls who were struggling socially or academically were selected by a team of program coordinators, social workers, middle school teachers, instructional support teams, and nurses (Gatz, 2019). A study in elementary schools in Israel used referrals by school staff (e.g. principal, homeroom teacher, psychologist, and counsellor) of children demonstrating aggressive behaviour with the additional conditions that they were not subject to a therapeutic intervention and that they liked sports (Sharchar et al., 2016).

Community-based programmes: rely on geographical targeting, referrals, word of mouth and street recruitment (outreach). For example, a soccer coaching programme in disadvantaged areas in Scotland relied on direct recruitment by outreach workers and referrals from agencies working with young people, such as job centers and local youth services (Cowan, 2012). The Club Deportivo Dan soccer programme in Peru used referrals from existing members, word of mouth so eligible youth coming forward, and 'street recruitment, that is one-on-one interactions with adolescents on the streets of the area around the project site (Antonio

2016 and 2017). The Link4Life project in Rochdale (England, UK) carried out activities in a park near the local shops where CYP congregated, managing to attract them from there to the park. Coatler (2013) reviews a number of programmes in England and Scotland which were geographically targeted, including soccer in a deprived inner-city area, and a basketball programme in deprived areas in city in Scotland.

Outcome Categories

The review included the studies which evaluated the effects of the sports and physical activity intervention in changing the anti-social behaviours and offending outcomes. In terms of primary outcomes, the review identified 22 studies about behavioural outcomes such as aggression, anti-social and delinquent behaviour, externalizing behaviour, social skills, and pro-social behaviour (Figure 6). The review included thirteen (14) studies that evaluated psychosocial and cognitive outcomes such as self-esteem, self-control, and Mental Health. There are three studies with the offending outcomes. In secondary outcomes, we identified only two studies with attitudes and belief outcomes. And there are thirteen included studies which measure the effects on protective factors, mainly engagement in education and academic achievement.

Figure 6- Number of the studies in each outcome categories and sub-categories

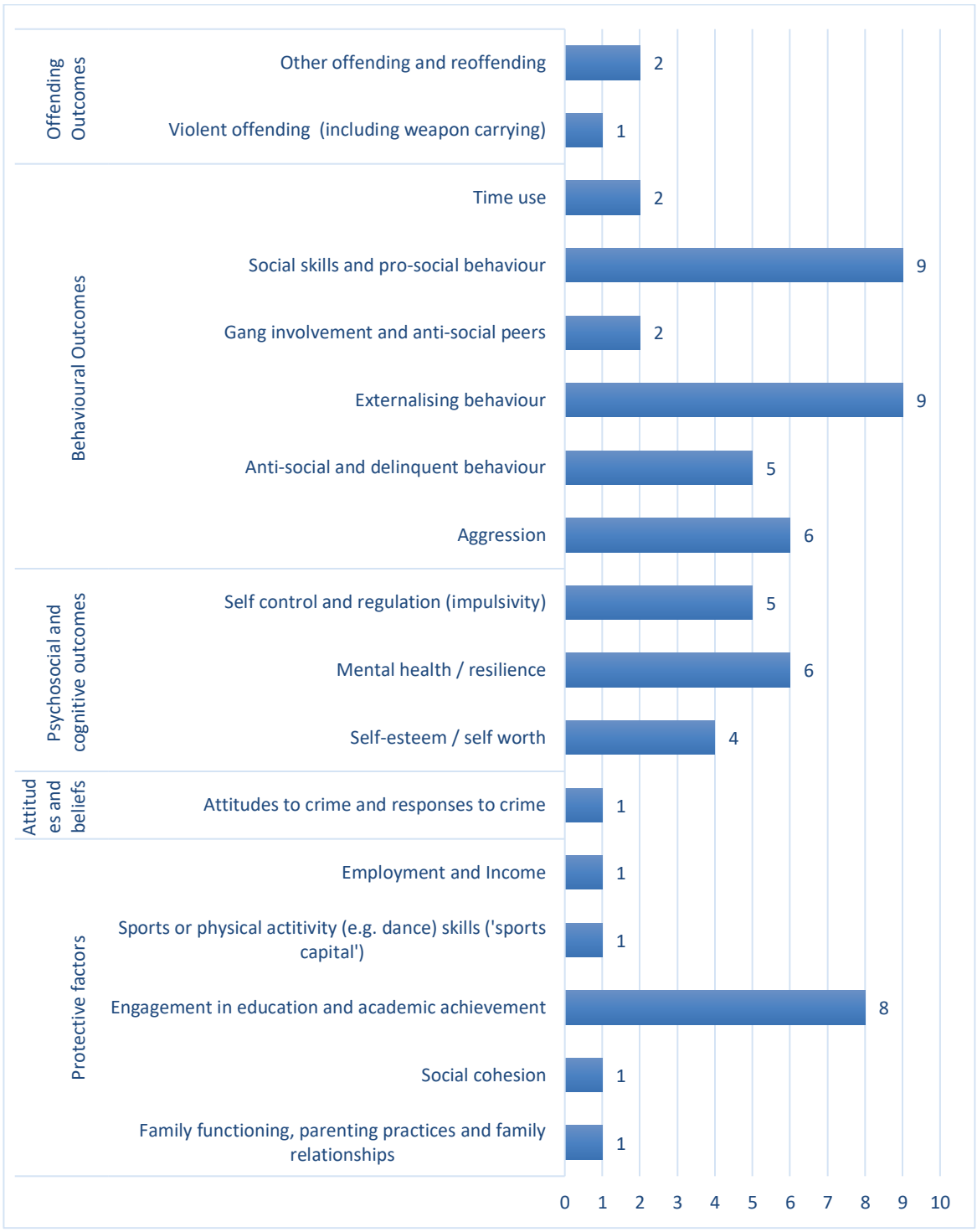

Offending Outcomes
Other offending and reoffending
2
Violent offending (including weapon carrying)
1
Behavioural Outcomes
Time use
2
Social skills and pro-social behaviour
9
Gang involvement and anti-social peers
2
Externalising behaviour
9
Anti-social and delinquent behaviour
5
Aggression
6
Psychosocial and cognitive outcomes
Self control and regulation (impulsivity)
5
Mental health / resilience
6
Self-esteem / self worth
4
Attitudes and beliefs
Attitudes to crime and responses to crime
1
Protective factors
Employment and Income
1
Sports or physical actitivity (e.g. dance) skills ('sports capital')
1
Engagement in education and academic achievement
8
Social cohesion
1
Family functioning, parenting practices and family relationships
1
0 1 2 3 4 5 6 7 8 9 10

Table 8 Characteristics of the Included Studies

Effectiveness Study and Mixed Method								
Author and Year	**Name of the country/ Intervention Name/**	**Study design**	**Type of Intervention**	**Type of Sport**	**Duration of the Intervention**	**Target population/age**	**Location /Settings**	**Outcome Domain**
Anderson 1999	UK	Non-Experimental design	Sports intervention	Basketball Martial arts, *Karate, Baseball*	2 months	Under 9-9-14 Years	School – Urban	Behavioural Outcomes Psychosocial and cognitive outcomes
Antonio (2016)	Peru Club Deportivo Dan	Non-Experimental design	Sports intervention	Soccer		15-18 years	Sports or youth club-Urban	Behavioural Outcomes Protective factors
D'Andrea (2013)	USA Do the Good (DtG)	Non-Experimental design	Sports intervention	Basketball	5 months	9-14 Years-15-18 years-Above 18 Years`	Non-Custodial Residential (Summer	- Behavioural Outcomes -

							Camps etc)/urban	Psychosocial and cognitive outcomes
Freitag (2006)	USA Promoting achievement through sports (PATS)- Soccer Program	Non-Experimental design	Sports intervention	Soccer	5 months	9-14 Years	School/Urban	-Protective factors
Fung (2018)	China Chinese Martial Arts	Experimental design	Sports intervention	martial arts	Ten 90 minute weekly sessions (15 hours in total)	Under 9-9-14 Years/Both	School/Urban	- Behavioural Outcomes - Psychosocial and cognitive outcomes
Gatz (2019)	USA Aerobic Fitness Program	Non-Experimental design	Physical Activity	Aerobics	20 weeks	9-14 Years	School/Urban	- Behavioural

								Outcomes - Psychosocial and cognitive outcomes -Protective factors
Green (2010)	USA Squash Smarts	Non-Experimental design	Sports intervention	Squash	8 months	9-14 Years	School/Urban	- Behavioural Outcomes -Protective factors
Hartmann (2006)	USA Midnight basketball Program	Non-Experimental design	Sports intervention	Basketball		Above 18 Years	Community/Urban	-Offending Outcomes
Jones (1989)	Canada Ottawa Project	-Non-Experimental design -Cost Analysis	Sports intervention	Swimming, hockey		Under 9 -9-14 Years -15- 18 years/Both	Community/Urban	- Behavioural Outcomes -

								Psychosocial and cognitive outcomes
Kebles (1995)	USA Non-competitive basketball	Non-Experimental design	Sports intervention	Basketball	10 weeks	9-14 Years-Under 9/Both	Community/Urban	-Behavioural Outcomes -Psychosocial and cognitive outcomes -Protective factors
Mason, (2017)	UK Street Games Pilot	-Non-Experimental design -Process Evaluation -Cost Analysis	Sports intervention	Boxing ,Football, Multi-Sport and Skateboard	48 weeks	9-18 years and above/Both	Community/Urban	-Behavioural Outcomes

Nathan (2013)	Australia Football United Program	-Non-Experimental design -Process Evaluation	Sports intervention	Football		9-18 years/Both	School/Urban	-Behavioural Outcomes -Psychosocial and cognitive outcomes -Protective factors
Nichols (2007)	UK, West Yorkshine Sports Counselling	-Non-Experimental design -Process Evaluation	Sports intervention		12 Weeks	15-18 and above 18 years	Community/Urban	Offending Outcomes
Olive (2021)	USA Physical Activity and Learning (PAL) Program	Non-Experimental design	Physical Activity	Physical activity	4-week	9-14 years/both	School/Urban	-Behavioural Outcomes

Palermo (2006)	Italy Wa Do Ryu karate program	Experimental design	Sports intervention	Karate	10 months	9-14 years/both	Community/Urban	- Behavioural Outcomes - Psychosocial and cognitive outcomes
Shachar (2016)	Israel	Non-Experimental design	Sports Intervention	*soccer, basketball, volleyball, mini-football, capoeira*), Martial arts	120 hours (24 weeks)	Under 9-9-14 Years/Both	School/Urban	- Behavioural Outcomes - Psychosocial and cognitive outcomes
Smith (1999)	USA Gentle Warriors	Non-Experimental design	Sports Intervention	Martial Arts	not reported	9-14 Years/male	School/Urban	- Behavioural Outcomes

								-Protective factors
Spruit (2018)	Netherlends Only You Decide Who You Are (Dutch sports-based intervention)	Non-Experimental design	Sports Intervention	Soccer, basketball, baseball	1 year	9-18 years/Both	Community/Urban	-Behavioural Outcomes -Offending Outcomes -Protective factors
Terry (2014)	Australia Boxâ€™Tag programme	Experimental design	Sports Intervention	Boxing	8 weeks	9-14 years/both	School/Urban	-Behavioural Outcomes -Psychosocial and cognitive outcomes
Velasquez (2015)	Colombia yoga workshop	Experimental design	Physical Activity	Yoga	12 weeks	9 to 18 years/gender not reported	School/Urban	-Behavioural Outcomes

								- Psychosocial and cognitive outcomes
Williams (2015)	UK Rugby Get Onside	Non-Experimental design	Sports Intervention	Sports intervention-	10 weeks	Above 18 Years/male	Custodial setting/urban	- Behavioural Outcomes - Psychosocial and cognitive outcomes -Attitudes and beliefs
Zivin (2001)	USA Traditional martial arts	Non-Experimental design	Sports Intervention	martial arts-traditional martial arts	30 sessions	9-18 years/male	School/Urban	- Behavioural Outcomes - Psychosocial and

								cognitive outcomes -Protective factors

Characteristics of the Qualitative/ Process Evaluations

Author and Year	Name of the country/ Name of the Intervention	Type of Intervention	Type of Sports	Duration of the Intervention	Target population/age	Location /Settings
Agbuga (2007)	USA Catch 22	Physical Activity	Aerobic games, sports, jumping rope, parachute activities, and muscular strength games	*1 Month*	Under 9 to 14 Years	School
Andrew (2014)	UK, Sports Programme	Sports Intervention	Boxing , Cricket, Football *Rugby*	*12 Week*	15- 18 years	Custodial setting
Armour (2013)	Sky Sports Living For Sport (SSLfS) UK	Sports Intervention Physical Activity	Basketball, Football, Swimming Hiking or walking, Badminton, Hockey, *High ropes courses, caving, sailing, hiking, and rafting*	*5 years*	9-14 Years	School

Barnes (2010)	Catch 22 UK	Sports Intervention		Not reported	15- 18 years	Community
Brake (2020)	Soccer Program, Canada	Sports Intervention	Soccer	*3 years*	15- 18 years	Community
Coalter (2013)	UK	Sports Intervention Sports Plus Intervention	Basketball, Football, *Soccer*	*3 Years*	9 to 18 years	Community
Cohen (2018)	USA Hip Hop Loves	Sports Plus Intervention	Boxing , Yoga *Hip Hop, Kick- Boxing*	Not reported	Not reported	Community
Cordova (2020)	USA *GISP*	Sports Intervention	*Customized sports-based development Programme- Modified Games and challenging Fitness activities*	*8 weeks session*	9 to 18 years	Community
Cowan (2012)	UK	Sports Intervention	Soccer	*13 Week*	15 to Above 18 Years	Community
Crabbe (2005)	UK Positive Futures	Sports Intervention	Football	*13 weeks*	9 to 18 years	Community
DinanThompson (2008)	Australia Kick Start Program	Sports Intervention	Football	Not reported	9 to 18 years	Community

Draper (2013)	South Africa Fight with insight programme	Sports Intervention	Boxing	*12 weeks*	9 to 18 years	Community
Draper (2016)	South Africa Buffalo City Soccer School (BCSS)	Sports Plus Intervention	Soccer	Not reported	9 to 18 years	School
Evi (2015)	Soccer coach training program *Brussels*	Sports Intervention	Soccer	*3 Years*	15- 18 years	Community
Gipson (2018)	USA Cross Fit	Sports Intervention	Basketball, Football	*12 Weeks*	Not reported	Community
Glanz (1994)	USA Martial Arts Program	Sports Intervention	Martial arts	Not reported	Under 9 to 14 Years	School
Gozzoli (2013)	Italy	Sports Intervention	Soccer , Volleyball , Basketball		Under 9 to 18 years	
Hartmann (2003)	USA	Sports Intervention	Basketball		9 to Above 18 Years	Community
Haudenhuyse (2012)	*Belgium* Boxing Upward	Sports Plus Intervention	Boxing	Not reported	15- 18 years	Sports or youth club
Kelly (2013)	UK, Positive Future	Sports Intervention		Not reported	9 to Above 18 Years	Community
Kim (2008)	Teacher-Student-Together (TST) programs *South Korea*	Sports Intervention	*Floorball,Bowling* Soccer	*One Year*	9 to 18 years	School

Markowitz (2011)	USA,Powerplay	Sports Intervention	Basketball, Football, Volleyball Tennis, Soccer		9 to 18 years	
Martinek (2001)	USA, Project Effort	Physical Activity		*6 Months*	Under 9 to 14 Years	Sports or youth club
Marttinen (2019)	USA, REACH	Physical Activity		Not reported	9-14 Years	School
Meixner (2019)	USA,Integra Mindfulness martial arts	Sports Intervention	Martial arts	*20 Week Program (2 years)*	9 to 18 years	School
Mendenhall (2006)	USA, Buddhist martial arts	Sports Intervention	Martial arts	*12 Weeks*	15 to Above 18 Years	Custodial setting
Milligan (2017)	USA, Integra Mindfulness Martial Arts (Integra MMATM)	Sports Intervention	Martial arts	*20 Weeks*	9 to 18 years	School
Newman (2020)	USA,LiFEsports	Sports Intervention	Volleyball , Basketball, Football *health and fitness, lacrosse, running, , social dance, softball, swimming, tennis,*	*18 Weeks*	9-14 Years	Non-Custodial Residential (Summer Camps etc)

			and ultimate frisbee, Soccer			
Nichols (2007)	UK,Northtown Parks for all (Martial Art Centers) dojos	Sports Intervention	Martial arts	*5 hours in a week*	9 to 18 years	Community
Nichols (2007)	UK,West Yorkshine Sports Counselling	Sports Intervention		*12 Weeks*	15 to Above 18 Years	Community
Nichols, (2007)	UK, Clontarf Foundation's Football Academies	Sports Intervention	Football	Not reported	9 to 18 years	Community
Nichols, (2007)	UK,Summit Programme	Sports Intervention		Not reported	9 to 18 years	Community
Nichols, (2007)	UK, Splash Programme	Sports Intervention		*5 weeks*	Under 9 to 18 years	Community
Schaillee (2017)	Urban dance programmes- 1. Â€˜Zwartbergâ€™ (literally: â€˜Black Mountainâ€™) 2. Jeugd en Stadâ€™ (in short JES; literally: â€˜Youth and Cityâ€™) 3. Letâ€™s Go Urbanâ€™ (in short LGU) *Belgium*	Physical Activity	*Dance*	*1-3 Years*	9 to Above 18 Years	Community

Swendeman (2019)	South Africa	Sports Intervention	Soccer		15 to Above 18 Years	
Walsh (2010)	USA, TPSR-based program, Coaching Club	Sports Intervention	Basketball	*2 years (45 Sessions)*	9-14 Years	School
Yang (2016)	USA, Sports Summer Camp	Sports Intervention	Basketball, Football , Tennis, Soccer *Track & field and baseball*	Not reported		Non-Custodial Residential (Summer Camps etc)
Zipp (2017)	St. Lucia, Others Sports and Physical Activity Interventions	Sports Intervention	Football, *Dance*	Not reported	9 to 18 years	Community

Table 9- Characteristics of the Excluded Studies

Author and Year	Type of Intervention/ Type of Sport.	Name of the country/ Intervention Name/	Reason For Exclusion
Basaran (2016)	Sports intervention-Judo, table tennis, ice skating, gymnastics, and taekwondo-8 weeks	Turkey Our Future is Safe with Sport	Study Design – Before vs After

Castillo (2021)	Sports intervention-Karate-Afterschool program	USA After School program Traditional martial art of Kenpo Karate	Non – Experimental without comparison group
Conklin-Ginop (2011)	Physical activity-Dance	USA 4-H Bloco Drum and Dance	Study Design – Before vs After
Fleisher (1995)	Sports intervention-Judo	USA Judo/Community Organization Program	Study Design – Before vs After
Gardner (2012)	Organized Activity	USA After school programme	Associational study
Hastie (1999)	Sports intervention-Modified football	USA Kangroo Ball (Modified Football)	Study Design – Before vs After
Khoury-Kassabri (2018)	Sports intervention-Football, Soccer, Basketball, Tennis, Horseback riding and martial arts-Sports and physical activity interventions	Israel	Study Design – Before vs After

Meek (2012)	Sports intervention-Football	UK 2nd Chance Project rugby and football academies	Study Design – Before vs After
Riley (2017)	Sports intervention-Volleyball, Basketball, Football, Swimming, Health, and fitness, lacrosse, social dance, softball, Soccer	USA LifeSports	Study Design – Before vs After
Rodgers (2016)	Physical activity	USA Moving in the Spirit (MITS)	Non – Experimental without comparison group
Spruit (2018)	Sports intervention-Soccer, basketball, baseball	Netherlends Only You Decide Who You Are (Dutch sports-based intervention)	Study Design – Before vs After
Stevens (2017)	Sports intervention-tennis	USA ACE Afterschool Tennis Program	Study Design – Before vs After
Tester (1999)	Sports intervention-basketball	Singapore Sports Challenge program	Study Design – Before vs After

