









STUDY PROTOCOL

REVISED **Policy Evaluation Network (PEN): Protocol for systematic literature reviews examining the evidence for impact of policies on physical activity across seven different policy domains [version 3; peer review: 1 approved]**

Previously titled: Policy Evaluation Network (PEN): Protocol for systematic literature review examining the evidence for impact of school policies on physical activity

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V3 **First published:** 04 Sep 2020, 3:62
<https://doi.org/10.12688/hrbopenres.13089.1>
Second version: 01 Dec 2020, 3:62
<https://doi.org/10.12688/hrbopenres.13089.2>
Latest published: 29 Mar 2021, 3:62
<https://doi.org/10.12688/hrbopenres.13089.3>

Abstract

Introduction: Over 40 million deaths annually are due to noncommunicable diseases, 15 million of these are premature deaths and physical inactivity contributes an estimated 9% to this figure. Global responses have included the Sustainable Development Goals (SDGs) and the Global Action Plan on Physical Activity (GAPPA). Both point to policy action on physical activity (PA) to address change, yet the impact of policy on PA outcomes is unknown. The protocol described outlines the methodology for systematic literature reviews that will be undertaken by the Policy Evaluation Network (PEN) to address this knowledge gap.

Methods: The seven best investments for promotion of population PA identified in the Toronto Charter highlighted seven policy domains (schools, transport, urban design, primary health care systems, public education, community-wide programmes and sport) which will form the basis of these PEN reviews. Seven individual scientific literature

Open Peer Review**Reviewer Status** 

Invited Reviewers

1

version 3

(revision)

29 Mar 2021



report

**version 2**

(revision)

01 Dec 2020



report

**version 1**

04 Sep 2020



report

1. **Melinda Craike** , Victoria University,

searches across six electronic databases will be conducted. Each will use the key concepts of policy, PA, evaluation and a distinct concept for each of the seven policy domains. This will be supplemented with a search of the reference list of included articles. Methodological quality will be assessed and overall effectiveness for each included study will be described according to pre-determined criteria.

Conclusions: Each review will provide policy makers with a list of policy statements and corresponding actions which the evidence has determined impact on PA directly or indirectly. By collating the evidence, and demonstrating the depth of the science base which informs these policy recommendations, each review will provide guidance to policymakers to use evidence-based or evidence-informed policies to achieve the 15% relative reduction in physical inactivity as defined by GAPPA.

Registration: PROSPERO [CRD42020156630](https://doi.org/10.1186/1745-6215-156630) (10/07/2020).

Keywords

physical activity, policy, protocol, systematic review, evaluation

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Any reports and responses or comments on the article can be found at the end of the article.

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Competing interests: No competing interests were disclosed.

Grant information: Health Research Board [JPI-HDHL-PEN-2017-1]. The PEN project is funded by the Joint Programming Initiative (JPI) “A Healthy Diet for a Healthy Life”, a research and innovation initiative of EU member states and associated countries. The funding agencies supporting this work are (in alphabetical order of participating countries): Germany: Federal Ministry of Education and Research (BMBF); Ireland: Health Research Board (HRB); Italy: Ministry of Education, University and Research (MIUR); The Netherlands: The Netherlands Organisation for Health Research and Development (ZonMw); New Zealand: The University of Auckland, School of Population Health; Norway: The Research Council of Norway (RCN); Poland: The National Centre for Research and Development (NCBR). Additionally, the French partners acknowledge the support through the Institute National de la Recherche Agronomique (INRA).
The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

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How to cite this article: Volf K, Kelly L, García Bengoechea E *et al.* **Policy Evaluation Network (PEN): Protocol for systematic literature reviews examining the evidence for impact of policies on physical activity across seven different policy domains [version 3; peer review: 1 approved]** HRB Open Research 2021, 3:62 <https://doi.org/10.12688/hrbopenres.13089.3>

First published: 04 Sep 2020, 3:62 <https://doi.org/10.12688/hrbopenres.13089.1>

REVISED Amendments from Version 2

Words “physical activity” put back into the title.

Any further responses from the reviewers can be found at the end of the article

Introduction

Physical activity (PA) is defined as “any bodily movement produced by skeletal muscles that requires energy expenditure” (Caspersen *et al.*, 1985). The relationship between PA levels and health outcomes is well established (Rutten *et al.*, 2016). Insufficient PA has been identified by the World Health Organisation (WHO) as the fourth leading risk factor for mortality worldwide (WHO, 2009) and in 2012 it was estimated that 9% (range 5.1 – 12.5%) of global premature mortality can be attributed to physical inactivity (Lee *et al.*, 2012). The European region has been strongly affected by the costs of inactivity, absorbing 16.9% of the disability that inactivity causes, through its contribution to morbidity from coronary heart disease (CHD), cancer, stroke and diabetes, and 21.8% of the healthcare cost (Ding *et al.*, 2016).

