

# School-based physical activity interventions and wellbeing in children: a systematic review and intervention complexity assessment

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## TITLE OF THE REVIEW

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School-based Physical Activity Interventions and Wellbeing in Children: A Systematic Review and Intervention Complexity Assessment

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## BACKGROUND

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### **Introduction**

Schools play an important role in determining the level of physical activity (PA) of children and adolescents (Dale, Corbin, & Dale, 2000) and a number of recent systematic reviews have examined the types of school-based PA interventions which positively impact upon aspects of physical health, PA behaviours and fitness (Vvan Sluijs, McMinn, & Griffin, 2007; Kriemler et al., 2011; Demetriou & Höner, 2012; Dobbins, Husson, DeCorby, & LaRocca, 2013; Kriemler et al., 2011). However, there is a growing body of evidence to suggest that PA can also have a positive impact on other aspects of wellbeing which are seen as essential to the present and future development of a child, including for example mental health, psychological wellbeing and educational outcomes (Ahn & Fedewa, 2011; Poitras et al., 2016). Whilst research in this area continues to grow, reviews to date have primarily focused on associations and efficacy of PA interventions for a limited range of wellbeing outcomes, with little consideration of the constituent parts or complexity of interventions that lead to positive outcomes. Given the gap in the current literature, this proposed review aims to summarise the evidence for school-based PA interventions and a broader range of wellbeing outcomes. In addition, the Intervention Complexity Assessment Tool for Systematic Reviews (iCAT-SR) (Lewin et al. 2013) will be used as a method of disaggregating the component parts of the interventions and thus enabling more effective comparison and interpretation of the review findings.

### **PA and wellbeing Outcomes**

A recent editorial by Archer and Garcia (2014) highlights the need to consider all aspects of wellbeing in relation to physical activity including subjective well-being (life satisfaction, positive and negative affect), psychological well-being (personal growth, self-acceptance, environmental mastery, autonomy, positive relations with others, and meaning in life) as well as self-regulation (assessment and locomotion). However, at present a lack of clear definition or agreed list of indicators for child wellbeing presents difficulties when developing adequate search strategies for a systematic review.

A number of previous reviews of PA interventions and cross sectional studies in children and adolescents have focused on certain areas of wellbeing including specific mental health outcomes such as depression and anxiety (Brown, Pearson, Braithwaite, Brown, & Biddle, 2013; Larun, Nordheim, Ekeland, Hagen, & Heian, 2006), psychological wellbeing outcomes including self-esteem or self-concept (Ekeland, Heian, Hagen, & Coren, 2005); Babic et al., 2014; Liu, Wu, & Ming, 2015), social outcomes (Eime, Young, Harvey, Charity, and Payne,

2013) and educational outcomes (Esteban-Cornejo, Tejero-Gonzalez, Sallis, & Veiga, 2015; Singh, Uijtdewilligen, Twisk, van Mechelen, & Chinapaw, 2012; Trudeau & Shephard, 2008). However, and within this, few reviews have taken a holistic approach when considering wellbeing in general.

Of those that have taken a broader view, there is still a degree of heterogeneity. For example, Biddle and Asare (2011) addressed four specific aspects: depression, anxiety, self-esteem and cognitive functioning. In contrast, Lees and Hopkins (2013) only focused on mental health, cognition and behaviour. More recently, Spruit, Assink, van Vugt, van der Put, and Stams (2016) defined the outcomes under four broader headings: externalizing problems, internalizing problems, self-concept and academic achievement. However, perhaps the most comprehensive to date is Poitras et al. (2016) in which objectively measured PA in children and youth aged 5-17 years was explored with regards to eleven outcomes. These included seven critical health indicators (primary outcomes): body composition, cardio-metabolic biomarkers, physical fitness, behavioural conduct/pro-social behaviour, cognition/academic achievement, quality of life/well-being and harms (i.e., injuries). In addition, the review included an additional four health indicators which the authors identified as important (secondary outcomes): bone health, motor skill development, psychological distress, and self-esteem. Findings for all outcomes came from a range of different study types including RCT, non-RCT, cross-sectional and longitudinal studies in all settings and overall the review showed some support for favourable relationships between total PA and quality of life/well-being, cognition and psychological distress. Within this, higher intensity PA showed more consistent and robust relationships with health indicators than lower intensity PA. However, it is worth noting that although this review included 162 studies, the majority (approximately 5 in 6) focused on physical health outcomes and evidence for other wellbeing outcomes was limited. In particular, the relatively small number of RCTs meant that the authors were unable to address questions of causation particularly for wellbeing outcomes. It may therefore be prudent to include both objective and subjective measures of PA in the proposed review to ensure that a broader range of studies that include a focus on wellbeing are included.