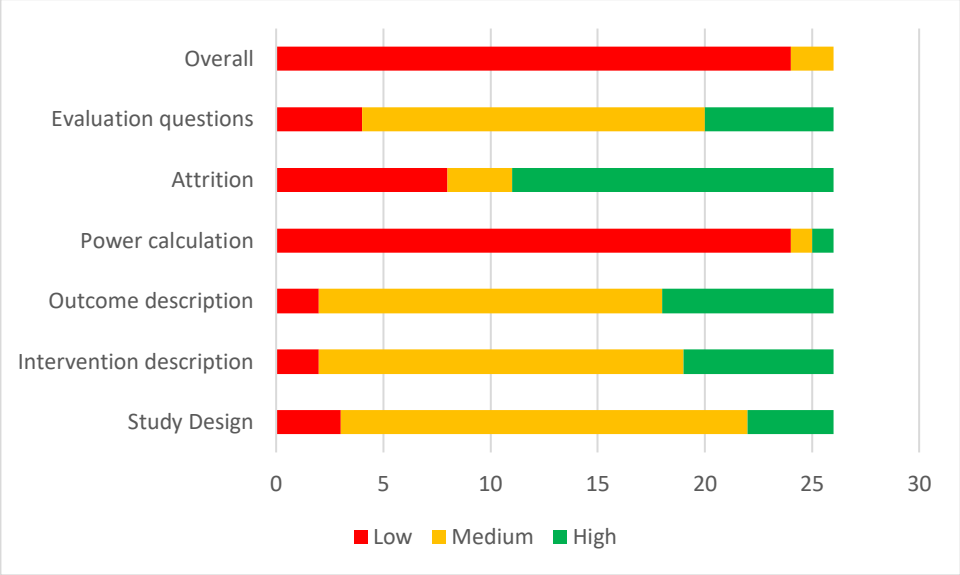
Twemlow (2008)	Sports intervention-martial arts	USA Gentle Warriors-Martial Arts	Study Design – Before vs After
Williams (2006)	Sports intervention-Basketball	USA Friday night youth basketball league	Study Design – Before vs After
Agbuga (2007)	Physical Activity, Aerobic games	USA Catch 22	Mixed method study, No Control group. Included only in process evaluation.
Cordova (2019)	Sports Intervention	USA GISP	Mixed method study, No Control group. Before vs After. Included only in process evaluation.
Markowitz (2010)	Sport Intervention – basketball, volleyball Football, lacrosse, tennis, rowing and soccer	USA Powerplay	Mixed method study, No Control group. Included only in process evaluation
Yang (2016)	Sports Intervention Basketball, Football, Tennis and Soccer	USA Sports Summer camp	Mixed method study, No Control group. Included only in process evaluation

Critical Appraisal of the studies

Effectiveness studies

The large majority of effectiveness studies (20 studies out of 22 studies) are rated as low confidence in study findings, with just two at medium and none as high confidence (Figure 7). Many studies have low attrition, reflecting that they are often short duration interventions in school settings, or even custodial settings. A large number are also assessed as high or medium confidence for intervention and outcome description, as well as for clear evaluation questions. But overall the assessment is largely low confidence owing to an absence of power calculations (and several studies have small sample size), and there are relatively few RCT, so study designs are at best medium confidence.

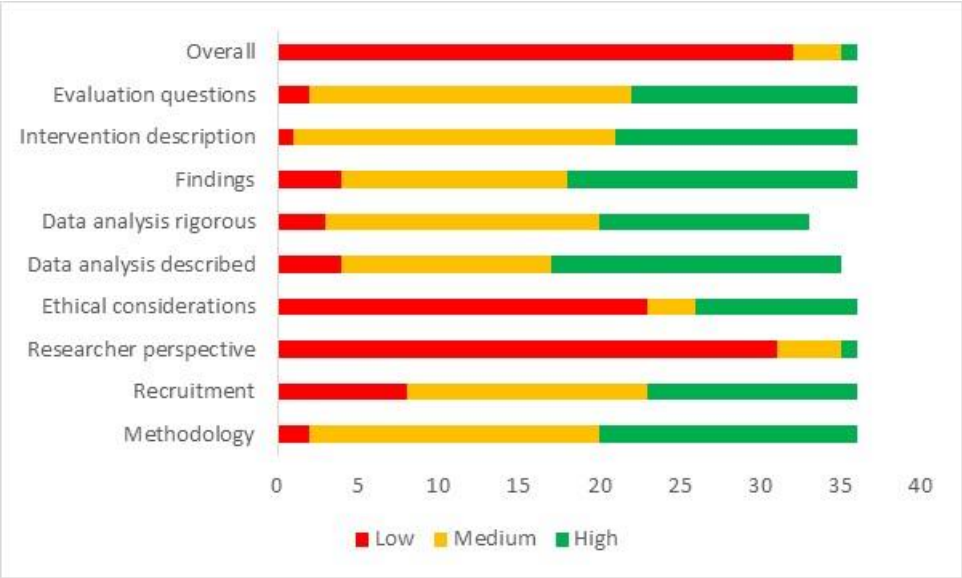
Figure 7 Critical appraisal of effectiveness studies (confidence in study findings)



Process evaluations

Figure 8 shows the findings from the critical appraisal of qualitative studies (process evaluations). Again, the majority are rated as low confidence (24 studies), with the lack of consideration into the researcher's own perspective being the main constraint.

Figure 8 Critical appraisal of process evaluations



5. Synthesis of the findings (Quantitative and Qualitative)

Results: Meta-Analysis

The following sections describe the procedure for conducting a meta-analysis of sports intervention programmes. Multiple meta-analyses were conducted for different outcomes that were reported by the primary evaluations, and each meta-analysis followed the same procedure.

Data extraction

Excluded studies

There were several studies eligible for inclusion in the systematic review of sports intervention programmes that were excluded from the meta-analysis. Table 10 describes these studies in further detail, along with any relevant effect size (n = 26). One study, Palmero et al. (2006) was excluded because the result was reported using the non-parametric Mann Whitney U test, and previous meta-analyses have suggested this statistic is ineligible for inclusion (.de). Zivin et al. (2001) reported the results of an evaluation of a martial arts programme to reduce violence amongst boys in US middle schools. However, the data is reported using graphs (see Figure 2, p. 449). No exact figures are reported, and so the information cannot be used to estimate an appropriate effect size.

Table 10

Studies excluded from the meta-analysis

Study	Description -> *Reason for exclusion*	Effect size
D'Andrea et al. (2013)	An evaluation of a sports-based intervention for female youth in a residential treatment centre. The programme was informed by trauma treatment principles and involved weekly basketball sessions. Participants were aged between 12 and 21 years old (N = 88) and voluntarily enrolled in the programme. Participants met the criteria for PTSD and had a history of adverse childhood experiences. -> *Sample; Outlier effect size*	Externalising and internalising behaviour both decreased in the experimental group compared to the control group. The effect sizes were considered outliers, and so excluded from the meta-analysis[17].
Gipson et al. (2018)	In a collaboration between the Boys and Girls club USA and CrossFit, a local gym implemented high-intensity CrossFit sessions for at-risk youth. Sessions occurred three times per week for 12 weeks and ten participants completed the programme, but no effectiveness outcomes are reported. -> *No evaluation data*	N/A
Hartmann & Depro (2006)	Using city-level crime data, this study compared the crime rates in cities that implemented a midnight basketball league with	Retrospective city-level crime data was used in a Wilcoxon rank sum test and found that the rate of

[17] For example, the effect size for externalising behaviour was OR = 528.82 and the effect size for internalising behaviour was OR = 1587.15. The review team collectively decided that these were outliers and that there was possibly an issue with the raw data that we could not rectify.

	comparable US cities that did not implement the sports-based initiative. The intervention was not specifically for children and young people. -> *No evaluation data*	violent crime (t = -2.56, p < .01) and property crime (t = -2.33, p < .01) decreased in cities with midnight basketball leagues in comparison to cities that did not. [p. 189]
Palmero (2006)	Evaluated the impact of a karate programme on externalising and internalising behaviours of 16 Italian children that met the diagnostic criteria for oppositional defiant disorder. Half of the participants (n = 8) participated in a 10-month karate programme and the remaining half acted as a control group. The outcomes were focused on temperament, specifically, the intensity, adaptability, and regulation of behaviours. ->*Inadequate data*	The results of a non-parametric comparison of mean scores at baseline and follow-up found that the intensity of problem behaviours (z = -3.608, p < .001), adaptability of problem behaviours (z = -2.095, p = .036), and mood regulation (z = -2.21, p = .027) all improved in the treatment group (n = 8) compared to the control group (n = 8). [Table 2, p. 658]
Smith (1999)	Evaluation of a martial arts intervention programme in two schools to reduce bullying behaviours. The 'Gentle Warriors' programme taught participants martial arts techniques, philosophies, and coping skills, meditation, and self-control. Outcomes were measured in interviews with a random selection of participants. -> *Inadequate data*	There was a notable decrease in the suspension rate at the intervention school, from 62% to 36% and a 32% decrease in referrals to the principal for problem behaviour in classrooms. [p. 34]
Zivin et al. (2001)	An evaluation of a martial arts intervention implemented with 60 middle school boys in the US and using a waitlist control group. Participants took part in 30 martial arts classes which took place 3	Results of the intervention are presented graphically. Overall, there was a desirable intervention effect on negative behaviours such as violence, breaking rules, impulsivity and inappropriate social behaviour, as the

	times per week. The sample were in 6th – 8th grade and the mean ages ranged from 12.11 years old to 14.30 years old. -> *Inadequate data*	bar chart suggests that these outcomes either increased in the control group and decreased in the experimental group, or decreased by a greater amount in the experimental group in comparison to the control group. Exact figures are not provided. [Figure 2, p. 449]

Estimation of effect sizes

The Campbell Collaboration online effect size calculator[18] was used to compute effect sizes. Cohen's *d* effect sizes were calculated for evaluations that reported outcomes as continuous variables (e.g., Fung et al., 2018) and odds ratios were calculated for evaluations that reported outcomes dichotomously (e.g., Jones et al., 1989; Nichols, 2007).

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 sports intervention. This calculation is described in Technical Appendix E. For some evaluations this was not necessary (e.g., Gatz et al., 2019; Nathan et al., 2013; Shachar et al., 2016) as the intervention effect was reported by the primary evaluation.

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

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 (Table 2). We also recorded the instrument used to measure each outcome and the definition of the specified outcome to ensure that outcomes grouped together for the meta-analysis were indeed comparable.

The majority of outcomes showed changes in the expected direction, for example, higher values indicated more aggression (e.g., Anderson et al., 1999) or more prosocial behaviour (e.g., Terry et al., 2014). For outcomes such as aggression or delinquency, a desirable intervention effect would

[18] https://www.campbellcollaboration.org/research-resources/effect-size-calculator.html

be indicated by a greater *reduction* in the experimental group relative to the change in the control group[19].

The opposite is true for outcomes such as self-control or prosocial behaviours, where higher scores are desirable. Thus, we adjusted the direction of effect sizes for outcomes such as aggression, so that the resulting intervention effects have a consistent desired direction across all meta-analyses.

The rationale for this adjustment is described in further detail in Technical Appendix E. The result is that for all meta-analyses, odds ratios greater than 1 represents a desirable intervention effect. It follows that odds ratios less than 1 represent an undesirable intervention effect and an odds ratio equal to one suggests a null intervention effect. In other words, a mean odds ratio of greater than 1 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.

Meta-analysis

Choosing a model

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, and different groups (Hedges et al., 2010). For example, Fung et al. (2018) reported several aggression outcomes, for multiple treatment groups and one control group[20]. An effect size can thus be estimated for each treatment group compared to the one control group, for multiple outcomes. However, when it is time to compute the weighted mean effect size

[19] Desirable intervention effects also indicated by: (1) no change in the control group, but a reduction in the experimental group; (2) an increase in both groups, but less of an increase in the experimental group compared to the control group; (3) a decrease in both groups, but more of a decrease in the experimental group compared to the control group.

[20] Fung et al. (2018) randomly allocated participants to one of four possible groups, which they varied by the type of intervention activities involved. The 'skills-only' group participated in martial arts practical skills only, the 'philosophy-only' received lessons on the moral principles of martial arts, and the 'skills-philosophy' group received both. The fourth group was considered a placebo control group, and participate in "various physical exercises" (Fung et al., 2018, p. 4). As the purpose of the current review is to evaluate the effectiveness of sports and physical activity interventions, the 'philosophy-only' group was considered the control group as this was the only group without any physical activity.

these effect sizes nested in dependent clusters and will impact the overall result of the meta-analysis (Harrer et al., 2021).

One way to include these dependent effect sizes in a meta-analysis is to use a three-level meta-analysis. 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 E. We report the weighted mean effect size, 95% confidence intervals and significance test using this script. The variance between clusters of effect sizes ($\sigma^2_{level\ 2}$) and the variance between clusters of effect sizes ($\sigma^2_{level\ 3}$) was estimated and reported in accordance with the recommendations of Harrer et al. (2021).

Another method of computing a meta-analysis with dependent effect sizes is the robust variance estimation model (RVE; Fisher & Tipton, 2015; Hedges et al., 2010). Recent research has suggested that the RVE model should be favoured over a three level meta-analysis when fewer than 25 studies are included (Moeyart et al., 2017). In such instances, the three level meta-analysis model would underestimate the variance of the weighted mean effect size and so the precision would be overstated (Moeyart et al., 2017). Yet, meta-analysts also urge caution when interpreting the results of a RVE meta-analysis with a small number of studies (i.e., $df < 4$; Tanner-Smith & Tipton, 2013). Which is the case for many of the outcome domains included in the present review.

Therefore, a three-level model of meta-analysis was chosen, but the confidence intervals and significance of weighted mean effect sizes is interpreted with caution. As a further check on the suitability of the three-level model, we computed a meta-analysis where the between-clusters variance was constrained to zero (using l3.removed function in metafor).

Missing data

There were a number of scenarios where missing data could impact the results of our meta-analysis. For example, when examining the relationship between the mean age of participants and effect size, an evaluation may report an age range rather but not the value of the mean age. As such, we handled missing data using the "infer, initiate, impute" method described by Pigott and Polanin (2020; Polanin et al., 2021).

Results

Summary of results

Overall, sports interventions mostly had a desirable impact on outcomes included in the present review. The results of the three-level meta-analyses suggest that sports interventions reduced: offending, aggression, externalising behaviour and internalising behaviour; and improved: prosocial behaviour, self-esteem, and academic achievement. Table 11 presents a summary of the weighted mean effect sizes for each of the outcome reported in the present review, but the following sections provide a full outline of the results.

Table 11

Summary of weighted mean effect sizes for each outcome

Outcome	*N*	*k*	OR	95% CI	*p*	$\sigma^2_{level\ 2}$ I^2	$\sigma^2_{level\ 3}$ I^2
Offending	6	9	2.466	1.200 – 5.065	.020	44.43%	44.43%
Aggression	6	16	1.599	0.926 – 2.759	.087	64.49%	27.34%
Externalising behaviour	8	19	1.392	0.952 – 2.037	.084	64.72%	27.26%
Internalising behaviour	5	13	1.52	1.087 - 2.124	.019	87.18%	1.65%
Prosocial behaviour	4	11	1.103	0.863 - 1.409	.394	68.96%	< .001%
Social skills	4	8	0.881	0.547 - 1.420	.55	61.23%	.001%
Self-esteem	3	4	2.075	0.417 - 10.327	.244	9.81%	80.38%
Academic achievement	3	7	1.611	0.495 – 5.253	.362	< .001%	90.75%
Time use	0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Adult relationships	0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Note. n = number of studies; k = numbSelfer of effect sizes; OR = odds ratio; CI = 95% confidence intervals; $\sigma^2_{level\ 2}$ = within-clusters of effect sizes; $\sigma^2_{level\ 3}$ = between-clusters of effect sizes. N.a. is not applicable as there are no studies.

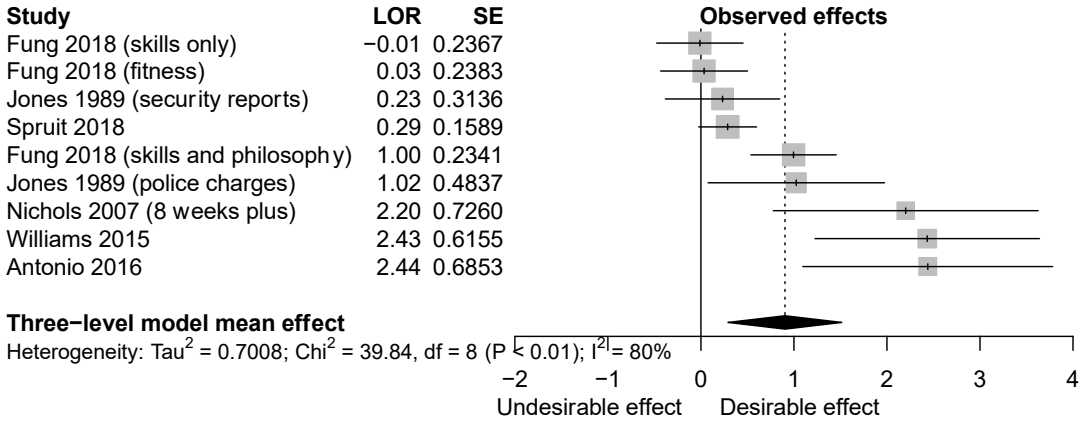
Offending

Using a three-level meta-analytical model, the mean effect size for offending outcomes indicated that sports interventions had a desirable effect (OR = 2.466; 95% CI 1.200, 5.065, p = 0.020). This suggests that, overall, in comparison to a control condition, sports interventions are effective in reducing offending.

For offending outcomes, there was significant heterogeneity between effect sizes (Q (df = 8) = 39.839, p < .001). Figure 9.1 presents a forest plot of the observed effects for delinquency outcomes. The estimated variance at multiple levels of the model found that the variance was distributed quite evenly within-clusters of effect sizes ($\sigma^2_{level\ 2}$ = 0.35; I^2 = 44.43%) and between-clusters of effects ($\sigma^2_{level\ 3}$ = 0.35; I^2 = 44.43%), with overall heterogeneity of 80%.

Further tests suggested that, for offending outcomes, the result suggests there was no real difference between a two-level and three-level model of meta-analysis.

Figure 9.1. Forest plot of observed effects for offending outcomes. (log odds ratio).

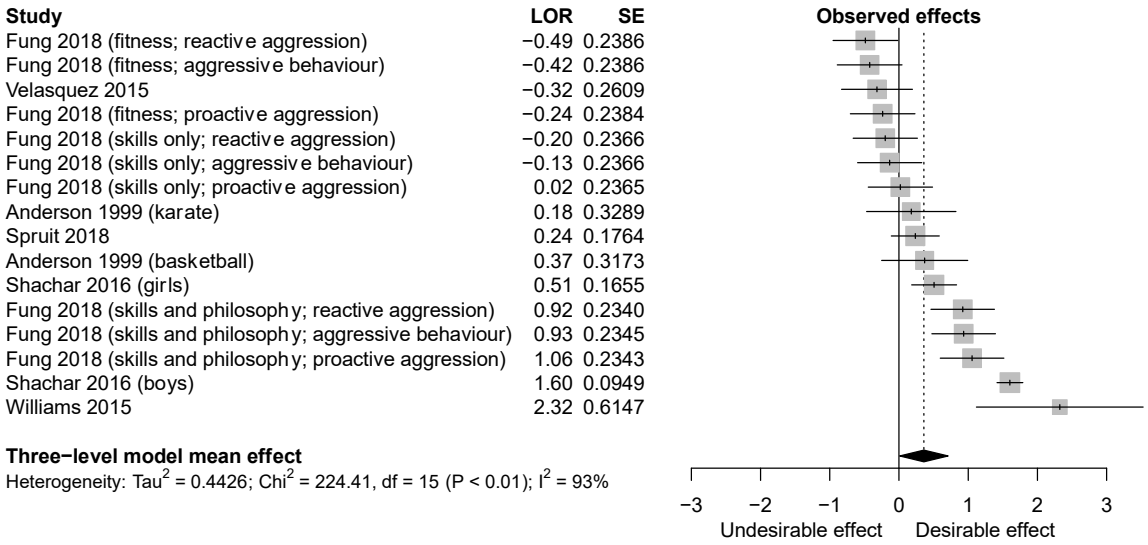


Aggression

Using a three-level meta-analytical model, the mean effect size for aggression outcomes indicated a desirable effect of sports interventions (OR = 1.599; 95% CI 0.926, 2.759, p = 0.087). This suggests that, overall in comparison to a control condition, sports interventions were effective in reducing aggression.