This epidemiological evidence reveals inactivity to be a substantial public health issue and advocacy by public health specialists and the academic community has demanded policy responses to this issue. For the purposes of this document, policy should be understood as “decisions, plans, and actions that are implemented by national or regional governments to achieve specific health promotion goals within a society” (Lakerveld *et al.*, 2020). As indicated by the WHO (WHO Regional Office for Europe, 2010), policy can give support, coherence and visibility at the political level, while making it possible for the organisations involved at national, regional, and local levels – e.g., national government sectors, regional or local authorities, stakeholders, and the private sector – to be logical and consistent in their actions to achieve a shared goal. This applies to food and PA environments, systems and behaviours (WHO Regional Office for Europe, 2010). In order to reflect the complexity of the policies that may affect the PA policy environment, Lakerveld & colleagues (2020) distinguish between “direct” policies, which refers to policies where improving the PA environment and increasing participation is the primary aim, and “indirect” policies, where the primary aim of the policy is not to increase PA but this may occur as a co-benefit of successful implementation. The International Society for Physical Activity and Health (ISPAH) was established in 2009 (Kohl *et al.*, 2012) and numerous articles and editorials in leading academic and medical journals have pointed out the need to address physical inactivity (Bull & Bauman, 2011; Das & Horton, 2012; Kohl *et al.*, 2012; Woods & Mutrie, 2012).

At its third biennial congress ISPAH promulgated the Toronto Charter calling for political commitment to achieving greater

opportunities for PA (Bull *et al.*, 2010). To guide action on this issue the Charter was subsequently accompanied by a document titled Non-Communicable Disease Prevention: Investments that Work for Physical Activity (ISPAH, 2012). This document declared seven domains which evidence suggested could be effectively targeted to increase PA opportunities. These were whole-of-school programmes, transport policies and systems, urban design regulations and infrastructure, primary health care, public education, community-wide programmes and sport systems and programmes that promote ‘sport for all’. These seven domains provide a policy setting structure for systematic literature review search.

Over recent years there has been an acceleration in the production of policy responses to the epidemics of physical activity and sedentary behaviour (Klepac Pogrmilovic *et al.*, 2018). The Global Observatory for Physical Activity (GoPA) reports that by 2013, 139 countries were members of its PA advocacy alliance and 26.6% of these countries had already published a stand-alone PA plan (Ramirez Varela *et al.*, 2016). Furthermore, in 2013, the WHO published a document which recognised PA as a part of the global effort to combat non-communicable diseases (NCDs) (WHO, 2013).

A significant development occurred in 2017 when, in response to demands for direction on the problem of physical inactivity, the WHO committed to publishing a stand-alone action plan on this issue. This commitment was realised in 2018 when the WHO published the Global Action Plan on Physical Activity (GAPPA), which targeted an even more ambitious PA target than the previous NCD plan (WHO, 2018).

The recent rise in the number of national PA policies allows research into the question of which of these policies are effective in improving PA outcomes. A scoping review published in 2016 provided evidence that research into policy effectiveness lagged behind research that links PA to health and research that links PA interventions to behaviour (Rutten *et al.*, 2016). However, with the increase in the number of PA policies there may have been a concomitant rise in research examining the effectiveness of these policies. Furthermore, to the best available knowledge, no project has linked existing policy statements with research that corroborates or discredits the effectiveness of these statements.

As part of the Joint Programming Initiative “A Healthy Diet for a Healthy Life” (JPI HDHL), researchers from 28 institutes in seven European countries (France, Germany, Ireland, Italy, Norway, Poland, and the Netherlands) and New Zealand combine their expertise to form a Policy Evaluation Network (PEN) (Lakerveld *et al.*, 2020; see <https://www.jpi-pen.eu/>). PEN’s vision is to provide Europe with tools to identify, evaluate and benchmark policies designed to directly or indirectly address unhealthy lifestyle behaviours which contribute to overweight and obesity, while accounting for existing health inequities. Using structured evaluation principles and methods, PEN will examine the content, implementation and impact of lifestyle

policies across Europe and will build on existing knowledge. PEN will provide an overview of the ‘best’ public policies most likely to sustainably support more favourable health behaviours.

This protocol paper outlines the methodology for seven complementary systematic literature reviews as part of PEN. Each review is designed to determine the impact of policy, either directly or indirectly, on physical activity outcomes across the different policy domains identified in the “Seven Best Investments” (ISPAH, 2012). These policy domains are whole-of-school programmes, transport policies and systems, urban design regulations and infrastructure, primary health care, public education, community-wide programmes involving multiple settings and sport systems and programmes that promote ‘sport for all’. These reviews will provide evidence supporting the development of a tool named the Physical Activity Environment Policy Index (PA EPI), based on similar principles to an existing tool called the Food Environment Policy Index (Food EPI) (Swinburn *et al.*, 2013). The PA EPI will provide policy makers with a list of policy statements and corresponding actions which the evidence has determined improve PA outcomes across domains. The aim of each PEN review is to evaluate the status of the evidence base for the impact of policy on PA outcomes across the different policy domains identified in the “seven best investments”.