Only one review to date by Rafferty, Breslin, Brennan, and Hassan (2016), has specifically examined school-based physical activity interventions on children's wellbeing. This review again highlights the lack of consensus regarding indicators and the lack of consistency in the measurement of wellbeing. The authors also question whether due consideration has been given to children's views of wellbeing. Altogether 13 different indicators of wellbeing were identified in the included studies, however, a narrow use of search terms may have limited the scope of their study. For example, mental health was not included in their outcome terms though anxiety and depression were.

Although all the aforementioned systematic reviews broadly cover the same area of physical activity and wellbeing in children, due to differences in inclusion and exclusion criteria and search strategies, very few studies were found in more than one review. Therefore, this proposed review will adopt a more systematic and thorough approach to searching, using a

pearl harvesting method (Sandieson, 2006) which involves taking all search terms used by previous reviewers in this area to develop a comprehensive search strategy and will include both objective and subjective measures of PA.

### **School-based PA interventions and wellbeing outcomes**

Schools have been widely acknowledged as an ideal setting for not only providing opportunities to participate in physical activity but also providing opportunities for educating about the importance of physical activity (Eather, Morgan, & Lubans, 2013; McGoey, Root, Bruner, & Law, 2016). There are a number of reasons why this is the case. For example, school is compulsory for most children and is inclusive, therefore interventions can target at risk children as well as those not at risk without undue stigmatisation (Dobbins et al., 2013). Also, from a research perspective, there is easy access to children within the school setting and a curriculum which already includes physical education (Demetriou & Höner, 2012).

However, schools are more than a convenient location to collect data as children spend a significant amount of their time travelling to, or being at, school and therefore schools themselves can play an important role in determining the level of physical activity of a child/adolescent as well as their overall health (Bonell et al., 2013). Moreover, research indicates that when physical activity is restricted during school hours children do not compensate at other times of the day/week, thereby perpetuating an ever-increasing sedentary lifestyle in young people (Dale et al., 2000). In a recent review, McGoey, Root, Bruner, and Law (2015), evaluated PA interventions in all settings and concluded that multi-level school-based interventions that included environment and policy strategies and/or community and family linkages were the most successful in increasing PA or fitness in children and young people with curriculum-based and extra-curricular interventions also proving relatively successful. These findings are echoed in a number of systematic reviews with regards to physical health, fitness and PA behavior (Van Sluijs et al., 2007; Kriemler et al., 2011; Demetriou & Höner, 2012; Dobbins et al., 2013).

By comparison, relatively little is known at present about the types of school-based PA interventions that particularly impact upon wellbeing outcomes. For example, although Strong et al. (2005) conclude that PA interventions to increase PA which are augmented with cognitive behavioural modifications have beneficial effects on self-concept, Rafferty et al. (2016) conversely reported that interventions which include wellbeing components showed non-significant results for wellbeing outcomes, though there is no elaboration on what the wellbeing components entail. Furthermore, a number of studies have indicated that the influence of physical activity on psychological outcomes such as self-concept and state anxiety are mediated by mode of activity. For example, beneficial effects on self-concept have been associated with aerobics, dance and perceptual motor activities (Strong et al., 2005, Ahn & Fedewa, 2011, p. 5). Therefore, school policy and practice including the range of PA opportunities that schools provide may also impact significantly on wellbeing outcomes.

Whilst the publication of evidence to support all PA outcomes continues to grow at an ever-increasing pace, the degree of heterogeneity between studies, and the complex nature of the relationship between PA and wellbeing outcomes in particular, impedes the translation of evidence into every day practice. This is particularly true within the school setting where there is a strong emphasis on accountability and teachers/schools need reassurance that time taken away from more academically focused activities will not impact negatively on overall school attainment. Sutcliffe, Thomas, Stokes, Hinds, and Bangpan (2015) believe that in order to replicate successful outcomes and ultimately to influence policy and practice, it is important that systematic reviews provide evidence of the critical features of effective complex interventions. Therefore this proposed review will use iCAT\_SR, a Cochrane review method which was developed to overcome some of the challenges of understanding complex interventions (Lewin et al. 2013). This method involves assessing each intervention across ten dimensions to disaggregate the component parts of the interventions, determining those that are structural and those that are functional, allowing for a more transparent comparison and interpretation of the review findings.

