Review Article

Barriers and facilitators to the implementation of physical activity policies in schools: A systematic review

Nicole Nathan[a,b,c,d,*], Ben Elton[a], Mark Babic[a,c,d], Nicole McCarthy[a,d], Rachel Sutherland[a,b,c,d], Justin Presseau[e,f,g], Kirsty Seward[a,b,c,d], Rebecca Hodder[a,b,c,d], Debbie Booth[h], Sze Lin Yoong[a,b,c,d], Luke Wolfenden[a,b,c,d]

[a] Hunter New England Population Health, Hunter New England Area Health Service, Newcastle, Locked Bag No. 10, Wallsend, NSW 2287, Australia
[b] School of Medicine and Public Health, The University of Newcastle, University Drive, Callaghan, NSW 2308, Australia
[c] Priority Research Centre for Health Behaviour, The University of Newcastle, University Drive, Callaghan, NSW 2308, Australia
[d] Hunter Medical Research Institute, 1/Kookaburra Circuit, New Lambton Heights, NSW 2305, Australia
[e] Clinical Epidemiology Program, Ottawa Hospital Research Institute, Ottawa, Ontario K1H 8L6, Canada
[f] School of Epidemiology and Public Health, University of Ottawa, Ottawa, Ontario, Canada
[g] School of Psychology, University of Ottawa, Ottawa, Ontario, Canada
[h] University Library, Academic Division, University of Newcastle, University Drive, Callaghan, NSW 2308, Australia

ARTICLE INFO

ABSTRACT

Research consistently indicates that schools fail to implement mandatory physical activity policies. This review aimed to describe factors (barriers and facilitators) that may influence the implementation of school physical activity policies which specify the time or intensity that physical activity should be implemented and to map these factors to a theoretical framework.

A systematic search was undertaken in six databases for quantitative or qualitative studies published between 1995-March 2016 that examined teachers', principals' or school administrators' reported barriers and/or facilitators to implementing mandated school physical activity policies. Two independent reviewers screened texts, extracted and coded data from identified articles using the Theoretical Domains Framework (TDF).

Of the 10,346 articles identified, 17 studies met the inclusion criteria (8 quantitative, 9 qualitative). Barriers and facilitators identified in qualitative studies covered 9 and 10 TDF domains respectively. Barriers and facilitators reported in quantitative studies covered 8 TDF domains each. The most common domains identified were: 'environmental context and resources' (e.g., availability of equipment, time or staff), 'goals' (e.g., the perceived priority of the policy in the school), 'social influences' (e.g., support from school boards), and 'skills' (e.g., teachers' ability to implement the policy).

Implementation support strategies that target these factors may represent promising means to improve implementation of physical activity policies and increase physical activity among school-aged children. Future studies assessing factors that influence school implementation of physical activity policies would benefit from using a comprehensive framework to help identify if any domains have been overlooked in the current literature. *Registration:* This review was prospectively registered with PROSPERO (CRD42016051649) on the 8th December 2016.

1. Background

Physical inactivity is the fourth leading cause of death worldwide accounting for 6–10% of all non-communicable deaths (Kohl et al., 2012). For children aged 5–12 years, participation in at least 60 min of moderate-to-vigorous physical activity (MVPA) per day is essential for their healthy growth and development (Okely et al., 2012). Despite this, international research indicates that the majority of school-aged children are not sufficiently active (Tremblay et al., 2014). Interventions to improve children's physical activity levels have been identified as a

* Corresponding author at: Hunter New England Population Health, Hunter New England Area Health Service, Newcastle, Locked Bag No. 10, Wallsend, NSW 2287, Australia.
  E-mail addresses: Nicole.Nathan@hnehealth.nsw.gov.au (N. Nathan), Ben.Elton@hnehealth.nsw.gov.au (B. Elton), Mark.Babic@hnehealth.nsw.gov.au (M. Babic),
Nicole.McCarthy@hnehealth.nsw.gov.au (N. McCarthy), Rachel.Sutherland@hnehealth.nsw.gov.au (R. Sutherland), jpresseau@ohri.ca (J. Presseau),
Kirsty.Seward@hnehealth.nsw.gov.au (K. Seward), Rebecca.Hodder@hnehealth.nsw.gov.au (R. Hodder), Debbie.Booth@newcastle.edu.au (D. Booth),
Serene.Yoong@hnehealth.nsw.gov.au (S.L. Yoong), Luke.Wolfenden@hnehealth.nsw.gov.au (L. Wolfenden).

public health priority by the World Health Organization (WHO) (World Health Organisation, 2004). Schools have been recommended as a key setting for the delivery of population-wide physical activity initiatives as they provide almost universal access to children (Carter and Swinburn, 2004; World Health Organisation, 2008). Evidence from systematic reviews demonstrates that school-based interventions that increase opportunities for student physical activity are effective in increasing students' MVPA (Dobbins et al., 2013; Holman et al., 2011; Metcalf et al., 2012). As such, governments internationally have released guidelines or policies mandating a minimum accumulated time or intensity schools are to schedule structured physical activity for children (NSW Government, 2015; Hardman, 2008; Harrington et al., 2014; Mâsse et al., 2013). Despite their existence and wide dissemination, most schools internationally fail to implement these policies (Hardman, 2008; Harrington et al., 2014).