Method

Original material examining the evidence of what works in terms of direct and indirect policies on PA will be identified in the following ways:

- (1) A search, with no date restrictions, of the following electronic databases: four specialized sport science or biomedical databases, MEDLINE (Ebsco), SportDiscus, Cinahl, and Cochrane library, and two general social science databases, Web of Science and Scopus. Search results will be limited to articles that are identified through searching the titles and abstracts.
- (2) Manual reference checks of identified original studies.
- (3) Publicly available English-language resources and documents of major national and international stakeholders will be searched to identify existing reviews and position papers discussing the evidence of what works in terms of direct and indirect policies for increasing PA, e.g., the WHO’s European database on Nutrition, Obesity and Physical Activity (NOPA), Global Action Plan on Physical Activity (GAPPA), the European Physical Activity Strategy (EPAS) (WHO Regional Office for Europe, 2015) and the European Physical Activity Guidelines (EPAG) (European Commission, 2008).

A content analysis was performed on the Toronto Charter complementary document (ISPAH, 2012). These ‘investments’ identified the policy domains or sectors in which policies are made that could directly or indirectly impact on physical activity, i.e., schools, transport, urban design, healthcare, public education, the community and sport. This document

was searched for key words to be included in the search syntax. Researchers consulted with librarians and other research staff for suggestions on search terms.

The search of electronic databases will comprise seven individual searches (corresponding to the seven best investments), each one to be run on each of the databases. The seven searches will be formed by combining the same basic search strategy (i.e. general eligibility criteria) with seven distinct search concepts (i.e. specific eligibility criteria for each domain). The basic search strategy will consist of three search concepts (Table 1): search concept one (C1), which will combine synonyms for the keyword “policy” with the Boolean Operator “OR”; search concept two (C2), which will do the same with the keyword “physical activity”; and search concept three (C3), which will do the same for the keyword “impact”. The three search terms will be combined with the Boolean operator “AND” (Table 1).

Each of the seven searches will further be combined with a specific search term constructed to reflect only one of the seven best investments declared in the document *Non-Communicable Disease Prevention: Investments that Work for Physical Activity* (ISPAH, 2012) (Table 2). It is proposed that individual systematic literature reviews will be performed for each of the seven best investment domains, with an initial review focusing on schools and subsequent reviews focusing on ‘transport’, ‘public education’ and ‘sport’ domains in the first instance.

The following criteria will be applied for searches in databases: language will be limited to English language only.

Eligibility criteria

In order to answer our research question some eligibility criteria were developed to screen out irrelevant documents. Studies will be included based on the following criteria for 1) type of study, 2) participants/population, 3) exposure/intervention, and 4) outcomes.

General eligibility criteria were formulated as well as “specific” eligibility criteria for each of the seven searches. Publications that do not meet the “general” eligibility criteria will be excluded from review. Publications that do not meet the “specific” eligibility criteria will be set aside and possibly reassigned to a different search category if they are not duplicates of any publication already included in that search category.

Types of study to be included/excluded. No limitations regarding study type will be placed as long as the study design allows the research questions to be addressed. In addition, reviews using a comprehensive search strategy (including systematic, scoping and realist reviews) and analysing original research on the evidence of what works, in terms of direct and indirect policies for increasing PA; and reviews and policy analysis documents issued by major national and international organisations addressing recommendations referring to the same evidence will be eligible for inclusion. Studies will be excluded

Table 1. General Search terms.

Keyword	Synonyms
"Policy"	(MH "Policy") OR (MH "Public Policy") OR (MH "Policy Making") OR ("policy") OR ("policies") OR ("national policy") OR ("national framework") OR ("policy framework") OR ("policy action") OR ("legislation") OR ("strategy") OR ("policy making")
"Physical Activity"	(MH "Exercise") OR (MH "Sedentary Behavior") OR ("physical activit*") OR ("physical inactivity") OR ("play") OR ("physical education") OR ("sedentar*") OR ("sitting") OR ("healthy lifestyle") OR ("health initiative")
"Impact"	("evaluat*") OR ("impact") OR ("appraisal") OR ("effect*") OR ("assessment")

Abbreviations: 'MH' = MeSH Heading.

Table 2. Specific Search terms based on each of the seven best investments document (ISPAH, 2012).

1. "Whole of School Approach"	"Whole-of-school" OR "Whole School" OR "Whole of School" OR WSCC OR "school intervention" OR "school based intervention" OR "school initiative" OR "school based initiative" OR "school program*" OR "School health" OR "Wellness" OR "well-being"
2. "Transport Policy"	"active transport*" OR "walk*" OR "cyclist*" OR "bik*" OR "bicycl*" OR "cyclist" OR "cycling" OR "active travel*" OR "commute*" OR "transport mode" OR "transportation mode" OR "travel mode" OR "pedestrian*" OR "traffic volume" OR "traffic count" OR "transport plan*" OR "road safety" OR "public transport" OR "transport systems"
3. "Urban Design"	MH "Environment Design" OR MH "Environment" OR MH "Environment and Public Health" OR "urban design" OR "urban environment" OR "built environment" OR "urban environment" OR "mixed-use development" OR "footpaths" OR "bikeways" OR "street network*" OR "green spac*" OR "green areas" OR "green network" OR "recreational spac*" OR "urban plan*" OR "public amenit*" OR "network infrastructure"
4. "Primary Health care systems"	"primary health" OR "health care" OR "health system"
5. "Public Education"	"public education" OR "mass media" OR "mass communication" OR "social marketing" OR broadcast* OR MH "Communications Media" OR MH "Social Media" OR "media" OR "health campaigns" OR "public education"
6. "Community Programmes"	"Whole-of-community" OR "Community-wide programs" OR "capacity building" OR "community development" OR "community empowerment" OR "community network*" OR "coalition building" OR "community capacit*" OR "community"
7. "Sport Programmes"	"health promoting clubs" OR "sport*" OR "athletics"