However, the mean effect size was not statistically significant at 5% as the 95% confidence intervals crossed zero for aggression outcomes, and there was also significant heterogeneity between effect sizes ($Q(df$ =15) = 224.41, p < .001). Figure 9.2 presents a forest plot of the observed effects for aggression outcomes. The estimated variance at multiple levels of the model found that most of the variance was within-clusters of effect sizes ($\sigma^2_{level\,2}$ = 0.359; I^2 = 64.49%). Variance was observed between-clusters of effects ($\sigma^2_{level\,3}$ = 0.152; I^2 = 27.34%). Overall heterogeneity was 93%. Further tests suggested that, for aggression outcomes, a two-level meta-analysis was the best fit (χ^2 = 0.505, p = .478). When the $level_3$ heterogeneity was constrained to zero, the mean effect size for aggression outcomes was OR = 1.433 (95% CI 0.979, 2.096, p = .063).

Figure 9.2. Forest plot of observed effects for aggression outcomes (log odds ratio)



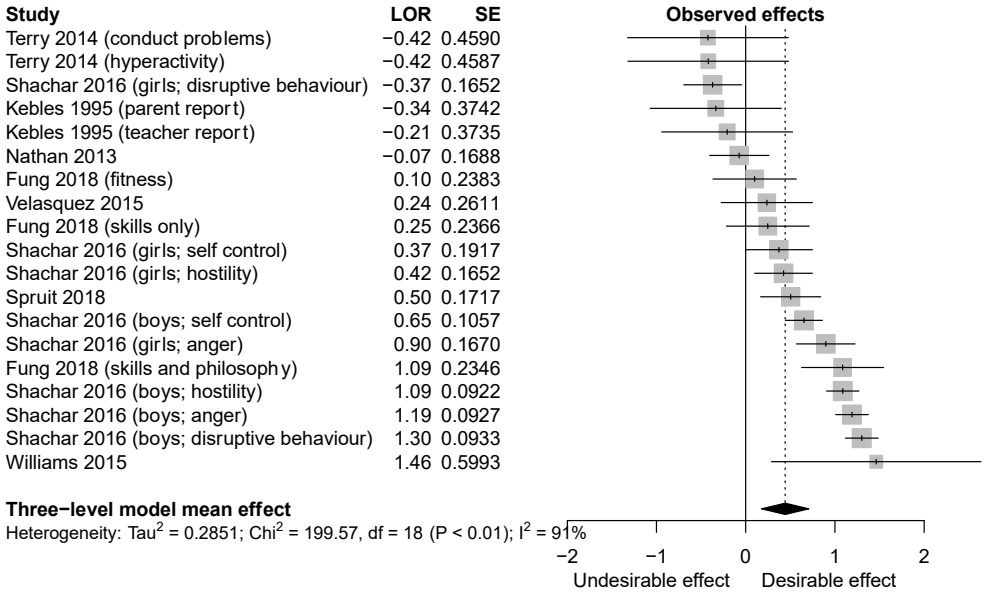
Externalising behaviours

The mean effect size for externalising behaviour outcomes indicated that sports interventions had a desirable impact (OR = 1.392; 95% CI 0.952, 2.037, p = 0.084), using a three-level meta-analytical model. This suggests that, overall in comparison to a control condition,, sports interventions were effective in reducing externalising behaviours,

For externalising behaviour outcomes, and there was also significant heterogeneity between effect sizes (Q (df = 18) = 199.567, p < .001). Figure 9.3 presents a forest plot of the observed effects for externalising behaviour outcomes. The estimated variance at multiple levels of the model found that most of the variance was within-clusters of effect sizes ($\sigma^2_{\text{level 2}}$ = 0.219; I^2 = 64.72%). In relation to externalising behaviour outcomes, there was also significant variance between-clusters of effects ($\sigma^2_{\text{level 3}}$ = 0.093; I^2 = 27.26%), and high overall heterogeneity at 91%.

Further tests suggested that, for externalising behaviour outcomes, a two-level meta-analysis was the best fit (χ^2 = 1.217, p = .269). Under a two-level meta-analytical model, the mean effect size was OR = 1.556, (95% CI 1.171, 2.068, p = .004).

Figure 9.3. Forest plot of observed effects for externalising behaviour outcomes (log odds ratio).



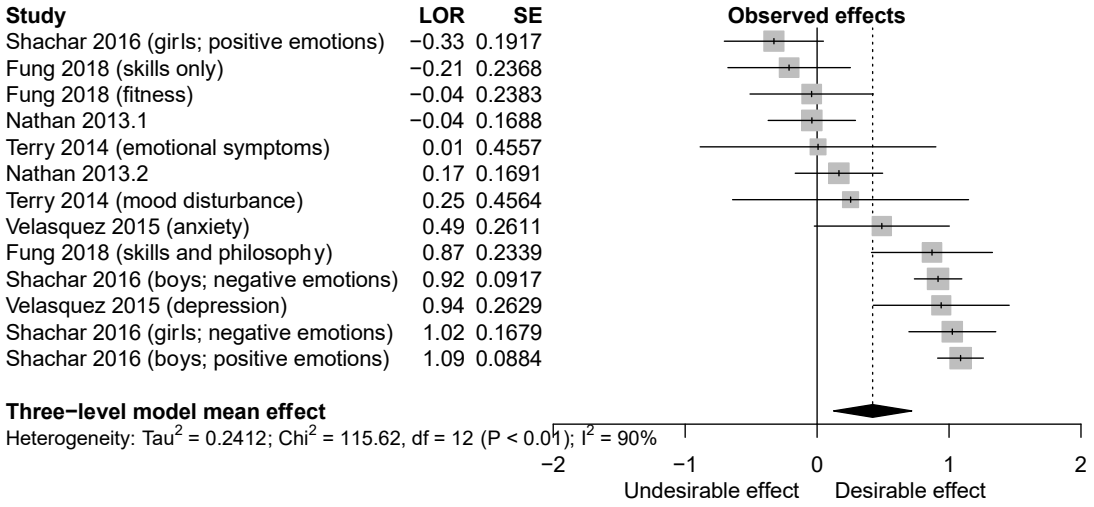
Internalising behaviour

The mean effect size (OR = 1.5195; 95% CI 1.087, 2.124, p = 0.019), indicated that sports interventions had a desirable impact on internalising behaviour outcomes, under a three-level meta-analytical model. This suggests that, overall, in comparison to a control condition sports interventions were effective in reducing internalising behaviours.

For internalising behaviour outcomes, there was significant heterogeneity between effect sizes (Q (df = 12) = 115.621, p < .001; (I^2 = 90%). Figure 9.4 presents a forest plot of the observed effects for internalising behaviour outcomes. The estimated variance at multiple levels of the model found that most of the variance was within-clusters of effect sizes ($\sigma^2_{level\ 2}$ = 0.237; I^2 = 87.18%), with between-clusters of effects variance being a lot less ($\sigma^2_{level\ 3}$ = 0.045; I^2 = 1.65%).

Further tests suggested that, for internalising behaviour outcomes, a two-level meta-analysis was the best fit (χ^2 = 0.003, p = .953). Under a two-level meta-analytical model, the mean effect size was OR = 1.523, (95% CI 1.096, 2.118, p = .017).

Figure 9.4. Forest plot of observed effects for internalising behaviour outcomes (log odds ratio)



Delinquent peers

Only one study reported the effects of sports interventions on delinquent peers: Spruit et al. (2018). In total, two dependent effect sizes were estimated for this outcome domain and so a meta-analysis was not deemed appropriated. Additionally, the outcomes were not comparable enough (i.e., perception of peer pressure and peer delinquency) to compute a meaningful mean effect size. The effect sizes for this study are outlined in Table 12.

Table 12- Effect sizes for the study

Study	*Outcome*	*OR*	*SE*
Spruit 2018	Peer delinquency	1.146	0.001
Spruit 2018	Perceived peer pressure	0.776	0.001

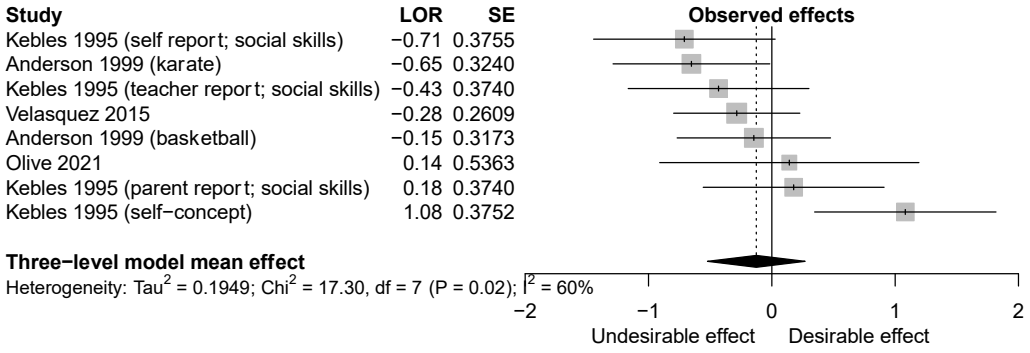
Social skills

Under a three-level meta-analysis, the mean effect size for social skills was OR = 0.881 (95% CI 0.547, 1.420, p = .550). This suggests that sports intervention had an undesirable effect, in comparison to a control condition that is, a reducing in social skills,

However, the overall effect size was not statistically significant, the confidence intervals crossed zero and there was significant heterogeneity between effect sizes (Q (df = 7) = 17.301, p = .016). Figure 9.5 presents a forest plot of observed effect sizes for social skills outcomes. The estimated variance at multiple levels of the model found that most of the variance was within-clusters of effect sizes ($\sigma^2_{\text{level 2}}$ = 0.195; I^2 = 61.23%). In relation to social skills outcomes, there was a negligible amount of variance between-clusters of effects ($\sigma^2_{\text{level 3}}$ = < .001; I^2 < .001%).

Further tests suggested that, for social skills outcomes, a two-level meta-analysis was the best fit (χ^2 = 0.003, p = .953), which is unsurprising given the lack of variance between-clusters of effects. The mean effect size under a two-level meta-analysis was subsequently the same as the mean effect for the three-level model.

Figure 9.5. Forest plot of observed effects for social skills outcomes(log odds ratio).

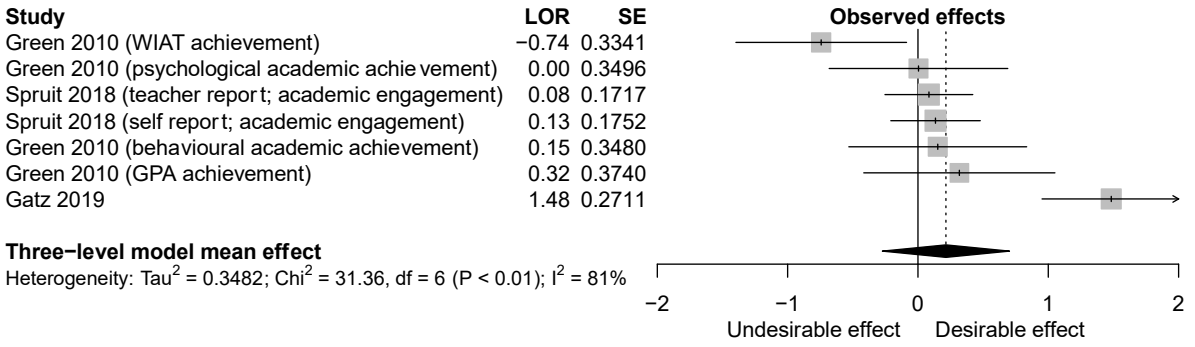


Academic achievement

Under a three-level meta-analysis, the mean effect size for academic achievement suggested that sports interventions had a desirable impact (OR = 1.611; 95% CI 0.495, 5.253, p = .362). This indicates that sports interventions, overall, in comparison to a control condition increased academic achievement.

There was significant heterogeneity between effect sizes (Q (df = 6) = 31.358, p < .001) for academic achievement outcomes. Figure 9.6 presents a forest plot of the observed effects for academic achievement outcomes. The estimated variance at multiple levels of the model found that most of the variance was between-clusters of effect sizes ($\sigma^2_{\text{level 3}}$ = 0.661; I^2 = 90.75%). There was a negligible amount of variance within-clusters of effects ($\sigma^2_{\text{level 2}}$ < .001; I^2 < .001%). Further tests suggested that, for academic achievement outcomes, a three-level meta-analysis was a marginally better fit (χ^2 = 2.622, p = .105).

Figure 9.6. Forest plot of observed effects for academic achievement outcomes (logs odds ratio).

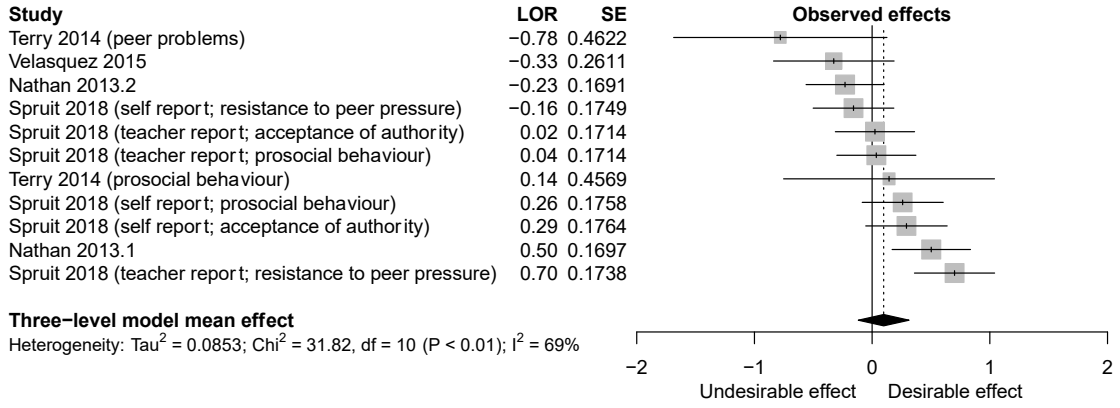


Prosocial behaviour

The mean effect size for prosocial behaviour suggested that sports interventions had a desirable impact (OR = 1.103; 95% CI 0.863, 1.409, p = .394). This indicates that sports interventions, overall, increased prosocial behaviour.

There was significant heterogeneity between effect sizes (Q (df = 10) = 31.818, p < .001) for prosocial outcomes. Figure 9.7 presents a forest plot of the observed effects for prosocial behaviour outcomes. The estimated variance at multiple levels of the model found that most of the variance was within-clusters of effect sizes ($\sigma^2_{level\ 2}$ = 0.085; I^2 = 68.96%). There was a negligible amount of variance between-clusters of effects ($\sigma^2_{level\ 3}$ < .001; I^2 < .001%). Further tests suggested that, for prosocial behaviour outcomes, a two-level meta-analysis was a better fit for the data which was unsurprising given the lack of variance between clusters of effects.

Figure 9.7. Forest plot of observed effects for prosocial behaviour outcomes (log odds ratio)..

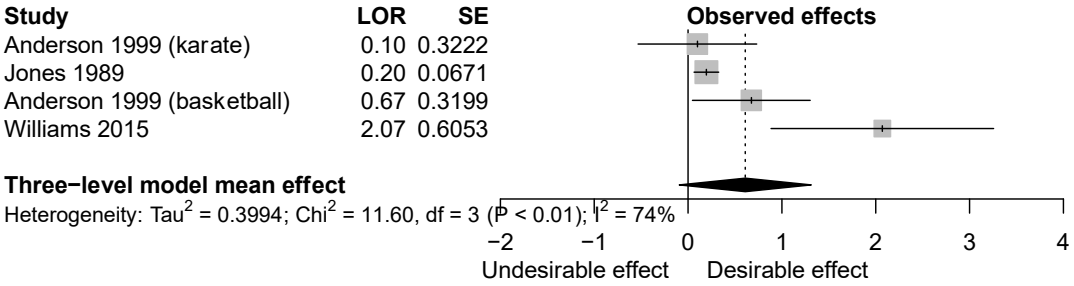


Self-esteem

The mean effect size for self-esteem outcomes suggested that sports interventions had a desirable impact (OR = 2.075; 95% CI 0.417, 10.327, p = .244). This indicates that sports interventions, overall, increased self-esteem.

However, the mean effect size was not statistically significant, the confidence intervals crossed zero, and there was significant heterogeneity between effect sizes (Q (df = 3) = 11.6, p = .009) for self-esteem outcomes. Figure 9.8 presents a forest plot of the observed effects for self-esteem outcomes. The estimated variance at multiple levels of the model found that most of the variance was between-clusters of effect sizes ($\sigma^2_{\text{level 3}}$ = 0.593; I^2 = 80.38%) and a small amount of variance was observed within-clusters of effects ($\sigma^2_{\text{level 2}}$ = 0.072; I^2 = 9.81%). Further tests suggested that, for self-esteem outcomes, a two-level meta-analysis was a better fit (χ^2 = 0.386, p = .534).

Figure 9.8. Forest plot of observed effects for self-esteem outcomes. (log odds ratio).



Time use

Since useful ways to occupy tie is an important part of the theory of change for how sports intervention may work it would be useful to be able to report time use (e.g. time spent hanging around in public spaces). However, no studies report this outcome.

Trusting relationship with an adult

The relationship with the sports coach is a possible important causal pathway, so it would be useful to capture meaningful relationship with an adult (e.g. if you have a problem related to X, who would you discuss it with?). However, no studies report such outcomes.

Publication bias analysis

There are several methods for assessing publication bias in meta-analyses, and recent research suggests that "no publication bias method consistently outperforms all the others" (Carter et al., 2019; Harrer et al., 2021). In the present review, we used Egger's regression test and examination of funnel plots to assess the possibility of publication bias in each of the meta-analyses.

Figures 10.1 to 10.8 present the funnel plots for publication bias for each outcome. Assessing these plots suggests that publication bias was likely present in the majority of our meta-analyses. The plots for prosocial behaviour and social skills outcomes are the most in line with what we would expect from a funnel plot.

Figure 10.1. Funnel plot for offendingoutcomes.

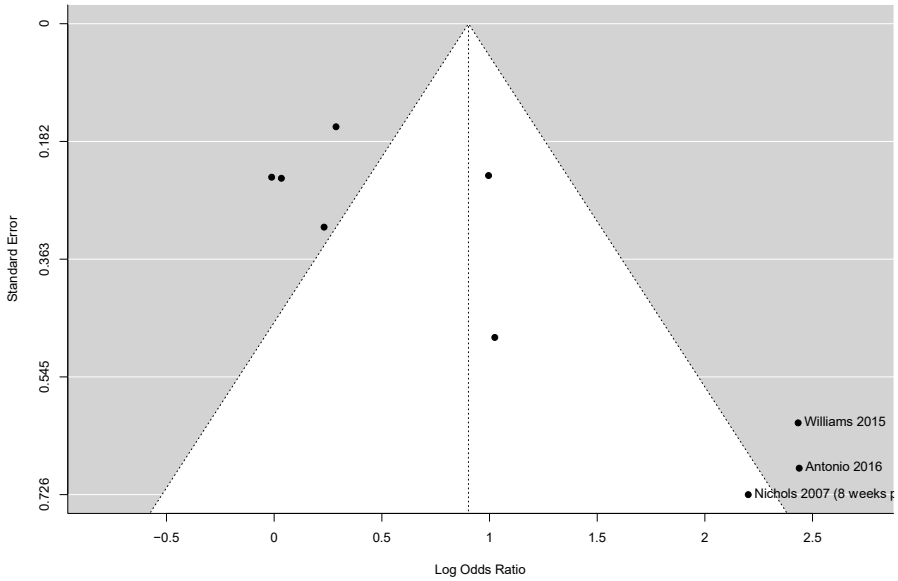


Figure 10.2. Funnel plot for aggression outcomes.

