Barriers to Implementation of Physical Activity in Danish Public Schools

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Abstract

Purpose. In 2014, the Danish Government introduced a new public school reform which included implementation of 45 minutes of daily physical activity within the academic classroom curriculum. The purpose of the present study was to explore school staff’s perceived barriers to implementation of a national PA policy. Method. A mixed methods approach using a questionnaire and semi-structured interviews was conducted. A total of 198 teachers and 26 school management team members (principals, deputy principals, leading teachers) from 31 schools completed a questionnaire, and 11 school management team members were interviewed. The socio-ecological model was used as a theoretical framework to examine the results. Results. A total of 15 different barriers were identified and reflected within all levels of the socio-ecological model. Facilities, motivation, and time were the most prominent barriers identified. Conclusion. Development and deployment of a national PA policy needs to be done in cooperation with consumers from all levels within the socio-ecological model to ensure successful implementation.

Keywords: school staff, policy, socio-ecological model, mixed methods.
Barriers to Implementation of Physical Activity in Danish Public Schools

Physical activity (PA) is generally promoted for its numerous physical health benefits, and schools are considered ideal settings for PA promotion (Janssen & LeBlanc, 2010; Morton, Atkin, Corder, Suhrcke, & van Sluijs, 2016; Watson, Timperio, Brown, Best, & Hesketh, 2017). As such, governments have internationally released guidelines or policies mandating structured PA in schools (Allison et al., 2016; Chesham et al., 2018; Harrington et al., 2014; Mässé, McKay, Valente, Brant, & Naylor, 2012).

In 2014, the Danish government introduced a wide-ranging school reform that applied to all municipal primary and lower secondary public schools. The school reform entailed a longer and more varied school day intending to alternate between regular classes and activities (Ministry of Education, 2017). The overall aim of the school reform was to ensure that all children meet their full learning potential in order to counterbalance social backgrounds impacting academic performance and to ensure well-being among all children and adolescents (Ministry of Education). From a PA promotion perspective, a distinctive feature of the school reform was that it became mandatory to implement an average of 45 minutes of daily PA within the academic classroom curriculum.

Despite the benefits of promoting PA in an academic school curriculum, international research suggests that most schools fail to implement PA policies at scale (Nathan et al., 2019). Thus, developing policies to increase PA (e.g., physically active learning, brain breaks) through school leaders (teachers and principals) requires an understanding of factors that impede implementation (Nathan et al., 2018). Several studies have reported a number of barriers to implementing PA policies, including lack of time in an already crowded curriculum (Brown & Elliott, 2015; Weatherson, McKay, Gainforth, & Jung, 2017), competence or ability to implement PA (Mässé et al., 2012; Nathan et al., 2018), lack of indoor and outdoor facilities for initiating PA (Nathan et al., 2018;
Weatherson, McKay, et al., 2017), inadequate resources, such as available school funds for equipment and teacher education (Nathan et al., 2018; Weatherson, Gainforth, & Jung, 2017), and limited support from school executive staff in relation to education and as role models for implementation (Allison et al., 2016; Nathan et al., 2018; Weatherson, Gainforth, et al., 2017).

To our knowledge, the Danish school reform is one of the first policy-driven initiatives aiming to integrate a substantial amount of mandatory PA within the school day. Similar policies have been introduced in other countries (Allison et al., 2016; Chesham et al., 2018; Government of Hungary, 2011; Stortinget, 2017). Yet, none of these policies have been initiated on a national political level, mandating all school staff to be front-line providers for the implementation. Thus, a comprehensive understanding of the barriers and facilitators influencing implementation of this nationwide policy on PA is needed in order to ensure implementation (Nathan et al., 2018). Therefore, to provide guidance to policymakers, school administrators, and teachers responsible for the implementation of PA policies in schools, the present study aimed to explore school staff’s perceived barriers to implementation of the national PA policy in Danish public schools.

Methods

Design

The study is part of a larger research study PHASAR study aiming to evaluate the implementation and effects of the nationwide school-based initiative on PA and body composition (Pedersen et al., 2018). In the current sub-study, a sequential mixed methods approach using a questionnaire followed by semi-structured interviews was conducted for the purpose of verification to gain a broader understanding of the school staff’s perceived barriers to the implementation of the national PA policy (Greene, 2007).

Ethical Considerations
The study was approved by the Danish Data Protection Agency (2015-57-0008) and by the municipalities and school principals. Written consent was obtained from all participants, who were informed that they could withdraw from the study at any time. Schools and participants were anonymized by giving the respondents numbers and changing the interview participants names. All data is stored and processed in accordance with Danish Data Protection Act and the General Data Protection Regulation.

**Framework**

The socio-ecological model (SEM; Brofenbrenner, 1977; Sallis et al., 2006) was used as a theoretical framework. The SEM was originally developed by Bronfenbrenner and developed further from a health perspective by Sallis who postulated that in order to understand human health behavior, the entire ecological system needs to be taken into account (Sallis et al., 2006). At the core of the SEM is the individual’s biological and psychological makeup, based on individual and genetic developmental history. This makeup continues to be affected and modified by the individual’s immediate physical and social environment (microsystem) as well as interactions among the systems within the environment (mesosystems). Other broader social, political, and economic conditions (exosystems) influence the structure and availability of microsystems and the manner in which they affect the individual. Finally, social, political, and economic conditions are themselves influenced by the general beliefs and attitudes (macrosystems) shared by members of the society (Brofenbrenner, 1977; Sallis et al., 2006). The idea behind the SEM is that every layer in the model is connected and it is not possible to understand the whole without recognizing how the component parts interact, affect, and change each other (Sallis et al.).