Abbreviations: 'MH' = MeSH Heading.

based on the following criteria: a direct or indirect form of policy intervention is not identifiable; no information is provided regarding the effects of the policy under consideration on the desired outcomes.

Condition or domain being studied. Reviews examining the evidence of what works in terms of direct and indirect policies on PA.

Participants/population. Eligibility criteria relating to population characteristics are described in [Table 3](#).

Exposure(s), intervention(s). Policies that aim to have a direct or indirect effect on PA behaviour of target groups and populations and on the PA environment that support the behaviour under consideration.

Grey literature/Other: Similar to the empirical studies, included grey literature will need to make reference to the impact of PA policy in the relevant domain.

Context. These systematic reviews are performed as a task of PEN. PEN's vision is to provide Europe with tools to identify, evaluate and benchmark policies designed to directly or indirectly address physical inactivity. Further information on PEN is available at www.jpi-pen.eu or [Lakerveld & colleagues \(2020\)](#)

Main outcome(s). All study designs (e.g., reviews, empirical evidence) and grey literature/other must include the following outcome(s); a changes in PA (or proxy, e.g. fitness), assessed by means of self-report or wearable devices (e.g., accelerometer); a change in features of the physical and social environment

Table 3. Population related inclusion criteria.

General criteria	School specific criteria	Transport specific criteria	Urban design specific criteria	Primary health care specific criteria	Public education specific criteria	Community programmes specific criteria	Sport programmes specific criteria
The study intervention targets the general human population or parts of it that are relevant for the respective review	The study intervention targets students and staff in the school setting .	The study intervention targets the commuters and their preferred mode of transport .	The study intervention targets the residents of urban areas	The study intervention targets patients or primary care professionals	The study intervention targets the general population through public outreach and mass communication.	The study intervention targets the general population in the community setting.	The study intervention targets the general population in sport settings .

(e.g., facilities, equipment, action plans, programmes) hypothesised to lead to changes in PA outcomes as a result of a policy intervention.

Study selection and data extraction

Download of title and abstract records. Titles and abstracts identified by the search will be downloaded as “Endnote import” (extension.enw) files or other file formats compatible with our software. They will be uploaded to Endnote X9, a citation management software, and Rayyan (Ouzzani *et al.*, 2016), an online software dedicated to managing reviews. Other freely available alternative software includes Mendeley reference manager or Zotero. Once records have been uploaded to Rayyan, the software will identify duplicate articles and one of the two identical articles will be removed. The remaining articles will undergo the first round of screening by two researchers in a shared Rayyan account.

Title and abstract review. Title and abstract reviews will be performed by at least one reviewer and checked by another reviewer. Checking will involve reviewing title and abstracts decisions to establish whether the second reviewer concurs with the screening decision. Discrepancies will be resolved by discussion to reach consensus, in consultation with a third researcher when necessary. The screening process will involve comparing the information presented in the title and abstract to the eligibility criteria. Titles and abstracts that appear to conform to the eligibility criteria will be deemed eligible for full text review while those that do not will be discarded from the next stage of the data extraction process.

Download of full articles. Full text articles will be downloaded using the resources provided by their Institution. If a full text record cannot be acquired using these resources, researchers’ will investigate whether they can be located through use of other libraries to which the research team has access. If a full text article cannot be located through any of these library resources, the authors will be contacted through whichever channels can be identified from the information in the title and abstract.

Full text review. Full text reviews will be performed by at least one reviewer and checked by a second reviewer. Discrepancies will be resolved by discussion to reach consensus, in consultation with a third researcher when necessary. The following information will be extracted: first author, year of publication, country, study design, data collection method, sample, recruitment/setting, sample size, and response rate.

Risk of bias (quality) assessment

Risk of bias will be assessed by at least one reviewer and checked by another reviewer. Discrepancies will be resolved by discussion to reach consensus, in consultation with a third researcher when necessary. The results of the quality assessment will be narratively incorporated into the synthesis process. A descriptive summary using the criteria described below will be presented at study level and discussed in the review. Furthermore, the methodological quality will be narratively summarized at review level.

The quality of the included quantitative studies, inclusive of randomised, non-randomised and observational studies (encompassing both longitudinal and cross-sectional studies) will be assessed by means of an adapted ‘Downs and Black’ checklist tool (Downs & Black, 1998). This tool is apt to assess common biases in a range of study types as noted. The checklist will be modified to meet the aims of this review with some items deemed non applicable and subsequently removed.