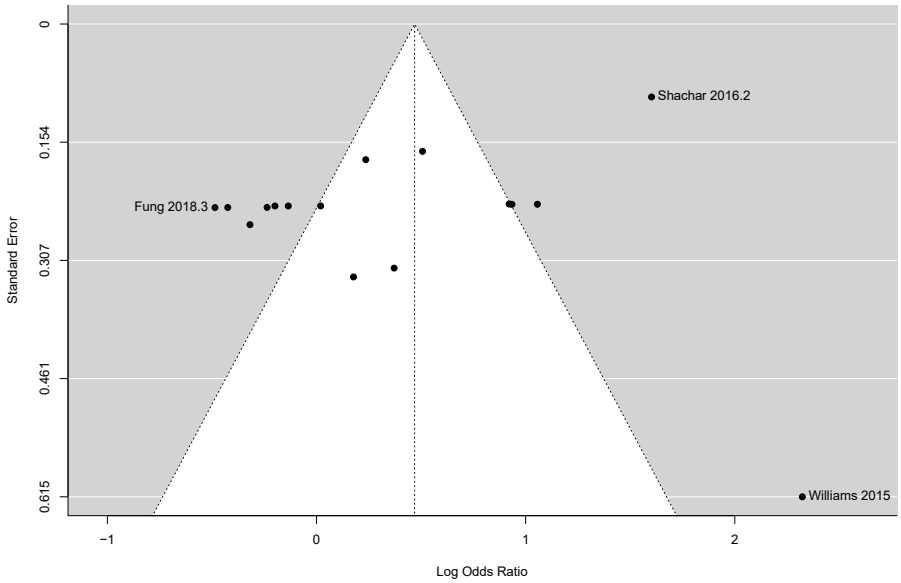


Figure 10.3. Funnel plot for externalising behaviour outcomes

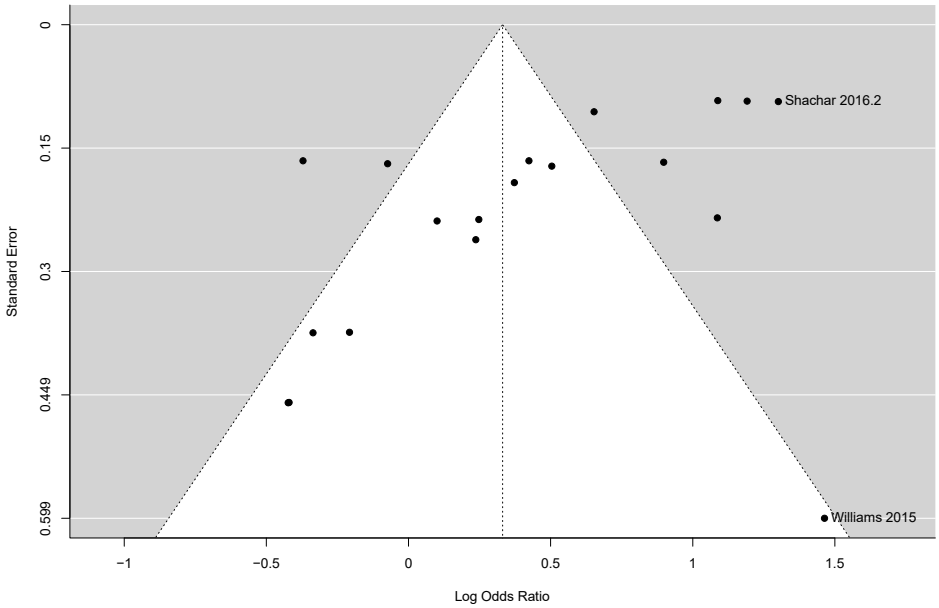


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Figure 10.4. Funnel plot for internalising behaviour outcomes.

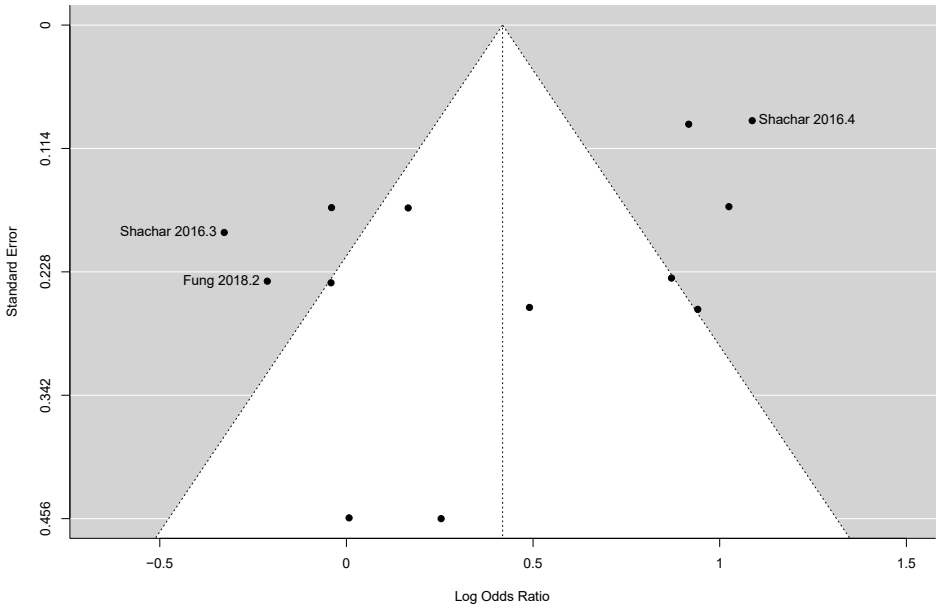

Figure 10.5. Funnel plot for prosocial behaviour outcomes.

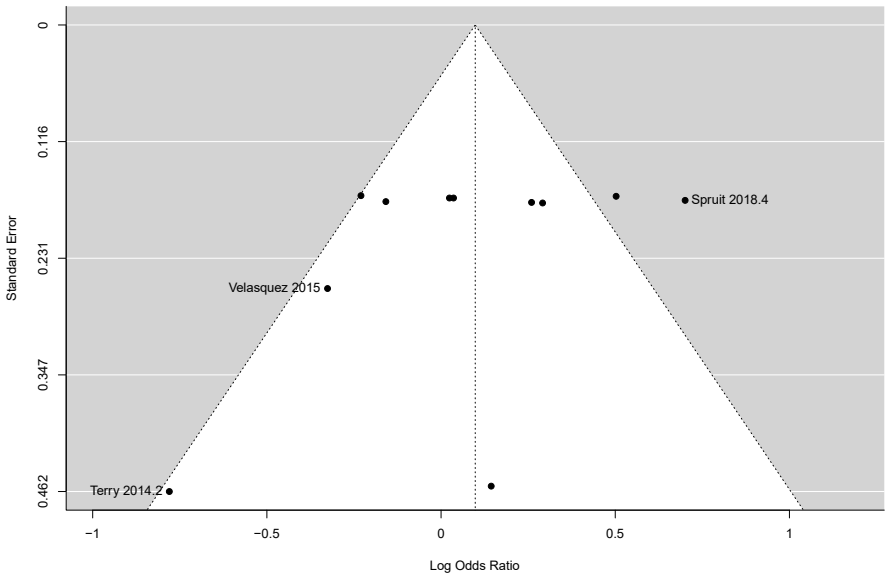

Figure 10.6. Funnel plot for social skill outcomes.

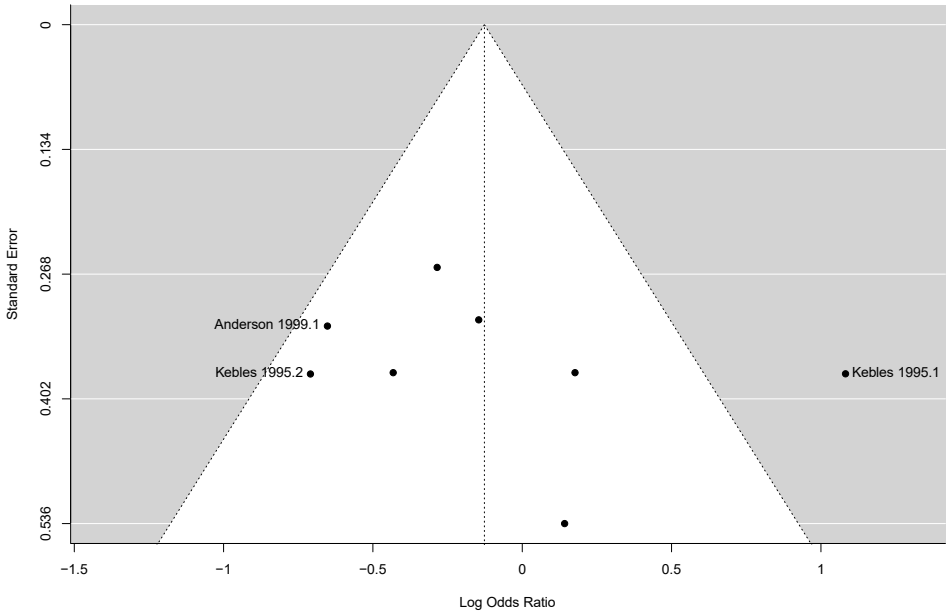

Figure 10.7. Funnel plot for self-esteem outcomes.

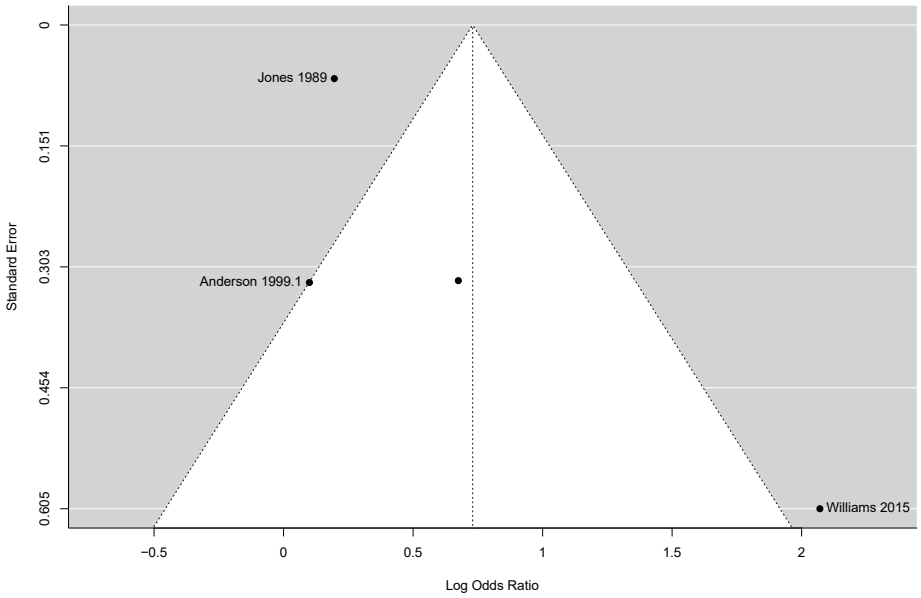

Figure 10.8. Funnel plot for academic achievement outcomes.

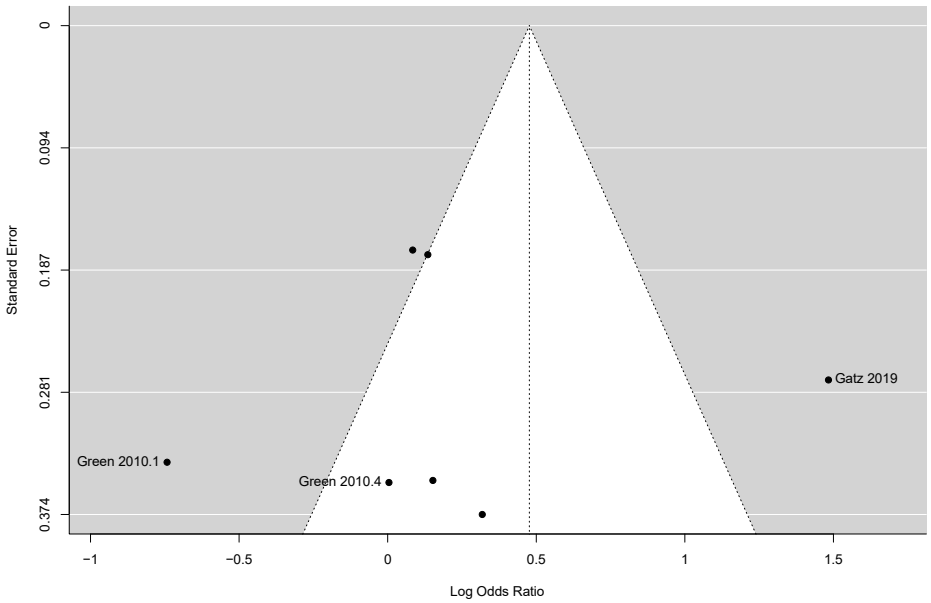

Table 13 outlines the results of Egger's regression test for plot asymmetry for each of the meta-analyses. This test assesses the relationship between observed effect sizes and the standard error and if the relationship is statistically significant, then asymmetry is present (Viechtbauer, 2010). Thus, if asymmetry is present this is considered an indication that publication bias is present in the meta-analysis.

This means that we should interpret the results for outcomes such as offending, aggression, and self-esteem with caution as there is likely publication bias present.

Table 13 *Egger's regression test for publication bias: Results*

Outcome domain	Egger's regression test	95% CI	*z*	*p*
Offending	-0.610	-1.318 – 0.097	4.037	< .001
Aggression	0.404	-0.66 – 1.468	4.558	< .001
Externalising behaviour	1.796	1.112 - 2.481	.021	0.983
Internalising behaviour	2.058	1.404 – 2.172	-1.515	0.129
Prosocial behaviour	1.289	0.943 – 1.636	-1.269	0.204
Social skills	0.758	-0.745 – 2.261	0.442	0.659
Self-esteem	0.142	-1.453 – 1.737	4.730	< .001
Academic achievement	1.931	-0.526 – 4.388	-0.359	0.719

Moderator analyses

There was significant heterogeneity between observed effect sizes for all outcome domains, and so moderator analyses was conducted to examine possible reasons for this variation. Several moderator variables were defined *a priori* to conducting the current meta-analysis. These included: methodological quality, gender of participants, ethnicity of participants, age of participants, duration of intervention, intensity of intervention, and the type of intervention (e.g., sports, sports plus, or physical activity).

Moderator analysis in a three-level model of meta-analysis was then computed using the 'mods' argument in the rma.mv package for *R* (Harrer et al., 2021). This allows for meta-regression analysis with multiple categorical or continuous moderator variables.

The results of the moderator analysis should be interpreted with caution. Given the small number of studies and the unequal numbers of effect sizes in subgroups, the moderator analysis should be considered an exploratory exercise. More primary research and more robust reporting of empirical findings from evaluations is needed. The strength of conducting a mixed-methods review is that given the limitations of the quantitative moderator analysis, the findings can be supplemented with the findings of the qualitative synthesis.

Methodological quality

The Campbell Collaboration critical appraisal tool was used to evaluate the methodological quality of included evaluations. The tool scores evaluations according to several criterion (e.g., study design, power calculations, attrition) and rates studies according to the following categories: high confidence; medium confidence; and low confidence.

All the quantitative evaluations included in the present review were categorised as low confidence. Thus, no further examination of how the effect sizes may vary in relation to the methodological quality of evaluations could be conducted for the majority of outcome domains.

The exception was academic achievement outcomes. For these outcomes, five effect sizes were categorised as 'medium confidence' and two effect sizes were categorised as 'low confidence' (N = 7*)*. Meta-regression analysis indicated that there were no significant differences between these groups ($F_{1,5}$ = 0.069, p = 0.804).

Table 14.1

Moderator analysis results: Methodological quality

Outcome	Subgroup	*k*	*n*	OR	95% CI	*p*
Academic achievement	Low	2	1	1.116	0.324 – 3.844	0.829
	Medium	5	2	1.299	0.259 – 5.224	0.804

Gender

Information about the gender of participants in evaluations was coded, where this information was reported. Evaluations were coded as either including: (1) all male participants, (2) all female participants, or (3) both male and female participants. Due to the small number of evaluations and the lack of differences between primary studies, this moderator was collapsed to a dichotomous variable. This meant that moderator analyses could be conducted to compare the mean effects of studies that evaluated an intervention implemented with only one gender to studies that evaluated an intervention implemented with mixed genders. In relation to internalising behaviour and prosocial behaviour outcome domains, no moderator analysis could be conducted because all evaluations included both male and female participants.

Table 14.2 presents the results of the subgroup analysis under a three-level model of meta-analysis. Meta-regression analysis indicated that in all cases effect sizes were larger for single-sex programs than mixed sex ones. However, there were no significant differences between these groups for aggression ($F_{1,14}$ = 1.041, p = 0.325), externalising behaviour ($F_{1,17}$ = 1.675, p = 0.213), social skills ($F_{1,6}$ = 0.633, p = 0.457), self-esteem ($F_{1,2}$ = 0.435, p = 0.577). There was a significant difference between groups for offending outcomes ($F_{1,7}$ = 11.414, p = 0.012) and academic achievement outcomes ($F_{1,5}$ = 24.848, p = 0.004).

Table 14.2

Moderator analysis results: Gender

Outcome	Subgroup	*K*	*n*	OR	95% CI	*p*
Offending	Single	2	2	11.419	1.966 – 28.315	.008
	Mixed	3	2	1.619	1.018 – 2.576	.044
Aggression	Single	3	2	2.206	0.569 – 4.879	.325
	Mixed	13	4	1.323	0.865 – 2.024	.179
Externalising behaviour	Single	1	1	4.321	0.516 – 15.862	.213
	Mixed	18	7	1.511	1.133 – 2.016	.008
Social skills	Single	2	1	1.420	0.218 – 2.174	.457
	Mixed	6	3	0.977	0.536 – 1.782	.928
Academic achievement	Single	1	1	4.407	2.009 – 8.886	.004
	Mixed	6	2	1.043	0.805 – 1.350	.694
Self-esteem	Single	3	2	1.916	0.028 – 133.087	.835
	Mixed	1	1	1.216	0.028 – 133.087	.577

Ethnicity

We also coded information about the ethnicity of participants included in primary evaluations. Specifically, studies were categorised depending on the proportion of minority ethnicity participants included in the study: (1) all or majority (80% or more) of participants identified as an ethnic minority; (2) a substantial proportion of participants identified as an ethnic minority (i.e., 30 – 79%); and (3) none of the participants, or very few, identified as an ethnic minority (i.e., less than 30%). We also recorded where no information about the ethnicity of participants was provided.

Table 14.3 presents the results of moderator analyses for ethnicity of participants. Meta-regression results indicated that in all cases but one the effect was larger with majority ethnic minority participants. However, the difference between groups for delinquency ($F_{2,6} = 1.423$, $p = 0.312$), externalising behaviour ($F_{2,16} = 3.306$, $p = 0.063$), internalising behaviour ($F_{1,11} = 0.447$, $p = 0.518$), social skills ($F_{2,5} = 0.094$, $p = 0.912$), prosocial behaviours ($F_{2,7} = 1.419$, $p = 0.297$) and

academic achievement ($F_{1,5}$ = 0.069, p = 0.804) was not statistically significant. The difference between mean effect sizes for aggression was statistically significant ($F_{2,13}$ = 4.347, p = 0.036). There was an inadequate number of studies for self-esteem outcomes to conduct a moderator analysis.