A 2011 study that undertook observations of 154 physical education lessons found that only 5% of schools in the United States (U.S.) adhered to mandated state policies that required 100 min of physical education to be taught each week (Thompson et al., 2013). Similarly, a 2011 Canadian study found that only 43% of elementary school teachers reported implementing the mandatory daily 30-minute physical activity policy (Mâsse et al., 2013). Furthermore, a 2007 survey of 71 Australian elementary school key stakeholders found that only 27% were providing two or more hours of planned physical activity per week (Ministerial Review Committee for School Sport and Physical Activity, 2007). School leaders (teachers, principals, and administrators) play important roles in the policy process as they are at the front line of implementing for such policies (Cox et al., 2011). However, developing strategies to improve policy implementation through school governance leaders requires an understanding of factors that impede or facilitate implementation.

Several studies have reported a number of barriers to the implementation of mandatory policies regarding the minimum accumulated time or intensity of school physical activity opportunities, including an already 'crowded curriculum' (Dwyer et al., 2003; Morgan and Hansen, 2008) inadequate resources (Dwyer et al., 2003; Jenkinson and Benson, 2010) and limited support from school executive staff (Morgan and Hansen, 2008; Barroso et al., 2005). However, there has been little synthesis of this research. To our knowledge, only one review has been undertaken focussing on the barriers and facilitators to implementation of physical activity policies in schools (Weatherson et al., 2017). This scoping review provided a preliminary assessment of the scope of the available research, however it only included studies conducted in Canadian schools, limiting its generalizability to other jurisdictions. A comprehensive understanding of the factors that may influence implementation of physical activity policies should represent the foundation on which strategies are built upon to ensure their implementation. An absence of an international synthesis of such literature is, therefore, a significant evidence gap.

To provide guidance to policymakers, practitioners and school administrators responsible for supporting physical activity policy implementation, the aim of this paper was to undertake a comprehensive systematic review to describe factors (barriers and facilitators) that may influence the implementation of school based physical activity policies which specify the time or intensity that physical activity should be provided to students.

2. Methods

2.1. Registration

This review was prospectively registered with PROSPERO (CRD42016051649) and is reported in accordance to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Additional file 1).

2.2. Eligibility criteria

Studies published between 1995 and March 2016, of any design, which qualitatively and/or quantitatively examined factors that influence the implementation of physical activity policies or guidelines, and stipulate the time or intensity of physical activity to be provided by teachers in elementary (catering for children aged 5–12 years) or secondary schools (catering for children aged 13–18 years of age), were eligible for inclusion. Such factors could include those that impede or are barriers to policy implementation, or those that facilitate policy implementation. For this review, a barrier was defined as "a circumstance or obstacle that keeps people or things apart or prevents communication or progress" (University Oxford, n.d.) whereas a facilitator was defined as "a person or thing that makes something possible" (University Oxford, n.d.). Studies were excluded if they reported on: a policy or guideline that does not stipulate the time or intensity of physical activity to be implemented; policies where non-school staff delivered the physical activity; general health promoting policies where the barriers or facilitators specific to the implementation of the physical activity policy or guideline are not reported separately; and policies that aimed to deliver physical activity out of school hours.

2.3. Information sources and search strategy

A search of peer reviewed literature combining, where possible, published search filters for schools, physical activity, policy and barrier (s) or facilitator(s) was undertaken (Williams et al., 2015). An experienced academic librarian (DB), assisted with developing the search terms and conducted databases searches for studies in: MEDLINE, EMBASE, A + EDUCATION, PsycINFO, ERIC, and Scopus. Search strategies were developed in MEDLINE and adapted according to the individual databases (Additional file 2). To identify any additional studies the reference lists of all included studies were screened, as well as hand searching of studies published in the last two years in two peer reviewed journals (Implementation Science and the International Journal of Behavioral Nutrition and Physical Activity). To identify published government reports and other grey literature we searched the web-engine 'Google' using the phrase 'barriers or enablers to physical activity policy implementation in schools'. The first 200 citations were examined.

2.4. Study selection

Double independent searching for eligible studies by viewing titles and abstracts was conducted by two teams (NN, BE, NM, MB) not blinded to journal information or author. The same two teams assessed full texts of all potentially relevant studies against the inclusion criteria described above. In instances where teams could not resolve discrepancies through consensus author LW was consulted for a decision. The number of articles at each screening stage is shown in Fig. 1.