The AMSTAR tool will be used for the assessment of systematic reviews and comprehensive reviews with a rigorous search strategy, including reviews of reviews. This tool consists of 11 items and has good face and content validity for appraising the methodological quality of systematic reviews (Shea *et al.*, 2007). Not all items are applicable to every type of review being assessed and quality ratings will take account of this circumstance. Similar to Messing *et al.* (2019), to assess the quality of included studies, we will calculate percentage values for each study. Each study will be assessed by a tool

appropriate for its study design and these percentage values will be calculated based on the percentages of criteria met by a study, which will be particular to the tool used to assess it.

Strategy for data synthesis

A narrative synthesis will be used to interpret and analyse the data. The results of the data synthesis will be presented in a table. Within this table, a list of short descriptive statements will be compiled based on the policy actions identified in the scientific literature. Evidence on the effectiveness of these policy actions will then be described using a method used by Panter & colleagues (2019). Specifically, when a study presents quantitative evidence about the effectiveness of one policy action a symbol will be assigned next to that particular policy action in the table. There are four categories of symbols reflecting the four possible outcomes: “significantly positive evidence” (+), “significantly negative evidence” (-), “no significance test” (?) or “inconclusive” (0). In addition, data extraction tables will be designed to distinguish any demographic, environmental or other variables pertinent to synthesising the data. For example, in the schools’ review, data extraction columns will be included to reflect evidence of effectiveness stratified by gender, school level (primary, secondary, combined) or socio-economic status where appropriate.

Finally, for the included reviews and policy analysis documents, the main findings stated in the discussion and conclusions section will be extracted. Main findings of the articles will be copied into a single table along with a reference to the article itself, and details of the overall risk of bias of the study from which the information is extracted. The synthesised data will be presented in a six-column table with the different columns presenting information on the reference, study description, study type, main findings or outcomes, risk of bias and category of evidence, respectively.

Dissemination

Study findings will be presented at professional networking events such as the World Congress on Public Health. Manuscripts will be prepared for publication in scientific peer-reviewed journals and presented at academic conferences.

Study status

The submission of the first of seven intended reviews is being finalised, this focuses on the school setting. A further three reviews are underway, these will focus on transport, public education and sport policy domains.

Conclusion

An aim of this project is to assist policymakers to assist policymakers to achieve the GAPP target of a 15% relative reduction in the prevalence of insufficient PA (WHO, 2018). The proposed reviews will attempt to determine what is the impact of policy interventions on PA outcomes in the domains identified in the ‘Seven Best Investments’ document (ISPAH, 2012). By providing this evidence, this review will support the development of the PA EPI. The PA EPI in turn will support policy makers by facilitating the development and benchmarking of policies which will work towards achieving this target. Achieving this target will provide health benefits such as reduced premature mortality as well as substantial co-benefits such as contributing to a sustainable environment and quality education (WHO, 2019).

Data availability

Underlying data

No underlying data are associated with this article.

Reporting guidelines

Open Science Framework: PRISMA-P checklist for “Policy Evaluation Network (PEN): Protocol for systematic literature review examining the evidence for impact of school policies on physical activity”. <https://doi.org/10.17605/OSF.IO/26QYF> (Volf, 2020).

Data are available under the terms of the [Creative Commons Zero “No rights reserved” data waiver](#) (CC0 1.0 Public domain dedication).

Acknowledgements

The authors thank Dr Sarah Taylor and Michael Lawlor for their assistance in developing the search terms used in the study. The PEN project is funded by the Joint Programming Initiative (JPI) “A Healthy Diet for a Healthy Life”, a research and innovation initiative of EU member states and associated countries. The funding agencies supporting this work are (in alphabetical order of participating countries): Germany: Federal Ministry of Education and Research (BMBF); Ireland: Health Research Board (HRB); Italy: Ministry of Education, University and Research (MIUR); The Netherlands: The Netherlands Organisation for Health Research and Development (ZonMw); New Zealand: The University of Auckland, School of Population Health; Norway: The Research Council of Norway (RCN); Poland: The National Centre for Research and Development (NCBR). Additionally, the French partners acknowledge the support through the Institute National de la Recherche Agronomique (INRA). A full list of PEN consortium members is available at www.jpi-pen.eu.

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Open Peer Review

Current Peer Review Status: 

Version 3

Reviewer Report 31 March 2021

<https://doi.org/10.21956/hrbopenres.14427.r29226>

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Melinda Craike 

¹ Institute for Health and Sport, Victoria University, Melbourne, Vic, Australia

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No new comments.

Competing Interests: I have previously worked with one of the co-authors of this paper. This has not affected my ability to review impartially.

Reviewer Expertise: Physical activity behaviour change; systematic reviews.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Version 2

Reviewer Report 17 December 2020

<https://doi.org/10.21956/hrbopenres.14323.r28482>

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Melinda Craike 

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I thank the Authors for their thorough responses to my comments and proposed revisions. I am

happy with the revisions and have no further comments. I wish the Authors all the best with this series of reviews.

Competing Interests: I have previously worked with one of the co-authors of this paper. This has not affected my ability to review impartially.