Table 14.3

Moderator analysis results: Ethnicity

Outcome domain	Subgroup	*k*	*n*	OR	95% CI	*p*
Offending	> 80% ethnic minority	1	1	11.393	1.047 – 124.002	0.047
	30-79% ethnic minority	1	2	2.644	0.013 – 4.159	.262
	Not reported	6	3	1.949	0.014 – 2.158	.144
Aggression	> 80% ethnic minority	3	2	3.702	1.702 – 8.053	.003
	30-79% ethnic minority	3	2	1.297	0.118 – 3.492	.058
	Not reported	10	2	1.123	0.126 – 0.730	0.012
Externalising behaviour	> 80% ethnic minority	9	2	2.112	1.471 – 3.031	.001
	30-79% ethnic minority	4	3	1.015	0.243 – 0.953	.037
	Not reported	6	3	1.238	0.319 – 1.078	.082
Internalising behaviour	> 80% ethnic minority	6	2	1.761	1.042 – 2.975	.037
	30-79% ethnic minority	0	0	NA	NA	NA
	Not reported	7	3	1.414	0.397 – 1.655	0.518
Social skills	> 80% ethnic minority	1	1	1.152	0.158 – 8.380	.861

	30-79% ethnic minority	6	2	0.886	0.094 – 6.285	.761
	Not reported	1	1	0.752	0.052 – 8.227	.683
Prosocial behaviour	> 80% ethnic minority	2	1	1.146	0.665 – 1.974	.580
	30-79% ethnic minority	6	1	1.212	0.563 – 1.985	.843
	Not reported	3	2	0.726	0.276 – 1.457	.242
Academic achievement	> 80% ethnic minority	5	2	1.299	0.556 – 3.039	.463
	30-79% ethnic minority	2	1	1.116	0.191 – 3.848	.804
	Not reported	0	0	NA	NA	NA

Note. > 80% indicates that more than 80% of the sample identified as an ethnic minority; 30-79% indicates that between 30 and 79% of the sample identified as an ethnic minority.

Age of participants

The mean age of participants was recorded for each intervention. Meta-regression analysis found there was no relationship between the age of participants and effect size for any of the outcome domains.

Duration of intervention

Using information provided by primary evaluations, a continuous variable for the duration of interventions was created. This was representative of the number of hours of intervention activities that experimental participants were eligible to complete. A meta-regression analysis found a that the greater the hours of intervention activities then the larger the effect size for aggression ($F_{1,14}$ = 8.443, p = 0.012) and externalising behaviour ($F_{1,16}$ = 6.299, p = 0.023) outcomes. There was no significant relationship between the hours of intervention activities and effect sizes for delinquency ($F_{1,3}$ = 3.416, p = 0.162), internalising behaviour ($F_{1,9}$ = 1.167, p = 0.308), prosocial behaviour ($F_{1,7}$ = 3.337, p = 0.111), academic achievement ($F_{1,5}$ = 3.948, p = 0.104), social skills ($F_{1,6}$ = 0.079, p = 0.788) and self-esteem ($F_{1,1}$ = 5.533. p = 0.256) outcomes.

Type of intervention

Evaluations included in the present review could have evaluated the effect of different types of interventions. Namely, eligible interventions were those defined as: (1) sports interventions; (2) sports plus interventions; and (3) physical activity interventions. All of the evaluations included in our review reported the effects of sports or physical activity interventions. In addition, only two evaluations of physical activities were included. Gatz et al. (2019) evaluated the impact of an aerobic fitness programme and Velasquez et al. (2015) evaluated the impact of a yoga workshop. Due to the lack of variation in the type of intervention evaluated, further moderator analyses were not conducted.

Communicating results: Transforming effect sizes to relative change

To better communicate the meaning of the results of our meta-analyses, we used a common procedure to transform the effect sizes to a percentage relative change in the outcome. As with the odds ratios, a decrease in the following outcomes was associated with a desirable intervention effect: delinquency; aggression; externalising behaviour; and internalising behaviour. In contrast, an increase in the following outcomes was associated with a desirable intervention effect: prosocial behaviour; social skills; self-esteem; and academic achievement. The process for estimating the relative reduction or improvement from mean effect sizes is outlined in Technical Appendix E.

Table 15 Results of the effect sizes

Outcome domain	*OR*	*% change*
Delinquency	2.466	52.37% reduction
Aggression	1.599	31% reduction
Externalising behaviour	1.392	22.72% reduction
Internalising behaviour	1.52	28.04% reduction
Prosocial behaviour	1.103	7.15% improvement
Social skills	0.881	9.8% reduction [a]
Self-esteem	2.075	44.64% improvement
Academic achievement	1.611	31.42% improvement

Note. a = indicates an undesirable intervention effect.

Qualitative synthesis

We present a qualitative synthesis of 38 process evaluations and other qualitative studies of which 12 are from the UK. We carried out a qualitative thematic synthesis of these studies, using a coding framework based on the conceptual elements which are the basis for a theory-based approach. Specifically, we collected from these studies information on (i) design (target group, sport, referral mechanism, setting and any plus activities whether formal or informal), (ii) barriers and facilitators to participation, including factors affecting staying on or dropping out, (iii) barriers and facilitations to achieving outcomes, and (iv) illustrating causal processes. This information was also collected from the effectiveness studies, though they less commonly report these data.

These qualitative data extracted from the studies were included in what we call the 'TBSR matrix'. Key themes and common elements under each of these headings were identified which are summarized in this section. Note that it is common when synthesizing findings on barriers and facilitators to find that the same factor is both a barrier and a facilitator: skilled staff are a facilitator or success factor if available and a barrier if not. Likewise, for an appropriate venue. That was found to be the case here.

The findings regarding design have been reported above in the description of the interventions. Here we report barriers and facilitators and causal processes.

(i) Barriers and facilitators to participation

The interventions took place in various settings: (1) school-based studies taking place in schooltime; (2) after-school clubs; (3) residential institutions for offenders or CYP at risk; (4) an established sports club; and (5) another community setting.

In all cases participation is voluntary. Reaching CYP in school and residential settings is easier, as is maintaining their participation. Challenges arise in community settings, where CYP may be referred to a sports intervention, recruited, e.g. by visiting locations where CYP spend time or using networking in which participants and others are encouraged to invite eligible participants.

Hence for community-based programmes, the programme needs to be known by referral agencies and intended participants. It is important to establish a good relationship with service providers the participant uses or may be hoped to use: doing this has frequently proved problematic. These considerations mean that the programmes need to have a clear ethos or identity as to what it is, who it is for, and what it hopes to achieve.

Sports is a hook for some, but not all children. In community-based programmes it is to be expected that not all the target group, nor even all those explicitly invited or referred, will attend. In a community programme in the United Kingdom, the study author commented that having 40% of the target group complete the programme was a good result (Nichols, 2007).

The type of activity matters, as different activities appeal to different people. One programme experienced a substantial reduction in the number of participants - from 70% to 49% of the target population - when it reduced the number of activities being offered. Certain activities, such as dance or yoga, are more likely to appeal to a larger number of girls, and there is some evidence that CYP with higher baseline aggression are more attracted to contact sports (Anderson, 1999).

Take up rates are higher when CYP have expressed an interest in the activity rather than just being referred without consultation. Where CYP are simply referred without contact then participation is low not only as the person referred may have no interest, but even because the referring agency doesn't have correct contact information for the person.

What is referred to as an effective programme "goes beyond the sport, it also concerns both the venue and the staffing, both of which are important factors in getting young people to attend in the first place and for completion of the programme. Several aspects of the venue are important: being somewhere young people are able and willing to attend (transport and turf issues), having the equipment and facilities for the intended sports activities, sessions are at a time youth can attend (preferably at a time which achieves the maximum diversion effect – which are usually the hours immediately after school,[21] though the United States has midnight basketball programmes - and with some flexibility over time to meet the individual participant's needs), to have all

[21] This statement is supported by the systematic reviews of curfews which finds their effect on offending to be limited at curfews are usually from around 8 pm whereas most anti-social and offending behaviour takes place in the hours immediately after children leave school (Wilson et al., 2016).

weather facilities (such as both indoor and outdoor facilities). Finally, the offer has to be attractive to girls as well as boys, which affects the sports which should be offered, the facilities available and the sex of the sports leaders.

Community-based programmes are also more likely to suffer higher attrition. Studies with less attrition are in other settings such as residential homes (D'Andrea, 2013), school-based (Olive, 2021), home and school-based Fung (2018) and custodial settings (Williams, 2015). The various reasons CYP leave community programmes include:

- ***Natural attrition***: There are a number of valid reasons why CYP may leave a programme: 'ageing out' (Antonio 2016 and 2017), moving out of the area; injury; time constraints (Spruit, 2018; Shacher, 2016); and the sports club discontinued programme (Spruit, 2018).

- **Progression**: Take up or be referred to another sport or programme or follow the same sport in regular club (Antonio 2016 and 2017; Jones and Offord, 1989).

- ***Sanctions***: A CYP may be required to leave due to behaviour difficulties either in the programme, or in school more generally; e.g. Zivin (2001) lost several children from her study - all from control – as they were expelled from the school, and so no longer available for data collection. Some programmes have academic requirements or the requirement to abstain from drugs and alcohol, so students may be required to leave the programme if they fail to meet these requirements. Temporary suspension from games has also resulted in CYP leaving the programme (Antonio 2016 and 2017).

- ***Lose interest***: some CYP say that they lost interest in the programme (e.g. Nichols, 2007)

But there are also programme features which encourage CYP to remain in the programme. These include:

- ***Enjoyment***: Those that do attend usually enjoy the intervention, which is a reason for completing the programmee, and support for the idea that sports is an effective hook. In a survey at the end of the Streetgames pilot, responses indicated that the programme had

been well received by participants. 92% of young people indicated they enjoyed the sessions and 94% would recommend the programme to a friend. The majority of participants (60%) also indicated that they were motivated to engage in other activities following completion of the programme and generally felt they were more active and confident. Other examples of participants enjoying the programme come from a prison-based programme in the U.K. two programmes in the U.S., and in Australia:

'It gives me a real buzz, running about an' that. An', y' know, sports really push you to the limit an' I really enjoy that' (respondent; Andrews, 2014)

'I like physical activity classes because I have fun and play different games that I can't do in other classes' (Agbuga 2007)

'It was so fun, cause like playing with firefighters and police officers was so fun' (Brake, 2020)

I play soccer, I'm feeling so happy (Male; Nathan, 2013).

Career advancement: Some interventions lead to coaching accreditations which may be useful in gaining employment

Something to do: CYP in some studies echoed the boredom hypothesis and diversion saying that sport gave them something to do; e.g. from a soccer programme in South Africa, and a sports programme in a deprived area of Wales (U.K.):

'"It would have been the same with me because one did not have anything to do [before the intervention], so drinking and smoking is the only form of socializing" (Swendeman et al., 2019: 9);

'[before the programme I used to go "either round my friends' house or families or I used to hang round down the street but I don't no more' (Barnes, 2010: 18)

The latter study goes on to report 'Most of the respondents stated that they go to the youth centre 'all the time, every day it's open' because they wanted 'to keep out of trouble'. The interview responses suggest that there has been a change in the interviewees' behaviour, primarily as a result of reducing the boredom factor' (Barnes, 2010: 18); and from an after-schools programme in the United States:

'After school at home, I would sit around, watch TV, play video games, fall asleep, and you know, I would be bored. And it is hard for me to get up in the morning early and practice basketball. I'm not bored any more because I get to practice more basketball in the after-school program' (Agbuga, 2007: 80).

Incentives: Some interventions pay for training courses, fitness centre access, and coaching programmes for accreditation, giving an incentive to stay on. Or the fees may be subsidized: "Compared to other dance clubs, here it is much cheaper. That is very important for me, because if it would be more expensive, I would not be able to continue.' (Schaillee, 2017: 33)

(ii) Barriers and facilitations to achieving outcomes

The following success factors were identified, which facilitate achieving the intended outcomes: (i) **good relationship with the coach which is the basis for developing trust, and which includes the feeling of being treated with respect**:

A positive and trusting relationship with the coach or mentor has consistently emerged as a crucial facilitator in achieving desired outcomes across various programmes. Included papers have highlighted this as a very important factor in attaining intended results (Cordova 2020; Zipp 2017). Several studies also point to a combination of key facilitators—such as the relationship with the coach, structured pathways, and programmes tailored to meet the specific needs of the child—as essential to success. The relationship with coach, built on mutual respect and empathy, are foundational in fostering trust and meaningful engagement (Coalter, 2013; Barnes, 2010; Armour, 2013). The interpersonal skills of instructors—such as empathy, effective communication, and a caring attitude—significantly contribute to participants' experiences and motivation. For instance, Yang (2016) found that instructors who provided supportive behaviours for autonomy, competence, and relatedness through initiative games positively influenced the

boys' perceptions of the programme. Zipp (2017) emphasized the role of a positive and trusted adult mentor. Trusted mentors not only offer guidance but often serve as role models, with some participants aspiring to become coaches themselves (Marttinen, 2019).

Coaches were found to create autonomy-supportive rather than controlling environments, which encouraged cooperation and communication among peers. Participants frequently noted their perception of a caring climate, where coaches demonstrated genuine interest in their everyday lives through informal interactions and occasional meetings beyond the structured sessions. Schaillee (2017) further highlighted the importance of coach-created motivational climates, emphasizing how such environments foster participants' engagement and emotional connection to the programme.Altogether, these findings emphasize that supportive and respectful relationships with programme leaders, mentors, and staff are central to delivering impactful and meaningful interventions.

"During activity, I had freedom to express my ideas and make up rules". Yang (2016)

"I feel safe because I could tell him to help me" Yang (2016)

if you, like, forgot the moves the first time, she helped you learn it. If we were behind the group, she would teach you, but didn't get frustrated' Zipp (2017)

"some guy that lives down the block from me. His name is Kyle. He's in college Division ….When he comes from college he teaches me stuff that he learned over there. I was happy…. Coz he – he says that I'm like his little brother so. Marttinen (2019)

"I think the mentors were absolutely terrific, they helped us do many things, and not only 520 that, they became our friends." Armour (2013)

"it's keeping me off the streets and stopping me from getting into trouble"The interviewees' described the staff as, 'cool', 'wicked', 'brilliant', 'safe', 'kind' and 'nice', with only two interviewees' claiming, 'they're alright" Barnes (2010)

(ii) structured pathways so the programme supports positive youth development;

Structured pathways were identified in the included papers as supporting positive youth development by enabling sustained involvement in programme activities and promoting connectedness. Armour (2013) highlighted that structured pathways allow for ongoing engagement in programme activities and complementary opportunities. Markowitz (2011) noted that structured activities promote connectedness among participants. Mason (2017) emphasized the importance of delivering programmes at the right place, at the right time, for the right price, in the right style, and by the right people. A clear ethos, where young people feel valued and part of something, was also noted, along with sustained delivery, multi-agent partnerships, personal development opportunities, and the concept of a "positive pathway."

'The reason that I went into community and youth work is through the youth club because I went through a lot when I was younger, which led, like the way I was going on anti-social behaviour and stuff like that. One youth worker changed my entire life, so I could do it with all these … And there's a lot more issues going on now in the big world than there was when I was younger.' (Young Volunteer, Bright Futures) Mason, (2017)

(iii) **ensuring that the programme offers activities which match the child's needs.**

Ensuring that the programme offers activities which align with the specific needs of the child was identified as a key facilitator in the included studies. Armour (2013) highlighted the importance of matching pupils' needs with programme objectives, conducting activities outside the traditional school environment, and working closely with pupils to select activities, set targets, and review progress. Draper (2016) mentioned that the involvement in engaging activities, opportunities for travel, and participation in experiences that promote personal growth and enhance self-esteem. Programmes that support planning and goal setting, foster a sense of safety and belonging, and enable the development of friendships and positive connections were also found to be particularly effective.

Buffalo City Programme for me, it's helping me because we have life skills…I have learnt to. Feeling safe - it keeps me away from the negative things because mostly weekends I am here or I am with the guys playing a match. Some days like we are here for life skills and at gym
become a better person…I am learning a lot in the life skills. I've learnt a lot. Self-efficacy-this club has really shown me which direction I really want to go. Not only on the field but

off the field and they have learnt [sic] me a lot…Actually it does apply at home too. Draper (2016)

"because it was awesome, like, the whole program. It's like one of those things where it's too much to name. , saying "it was a lot of things I learned from it that I will take with me for life, and a lot of things I gained from it, like sports and my resume and my business card and my cover letter. All the things I've done will help me, not just for high school or college, but for life. I think it's just a great overall program." Markowitz (2011)

There are also **several factors** that may act as barriers to achieving these outcomes:
(i) engagement with anti-social peers may reverse gains;

(ii) transgressions can lead to participants being removed from the programme or disrupt the intended structured pathway—although such behaviors are likely within the intended target group;

(iii) stereotyping by those in authority or the wider community may cause children and young people (CYP) to revert to negative behaviours;

(iv) initial resistance from participants, often rooted in distrust, previous negative experiences, or a lack of motivation—particularly when participants are not involved in co-designing activities or setting their own goals;

(v) lack of soft skills among coaches—such as empathy, effective communication, and consistency—as well as authoritarian attitudes, can damage trust and reduce engagement (Gipson, 2018). The departure of trusted mentors or coaches can result in emotional setbacks for participants, particularly when strong bonds have been formed (Zipp, 2017);

(vi) practical challenges such as lack of transportation, inadequate nutrition, unsuitable clothing, and limited access to basic resources can act as direct barriers to participation, especially in resource-constrained settings (Gipson, 2018). Additionally, inconsistent or unclear use of incentives may unintentionally distort motivation (Schaillee, 2017); and

(vii) lack of family support, which is often a critical enabler of sustained engagement (Gipson, 2018).

(iii) Design

Programme establishment: It is important to ensure that the intervention involves the appropriately skilled and qualified staff, who can understand participants, establish good relationships, and have authority. It is also important that the intervention is delivered in the right style (e.g., needs-based, accessible and respectful to participants) and place (e.g., a safe environment). Shortage of – or lack of continuity of – such staff is flagged as an issue in several studies. Ideally the sports leader can play the role of both mentor and role model: a trusted person who the participant will turn to for advice. Overall, the programme's structure , and the individual sports leaders, will offer participants rewards and recognition.

(iv) Illustrating causal processes

Two causal pathways for which there are no quantitative data are strongly supported by the qualitative findings. These are boredom theory and the role of the coach. In addition, we also highlight evidence of connections to services, and supporting the personal development of participants more generally, the role of incentives and sanctions and non-sports elements such as life skills training. Whilst the support for boredom theory suggests that sports programmes in general may have positive effects on offending in at risk populations, much of the evidence is in support of the Sports+ programmes whether it is formal or informal. Here, formal sports refer to structured, organized activities with scheduled sessions and designated facilitators. In contrast, informal sports involve unstructured play or general participation in sports such as playing casually with peers.

Boredom: Evidence related to boredom theory is mentioned in several studies by CYP and their families: 'it keeps me away from the negative things because mostly weekends I am here or I am with the guys playing a match' (Draper, 2016); "it's keeping me off the streets and stopping me from getting into trouble" (Barnes, 2010).; and Beumel (2013: 91)

Role of coach: The coach or mentor is usually the main contact in sports programmes and the relationship with that person is important in how the programme is seen and the benefits obtained. These benefits go well beyond sporting performance: "I think the mentors were absolutely terrific, they helped us do many things, and not only that, they became our friends" (Armour, 2013). 'It's not always with the training. When you have, for example, a problem in the neighbourhood or at home in, you can always go and talk to him [the head coach] about it. About anything" (Haudenhuyse, 2012). From a dance programme in Belgium: "Coaches showed interest in participants' everyday life, through informal interaction, occasional meetings outside dance classes, and contacts through social media. In that respect, participants who had participated in other urban dance initiatives considered the caring climate (i.e. the feeling of being part of a family) at JES and Zwartberg[22] and the relationship with coaches as better than in other dance settings they experienced before "(Schaillee, 2017: 36). And from a soccer coaching programme: "To begin with he was just another coach but when he brought out his funny side you felt he was getting personal to you. You felt if you needed someone he would be there for you." Cowan (2012). However, the same author notes that authoritarian coaching styles are common in professional sports which when applied to this group can be ineffective and even have adverse effects.