2.5. Data collection process

Double independent data extraction was undertaken by two teams (NM, BE, MB and JT - see Acknowledgements) not blinded to author or journal information from all included studies, using a pre-piloted data extraction tool. Any discrepancies between review authors regarding data extraction were resolved by consensus and, when required, NN was consulted. The following information was extracted: year of publication, country, school type, demographics, study design, sampling method and size, inclusion and exclusion criteria, recruitment method, data collection method, barriers and facilitators identified and the validity of the measures used. Similar to previous reviews for qualitative studies, examples of participant quotes relating to each domain were extracted. For quantitative studies the proportion of respondents that identified each barrier/facilitator was extracted.
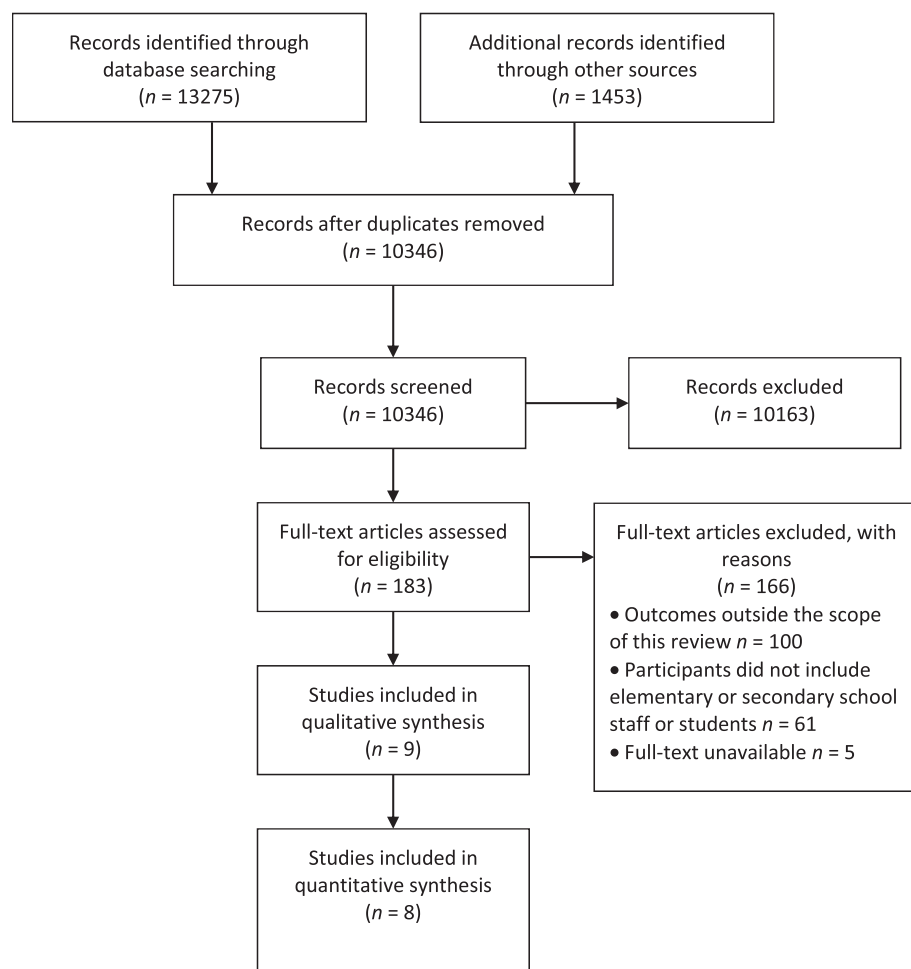
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            │  eligibility          │      │  (n = 166)                      │
            │  (n = 183)            │      │  • Outcomes outside the scope   │
            └──────────────────────┘      │  of this review n = 100         │
                             │             │  • Participants did not include │
                             ▼             │  elementary or secondary school │
            ┌──────────────────────┐      │  staff or students n = 61       │
            │  Studies included in  │      │  • Full-text unavailable n = 5  │
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            │  quantitative         │
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2.6. Data synthesis

Barriers and facilitators reported to influence physical activity within a school environment were synthesized using the TDF. The TDF includes 14 theoretical domains synthesized from 33 behaviour change theories and 84 theoretical constructs in a single framework, providing a comprehensive coverage of the possible individual, social and environmental influences on behaviour (Cane et al., 2012). The framework is recommended for use to identify barriers and facilitators to implementation, and has been widely applied in clinical and community settings and in evidence synthesis for this purpose (French et al., 2012; Presseau et al., 2016; Taylor et al., 2013; Tuti et al., 2017). Two review authors (NN and BE) separately coded the barriers and facilitators identified in qualitative and quantitative research to the relevant TDF domains according to definitions pre-specified in a coding manual developed by authors (NN and BE) (Additional file 3) based on definitions from Cane et al. (2012). Any discrepancies were resolved by a third review author (LW or JP). For the qualitative studies we reported the number of studies reporting barriers or facilitators as classified in each of the TDF domains. For the quantitative studies we reported the number of studies reporting barriers or facilitators as classified in each of the TDF domains. To assess the prevalence of barriers and facilitators we extracted data on the prevalence of all factors mapped to each domain across all included studies. To provide some context on the extent of the barrier/facilitator for quantitative studies the median and range of the prevalence of barriers and facilitators is reported.