## **Conclusions**

A number of previous systematic reviews exploring the relationship between school-based physical activity and wellbeing have been published. However, these are primarily reviews of cross-sectional associations and longitudinal studies, and emphasise physical health or behaviour outcomes. While the associations between PA and wellbeing outcomes in children have begun to receive more attention, only one systematic review has specifically examined the causal effect of school based interventions however, this review was mainly concerned with efficacy and little consideration was given to the content or complexity of successful interventions, which will influence the generalisability of findings. Recognising and understanding which components of interventions work and in what contexts is important in order to successfully impact upon school policy and practice, therefore the purpose of this proposed review is to examine in detail the content of school based PA interventions in order to make effective and meaningful comparisons.

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## **OBJECTIVES**

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The objectives of the review are:

- 1) To review existing studies to identify and delineate the core elements/factors of wellbeing as they apply to school children.
- 2) To identify, appraise and synthesise evidence on the effectiveness of school-based physical activity interventions on the wellbeing outcomes.
- 3) To use iCAT-SR to describe the degree of complexity within school-based physical activity interventions, and explore the influence of complexity and context on improvements in wellbeing outcomes.

- 4) To provide a narrative synthesis on what type, level and frequency of physical activity programmes appear to offer optimal results for wellbeing outcomes.
- 5) To determine if the characteristics of schools have a mediating role in influencing the effectiveness of such interventions on children's wellbeing.

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## EXISTING REVIEWS

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A number of reviews were highlighted in the introduction section which focus on the various component parts of school based physical activity that impact upon physical health, fitness and PA behaviour. For example, a review by (Demetriou & Höner, 2012, p. 192) found that school-based interventions which included a cognitive component were more likely to result in reduced BMI. Similarly, Dobbins et al. (2013) concluded that school-based interventions which at a minimum, included a combination of printed materials and changes to the school curriculum that promote physical activity during school hours were effective in increasing the amount of MVPA during school hours by between 5 and 45 minutes per day.

Other reviews have looked at a range of different aspects of wellbeing. The most recent comprehensive review by Poitras et al. (2016) considered a number of different health indicators: body composition, cardio-metabolic biomarkers, physical fitness, behavioural conduct/pro-social behaviour, cognition/academic achievement, quality of life/well-being, and harms (i.e., injuries), bone health, motor skill development, psychological distress, and self-esteem. However, this review only considered these outcomes in relation to objectively measured PA and did not examine the effect of school-based interventions on these outcomes.

A review by Rafferty et al. (2016), has specifically examined school-based physical activity interventions on children's wellbeing. However, this review mainly focused on the effectiveness of interventions with little reference to what the PA interventions entailed. Also, a potentially narrow use of search terms may have limited the scope of their study

Two further reviews that may be relevant to this research has been registered with PROSPERO:

1. A systematic review of the associations between physical activity and happiness in childhood and adolescence  
[http://www.crd.york.ac.uk/PROSPERO/display\\_record.asp?ID=CRD42015019687](http://www.crd.york.ac.uk/PROSPERO/display_record.asp?ID=CRD42015019687)
2. A systematic review of school-based physical activity interventions on children's wellbeing: studies incorporating self-determination theory  
[http://www.crd.york.ac.uk/PROSPERO/display\\_record.asp?ID=CRD42015024545](http://www.crd.york.ac.uk/PROSPERO/display_record.asp?ID=CRD42015024545)

Overall, the studies outlined have, or are, either examining the association between PA and physical health or wellbeing, or a subset of wellbeing literature such as a focus on a narrow group of interventions (based only on self-determination theory) or outcomes.

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## **INTERVENTION**

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This review will consider universal interventions that are primarily school-based and take place within the normal school day though they may have a before/after school or community/family element.

Interventions may be whole school or limited to specific year groups or classes and may be delivered by teachers or by external facilitators.

They must include a sports (aerobic) exercise or PA component as a key aspect of the intervention and only interventions lasting longer than 6 weeks will be eligible.

Control groups should not be exposed to the intervention; however, it is anticipated that pupils would continue to participate in PA including Physical Education as is usual for their school.

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## **POPULATION**

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Participants will be children attending primary or elementary schools which typically includes 5-12 year olds but in some circumstances may include 4 year olds.

This review focuses on universal, school-based interventions therefore studies that investigate specific populations will be excluded. These include children with physical or mental disabilities, children with critical or chronic illness (other than obesity), and those with already diagnosed mental disorders.

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## **OUTCOMES**

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### **Physical Activity Outcomes**

Eligible studies must have a measure of PA and/or fitness, however, this can be either measured using objective or subjective tools. For example, they may include devices such as pedometers or questionnaires asking participants to recall physical activity participation over a set time period.