Reviewer Expertise: Physical activity behaviour change; systematic reviews.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Version 1

Reviewer Report 05 November 2020

<https://doi.org/10.21956/hrbopenres.14190.r28217>

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Melinda Craike

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Thank you for the invitation to review this paper. This protocol paper outlines the details of the first of several planned systematic literature reviews to assess the impact of policy on physical activity outcomes based on the “seven best investments” document (ISPAH, 2012). This is a very ambitious review series and I commend the authors on undertaking this important work. While the methods to be employed is generally clear, there are several areas that require more detailed explanation/rationale. I believe that doing so will strengthen this paper and ultimately, the review.

Introduction

It would be helpful to include specific aims of the systematic review.

P 4- Eligibility criteria

The authors need to clearly define what they mean by a ‘whole of school approach’ what are the critical components or does a policy just need to be labelled as such? For examples, does a ‘whole of school’ approach need to address the elements identified in ISPAH 2012: i.e. “prioritizing: regular, highly-active, physical education classes; providing suitable physical environments and resources to support structured and unstructured physical activity throughout the day (e.g., play and recreation before, during and after school); supporting walk/cycle-to-school programs and enabling all of these actions through supportive school policy and engaging staff, students, parents and the wider community”.

I was confused by the distinction between the “mandatory” eligibility criteria and specific “preferred” eligibility criteria and the rationale for this. I have not seen this before in a review. Can authors more clearly explain the application of these and the rationale? Perhaps by way of examples?

p. 5 Main Outcomes

The Introduction section implies that the focus of the review will be on the effectiveness of policies in increasing PA. This seems to be inconsistent with the Main Outcome(s), identified on p. 8, where studies will be eligible if they include “a change in features of the physical and social environment (e.g., facilities, equipment, action plans, programmes) hypothesised to lead to changes in PA outcomes as a result of a policy intervention”. I suggest that the Introduction include a section that alludes to this, and why such outcomes could be considered important (e.g., that focusing on mediators can be used as a proxy for actional PA participation outcomes).

p. 6 Full text review

Given the importance of implementation to the success of policies, I wonder if it would be worthwhile for the authors to attempt to gather data to indicate whether or not the policy was implemented? Or whether, for example, action plans were developed, and resources allocated to implementation. Given the importance of implementation to policy success, I would see this type of information as critical when evaluating the success of such policies.

Also, the inclusion of the validity and reliability of the PA measures should be included in the data extraction.

Each of the policy types is very broad, which will make it difficult to identify policy action that is needed to increase PA. For example, a ‘whole-of-school approach’ can include several different actions. Have the authors considered providing more detail or categorising the type of whole of school approach to facilitate a clearer and more meaningful assessment about the characteristics of effective whole of school policies?

p. 6. Strategy for data synthesis

I am not clear on what is meant by: “Outcome data extracted will be tabulated to determine the impact **on** (*my emphasis*) policy areas and policy actions (policy indicators)”. What is meant here by ‘policy indicators’ for example?

I suggest that the method described by Panter and colleagues (2019) be described in the paper (rather than just referring the reader to the paper). It is very important that the reader understands the criteria that is being used to assess the evidence of effectiveness.

I am unclear about how the findings from systematic reviews could be combined with primary research studies. This needs to be further explained.

Will there be any attempt to distinguish effectiveness based on the following: school level (primary or secondary school level), gender, level of socio-economic disadvantage?

Is the rationale for, and objectives of, the study clearly described?

Partly

Is the study design appropriate for the research question?

Partly

Are sufficient details of the methods provided to allow replication by others?

Partly

Are the datasets clearly presented in a useable and accessible format?

Not applicable

Competing Interests: I have previously worked with one of the co-authors of this paper. This has not affected my ability to review impartially.

Reviewer Expertise: Physical activity behaviour change; systematic reviews.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 18 Nov 2020

Kevin Volf, University of Limerick, Ireland

Dear Dr Craike,

On behalf of the review team, I would like to thank you for taking the time for your thorough review of our paper. The team would especially like to thank you for the timely manner in which your review was conducted. We have received your feedback and have made changes to the manuscript accordingly, and believe this has strengthened the quality of the paper.

Please find below a point-by-point response to the issues raised in your review, with changes from the previous version highlighted in red, for your consideration.

Yours sincerely,
Kevin Volf, B.Sc., MM.Sc. PhD Candidate

Comment 1:Introduction

It would be helpful to include specific aims of the systematic review.

--

We agree with the comment and the aims have added to the final paragraph of the Introduction section. To clarify the focus of this paper is to provide information on the protocol being used for seven reviews, this was unclear in the original manuscript. The text has been edited to make this point clearer throughout. Please see amendments below, text in bold is 'new' and has been added for clarity:

[Introduction page 6, paragraph 2]

At its third biennial congress ISPAH promulgated the Toronto Charter calling for political commitment to achieving greater opportunities for PA (Bull et al., 2010). To guide action on this issue the Charter was subsequently accompanied by a document titled Non-Communicable Disease Prevention: Investments that Work for Physical Activity (2012). This document declared seven domains which evidence suggested could be effectively targeted to increase PA opportunities. **These were whole-of-school programmes, transport policies and systems, urban design regulations and infrastructure, primary health care, public education, community-wide programmes and sport systems and programmes that promote 'sport for all'**. These seven domains provide a **policy setting** structure for systematic literature review search.