3. Results

3.1. Study selection

Overall, 10,346 records were screened for eligibility of which 10,163 were excluded. Of the remaining 183 papers that were included in the full-text screen, 166 were excluded as they did not meet our eligibility criteria (Fig. 1), thus leaving 17 studies, for inclusion in this review.

3.2. Study characteristics

A description of the included studies is shown in Table 1. Of the 17 included studies, 9 were qualitative studies (Mâsse et al., 2013; Dwyer et al., 2003; Amis et al., 2012a; Brown and Elliott, 2015; Gamble et al., 2017; Larsen et al., 2013; Rickwood, 2015; Usher and Anderton, 2014; Office of the Auditor General of Ontario, 2013) and 8 were quantitative studies (Cox et al., 2011; Alberta Education, 2008; Allison, 2016; Evenson et al., 2009; Kennedy et al., 2010; Lounsbery et al., 2011; Patton, 2012; Strampel et al., 2014). Nine were conducted in elementary schools (Dwyer et al., 2003; Brown and Elliott, 2015; Gamble et al., 2017; Rickwood, 2015; Usher and Anderton, 2014; Allison, 2016; Kennedy et al., 2010; Lounsbery et al., 2011; Strampel et al., 2014), 1 in secondary schools (Amis et al., 2012a), and 7 in both (Mâsse et al., 2013; Cox et al., 2011; Larsen et al., 2013; Office of the Auditor General of Ontario, 2013; Alberta Education, 2008; Evenson et al., 2009; Patton, 2012). Ten studies were conducted in Canada (Mâsse et al., 2013; Dwyer et al., 2003; Brown and Elliott, 2015; Rickwood, 2015; Office of the Auditor General of Ontario, 2013; Alberta Education, 2008; Allison,

Table 1
Characteristics of included studies (n = 17).

Authors, year	Location	Methods, data source	Study participants (n = sample size)	Summarised method of analysis	TDF domains (n)
AGO, 2013	Ontario, Canada	Qualitative. Survey, interviews, document review	School boards (teachers and principals) (n not reported)	Survey question type or exact method of analysis was not reported. Descriptive results from the survey were presented for the most influential barriers.	ECR (1), Goals (2), PRI (1)
Alberta Education, 2008	Alberta, Canada	Quantitative. Online survey	Principals (n = 387) & teachers (n = 638)	Teacher and principal responses were compared using the chi-square test of independence and a z-test.	ECR (7), Beliefs about consequences (1), Goals (1), Beliefs about capabilities (1), Social influences (2), Skills (1)
Allison, 2016	Ontario, Canada	Quantitative. Online survey	Teachers (n = 307) & school administrators (n = 209)	Responses were imported into IBM SPSS. For school administrator data, binary logistic regression was used to examine the relationship between predictors and implementation fidelity. For teacher data, generalized linear mixed models were used to adjust for clustering effects when examining the relationship between predictors and implementation fidelity.	Goals (1), ECR (6), Beliefs about capabilities (1), Social influences (3)
Amis et al., 2012a, 2012b	Mississippi & Tennessee, USA	Qualitative. Semi-structure interviews, focus group, document review	Teachers (n not reported)	Interview data was recorded and transcribed verbatim. Data analysis consisted of three main stages that were repeated several times in a circular manner. 1) Development of narratives of how policies were perceived and enacted in the school. 2) Teacher responses were coded to generate overarching themes. 3) Data evaluation to refine and check robustness of study conclusions.	Goals (3), ECR (1)
Brown and Elliott, 2015	Ontario, Canada	Qualitative. Semi-structured interviews	Teachers (n = 14) & principals (n = 5)	Interviews were transcribed verbatim. A data coding manual was developed by the authors. Teacher responses were coded into themes, guided by the ANGELO framework and analysed using computer assisted qualitative data analysis software.	ECR (17), Knowledge (2), Skills (10), Beliefs about consequences (4), Intentions (4), Beliefs about capabilities (2), Social influences (15), PRI (1)
Cox et al., 2011	California, USA	Quantitative. Online questionnaire	School board (teachers and principals) (n = 339)	Responses were collected via the online survey tool Survey Monkey.	ECR (11), Goals (1), Beliefs about consequences (1), Social influences (3), Beliefs about capabilities (1), Skills (1)
Dwyer et al., 2003	Ontario, Canada	Qualitative. Focus group interviews	Teachers (n = 45)	Interview responses were transcribed from audiotapes verbatim and imported into Ethnograph. A constant comparison approach was used to code teacher responses and generate themes. A common list of themes was agreed upon for synthesis.	Goals (2), ECR (1)
Evenson et al., 2009	USA	Quantitative.[a] Online survey (with open-ended questions)	School board (teachers and principals) (n = 106)	Responses were double-coded, checked, and grouped into themes. For all open-ended questions, responses were assigned to categories using a structured coding guide. Closed-ended questions were analysed using SAS.	ECR (8), Intentions (1), Goals (1), Skills (2), Social influences (2), Knowledge (1), Beliefs about consequences (2)
Gamble et al., 2017	Mississippi, USA	Qualitative. Focus groups or semi-structured interviews	District administrators, principals and teachers (n not reported)	Qualitative analysis in four stages. 1) Transcribed responses into meaningful qualitative elements, and imported as text documents into Dedoose, generating 1000 first-cycle codes into 26 second-cycle codes. 2) Authors eliminated	Goals (3), ECR (2), Social influences (2)