Positive pathways and connection to services: To maintain programme benefits, the programme needs to include a plan for post-programme activities. This may include continued participation in sports activities, but could also involve help with engagement with the justice system and social services, continuing education, employment, and accommodation. Some of these elements may be included in sports plus programmes, but the sports leader may play these roles even when it is not formally part of the intervention. For example, in a sports coaching program in England, the counsellor accompanied the participant to housing department interviews and assisted with job applications (Nichols, 2007).

Incentives / Sanctions: Interventions may provide both implicit and explicit incentives to change behaviour. For example, 'this program really helped in limiting the amount of alcohol that we consumed because we had a busy schedule at Champions League" Swendeman 2019; and

[22] Sports-based social projects in Flanders using urban dance: 'Zwartberg' (organized in the city of Genk, Limburg Province); 'Jeugd en Stad' and 'Let's Go Urban' (both located in the city of Antwerp, Antwerp Province) (Schaillee, 2017: 29).

“That [incentives] really helped a lot to encourage them to stay clean. Had there been no incentives they would not have been tested… it sort of became a competition as to who tested positive or negative as they would brag about being negative … Towards the end of the program, testing was something they were looking forward to and enjoyed doing.” Similarly, one young man said: “Yes, whenever I tested positive [for drugs or alcohol] I did not get the incentives and I felt bad and that also made me to seriously consider the consequences that this will have on my health’ Swendeman et al. (2019: 9). But the same author notes that there may be adverse effects, especially from paying cash incentives, as it can create the wrong motivation for participants. Furthermore, youth being suspended or expelled from the program means that they are deprived of its benefits, and so more likely to offend.

Life skills: In several studies the development of life skills is mentioned. For example, in an eight week sports programme for girls in New York with a range of sports and life skills training: "it was a lot of things I learned from it that I will take with me for life, and a lot of things I gained from it, like sports and my resume and my business card and my cover letter. All the things I've done will help me, not just for high school or college, but for life” Markowitz (2011). In another case “it’s helping me because we have life skills” (Draper, 2016).

Friends: Some studies confirmed that participants establish new social networks: "The friends I have now because of dancing also hang around with me at school. It means a lot to me, because before that they didn't notice me’ and ‘So when I came here and I started playing Football United, I met people from other countries, Iraq, Congo, Cambodia, and if it wasn't for soccer … I wouldn't know these people. So that’s a good thing about Football United” (Nathan, 2013).

Mental health, self regulation and aggression: CYP mentioned ways in which mental health and behaviour had changed: ‘I have never been able to control my temper. I have always done stupid things when I get mad, but since I started practicing, I have been doing better. I look forward to practicing and meeting with the sangha. I think I'm beginning to understand myself better. I might be learning who I really am. I still get angry, but I am trying to see things from other people’s eyes’ (Medenhall, 2006) and ‘I think there should be less fighting because I don't really think that it’s cool [to fight]. You can get killed while you are fighting. [You should] not fight as much. If you were fittin’ to say something ugly, you should stop and think about what you were going to say and then you should change the sentence around" (Martinek, 2001); and ‘I have

felt more relaxed, since I started Yoga I don't fight as much, when I have homework to do I don't get stressed, I do them well, with care and I am very relaxed, that's why I like Yoga classes, because I feel relaxed,' (Velasquez, 2015).

Cost effectiveness

Mason et al. (2017, p. 10) also reported on the cost-effectiveness of the intervention. Using data on the fiscal costs of antisocial behaviour (from December 2016), they found that the statistically significant benefits of the intervention were achieved with an investment of £263,800 and that it resulted in a net saving of £149,804. These savings were based on the reduced demand for police calls and services relating to youth anti-social behaviour. However, as noted above, the causal validity of the impact estimates in this study are weak.

The study by Meek (2012) of the sports intervention for youth in detention also reported a cost analysis. Meek reported that the Ministry of Justice give a cost figure of £47,137 per year for each prisoner to be held in a Young Offender Institution (under 21 years of age). This compares to the cost of the 2nd Chance Project at £1,130 per prisoner per year. This suggests that, if just two of those individuals who would have reoffended are prevented from doing so in one year, the project would have more than saved the initial expenditure. The actual reduction in reoffending is greater, so the programme is cost effective.

6. Authors' conclusions

Overview of findings

This review finds the secondary and tertiary sports and physical activity interventions may be successful in reducing youth offending – the observed effect size is equivalent to a 50% reduction. There are also positive effects in reducing aggressive and externalizing behaviour. However, these conclusions are based on a small number of studies for each outcome, many of the studies of having shortcomings, as such, we have low confidence in study findings.

Moreover, whilst sports are a hook to engage some children and young people, it does not appeal to all, and different activities appeal to different people. The 'hook' refers to attracting children and young people to activities which may involve more than just sports, such as life skills training or remedial classes. A broad range of activities on offer is more likely to attract a larger number of participants.

Sports has positive effects on self-esteem. However, the quantitative evidence shows no effect of intervention on developing social skills, pro-social behavior and engaging with more social peers, though there is qualitative evidence in favor of these. There is also no evidence to support 'counter theories' that bringing youth together may foster anti-social behavior.

The qualitative data strongly support two causal processes: boredom theory and the roles of the coash as mentor, which can take the form of advocate, role model, life coach, and connection to services, however, there is not quantitative evidence to support these theories.

Implications for research

This review has different findings to earlier reviews of associational studies on the relationship between sports participation and anti-social behaviour, which found no relationship or an adverse one. However, the evidence base on which the review is based is small and many studies have shortcomings. Few studies had effect sizes on offending behavior, making it difficult to conduct

meaningful moderator analysis to determine why sports works, and which program design components matter most to make it work. And there are no long run studies to know whether the effects are sustained after some months or even years. Hence, there is a need for further studies, preferably linked to sports program conducted in community and custodial settings, which have (i) rigorous quantitative methods to analyze causal effects, (ii) sufficient sample size for moderator analysis, including possibly A/B designs comparing different approaches such as Sports versus Sports Plus, and (iii) qualitative data to assess implementation as well as barriers and facilitators and to understand causal processes. These studies should analyze the understudied areas of diversion and the role of the coach.

Implications for policy and practice

The findings of this review support adding sports and physical activities to the list of interventions to tackle youth offending, though they should also be subject to further evaluation. The evidence is suggestive that the Plus elements of sports programmes– whether formal or informal – can play an important role. There is sufficient evidence in this review to consider development of an evidence-based guidance for sports and physical activity programs.

However, the evidence base could be stronger. Program managers are encouraged to work with research teams to undertake rigorous evaluations so we can learn how to better contribute to the positive development of our children and young people.

References

References to included studies

Effectiveness Studies

Anderson Christopher Marc. (1999). The effects of martial arts training with latency age children. (self-esteem, aggression, karate, sport). *Dissertation Abstracts International: Section B: The Sciences and Engineering*, 60, pp.1838.

Antonio Michael E and Shutt Susan R;. (2016). A community-based soccer program for at-risk youth in Ventanilla, Peru: An examination of the long-term effectiveness of Club Deportivo Dan. *Journal of Gang Research*, 23, pp.1-18.

D'Andrea Wendy, Bergholz Lou and Fortunato Andrea ; Spinazzola Joseph ;. (2013). Play to the whistle: A pilot investigation of a sports-based intervention for traumatized girls in residential treatment. *Journal of Family Violence*, 28, pp.739-749.

Freitag Eric J. (2006). Promoting achievement through sports: An in-depth analysis on the impact of sports and other extracurricular activities on the development of youth. *Dissertation Abstracts International Section A: Humanities and Social Sciences*, 66, pp.3806.

Fung A L. C and Lee T K. H;. (2018). Effectiveness of Chinese Martial Arts and Philosophy to Reduce Reactive and Proactive Aggression in Schoolchildren. *Journal of Developmental & Behavioral Pediatrics*, 39, pp.404-414.

Gatz Jennifer, Kelly Angela M and Clark Sheri L;. (2019). Improved executive function and science achievement for at-risk middle school girls in an aerobic fitness program. *The Journal of Early Adolescence*, 39, pp.453-469.

Green Heather Kestner. (2010). The impact of an academic sports-mentoring afterschool program on academic outcomes in at-risk youth. *Dissertation Abstracts International: Section B: The Sciences and Engineering*, 71, pp.3356.

Hartmann D and Depro B . (2006). Rethinking sports-based community crime prevention: A preliminary analysis of the relationship between midnight basketball and urban crime rates. *Journal of sport and social issues*, 30(2), pp.180-196.

Jones Marshall B and Offord David R;. (1989). Reduction of antisocial behavior in poor children by nonschool skill-development. *Journal of child psychology and psychiatry*, 30(5), pp.737-750.

Kebles John Paul and Jr. (1995). The effects of non-competitive basketball used in association with the instruction of social skills, on the self-concepts and perceptions of social competences of children with behavior problems. *Dissertation Abstracts International Section A: Humanities and Social Sciences*, 56, pp.0495.

Mason C, Downward P and Walpole C ; Clel ; J ; Aldridge J ;. (2017). Youth crime reduction and sport pilot project: Evaluation report. Loughborough University. , , pp..

Nathan S, Kemp L and Bunde-Birouste A ; MacKenzie J ; Evers C ; Shwe T A;. (2013). "We wouldn't of made friends if we didn't come to Football United": The impacts of a football program on young people's peer, prosocial and cross-cultural relationships. *BMC Public Health*, 13, pp..

Nichols Geoff. (200). West Yorkshine Sports Counselling. In: , ed., *Sport and Crime Reduction The Role of Sports in Tackling Youth Crime*. : , pp..

Olive C, McCullick B A and Tomporowski P ; Gaudreault K L; Simonton K ;. (2021). Effects of an after-school program focused on physical activity and social-emotional learning. *Journal of Youth Development*, 15, pp.292-305.

Palermo M T, Di Luigi M and Dal Forno G; Dominici C ; Vicomandi D ; Sambucioni A ; Proietti L ; Pasqualetti P ;. (2006). Externalizing and oppositional behaviors and karate-do: the way of crime prevention. A pilot study. *International Journal of Offender Therapy & Comparative Criminology*, 50, pp.654-60.

Shachar Keren, Ronen-Rosenbaum Tammie and Rosenbaum Michael ; Orkibi Hod ; Hamama Liat ;. (2016). Reducing child aggression through sports intervention: The role of self-control skills and emotions. *Children and Youth Services Review*, 71, pp.241-249.

Smith Judy, Twemlow Stuart W and Hoover Daniel W;. (1999). Bullies, victims and bystanders: A method of in-school intervention and possible parental contributions. *Child Psychiatry and Human Development*, 30, pp.29-37.

Spruit Anouk, Hoffenaar Peter and van der Put Claudia ; van Vugt Eveline ; Stams Geert Jan;. (2018). The effect of a sport-based intervention to prevent juvenile delinquency in at-risk adolescents. *Children and Youth Services Review*, 94, pp.689-698.

Terry Peter C, Hahn Allan and Simjanovic Melina ;. (2014). Effects of a sport programme (Box'Tag) on disadvantaged youth participants. *International Journal of Sport and Exercise Psychology*, 12, pp.258-272.

Velasquez Ana Maria, Lopez Maria Adelaida; Quinonez Natalia and Paba Diana Patricia;. (2015). Yoga for the prevention of depression, anxiety, and aggression and the promotion of socio-emotional competencies in school-aged children. *Educational Research and Evaluation*, 21, pp.407-421.

Williams D, Collingwood L and Coles J ; Schmeer S ;. (2015). Evaluating a rugby sport intervention programme for young offenders. *Journal of Criminal Psychology*, , pp..

Zivin G, Hassan N R and DePaula G F; Monti D A; Harlan C ; Hossain K D; Patterson K ;. (2001). An effective approach to violence prevention: traditional martial arts in middle school. *Adolescence*, 36, pp.443-59.

Process Evaluation

Agbuga Bulent. (2007). Children's achievement goals, attitudes, and disruptive behaviors in an after-school physical activity program. *Dissertation Abstracts International Section A: Humanities and Social Sciences*, 68, pp.2378.

J R Parker Andrew, Rosie Meek and Gwen Lewis ;. (2014). Sport in a youth prison: male young offenders' experiences of a sporting intervention. *Journal of Youth Studies*, 17, pp.381-396.

Armour Kathleen, Sandford Rachel and Duncombe Rebecca ;. (2013). Positive youth development and physical activity/sport interventions: Mechanisms leading to sustained impact. *Physical Education and Sport Pedagogy*, 18, pp.256-281.

Barnes R. (2010). How effective is the use of sports participation in combating youth antisocial behaviour in a deprived area of South Wales?. , , pp..

Brake J and Misener K . (2020). “It’s a ripple effect”: the role of intergroup contact within an inner-city youth sport for development and peace program. *Managing Sport and Leisure*, 25, pp.203-219.

Coalter Fred. (2013). 'There is loads of relationships here': Developing a programme theory for sport-for-change programmes. *International Review for the Sociology of Sport*, 48, pp.594-612.

Cohen Adam and Ballouli Khalid . (2018). Exploring the cultural intersection of music, sport and physical activity among at-risk youth. *International Review for the Sociology of Sport*, 53, pp.350-370.

Cordova Sierra Christine. (2020). The impact of a sports-based youth development program on at-risk youths' attitudes toward risk factors for gang joining. *Dissertation Abstracts International Section A: Humanities and Social Sciences*, 81, pp.No-Specified.

Cowan Daryl T and Taylor Ian M; McEwan Hayley E; Baker Julien S;. (2012). Bridging the gap between self-determination theory and coaching soccer to disadvantaged youth. *Journal of Applied Sport Psychology*, 24, pp.361-374.

Crabbe Tim. (2005). Getting to know you: engagement and relationship building - first interim National Positive Futures Case Study Research report. , , pp..

DinanThompson Maree, Sellwood Juanita and Carless Felicity ;. (2008). Kickstart to Life: Australian Football League as a Medium for Promoting Lifeskills in Cape York Indigenous Communities. *Australian Journal of Indigenous Education*, 37, pp.152-164.

Draper Catherine E, Errington Sheri and Omar Shaheda ; Makhita Stanley ;. (2013). The therapeutic benefits of sport in the rehabilitation of young sexual offenders: A qualitative evaluation of the Fight with insight programme. *Psychology of Sport and Exercise*, 14, pp.519-530.

Draper Catherine E and Coalter Fred. (2016). "There's just something about this club. It's been my family." an analysis of the experiences of youth in a South African sport-for-development programme. *International Review for the Sociology of Sport*, 51, pp.44-60.

Evi Buelens, Marc Theeboom and Jikkemien Vertonghen ; Kristine De ; Martelaer ;. (2015). Socially Vulnerable Youth and Volunteering in Sports: Analyzing a Brussels Training Program for Young Soccer Coaches. *Social Inclusion*, , pp.82.

Geoff Nichols and Iain Crow . (2004). Measuring the impact of crime reduction interventions involving sports activities for young people. *Howard Journal of Criminal Justice*, 43, pp.267-283.

Gipson Christina M, Hunt Tamerah and Moore Michael T;. (2018). Lessons Learned from a Nontraditional Sports Program: Crossfit Kids for Youth at Risk. *National Youth-At-Risk Journal*, 3, pp.25-37.

Glanz Jeffrey. (1994). *A School/Curricular Intervention Martial Arts Program for At-Risk Students*. : .

Gozzoli C, D'Angelo C and Confalonieri E ;. (2013). Evaluating sport projects which promote social inclusion for young people: A case study. *Revista Iberoamericana de Psicologia del Ejercicio y el Deporte*, 8, pp.145-163.

Hartmann D. (2003). Theorizing sport as social intervention: A view from the grassroots. *Quest*, 55, pp.118-140.

Haudenhuyse Reinhard Paul, Theeboom Marc and Coalter Fred ;. (2012). The Potential of Sports-Based Social Interventions for Vulnerable Youth: Implications for Sport Coaches and Youth Workers. *Journal of Youth Studies*, 15, pp.437-454.

Holt N L, Scherer J and Koch J ;. (2013). An ethnographic study of issues surrounding the provision of sport opportunities to young men from a western Canadian inner-city. *Psychology of Sport and Exercise*, 14, pp.538-548.

Jacobs J M, Wahl-Alexander Z and Mack T ;. (2019). Strategies for gaining access to deliver sport programs with highly vulnerable youth. *Journal of Youth Development*, 14, pp.155-164.

Kelly Laura. (2013). Sports-based interventions and the local governance of youth crime and antisocial behavior. *Journal of Sport & Social Issues*, 37, pp.261-283.

Kim Nam-Su. (2008). Program theory of sport-related intervention: A multiple case study of sport-related youth violence prevention programs. *Dissertation Abstracts International: Section B: The Sciences and Engineering*, 68, pp.6623.

Markowitz Ellen S. (2011). Exploring connectedness and self-esteem in a girls sports-based youth development program: How the ingredients fit together. *Dissertation Abstracts International Section A: Humanities and Social Sciences*, 72, pp.75.

Martinek Tom, Schilling Tammy and Johnson Dennis ;. (2001). Transferring personal and social responsibility of underserved youth to the classroom. *The Urban Review*, 33, pp.29-45.

Marttinen Risto, Johnston Kelly and Phillips Sharon ; Fredrick Ray N; Meza Brianna ;. (2019). REACH Harlem: Young Urban Boys' Experiences in an After-School PA Positive Youth Development Program. *Physical Education and Sport Pedagogy*, 24, pp.373-389.

Meixner T, Irwin A and Wolfe Miscio ; M ; Cox M ; Woon S ; McKeough T ; Milligan K ;. (2019). Delivery of Integra mindfulness martial arts in the secondary school setting: Factors that support successful implementation and strategies for navigating implementation challenges. *School Mental Health: A Multidisciplinary Research and Practice Journal*, 11, pp.549-561.

Mendenhall Marty. (2006). An investigation of the impact of buddhist martial arts as a rehabilitation intervention program to remedy emotional problems, curb aggressive tendencies, develop self-awareness, and cultivate a strong moral foundation with incarcerated juvenile delinquents. *Dissertation Abstracts International: Section B: The Sciences and Engineering*, 67, pp.3459.

Milligan K, Cosme R and Wolfe Miscio ; M ; Mintz L ; Hamilton L ; Cox M ; Woon S ; Gage M ; Phillips M ;. (2017). Integrating mindfulness into mixed martial arts training to enhance academic, social, and emotional outcomes for at-risk high school students: A qualitative exploration. *Contemporary School Psychology*, 21, pp.335-346.

Newman Tarkington J. (2020). Exploring life skill development and transfer: Experiences of youth in a community sport-based positive youth development program. *Dissertation Abstracts International Section A: Humanities and Social Sciences*, 81, pp.No-Specified.

Nichols G. (2007). Northtown Parks for All. In: Nichols G, ed., *Sports and Crime Reduction* . Abingdon, Oxon.: Routledge , pp.174-179.

Nichols Geoff. (200). West Yorkshine Sports Counselling. In: , ed., *Sport and Crime Reduction The Role of Sports in Tackling Youth Crime*. : , pp..

Nichols G. (2007). The Clontarf Foundation's Football Academies. In: Nichols G, ed., *Sports and Crime Reduction* . Abingdon, Oxon.: Routledge , pp.109-115.

Nichols G. (2007). Summit. In: Nichols G, ed., *Sports and Crime Reduction* . Abingdon, Oxon.: Routledge , pp.136-155.

Nichols G. (2007). Splash. In: Nichols G, ed., *Sports and Crime Reduction* . Abingdon, Oxon.: Routledge , pp.156-173.

Schaillee Hebe, Theeboom Marc and Skille Eivind ;. (2017). Adolescent girls' experiences of urban dance programmes: A qualitative analysis of Flemish initiatives targeting disadvantaged youth. *European Journal for Sport and Society*, 14, pp.26-44.

Swendeman D, Bantjes J and Mindry D ; Stewart J ; Tomlinson M ; Rotheram-Borus M J; Medich M ;. (2019). The Experiences of Young Men, Their Families, and Their Coaches Following a Soccer and Vocational Training Intervention to Prevent HIV and Drug Abuse in South Africa. *AIDS Education & Prevention*, 31, pp.224-236.