[Introduction page 7 paragraph 1]

This protocol paper outlines the methodology for seven complementary systematic literature reviews **as part of PEN. Each review is** designed to determine the impact of policy, **either directly or indirectly**, on physical activity outcomes **across** the different policy domains identified in the "Seven Best Investments" (ISPAH, 2011). **These policy domains are schools, transport, urban design, healthcare, public education, the community and sport. These** reviews will provide evidence supporting the development of a tool named the Physical Activity Environment Policy Index (PA EPI), based on similar principles to the Food Environment Policy Index (Food EPI) (Swinburn *et al.*, 2013). The PA EPI will provide policy makers with a list of policy statements and corresponding actions which the evidence has determined improve PA outcomes across domains. **The aim of each PEN review is to evaluate the status of the evidence base for the impact of policy on PA outcomes across the different policy domains identified in the "seven best investments"**.

Comment 2:

P 4- Eligibility criteria

The authors need to clearly define what they mean by a 'whole of school approach' what are the critical components or does a policy just need to be labelled as such? For examples, does a 'whole of school' approach need to address the elements identified in ISPAH 2012: i.e. "prioritizing: regular, highly-active, physical education classes; providing suitable physical environments and resources to support structured and unstructured physical activity throughout the day (e.g., play and recreation before, during and after school); supporting walk/cycle-to-school programs and enabling all of these actions through supportive school policy and engaging staff, students, parents and the wider community".

--

The reference to 'whole of school approach' is directly related to the 'Seven Investments' paper. The use of 'Whole of school' within the search strategy as part of the schools domain, is not for the purpose of evaluating the impact of 'whole of school programmes', rather to review policies pertinent to the school setting, to determine if any evidence of policy impact exists. The text has been modified as follows, text in bold is 'new' and has been added for clarity;

[Introduction page 7 paragraph 1]

This protocol paper outlines the methodology for seven complementary systematic literature reviews as part of PEN. Each review is designed to determine the impact of policy, either directly or indirectly, on physical activity outcomes across the different policy domains identified in the “Seven Best Investments” (ISPAH, 2011). **These policy domains are whole-of-school programmes, transport policies and systems, urban design regulations and infrastructure, primary health care, public education, community-wide programmes involving multiple settings and sport systems and programmes that promote ‘sport for all’**

It is proposed that individual systematic literature reviews will be performed on each of the seven best investment domains, with this initial review focusing on schools and subsequent reviews focusing on ‘transport’, ‘public education’ and ‘sport’ domains.”

Comment 3:

I was confused by the distinction between the “mandatory” eligibility criteria and “preferred” eligibility criteria and the rationale for this. I have not seen this before in a review. Can authors more clearly explain the application of these and the rationale? Perhaps by way of examples?

--

In essence, the “mandatory” and “preferred” nomenclature refer to “elements that are common to all reviews” and “elements that only relate to a particular review” respectively. While this was explained in the search details, to make this clearer we have edited the mandatory and preferred labels to “general” (applies to all mooted reviews) and “specific” (only applies to a particular review) as follows, text in bold is ‘new’ and has been added for clarity:

[Methods, p7 paragraph 5]:

“The search of electronic databases will comprise seven individual searches (corresponding to the seven best investments), each one to be run on each of the databases. The seven searches will be formed by combining the same basic search strategy (**i.e., general eligibility criteria**) with seven distinct search concepts (**i.e., specific eligibility criteria for each domain**). The basic search strategy will consist of three search concepts (Table 1): search concept one (C1), which will combine synonyms for the keyword “policy” with the Boolean Operator “OR”; search concept two (C2), which will do the same with the keyword “physical activity”; and search concept three (C3), which will do the same for the keyword “impact”. The three search terms will be combined with the Boolean operator “AND” (Table 1).

Each of the seven searches will further be combined with a specific search concept constructed to reflect only one of the seven best investments declared in the document *Non-Communicable Disease Prevention: Investments that Work for Physical Activity (ISPAH, 2011)* (Table 2). It is proposed that individual systematic literature reviews will be performed for each of the seven best investment domains, with an initial review focusing on schools and subsequent reviews focusing on ‘transport’, ‘public education’ and ‘sport’ domains.

Comment 4:

p. 5 Main Outcomes

The Introduction section implies that the focus of the review will be on the effectiveness of policies in increasing PA. This seems to be inconsistent with the Main Outcome(s), identified on p. 8, where studies will be eligible if they include “a change in features of the physical and social environment (e.g., facilities, equipment, action plans, programmes) hypothesised to lead to changes in PA outcomes as a result of a policy intervention”. I suggest that the Introduction include a section that alludes to this, and why such outcomes could be considered important (e.g., that focusing on mediators can be used as a proxy for actional PA participation outcomes).