Table 1 (continued)

Authors, year	Location	Methods, data source	Study participants (n = sample size)	Summarised method of analysis	TDF domains (n)
				duplicates and combined similar codes into hierarchical relationships. 3) Checked original responses to reassesses prevalence of these themes. 4) Authors independently developed diagrammatic representations of the data.	Beliefs about consequences (1)
Kennedy et al., 2010	Alberta, Canada	Quantitative.[a] Telephone interview or online survey	Principals/vice-principals (n = 55) & physical education (PE) teachers (n = 7)	Information was obtained via a descriptive survey. Responses were categorised by the investigators post-interview.	ECR (11) Social influences (6) Intentions (2) Goals (1)
Larsen et al., 2013	Norway	Qualitative. Focus group interviews	Principals (n = 8), project leaders (n = 7) and teachers (n = 38)	Data analysis contained five stages of framework analysis. 1) Interview responses were transcribed. 2) Developing a thematic framework or themes regarding policy implementation. 3) Coding responses to match identified themes. 4) Comparing responses across participant types. 5) Identifying patterns across concepts, themes and participant responses.	ECR (2) Skills (1) Goals (1)
Lounsbery et al., 2011	USA	Quantitative. Pen and paper or online questionnaire	Principal (n = 154) and physical education (PE) teachers (n = 154)	Static group comparisons were conducted between responses from policy adopter and non-adopter schools. Data analysis was performed using SAS. Categorical variables were described using percentages. Differences between policy adopter and non-adopter schools were tested using t-tests for independent samples.	ECR (7) Goals (1) Social influences (1) Skills (1)
Mâsse et al., 2013	British Columbia, Canada	Qualitative. Semi-structured interviews	Principals (n = 17) & teachers (n = 33)	Responses were transcribed verbatim and checked for accuracy. A constructivist-grounded theory was used for coding. A set of codes were created based on the interview guide and research objectives. Two independent coders developed patterns and themes from the data. Transcripts were then coded line by line using an inductive method of open coding. All data were coded in the NVivo 9 software.	Social influences (5) Knowledge (1) Beliefs about consequences (9) Beliefs about capabilities (1) ECR (5) PRI (1) Skills (1) Goals (2) Emotion (1)
Patton, 2012	Ontario, Canada	Quantitative. Pen and paper survey	Teachers (n = 145)	Data analysis was performed using SPSS. Descriptive statistics, including means and frequencies, were calculated for item responses.	Goals (1) ECR (5) Knowledge (1) Social influences (2)
Rickwood, 2015	Ontario, Canada	Qualitative. Semi-structured interviews	Teachers (n = 5) & school administrators (n = 4)	Responses were recorded using QuickTime application and transcribed. Participants reviewed transcripts for accuracy. Responses were organised via thematic patterns, with frequency of similar statements being calculated. Responses were clustered according to school practices, policies and beliefs.	Goals (1) Knowledge (1) Social influences (2) ECR (2)
Strampel et al., 2014	Ontario, Canada	Quantitative.[a] Pen and paper questionnaire (with open-ended questions)	Teachers (n = 137)	Data analysis was performed using SPSS. Descriptive statistics were calculated for each questionnaire item. Open-ended responses were transcribed and analysed for global themes. Analyses were completed using SPSS to calculate percentages of participants who answered the open-ended questions.	ECR (24) Social influences (8) Intentions (1) Beliefs about consequences (4) Beliefs about capabilities (3) Goals (4) Skills (2) Knowledge (4)
Usher and Anderton, 2014	Queensland, Australia	Qualitative. Semi-structured interviews	Teachers (n = 6)	Interviews were recorded and transcribed. "Hand analysis of qualitative data" was used for interview data. Content analysis was carried out on the data collected from particular questions in the survey. At "saturation" themes and concepts became formulated.	Goals (2) PRI (1) Beliefs about capabilities (1) ECR (1)

ANGELO framework = Analysis Grid for Environments Linked to Obesity; ECR = environmental context and resources; PRI = professional role and identity.

[a] Quantitative data extracted from a mixed design study.

Table 2
Identified factor (barriers and facilitators) domains and the factor prevalence from included studies (*n* = 17).