Walsh David S, Ozaeta Jimmy and Wright Paul M;. (2010). Transference of responsibility model goals to the school environment: Exploring the impact of a coaching club program. *Physical Education and Sport Pedagogy*, 15, pp.15-28.

Yang Jae Young. (2016). Effects of participation in a summer sports camp on at-risk boys: A self-determination theory perspective. *Dissertation Abstracts International Section A: Humanities and Social Sciences*, 76, pp.No-Specified.

Zipp S. (2017). Sport for development with 'at risk' girls in St. Lucia. *Sport in Society*, 20, pp.1917-1931.

References to excluded studies

Basaran Zekiye. (2016). The Effect of Sportive and Cultural Activities on the Self-Esteem and Hope of the Children Who Have Tendency to Involve in a Crime. *Educational Research and Reviews*, 11, pp.1324-1330.

Castillo Noel A. (2021). Measuring the social and emotional skills of Hispanic American students in an afterschool karate program. *Dissertation Abstracts International Section A: Humanities and Social Sciences*, 82, pp.No-Specified.

Conklin-Ginop Evelyn, Braverman Marc T and Caruso Robyn ; Bone Dennis ;. (2011). Bringing Carnaval Drum and Dance Traditions into 4-H Programming for Latino Youth. *Journal of Extension*, 49, pp..

Fleisher Stephen J, Avelar Charles and Latorre Sylvia E; Ramirez Jelga ; Cubillos Sylvia ; Christiansen Heidi ; Blaufarb Herbert ;. (1995). Evaluation of a Judo/Community Organization Program to treat predelinquent Hispanic immigrant early adolescents. *Hispanic Journal of Behavioral Sciences*, 17, pp.237-248.

Hastie Peter A and Sharpe Tom. (1999). Effects of a sport education curriculum on the positive social behavior of at-risk rural adolescent boys. *Journal of Education for Students Placed at Risk*, 4, pp.417-430.

Khoury-Kassabri Mona and Schneider Helen . (2018). The relationship between Israeli youth participation in physical activity programs and antisocial behavior. *Child & Adolescent Social Work Journal*, 35, pp.357-365.

Meek R. (2012). The role of sport in promoting desistance from crime: An evaluation of the 2nd Chance Project rugby and football academies at Portland Young Offender Institution. , , pp..

Nicolas Geoff. (2007). Hafotty Wen - Peaks Programme. In: Routledge , ed., *Sport and Crime Reduction The Role of Sports in Tackling Youth Crime.* : , pp..

Riley Allison, Anderson-Butcher Dawn and Logan Jessica ; Newman Tarkington J; Davis Jerome ;. (2017). Staff practices and social skill outcomes in a sport-based youth program. *Journal of Applied Sport Psychology*, 29, pp.59-74.

Rodgers Leon and Furcron Charne . (2016). The dynamic interface between neuromaturation, risky behavior, creative dance movement, and youth development programming. *American Journal of Dance Therapy*, 38, pp.3-20.

Spruit A, van der Put C and van Vugt E ; Stams G J;. (2018). Predictors of Intervention Success in a Sports-Based Program for Adolescents at Risk of Juvenile Delinquency. *International Journal of Offender Therapy & Comparative Criminology*, 62, pp.1535-1555.

Stevens B, Farrelly J and Quell A ;. (2017). Integrating Positive Behavioral Interventions and Supports Into an Afterschool Tennis Program for At-Risk Youth. *Report on Emotional & Behavioral Disorders in Youth*, 17, pp.47-51.

Tester G J and Watkins G G; Rouse I. (1999). The Sports Challenge international programme for identified 'at risk' children and adolescents: a Singapore study. *Asia-Pacific Journal of Public Health*, 11, pp.34-8.

Twemlow Stuart W, Biggs Bridget K; Nelson Timothy D; Vernberg Eric M; Fonagy Peter and Twemlow Stephen W;. (2008). Effects of participation in a martial arts-based antibullying program in elementary schools. *Psychology in the Schools*, 45, pp.947-959.

Williams K, Davis Iii and O ; Gittelman M ; Pomerantz W J;. (2006). Friday night youth basketball league: A program to increase self esteem, and decrease crime, violence and injury among inner city youth. *Journal of Trauma - Injury and Infection and Critical Care*, 60, pp.1385-1386.

Additional references

References

Arnett, J. J. (2018). Getting better all the time: Trends in risk behavior among American adolescents since 1990. *Archives of Scientific Psychology, 6*(1), 87-95. http://dx.doi.org/10.1037/arc0000046.

Bateman, Y. (2020). The state of youth justice 2020. An overview of trends and developments. Llangammarch Wells: National Association for Youth Justice.

Baumer, E. P., Velez, M. B., & Rosenfeld, R. (2018). Bringing crime trends back into criminology: A critical assessment of the literature and a blueprint for future inquiry. Annual Review of Criminology, 1, 38-61, https://doi.org/10.1146/annurev-criminol-032317-092339

Bonell, C., Hinds, K., Dickson, K., Thomas, J., Fletcher, A., Murphy, S., ... & Campbell, R. (2015). What is positive youth development and how might it reduce substance use and violence? A systematic review and synthesis of theoretical literature. *BMC public health*, *16*, 1-13.

Booth, A., & Carroll, C. (2015). Systematic searching for theory to inform systematic reviews: is it feasible? Is it desirable?. Health information and libraries journal, 32(3), 220–235. https://doi.org/10.1111/hir.12108

Carroll, C., Booth, A., Leaviss, J., & Rick, J. (2013). "Best fit" framework synthesis: refining the

method. BMC medical research methodology, 13, 37. https://doi.org/10.1186/1471-2288-13-37

Carvalho, S. & White, H., 1997. "Combining the Quantitative and Qualitative Approaches to Poverty Measurement and Analysis. The Practice and the Potential," Papers 366, World Bank - Technical Papers

Carvalho, S., & White, H. (2004). Theory-Based Evaluation: The Case of Social Funds. American Journal of Evaluation, 25(2), 141–160. https://doi.org/10.1177/109821400402500202

Case, S., & Browning, A. (2021). "Child First Justice: The Research Evidence-base [full Report]". Loughborough University. https://hdl.handle.net/2134/14152040.v1.

Coalter, F. (1996). Sport and Anti- social Behaviour: A Policy- related Review, Research Digest, (41), pp. 1-20, Edinburgh, The Scottish Sports Council.

Davies R, 2018, Representing Theories of Change: A Technical Challenge with Evaluation Consequences, CEDIL Inception Paper 15: London

Dyck C. B. (2011). Football and post-war reintegration: exploring the role of sport in DDR processes in Sierra Leone. Third world quarterly, 32(3), 395–415. https://doi.org/10.1080/01436597.2011.573936

Fernández-Molina E, & Bartolomé Gutiérrez R. (2020). Juvenile crime drop: What is happening with youth in Spain and why? European Journal of Criminology, 17(3):306-331. doi:10.1177/1477370818792383

Finkelhor, D., & Johnson, M. (2017). Has Psychiatric Medication Reduced Crime and Delinquency? Trauma, Violence, & Abuse, 18(3), 339–347. https://doi.org/10.1177/1524838015620817

Gamble, P. (2011). Training for Sports Speed and Agility – An Evidence-based Approach. 10.4324/9780203803035.

Hando, M. (2020) 'The Gender Trends of Juvenile Delinquency Drop in Japan', M.A. Thesis. Southern Illinois University Carbondale.

Higgins, J & Green, S. (2009). Cochrane Handbook for Systematic Reviews of Interventions. 10.1002/9780470712184. Higgins JPT, Green S (editors). Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0 [updated March 2011]. The Cochrane Collaboration, 2011. Available from www.handbook.cochrane.org

Hirschi, T. (1969). Causes of delinquency. Berkley, CA: University of California Press.

Holt, N., & Deal, C. J, Pankaw, K., (2020). Positive youth development through sport: A review.

https://doi.org/10.1002/9781119568124.ch20

Holt, N. L., Neely, K. C., Slater, L. G., Camiré, M., Côté, J., Fraser-Thomas, J., MacDonald, D., Strachan, L., & Tamminen, K. A. (2017). A grounded theory of positive youth development through sport based on results from a qualitative meta-study. International review of sport and exercise psychology, 10(1), 1–49. https://doi.org/10.1080/1750984X.2016.1180704

Janssens, J. & Verweel, P. (2014) The significance of sports clubs within multicultural society. On the accumulation of social capital by migrants in culturally "mixed" and "separate" sports clubs, European Journal for Sport and Society, 11:1, 35-58, DOI: 10.1080/16138171.2014.11687932

Jugl, I., Bender, D. & Lösel, F. Do Sports Programs Prevent Crime and Reduce Reoffending? A Systematic Review and Meta-Analysis on the Effectiveness of Sports Programs. J Quant Criminol (2021). https://doi.org/10.1007/s10940-021-09536-3

Kneale D, Thomas J, Bangpan M, Waddington H, & Gough D, (2018) Causal Chain Analysis in Systematic Reviews of International Development Interventions CEDIL Inception Paper 4: London

Lipsey, M. W., & Wilson, D. B. (2001). *Practical meta-analysis*. Sage Publications, Inc.

Littell, J. H., & White, H. (2018). The Campbell Collaboration: Providing Better Evidence for a Better World. Research on Social Work Practice, 28(1), 6–12. https://doi.org/10.1177/1049731517703748

Loeber R., Farrington D.P. (2014) Age-Crime Curve. In: Bruinsma G., Weisburd D. (eds) Encyclopedia of Criminology and Criminal Justice. Springer, New York, NY. https://doi.org/10.1007/978-1-4614-5690-2_474

Mason, C., Walpole, C., & Case, S. (2020). Using sport to enhance positive outcomes for young people in the context of serious youth violence: a theory of change. Streetgames, Loughborough University, and Youth Endowment Foundation.

Mason, C., Downward, P., Walpole, C., Cleland, J., & Aldridge, J. (2017). Youth crime reduction and sport pilot project: Evaluation report. Loughborough University.

Melendez-Torres, G. J., Dickson, K., Fletcher, A., Thomas, J., Hinds, K., Campbell, R., ... & Bonell, C. (2016). Positive youth development programmes to reduce substance use in young people: Systematic review. *International Journal of Drug Policy*, *36*, 95-103.

Mendel, R.A. (2024) Protect and Redirect: America's Growing Movement to Divert Youth Out of the Justice System. Washington D.C.: The Sentencing Project. https://www.sentencingproject.org/press-releases/new-report-americas-growing-

movement-to-divert-youth-out-of-the-justice-system/

Molly McCarthy (2021) How Universal is the Youth Crime Drop? Disentangling Recent Trends in Youth Offending through a Socio-Economic Lens, Victims & Offenders, 16:6, 796-818, DOI: 10.1080/15564886.2020.1855281

McMahon, S; Belur, J; (2013) Sports and Reducing Youth Crime. (Project Oracle synthesis study 02/13). Project Oracle: London, UK

Moeyaert, M., Ugille, M., Beretvas, N., Ferron, J., Bunuan, R., & van den Noortgate, W. (2017). Methods for dealing with multiple outcomes in meta-analysis: A comparison between averaging effect sizes, robust variance estimation and multilevel meta-analysis. International Journal of Social Research Methodology, 20(6), 559 – 572. https://doi.org/10.1080/13645579.2016.1252189

Morgan, D. (2000). The 'UP' Project- Wolverhampton, 'Sport versus Youth Crime', The Centre for Sport and Leisure Management, Bolton: Bolton Institute.

Nichols, G. (2007) Sport and Crime Reduction: The Role of Sports in Tackling Youth. Abingdon, United Kingdom: Routledge.

Pawson, R (2006). Evidence-based Policy: A Realist Perspective. Thousand Oaks, CA: Sage. 209 pages.

Petrosino, A. Turpin-Petrosino, C. Guckenburg S. (2014) 'The Impact of Juvenile System Processing on Delinquency' in D. Farrington and J. Murray Labelling Theory: empirical tests. London: Routledge.

Roberts, M, Buckland, G and Redgrave, H (2019) Examining the youth justice system: what drove the falls in first time entrants and custody, and what should we do as a result? London: Crest Advisory, https://static.wixstatic.com/ugd/b9cf6c_69afbe28369544c7bca350229d0be59f.pdf

Segrave, J.O. (1983) Sport and Juvenile Delinquency. Exercise and Sport Sciences Reviews, 11, 181.https://doi.org/10.1249/00003677-198301000-00007

Sønderlund, A.L., O'Brien, K., Kremer, P., Rowland, B., De Groot, F., Staiger, P., Zinkiewicz, L., & Miller, P.G. (2014). The association between sports participation, alcohol use and aggression and violence: A systematic review. Journal of Science and Medicine in Sport, 17(1), 2 – 7. https://doi.org/10.1016/j.jsams.2013.03.011

Spruit, A., van Vugt, E., van der Put, C., van der Stouwe, T., & Stams, G.-J. (2016). Sports participation and juvenile delinquency: A meta-analytic review. Journal of Youth and Adolescence, 45, 655 – 671. https://doi.org/10.1007/s10964-015-0389-7

Tacon, R. (2019), "Social capital and social ties in organisations: a case study of two voluntary sports clubs", International Journal of Sociology and Social Policy, Vol. 39 No. 9/10, pp. 883-898. https://doi.org/10.1108/IJSSP-09-2019-0177

Taylor, P., Davies,L., Wells, P., Gilbertson, J., & Tayleur, W., (2015). A review of the Social Impacts of Culture and Sport. Sheffield Hallam University Research Archive (SHURA)United Nations Convention on The Rights of The Child, (UNCRC). (2007) Children's rights in juvenile justice. Committee on the rights of the child.

Van der Laan, A.M. Rokven, J. Weijters G. & Beerthuizen M.G.C.J. (2021) The Drop in Juvenile Delinquency in The Netherlands: Changes in Exposure to Risk and Protection, Justice Quarterly, 38:3, 433-453, DOI: 10.1080/07418825.2019.1656762

Viechtbauer, W., (2010). Conducting Meta-Analyses in R with The metafor Package. Journal of Statistical Software. 36. 10.18637/jss.v036.i03.

Welsh, B., Yohros, A., & Zane, S., (2020). Understanding iatrogenic effects for evidence-based policy: A review of crime and violence prevention programs. Aggression and Violent Behavior. 55. 10.1016/j.avb.2020.101511.

White, H., (2018) Theory-based systematic reviews, Journal of Development Effectiveness, 10:1, 17-38, DOI: 10.1080/19439342.2018.1439078

White, H. (2021) 'Using causal chain analysis in systematic reviews', CEDIL Methods Brief 4, London and Oxford: CEDIL. Available at: https://doi.org/10.51744/CMB4

Wilson, D.B., Gill, C., Olaghere, A. and McClure, D. (2016), Juvenile Curfew Effects on Criminal Behavior and Victimization: A Systematic Review. Campbell Systematic Reviews, 12: 1-97. https://doi.org/10.4073/csr.2016.3

Wilson, D.B., Brennan, I. and Olaghere, A. (2018), Police-initiated diversion for youth to prevent future delinquent behavior: a systematic review. Campbell Systematic Reviews, 14: 1-88. https://doi.org/10.4073/csr.2018.5

Youth Endowment Fund (2021) Technical Guide version 3-2. London: Youth Endowment Fund. https://res.cloudinary.com/yef/images/v1624826001/cdn/YEF-Toolkit-technical-guide-June-21/YEF-Toolkit-technical-guide-June-21.pdf

Youth Justice Board / Ministry of Justice, Youth Justice Statistics, 2018/19, England and Wales, January 2020, Statistics bulletin www.gov.uk/government/collections/youth-justice-

statistics

Youth Justice Board / Ministry of Justice, Youth Justice Statistics, 2019/20, England and Wales, January 2021, Statistics bulletin, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/956621/youth-justice-statistics-2019-2020.pdf

Fisher, Z., & Tipton, E. (2015). *Robumeta: An R-package for robust variance estimation in meta-analysis*. Available from: https://cran.r-project.org/web/packages/robumeta/vignettes/robumetaVignette.pdf

Harrer, M., Cuijpers, P., Furukawa, T. A., & Ebert, D. D. (2021). *Doing meta-analysis with R: A hands-on guide*. Chapmann & Hall/CRC Press. Available from https://bookdown.org/MathiasHarrer/Doing_Meta_Analysis_in_R/

Hedges, L. V., Tipton, E., & Johnson, M. C. (2010). Robust variance estimation in meta-regression with dependent effect size estimates. *Research Synthesis Methods, 1*(1), 39 – 65.

Pigott, T. D., & Polanin, J. R. (2020). Methodological guidance paper: High-quality meta-analysis in a systematic review. *Review of Educational Research, 90,* 24 – 46. https://doi.org/10.3102/0034654319877153

Polanin, J. R., Espelage, D. L., Grotpeter, J. K., Ingram, K., Michaelson, L., Spinney, E., Valido, A., El Sheikh, A., Torgal, C., & Robinson, L. (2021). A systematic review and meta-analysis of interventions to decrease cyberbullying perpetration and victimisation. *Prevention Science,* https://doi.org/10.1007/s11121-021-01259-y

Tanner-Smith, E. E., & Tipton, E. (2013). Robust variance estimation with dependent effect sizes: Practical considerations including a software tutorial in Stata and SPSS. *Research Synthesis Methods, 5,* 13 – 30. https://doi.org/10.1002/jrsm.1091

Tipton, E. (2015). Small sample adjustments for robust variance estimation with meta-regression. *Psychological methods, 20*(3), 375 – 393. https://doi.org/10.1037/met0000011

Viechtbauer, W. (2010). Conducting meta-analyses in R with the metaphor package. *Journal of Statistical Software, 36*(3).

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- Suchi Malhotra: Project lead responsible for project management, report writing, search, and screening and coding. Suchi will lead the qualitative analysis under the guidance of HW.
- Ashima Mohan: Screening, coding and support to report writing.
- Hannah Gaffney: Hannah will provide support on content and lead on the meta-analysis.
- 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.

Potential conflicts of interest

Howard White is CEO of the Campbell Collaboration. As CEO he has no role in the editorial process.