--

We agree with the inconsistency and the text has been reworded in the following location, text in bold is 'new' and has been added for clarity:

[Introduction page 7 paragraph 1]

This protocol paper outlines the methodology for seven complementary systematic literature reviews **as part of PEN. Each review** is designed to determine the impact of policy, **either directly or indirectly**, on physical activity outcomes across the different policy domains identified in the “Seven Best Investments” (ISPAH, 2011).

Comment 5a:

p. 6 Full text review

Given the importance of implementation to the success of policies, I wonder if it would be worthwhile for the authors to attempt to gather data to indicate whether or not the policy was implemented? Or whether, for example, action plans were developed, and resources allocated to implementation. Given the importance of implementation to policy success, I would see this type of information as critical when evaluating the success of such policies. [...]

--

While we agree that level of implementation of policies is important, and believe that ‘impact on PA’ will be reflected in the degree of implementation presented, it is beyond the scope of this study to carry out a detailed examination of type of implementation beyond what is reported as evidence of impact. This very important topic may indeed be the subject of a follow up review.

Comment 5b:

[...] Also, the inclusion of the validity and reliability of the PA measures should be included in the data extraction.

--

Detailed information on any outcome measures used to assess PA will be provided in the data extraction tables and presented in the corresponding reviews.

Comment 6:

Each of the policy types is very broad, which will make it difficult to identify policy action that

is needed to increase PA. For example, a 'whole-of-school approach' can include several different actions. Have the authors considered providing more detail or categorising the type of whole of school approach to facilitate a clearer and more meaningful assessment about the characteristics of effective whole of school policies?

--

This links back to Comment 2, the focus of the systematic review is not to evaluate 'whole of school approach' but rather the available evidence on impact of direct or indirect policies within specific settings, e.g., the school setting, on PA outcomes. Therefore, the reviewer is quite correct, we envisage that policy action areas will be broad, e.g., physical education or extra-curricular sport, but the specific policy actions, e.g., require a minimum PE duration or require a PE curriculum may be more defined. Until the reviews are carried out, the level of evidence is unknown.

Comment 7:

p. 6. Strategy for data synthesis

I am not clear on what is meant by: "Outcome data extracted will be tabulated to determine the impact on (my emphasis) policy areas and policy actions (policy indicators)". What is meant here by 'policy indicators' for example?

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We agree with the reviewer that this is not clear. In order to improve clarity this sentence has been removed and the third paragraph on page 12 has been restructured as follows, text in bold is 'new' and has been added for clarity:

[Strategy for data synthesis, page 12 paragraph 4]

"A narrative synthesis will be used to interpret and analyse the data. **The results of the data synthesis will be presented in a table. Within this table, a list of short descriptive statements will be compiled based on the policy actions identified in the scientific literature.** Evidence on the effectiveness of these policy actions will then be described using a method **used** by Panter and colleagues (2019) [...]"

Comment 8:

I suggest that the method described by Panter and colleagues (2019) be described in the paper (rather than just referring the reader to the paper). It is very important that the reader understands the criteria that is being used to assess the evidence of effectiveness.

--

Detail has been added to the second half of the first paragraph on page 12 to describe the coding system inspired by Panter et al. It now reads as follows, text in bold is 'new' and has been added for clarity:

[Strategy for data synthesis, page 12 paragraph 4]

[...] **Specifically, when a study presents quantitative evidence about the effectiveness of one policy action a symbol will be assigned next to that particular policy action in the table. There are four categories of symbols reflecting the four possible outcomes: "significantly positive evidence" (+), "significantly negative evidence" (-), "no significance**

test" (?) or "inconclusive" (0).

Comment 9:

I am unclear about how the findings from systematic reviews could be combined with primary research studies. This needs to be further explained.

--

This may indeed be challenging, but until we examine the main results and conclusions of any systematic reviews that have reference to policy impact in the targeted domains, we cannot be sure of whether their evidence is strong enough and clearly defined in order to assess impact. While we agree it may be difficult, in the search strategy we will include these documents in the initial search and depending on what we find include or exclude in the final data synthesis.

Comment 10:

Will there be any attempt to distinguish effectiveness based on the following: school level (primary or secondary school level), gender, level of socio-economic disadvantage?

--

Until data extraction is complete, it is difficult to identify any specific stratification variables that would be pertinent to the presentation of the results. However, the data extraction tables will be devised to take into account any relevant stratification variables for each review as pertinent to the topic and domain.

As the reviewer's comment applies to the systematic review corresponding to the school setting only evidence of effectiveness will be presented in a manner that makes it clear which policy actions were shown to be effective at different school levels, across gender and SES where appropriate. The following sentence has been added to the strategy for data synthesis section to clarify this, text in bold is 'new' and has been added for clarity.

[Strategy for data synthesis, page 12 paragraph 3]

"In addition, data extraction tables will be designed to distinguish any demographic, environmental or other variables pertinent to synthesising the data. For example, in the schools review, data extraction columns will be included to reflect evidence of effectiveness stratified by gender, school level (primary, secondary, combined) or socio economic status where appropriate.

Competing Interests: No competing interests were disclosed.