TDF domain	Qualitative studies (*n* = 9)	Quantitative studies (*n* = 8)	
	No. of studies that identified factor	No. of studies that identified factor	Median (range) prevalence of factor reported within studies
Barriers			
1. Knowledge	3 (Mâsse et al., 2013; Brown and Elliott, 2015; Rickwood, 2015)	1 (Evenson et al., 2009)	1% (0–2.1%) of participants identified this factor
2. Skills	3 (Mâsse et al., 2013; Brown and Elliott, 2015; Larsen et al., 2013)	2 (Evenson et al., 2009; Lounsbery et al., 2011)	2.8% (0–7.1%) of participants identified this factor
3. Professional role and identity	3 (Mâsse et al., 2013; Brown and Elliott, 2015; Usher and Anderton, 2014)	Not identified in any study	
4. Beliefs about capabilities	2 (Mâsse et al., 2013; Brown and Elliott, 2015)	3 (Cox et al., 2011; Alberta Education, 2008; Allison, 2016)	41% (20.7–47.3%) of participants identified this factor
5. Optimism	Not identified in any study	Not identified in any study	
6. Beliefs about consequences	2 (Mâsse et al., 2013; Brown and Elliott, 2015)	4 (Cox et al., 2011; Alberta Education, 2008; Evenson et al., 2009; Strampel et al., 2014)	5.3% (0–45.2) of participants identified this factor
7. Reinforcement	Not identified in any study	Not identified in any study	
8. Intentions	1 (Brown and Elliott, 2015)	2 (Evenson et al., 2009; Strampel et al., 2014)	22.6% (10–23.6%) of participants identified this factor
9. Goals	8 (Mâsse et al., 2013; Dwyer et al., 2003; Amis et al., 2012a; Brown and Elliott, 2015; Gamble et al., 2017; Rickwood, 2015; Usher and Anderton, 2014; Office of the Auditor General of Ontario, 2013)	6 (Cox et al., 2011; Alberta Education, 2008; Allison, 2016; Evenson et al., 2009; Lounsbery et al., 2011; Patton, 2012)	20.6% (0.7–78.5%) of participants identified this factor
10. Memory, attention and decision processes	Not identified in any study	Not identified in any study	
11. Environmental context and resources	8 (Mâsse et al., 2013; Dwyer et al., 2003; Amis et al., 2012a; Brown and Elliott, 2015; Gamble et al., 2017; Larsen et al., 2013; Rickwood, 2015; Office of the Auditor General of Ontario, 2013)	7 (Cox et al., 2011; Alberta Education, 2008; Allison, 2016; Evenson et al., 2009; Kennedy et al., 2010; Lounsbery et al., 2011; Strampel et al., 2014)	18.6% (0–78.8%) of participants identified this factor
12. Social influences	4 (Mâsse et al., 2013; Brown and Elliott, 2015; Gamble et al., 2017; Rickwood, 2015)	7 (Cox et al., 2011; Alberta Education, 2008; Allison, 2016; Evenson et al., 2009; Kennedy et al., 2010; Lounsbery et al., 2011; Strampel et al., 2014)	9.8% (0.7–80.3%) of participants identified this factor
13. Emotion	Not identified in any study	Not identified in any study	
14. Behavioural regulation	Not identified in any study	Not identified in any study	
Facilitators			
1. Knowledge	1 (Brown and Elliott, 2015)	2 (Patton, 2012; Strampel et al., 2014)	88.9% of participants identified this factor
2. Skills	1 (Brown and Elliott, 2015)	3 (Cox et al., 2011; Alberta Education, 2008; Strampel et al., 2014)	13% (2–47%) of participants identified this factor
3. Professional role and identity	1 (Office of the Auditor General of Ontario, 2013)	Not identified in any study	
4. Beliefs about capabilities	2 (Brown and Elliott, 2015; Usher and Anderton, 2014)	1 (Strampel et al., 2014)	31.4% (24.8–40.9%) of participants identified this factor
5. Optimism	Not identified in any study	Not identified in any study	
6. Beliefs about consequences	2 (Mâsse et al., 2013; Gamble et al., 2017)	1 (Strampel et al., 2014)	26.5% (3.6–48.9%) of participants identified this factor
7. Reinforcement	Not identified in any study	Not identified in any study	
8. Intentions	1 (Brown and Elliott, 2015)	1 (Kennedy et al., 2010)	11.7% (9–14.4%) of participants identified this factor
9. Goals	4 (Mâsse et al., 2013; Brown and Elliott, 2015; Gamble et al., 2017; Larsen et al., 2013)	2 (Kennedy et al., 2010; Strampel et al., 2014)	9% (2–29.2%) of participants identified this factor
10. Memory, attention and decision processes	Not identified in any study	Not identified in any study	
11. Environmental context and resources	3 (Mâsse et al., 2013; Brown and Elliott, 2015; Usher and Anderton, 2014)	4 (Alberta Education, 2008; Kennedy et al., 2010; Patton, 2012; Strampel et al., 2014)	23.9% (1.3–84.7%) of participants identified this factor
12. Social influences	3 (Mâsse et al., 2013; Brown and Elliott, 2015; Gamble et al., 2017)	4 (Alberta Education, 2008; Kennedy et al., 2010; Patton, 2012; Strampel et al., 2014)	17% (2.3–77.4%) of participants identified this factor
13. Emotion	1 (Mâsse et al., 2013)	Not identified in any study	
14. Behavioural regulation	Not identified in any study	Not identified in any study	