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Online supplements

Appendix A: Search terms

1. **APA PsycInfo (Ovid) <1806 to February Week 2 2021>**

1 sports/ or baseball/ or basketball/ or football/ or judo/ or martial arts/ or soccer/ or swimming/ or tennis/ or weightlifting/ or "sports (attitudes toward)"/ or athletic participation/ or extracurricular activities/ or after school programs/ or school club membership/ (31372)

2 (sport* or baseball or basketball or football* or judo or "martial arts" or soccer or swimming or tennis or weightlifting or boxing or volleyball or (athletic adj2 (participat* or activ*)) or after-school or afterschool or ((extracurricular or extra-curricular) adj2 (activit* or participat* or involv*))).ti,ab. (52935)

3 or/1-2 (57762)

4 (adolescen* or teen* or youth or youths or juvenile* or "young people" or "young person*" or child*).ti,ab. (916596)

5 Early Adolescence/ or exp Predelinquent Youth/ (2452)

6 or/4-5 (916653)

7 behavior change/ or exp behavior disorders/ or exp aggressive behavior/ or exp antisocial behavior/ or exp behavior problems/ or exp criminal behavior/ or crime prevention/ or exp juvenile delinquency/ or juvenile justice/ or "Adolescent Psychology"/ or exp Adolescent Attitudes/ or exp Adolescent Psychopathology/ or exp Adolescent Psychiatry/ or Adolescent Development/ or treatment outcomes/ or Mental Health Program Evaluation/ or At Risk Populations/ or self-control/ or self-regulation/ or prosocial behavior/ (467938)

8 (delinquen* or anti-social or antisocial or "young offender*" or "young addict*" or (crime* adj2 prevent*) or at-risk or ((substance or drug) adj2 (misuse or abuse)) or ((disruptive or prosocial or externali* or criminal or aggressive or violen* or chang* or disorder*) adj2 behavio*)).ti,ab. (223341)

9 or/7-8 (595107)

10 program development/ or exp government programs/ or exp program evaluation/ or exp social programs/ or diversion programs/ (43228)

11 intervention/ or early intervention/ or school based intervention/ (97716)

12 (program* or project or projects or intervention*).ti,ab. (792480)

13 or/10-12 (810845)
14 athletes/ or college athletes/ or professional athletes/ or obesity/ or overweight/ (42307)
15 (athlete or athletes or obes* or overweight or "professional sport*").ti,ab. (61228)
16 or/14-15 (67267)
17 3 and 6 and 9 and 13 (1529)
18 17 not 16 (**1302**)
19 resource allocation/ or "cost containment"/ or exp "costs and cost analysis"/ or exp funding/ (52049)
20 (((cost or costs or costing* or economic* or funds or funding) adj2 (benefit* or evaluat* or analy* or contain* or utility)) or (resource* adj2 allocat*)).ti,ab. (22568)
21 or/19-20 (67509)
22 3 and 6 and 9 and 21 (23)
23 22 not 16 (**20**) **[Economic/Cost]**

2. **APA PsycExtra (Ovid) <1908 to January 11, 2020>**

1 sports/ or baseball/ or basketball/ or football/ or judo/ or martial arts/ or soccer/ or swimming/ or tennis/ or weightlifting/ or "sports (attitudes toward)"/ or athletic participation/ or extracurricular activities/ or after school programs/ or school club membership/ (2051)
2 (sport* or baseball or basketball or football* or judo or "martial arts" or soccer or swimming or tennis or weightlifting or boxing or volleyball or (athletic adj2 (participat* or activ*)) or after-school or afterschool or ((extracurricular or extra-curricular) adj2 (activit* or participat* or involv*))).ti,ab. (3562)
3 or/1-2 (3963)
4 (adolescen* or teen* or youth or youths or juvenile* or "young people" or "young person*" or child*).ti,ab. (55913)
5 Early Adolescence/ or exp Predelinquent Youth/ (101)
6 or/4-5 (55914)
7 behavior change/ or exp behavior disorders/ or exp aggressive behavior/ or exp antisocial behavior/ or exp behavior problems/ or exp criminal behavior/ or crime prevention/ or exp juvenile delinquency/ or juvenile justice/ or "Adolescent Psychology"/ or exp Adolescent Attitudes/ or exp Adolescent Psychopathology/ or exp Adolescent Psychiatry/ or Adolescent

Development/ or treatment outcomes/ or Mental Health Program Evaluation/ or At Risk Populations/ or self-control/ or self-regulation/ or prosocial behavior/ (38739)

8 (delinquen* or anti-social or antisocial or "young offender*" or "young addict*" or (crime* adj2 prevent*) or at-risk or ((substance or drug) adj2 (misuse or abuse)) or ((disruptive or prosocial or externali* or criminal or aggressive or violen* or chang* or disorder*) adj2 behavio*)).ti,ab. (17005)

9 or/7-8 (48961)

10 program development/ or exp government programs/ or exp program evaluation/ or exp social programs/ or diversion programs/ (8694)

11 intervention/ or early intervention/ or school based intervention/ (7462)

12 (program* or project or projects or intervention*).ti,ab. (63303)

13 or/10-12 (67239)

14 athletes/ or college athletes/ or professional athletes/ or obesity/ or overweight/ (2549)

15 (athlete or athletes or obes* or overweight or "professional sport*").ti,ab. (3380)

16 or/14-15 (3762)

17 3 and 6 and 9 and 13 (151)

18 17 not 16 (**132**)

19 resource allocation/ or "cost containment"/ or exp "costs and cost analysis"/ or exp funding/ (12256)

20 (((cost or costs or costing* or economic* or funds or funding) adj2 (benefit* or evaluat* or analy* or contain* or utility)) or (resource* adj2 allocat*)).ti,ab. (1049)

21 or/19-20 (12869)

22 3 and 6 and 9 and 21 (4)

23 22 not 16 (**4**)

Appendix B Screening Tool of Sports Review

Screening Tool			
1.	Is the paper in English?	No	Exclude
		Yes	Continue to q2

2.	Is the paper about an intervention intended to modify the behaviour or attitudes, either directly or indirectly, of children up to the age of 17 who are at risk?	No	Exclude
		Yes	Continue to q3a
3.	Is the intervention (a) involving sports activities in any settings (b) Sports plus activities or (c) Physical activity	No	Exclude
		Yes	Continue to q3
3a.	Is the paper a quantitative evaluation reporting measures of eligible outcomes compared to the outcomes (1) in a comparison group (either with or without baseline outcome measures).	No	Continue to q3b
		Yes	Continue to q4
3b.	Is the paper a qualitative process evaluation describing intervention design or implementation, or an analysis of intervention costs?	No Yes	Exclude Include (END)
4.	Do any outcome measuring externalizing, anti-social, conduct disorders or criminal behaviour.	No	Exclude
		Yes	Include

Appendix C Coding Tools (Including critical appraisal)

Category	Sub Category
Publication Status	• Ongoing • Completed
Region	• East Asia & Pacific • Europe & Central Asia • Latin America & Caribbean • Middle East & North Africa • North America • South Asia • Sub Saharan Africa • South America
Countries by income	• Low- Income Countries • Lower- Middle Income Countries • Upper- Middle Income Countries • High Income Countries
Country (e.g. USA, UK-England, Scotland and Ireland)	• Australia • Canada • China • Finland • Germany • Hong Kong • India • Indonesia • Ireland • Italy • Mexico

	• Netherlands • New Zealand • Nigeria • Norway • South Africa • Sweden • Turkey • UK • USA • Others
Settings	• Rural • Urban • Rural and Urban (Both) • Not Clear
Project/ Intervention Name	
Year	
Ages	• under 9 • 9-14 Years • 15-18 Years • Above 18 Years • Not reported
Gender	• Male • Female • Both • Non-Binary • All sexes • Not reported

Types of Intervention	• Sports Intervention • Sports Plus Intervention • Physical Activity
Level of Targeting	• Secondary- Interventions for children or youth with problem behaviours • Tertiary - Interventions for perpetrators and victims of crime and antisocial or delinquent behaviour
Sports or Physical Activity Type	• Boxing • Volleyball • Cricket • Basketball • Football • Tennis • Swimming • Yoga • Aerobics • Soccer • Play Activity • Badminton • Hockey • Martial Arts • Any other (pls specify)
Ethnic minorities	• Mainly/exclusively (80%) • Partly • None • Not clear
Study Design	• Experimental design

	• Non- Experimental design • Before vs After • Process Evaluation • Cost Analysis
Study Method	• Randomized Controlled Trial • Non- Experimental effectiveness study • Process evaluation or qualitative intervention study • Cost analysis • Before vs after
Location/ Settings	• Sports or youth Club • School • Community • Custodial setting • Non- Custidial Residential (Summer Camps etc)
Sample Size	• Total Numbers • Total Number of Participants in Intervention Group • Total Number of Participants in Control Group
Attrition	• Number
Costs involved	• Staff Training • Infrastructure • Personal Cost • Monitoring & supervision • Venue • Any Other
Frequency of the Intervention	• More than three times a week • Two- three times a week • Once a week

	• More than once a month • Less than once a month • Not reported
Session Duration	• One hour or less • 1-2 hours • More than 2 hours • Not reported
Intervention duration	• Duration • Not reported
Intervention category	**Intervention sub-category**
Behavioural interventions	• Mental Health & Therapeutic interventions (Counselling session) • Social and emotional interventions • Other
Mentoring	• Advice and Support
Skill development/Teaching	• Academic support • Skill development (communication skills, leadership skills, social skills, coping skills etc) • Life skills training
Connection to services	• Career/vocational guidance & support • Employment services (CVs etc) • Accommodation • Providing other desired information and guidance
Outcome Domain	**Outcome Sub-domain**

Offending outcomes	• Violent offending (including weapon carrying) • Drug use/misuse • Other offending and reoffending
Behavioural outcomes	• Aggression • Alcohol use/misuse • Anti- social and delinquent behaviour • Bullying and online perpetration • Externalising behaviour • Gang involvement and anti- social peers • Victimisation • Social skills and pro-social behaviour • Group membership and participation in community – based activities (volunteering) • Time use
Psychosocial and cognitive outcomes	• Self -esteem/self-worth • Mental health/resilience • Self-control and regulation (impulsivity)
Attitudes and beliefs	• Pro- social values • Attitudes to aggression and use of violence • Attitudes to drug use • Attitudes to crime and responses to crime • Attitudes to police and justice system • Attitudes to authority
Protective factors	• Family functioning, parenting practices and family relationships • Non- family adult relationships • Access to services and service linkages • Social cohesion

- Safe spaces
- Engagement in education and academic achievement
- Practical life skills
- Sports or physical activity (e.g.dance) skills ('sports capital)
- Employment and Income

Appendix C Critical appraisal tool for primary studies: effectiveness

Item	**Description**	**Key**	**Notes**
Intervention	Is the intervention clearly named and described, including all relevant components.	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	
Evaluation questions	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	
Study design	Use the study design coding	High: Experimental Medium: Non-experimental Low: Before versus after	
Outcomes	Are the outcomes clearly defined? Where appropriate do they use an existing, validated measurement tool?	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 sufficient references to source. Low: Little or no definition	
Sample size (power calculation)	Do the authors report a power calculation as the basis for sample size?	High: Power calculation report and sample size meets necessary sample size Medium: Power calculation mentioned and sample size meets necessary sample size Low: No mention of power calculation.	
Attrition	Reported for endline and longest follow up. Calculate overall attrition and differential attrition It is often necessary to calculate from table of results. If sample size varies by outcome calculate for highest attrition.	High: Attrition within IES conservative standard Medium: Attrition within IES liberal standard Low: Attrition outside IES liberal standard	
Overall (including questions	The overall score uses the weakest link in the chain principle i.e., is	High: High on all items Medium: No lower than medium on any item Low: At least one low	

for all studies)	the lowest score on any item		

Critical Appraisal tool – Process Evaluation

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				

Appendix D Definitions of Outcomes

Outcome category	Sub-category	Description
Offending Outcomes (Outcomes that refer to things that are against the law)	Violent offending (including weapon carrying)	Violent offenses: carrying or use of weapons, use or threat of physical assault, murder or manslaughter, mugging / hold up
	Drug use/misuse	The use or misuse of substances, including both illegal drugs and legal highs. Use can vary from CYP who use drugs recreationally to those who have a diagnosed addiction. E.g., heroin, marijuana, cocaine, ecstasy
	Other offending and reoffending	Committing any other offenses (any reporting system)
Behavioural Outcomes (Outcomes that refer to the way in	Aggression	Hostile or violent behaviour, e.g., hitting or punching someone
	Alcohol use/misuse	CYP who participate in the underage drinking of alcohol. This can be on a continuum from

which someone acts)		CYP who use alcohol recreationally to CYP who have a recognised problem with alcohol
	Anti-social and delinquent behaviour	Offensive behaviour in public places which is not against the law (e.g., shouting and swearing, verbal abuse, minor vandalism, playing loud music).
	Bullying and online perpetration	Behaviour that is repeated or sustained that is intended to hurt or intimidate someone else. E.g., assault, teasing/name calling, making threats
	Externalising behaviour	Behaviours directed outwards, towards others. They include aggressive behaviours (e.g., fighting, assault) and rule breaking behaviours (e.g. vandalism). They are also known as 'conduct' or 'behavioural' problems. In younger children this is often called disruptive behaviour or acting out.
	Gang involvement and anti-social peers	A group of youg people who identify themselves with a common name. They spend time together and may engage in criminal activity. Also includes non-gang peers who encourage anti-social behaviour.
	Victimisation	When an individual is harmed or injured because of a criminal act
	Social skills and pro-social behaviour	Interpersonal and communication skills, acting in a kind and caring way toward others, being able to manage disagreements and conflict without violence (conflict resolution)
	Group membership and participation in	Taking part in both regular and one-off community activities, such as member of a

	community-based activities (volunteering)	sports or dance club or group, and helping at community events
	Time use	How CYP spend their time, especially leisure time.
Psychosocial and cognitive outcomes (Psychosocial and cognitive)	Self-esteem / self-worth	Confidence in one's own worth
	Mental health / resilience	Any measure of mental health and resilience to adverse circumstances and events
	Self-control and regulation (impulsivity)	The ability to control ones behaviour, including in order to attain long-term goals. The negative counterpart is impulsivity, i.e. acting on impulse without regard for the consequences.
Attitudes and beliefs (An attitude refers to how someone thinks or feels about something whereas a belief is an acceptance that something is true)	Pro-social values	Believing it is important to act with care and concern for the feelings and welfare of others
	Attitudes to aggression and use of violence	Attitudes to aggressive and violent behaviour in themselves and in others
	Attitudes to drug use	Attitudes toward the acceptability of drug use
	Attitudes to crime and responses to crime	Attitudes toward crime and appropriate treatment of those who offend
	Attitudes to police and justice system	Attitudes toward police in general, how the police conduct their work, and to the workings of the justice system
	Attitudes to authority	Attitudes to and acceptance of authority, can be in any setting such as school or a sports club, or in general attitudes.
Protective factors	Family functioning, parenting practices and family relationships	Measures of attachment to any family member and relationships within the family. Measures of household systems and parent attitudes and behaviour), climate, cohesion and ability to meet all basic needs for example: domestic abuse/witnessing abuse, familial conflict resolution style

Non-family adult relationships	Quality of relationship with non-family adults, e.g., formal and informal mentors
Access to services and service linkages	Any measure of the use of social and welfare services and referrals made to these services
Social cohesion	Measure of belief/bonds and trust within a community. (Larsen, 2014) And/or any measures of perceived safety, crime levels etc
Safe spaces	Measures of how secure a young person feels in a particular setting
Engagement in education and academic achievement	Attendance at school and engagement in classroom and other activities. School grades.
Practical life skills	Skills that are of use in obtaining and keeping employment. Ability to manage own personal affairs, e.g., finances and form filling
Sports or physical activity (e.g., dance) skills ('sports capital')	Measures of ability must specific sport, or general measures of physical ability (e.g., speed and agility)

Appendix -E

Technical Appendices

1. Estimating an odds ratio for the before-after intervention effect: A worked example

Spruit et al. (2018) reported the effectiveness of a sports intervention programme, involving multiple sports, on official records of juvenile delinquency. These calculations were carried out in MS Excel.

Two effect sizes for the differences between the experimental and control group, one at baseline (i.e., pre-test) and another after the intervention had been implemented (i.e., post-test). At baseline, the effect size was a $LnOR_{before} = 0.2178$ ($var_{before} = 0.017$) and after the intervention the effect size was $LnOR_{after} = -0.069$ ($var_{after} = 0.017$), where LnOR is the natural log of the odds ratio and *var* is the variance.

The intervention effect ($LnOR_{change}$) is calculated as the difference between the effect size after the intervention and the effect size before the intervention, as outlined below. The variance is estimated as the correlation between effect sizes (assumed as 0.75) multiplied by the sum of the pre-test and post-test variances.

$$LnOR_{change} = LnOR_{after} - LnOR_{before}$$
$$var_{change} = 0.75 * (var_{before} + var_{after})$$

Thus, for Spruit et al. (2018) this means the effect size for the intervention effect is estimated as follows:

$$LnOR_{change} = -0.069 - 0.2178$$
$$LnOR_{change} = -0.2871$$
$$var_{change} = 0.75 * (0.017 + 0.017)$$
$$var_{change} = 0.025$$

The natural log can be converted to an odds ratio, using the exponential (e^{LnOR}) as this is more readily and easily interpreted. This effect size is then imported into R and used to compute a weighted mean effect size across all included evaluations.

2. Correcting direction of effects

Cohen's *d* is estimated using the following formula, where M_{exp} and M_{con} represent the mean scores in the experimental and control groups respectively and SD_{pooled} is the pooled standard deviation.

$$d = \frac{M_{exp} - M_{con}}{SD_{pooled}}$$

Therefore, if the mean of an outcome, for example aggression, is lower in the experimental group than in the control group, the resulting Cohen's *d* will be a minus value. Thus, the LnOR will be a minus value and the corresponding OR will be less than 1. Yet, if aggression is lower in the experimental group, this is a desirable effect of a sports intervention programme, because aggression has been reduced in the experimental group relative to the control group. The opposite is true if the outcome, for example, self-control or academic achievement, is coded so that higher scores are better (i.e., more self-control or achievement). In such cases, an odds ratio greater than 1 will represent a desirable effect of the sports intervention.

Thus, for consistency across outcomes, the LnOR_{change} for all evaluations reporting outcomes where higher scores are undesirable (e.g., aggression, delinquency) are inverted (multiplied by -1) to reverse the sign. This results in odds ratios greater than 1 representing a desirable intervention effect across all outcomes. This adjustment only applies to evaluations that reported outcomes as continuous variables (i.e., means and standard deviations).

For evaluations that reported outcomes as dichotomous variables, we simply inverted the 2x2 table used to estimate the odds ratio. Therefore, given the following data, the odds ratio is estimated as (AD/BC).

	Not delinquent	Delinquent
Experimental	A	B
Control	C	D

3. R script for aggression outcomes

```
library(metafor)
library(readxl)
raggression <- read_excel("~/Desktop/R/Data/raggression.xlsx")

full.model <- rma.mv(yi = yi,
                     V = vi,
                     slab = study,
                     data = raggression,
                     random = ~1 | study/es.id,
                     test = "t",
                     method = "REML")
summary(full.model)
i2 <- var.comp(full.model)
summary(i2)
plot(i2)

l3.removed <- rma.mv(yi = yi,
                     V = vi,
                     slab = study,
                     data = raggression,
                     random = ~1 | study/es.id,
                     test = "t",
                     method = "REML",
                     sigma2 = c(0, NA))
summary(l3.removed)
anova(full.model, l3.removed)
```

4. Transforming mean effect sizes to percentage relative change

This technical appendix uses the example of externalising behaviour outcomes to describe how to estimate the relative reduction from the mean odds ratio.

To transform an odds ratio to a relative change, we first assume 200 youth, evenly divided between treatment and comparison groups. That means there are 100 youth in the control group and 100 youth in the treatment group. Assuming that 25% of youth in the control group demonstrated externalising behaviour, the mean effect sizes can be easily transformed to a percentage reduction in the relevant outcome.

If the odds ratio for externalising behaviour is 1.392, then using the table below and the formula for an OR, we can estimate the value of X. The odds ratio is estimated as: A*D/B*C, where A is the number of youth in the treatment group who do not demonstrate externalising behaviours, B

is the number of youth in the treatment group that do demonstrate externalising behaviour, C is the number of youth in the control group that do not demonstrate externalising behaviour, and D is the number of youth in the control group that do demonstrate externalising behaviour.

	No externalising behaviour	Externalising behaviour	Total
Experimental	100-x	x	100
Control	75	25	100

Therefore, the value of X is 19.32 and is calculated as follows:

$$\frac{(100-x)(25)}{(75)(x)} = 1.392$$

We can then estimate the relative reduction in externalising behaviour is 22.72% and is calculated as follows:

$$\frac{25-19.32}{25} \times \frac{100}{1}$$

However, the prevalence of externalising behaviour is likely to vary between different studies and can be influenced greatly by the type of report (e.g., self-report or observational data) or the time frame (e.g., any externalising behaviour in the past couple of months versus any externalising behaviour demonstrated ever), etc. If we were to adjust our assumption that 25% of the control group demonstrate externalising behaviour, the resulting relative reduction in the treatment group is not greatly affected.

For example, if we assume that 10% of the control group demonstrated externalising behaviour, the 2x2 table would be as follows and the value of X would be 7.36 and the relative reduction is 26.1%.

	No externalising behaviour	Externalising behaviour	Total
Experimental	100-x	x	100
Control	90	10	100

dramatic difference in the assumed prevalence of delinquency, the percentage relative reduction does not vary greatly. Table Z outlines the variation in the relative reduction in externalising behaviour based on the assumed prevalence of externalising behaviour (i.e., 10%; 25%; 40%).

Table Z

Variation of the relative reduction in externalising behaviour depending on different assumptions.

Assumed prevalence	Relative reduction
10%	26.1%
25%	22.72%
40%	19.05%