### **Wellbeing Outcomes**

One of the objectives of this review is to identify and categorise the range of wellbeing outcome measures associated with physical activity, therefore the only restrictions on the outcomes placed at this stage is to exclude studies that only use measures of physical health, fitness, cardiovascular function or PA behaviour. A full list of wellbeing outcomes will be specified and justified conceptually in the protocol for this review.

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## STUDY DESIGNS

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Only randomised controlled trials or cluster randomised controlled trials will be included. Those studies without a control group or where the control group has not been selected through random assignment will be excluded.

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**ROLES AND RESPONSIBILITIES**

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**Johnson** is a PhD student at Queen's University Belfast and has dedicated much of her time thus far developing the background literature review for this systematic review. The main focus for her PhD is an evaluation of the effectiveness of a PA programme in primary schools. She will coordinate and lead this review under the direction of her supervisors: Connolly and Tully.

**Connolly** is Dean of Research for the Faculty of Arts, Humanities and Social Sciences at Queen's University Belfast. He is also Director of the Centre for Evidence and Social Innovation and previously Co-Chair of the Campbell Collaboration Education Coordinating Group. He has particular expertise in education and in statistical analysis. He is co-author on several current Campbell Reviews.

**Tully** is a Senior Lecturer in Public Health and is a member of the Institute for Health Sciences and an Associate Fellow of the Centre for Evidence and Social Innovation at Queen's University Belfast. His research focuses on addressing population levels of physical inactivity, in particular, the development of public health interventions that address the underlying determinants of physical activity, including individual, social and environmental factors. He has completed a number of Cochrane Reviews.

Johnson will lead the work on the review, with inputs and guidance from Connolly and Tully. The relative contributions of the team will be as follows:

- Content: Johnson, Tully, Connolly
- Systematic review methods: Tully, Connolly, Johnson
- Statistical analysis: Connolly, Tully, Johnson
- Information retrieval: Johnson, Connolly, Tully

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## **FUNDING**

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This review will form the basis of a PhD studentship funded by the Department for Education and Learning (DEL) in Northern Ireland.

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## **POTENTIAL CONFLICTS OF INTEREST**

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Dr Mark Tully is also overseeing the STEPSMART study. The aim of the study is to test the feasibility of conducting a RCT to investigate the effectiveness of a pedometer competition as an incentive to encourage physical activity behaviour change in 12-14 year olds. A future RCT of this study may possibly be included in a future update of this systematic review.

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## **PRELIMINARY TIMEFRAME**

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Note, if the protocol or review are not submitted within 6 months and 18 months of title registration, respectively, the review area is opened up for other authors.

- Date you plan to submit a draft protocol: March 2017
- Date you plan to submit a draft review: March 2018

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## **AUTHOR DECLARATION**

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### **Authors' responsibilities**

By completing this form, you accept responsibility for preparing, maintaining, and updating the review in accordance with Campbell Collaboration policy. The Coordinating Group will provide as much support as possible to assist with the preparation of the review.

A draft protocol must be submitted to the Coordinating Group within one year of title acceptance. If drafts are not submitted before the agreed deadlines, or if we are unable to contact you for an extended period, the Coordinating Group has the right to de-register the title or transfer the title to alternative authors. The Coordinating Group also has the right to de-register or transfer the title if it does not meet the standards of the Coordinating Group and/or the Campbell Collaboration.

You accept responsibility for maintaining the review in light of new evidence, comments and criticisms, and other developments, and updating the review every five years, when substantial new evidence becomes available, or, if requested, transferring responsibility for maintaining the review to others as agreed with the Coordinating Group.

### **Publication in the Campbell Library**

The support of the Coordinating Group in preparing your review is conditional upon your agreement to publish the protocol, finished review, and subsequent updates in the Campbell Library. The Campbell Collaboration places no restrictions on publication of the findings of a Campbell systematic review in a more abbreviated form as a journal article either before or after the publication of the monograph version in *Campbell Systematic Reviews*. Some journals, however, have restrictions that preclude publication of findings that have been, or will be, reported elsewhere and authors considering publication in such a journal should be aware of possible conflict with publication of the monograph version in *Campbell Systematic Reviews*. Publication in a journal after publication or in press status in *Campbell Systematic Reviews* should acknowledge the Campbell version and include a citation to it. Note that systematic reviews published in *Campbell Systematic Reviews* and co-registered with the Cochrane Collaboration may have additional requirements or restrictions for co-publication. Review authors accept responsibility for meeting any co-publication requirements.

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**Form completed by:** Aideen Johnson

**Date:** 09 January 2017