2016; Kennedy et al., 2010; Patton, 2012; Strampel et al., 2014), 5 in the U.S. (Cox et al., 2011; Amis et al., 2012a; Gamble et al., 2017; Evenson et al., 2009; Lounsbery et al., 2011), 1 in Australia (Usher and Anderton, 2014) and 1 in Norway (Larsen et al., 2013). Almost all (16 of the 17) included studies were cross-sectional (Mâsse et al., 2013; Cox et al., 2011; Dwyer et al., 2003; Brown and Elliott, 2015; Gamble et al., 2017; Larsen et al., 2013; Rickwood, 2015; Usher and Anderton, 2014; Office of the Auditor General of Ontario, 2013; Alberta Education, 2008; Allison, 2016; Evenson et al., 2009; Kennedy et al., 2010; Lounsbery et al., 2011; Patton, 2012; Strampel et al., 2014), with 1

study employing a longitudinal design (Amis et al., 2012a). Five studies were conducted with teachers (Dwyer et al., 2003; Amis et al., 2012a; Usher and Anderton, 2014; Patton, 2012; Strampel et al., 2014), 1 with principal, (Kennedy et al., 2010), 2 with school administrators (Cox et al., 2011; Evenson et al., 2009), and 9 included a combination of the three staff types (Mâsse et al., 2013; Brown and Elliott, 2015; Gamble et al., 2017; Larsen et al., 2013; Rickwood, 2015; Office of the Auditor General of Ontario, 2013; Alberta Education, 2008; Allison, 2016; Lounsbery et al., 2011), with participant numbers ranging from 6 to 1025. Studies were published between 2003 and 2016, with most (11 of 17) being conducted since 2012.

Among qualitative studies, data was collected via focus groups, semi structured interviews or pen and paper questionnaires. In quantitative studies, data was collected via electronic surveys, pen and paper questionnaires, or telephone interviews. Only 2 studies, 1 qualitative (Brown and Elliott, 2015) and 1 quantitative (Allison, 2016), used a theoretical framework to guide the development of their survey items. Brown and Elliott (2015) utilised both the social ecological theory and the Analysis Grid for Environments Linked to Obesity Framework (ANGELO framework), whilst Allison (2016), utilised the multilevel framework for implementation research. Only 4 studies stated that the psychometrics of their tools were considered, of which 3 reported that their surveys were reviewed for content validity (Cox et al., 2011; Lounsbery et al., 2011; Strampel et al., 2014) and 1 for face validity (Kennedy et al., 2010). Methods of analysis varied between studies and are summarised in Table 1. Only two studies (Evenson et al., 2009; Amis et al., 2012b) explicitly reported on factors for elementary and secondary schools separately and as there was no difference between the most prevalent factors and thus the domains they were mapped to the results are reported collectively.

3.3. Qualitative studies

3.3.1. Barriers

Across the 9 qualitative studies, 9 of the 14 domains were identified as barriers to the implementation of physical activity policies. The most frequently mapped barriers reported across studies were: 'goals' (e.g. competing curriculum demands of other subjects; physical activity considered a lower priority than other subjects) (8 studies), 'environmental context and resources' (e.g. lack of time in the curriculum; lack of space in the school for physical activity) (8 studies) and 'social influences' (e.g. perceived negative parent/guardian and student values towards physical activity; lack of student motivation) (4 studies).

3.3.2. Facilitators

Across the 9 qualitative studies, 10 of the 14 domains were identified as facilitators that enable schools' implementation of physical activity policies, the most frequent being: 'goals' (e.g. value and priority teachers place on physical activity; scheduling (including physical activity in timetable) (4 studies), 'environmental context and resources' (e.g. available school funds for equipment and resources; availability of indoor and outdoor facilities for physical activity) (3 studies) and 'social influences' (e.g. staff support for physical activity; teachers as role models for physical activity) (3 studies).

3.4. Quantitative studies

3.4.1. Barriers

From the 8 quantitative studies, barriers were mapped to 8 of the 14 TDF domains (Table 2). Across studies, the most frequently identified TDF domains were: 'environmental context and resources' (e.g. availability of facilities in the school environment; inclement conditions (i.e. weather/air quality) (7 studies), 'social influences' (e.g. lack of school board support; physical activity is not culturally accepted) (7 studies) and 'goals' (e.g. competing district policies; physical activity takes valuable time away from other subjects) (6 studies). The prevalence of

participants reporting of barriers within studies was highest for the domain of 'beliefs about capabilities' (e.g. lack of teacher expertise and confidence delivering physical activity; teacher's level of comfort delivering physical activity). Within this domain the barriers were reported by a median of 41% of participants of included studies, followed by the domains of 'intentions' (e.g. poor teacher attitude towards physical activity; lack of teacher motivation to implement physical activity) (22.6%) and 'goals' (e.g. competing curriculum priorities) (20.6%).

3.4.2. Facilitators

From the 8 quantitative studies, facilitators were mapped to 8 of the 14 TDF domains (Table 2). Across studies, the most frequently identified TDF domains were 'environmental context and resources' (e.g. having a physical education specialist in the school; adequate space in the school) (4 studies), 'social influences' (e.g. principal and administration support for physical activity; teachers who believe in the importance of physical activity) (4 studies) and 'skills' (e.g. teachers competence and ability to implement the policy) (3 studies). The domain 'knowledge' (e.g. sufficient knowledge about physical activity and health to effectively conduct physical activity; research information that supports the importance of physical activity) was the most prevalent facilitator, reported by a median of 88.9% of participants in the relevant studies, followed by the domains of 'beliefs about capabilities' (e.g. scheduling daily physical activity (DPA) is easy; it is easy to integrate DPA into other subject areas) (31.4%) and 'beliefs about consequences' (e.g. students are always physically active during outdoor/indoor DPA) (26.5%) (Table 2).

4. Discussion

The aim of this paper was to describe factors (barriers and facilitators) that may influence the implementation of school based physical activity policies which specify the time or intensity that physical activity should be implemented and to map these factors to the TDF which is a comprehensive implementation theoretical framework. The review identified a range of barriers and facilitators to implementation, incorporating most of the domains of the TDF. Such findings demonstrate the considerable challenges faced by school systems and their staff in implementing physical activity policies. The identification of numerous factors across most TDF domains suggests that comprehensive strategies targeting such factors to support implementation may be required.

Consistent with the findings of the previously published scoping review (Weatherson et al., 2017) this review identified that factors related to 'environmental context and resources' and 'social influences' were the most frequently reported domains from both qualitative and quantitative studies to impact on schools' implementation of physical activity policies. For example a lack of equipment, time, staff and facilities or perceptions that parents, students, school administrators or school-board members were not supportive of the policy were repeatedly reported to impede policy implementation. The inclusion of strategies that target environmental changes including the provision of resources, modelling or demonstration of desired behaviours by others or social processes of encouragement or support, may be particularly important strategies to address these domains (Michie et al., 2005). As school resourcing is often a function of policy decisions and funding models at a school jurisdiction level, research to better understand factors that may influence decision makers at this level is also warranted. The identification of 'goals', in particular goal priority (i.e. the order of importance or urgency that is placed on engaging in a behaviour), as being an important implementation barrier is consistent with health promotion research in schools more broadly (Hung et al., 2014) and research in other settings (Presseau et al., 2009). Strategies to improve the relative priority of policy adherence in schools, for example, through school leadership endorsement of physical activity policy, and the use of systems to monitor implementation performance of schools could be considered in interventions to support school policy

adoption.

Interestingly, in addition to the factors identified in quantitative studies, qualitative studies identified 'professional role and identity', as domains impeding implementation and 'professional role and identity', and 'emotions' as important domains enabling implementation. The difference in qualitative and quantitative findings in this review suggests that surveys administered in quantitative studies may have overlooked important factors influencing policy implementation in this setting. The inclusion of both quantitative and qualitative studies is therefore a strength of this review as it provides a more comprehensive understanding of factors that influence school personnel's implementation of physical activity policies. Nonetheless, a comprehensive barriers assessment using validated measures from existing theoretical implementation frameworks is warranted to verify the findings of this review and to identify any other important barriers that as a result may have not emerged or been overlooked in the included studies (Clinton-McHarg et al., 2016). Furthermore, the application of a theoretical framework to classify the barriers and facilitators that impact on schools' implementation of physical activity policies also strengthens the review. By taking this additional step it may support researchers and practitioners to purposefully select behaviour change techniques in the design of implementation interventions.

A limitation of this review is that the majority of studies were conducted in North America. Barriers and facilitators of physical activity policy implementation for schools in other jurisdictions may differ limiting the generalizability of findings. In addition, as many of the qualitative studies use thematic analysis, our coding of barriers/facilitators may be restricted by the interpretations and analyses of the primary studies. Therefore, the review may have been more likely to capture the primary, rather than all possible factors that impact on policy implementation.

5. Conclusion

This study adds to the scarce body of literature that identifies factors, from a theoretical perspective, that impact on schools' implementation of physical activity policies. Given schools' poor adherence to physical activity policies internationally, the findings provide guidance to researchers, policy makers and practitioners in the design of novel theory-based interventions that support schools' implementation of such policies. Furthermore, these findings may facilitate mediation analyses of implementation studies to understand how change in interventions occurs.

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ypmed.2017.11.012.

Abbreviations

TDF   Theoretical Domains Framework
PRISMA Preferred Reporting Items for Systematic Reviews and Meta-Analyses

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Availability of data and materials

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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