The SEM is an effective way to organize empirical findings for a problem-driven approach to changing behavior (Eldredge et al., 2016). Consistent with the SEM, barriers to implementation
of PA in schools can be conceptualized at the individual (e.g., knowledge), social (e.g., social climate), physical (e.g., facilities), and organizational (e.g., resources) levels (Sallis et al., 2006). Thus, the SEM was used in the current study to structure the data analysis by categorizing school staff’s perceived barriers to the implementation of the national PA policy at the different levels within the model (Pawlowski, Tjørnhøj-Thomsen, Schipperijn, & Troelsen, 2014).

**School Context**

In Denmark, public (state) schools are government (tax) funded and free of charge for all children between 6-16 years of age and mandatory unless attending private schools. Most children (77%) in Denmark attend public schools (Ministry of Education, 2019). Schools are typically organized in three tiers: pre-preparatory classes (grades 0-3, 6-9 years old), intermediate classes (grades 4-6, 10-12 years old), and lower secondary classes (grades 7-9, 13-16 years old). Children attend school 30-35 hours per week, of which approximately 75 minutes per day are dedicated to recess. As a mandate of the school reform, 45 minutes of daily PA is required to be integrated within academic classroom curriculums or as active breaks during lessons. The PA policy also requires students to have at least 60-90 minutes of physical education (PE) per week depending on age group. PE is included as part of the 45 minutes of daily PA, but recess is not included in the PA policy (Ministry of Education, 2018).

**Data Population**

A total of 31 representative schools were included in the present study. As shown in Table 1, the schools varied in geographic location, number of students, and socioeconomic status (SES). Schools and participants have been extensively described elsewhere (Pedersen et al., 2018). Teachers and school management team members (principals, deputy principals, or leading teachers) were the main study population in the current study. Danish, mathematics, and English courses take up a little more than half (53%) of the total teaching time in Danish public schools. Thus, teachers were
eligible to participate if they taught Danish, mathematics, or English. A total of 392 teachers and 31 school management team members were eligible to participate, whereas 215 teachers and 29 school management team members completed the questionnaire (n = 244).

The school liaison was asked to identify one person from the school management team who had in-depth knowledge of the process for implementation of the PA policy to participate in the questionnaire. School management team members from 11 schools were also selected for participation in a semi-structured interview to gather in-depth knowledge on school staff’s perceived barriers associated with the policy implementation. Maximum variation was used to select individuals from the school management teams for interviews and were based on the following criteria: geographic location, number of students, and SES (see Table 1). School management team members were asked to participate and respond on behalf of their school.

[Insert Table 1 about here]

Data Sources

Questionnaire. The questionnaire was administered electronically through the school’s internet, and the included teachers and school management team members received a hyperlink to the questionnaire. Reminders were e-mailed to participants who did not respond three times with one week between each reminder. Data collection lasted four weeks per school and took place between December 2017 and October 2018.

The questionnaire instrument consisted of a question regarding perceived barriers for implementation of PA and background information (gender, job position, work experience, PE teaching experience) and took approximately 15-20 minutes to complete. PE teaching experience was defined as having any education in teaching PE. The questionnaire was developed by two authors from this study and has not been systematically validated as a standalone instrument. To ensure trustworthiness, the questionnaire was developed and informed by reviewing relevant items from
the Theoretical Domains Framework (TDF; Atkins et al., 2017; Cane, O’Connor, & Michie, 2012). The TDF is recommend for identifying barriers and facilitators to implementation (Nathan et al., 2018). Reviews of the TDF were screened and findings extracted to inform the present questionnaire. Findings were discussed among the study authors and a categorical question including nine listed barriers identified from the TDF was developed (e.g., skills, resources; Nathan et al., 2018; Weatherson, Gainforth, et al., 2017; Weatherson, McKay, et al., 2017). Respondents were also given the option to add additional barriers. A Likert scale was used to scale the importance with which a certain barrier was perceived (extremely important, very important, moderately important, not important, not at all important). The questionnaire was tested and discussed by the members of the research group before pilot testing. The online procedure and the questionnaire were pilot tested with a group of teachers not included in the study to ensure face validity.

**Interviews.** Eleven of the 26 school management team members were interviewed (six males, five females). Prior to being interviewed, they had completed the questionnaire instrument. Three principals (two males, one female), four deputy principals (three males, one female), and four leading teachers with school management responsibilities (one male, three females) participated in the interviews.

The interviews were primarily used for verification of the questionnaire results. The interviewees were asked to identify perceived barriers to implementation of the national PA policy among school staff and elaborate on the barriers mentioned in the questionnaire. A central question asked was: (a) What barriers have you encountered in relation to the implementation of the policy?; (b) Can you elaborate on those barriers mentioned in the questionnaire?; and (c) How does the school accommodate these barriers? Interviews were collected during a one-day visit to each of the 11 schools between April and September 2018. All interviews were conducted one-on-one with the
lead author and lasted between 25 and 60 minutes. Verbal consent was obtained from each participant to audio record the interview.

Data Analysis

Questionnaire (quantitative data). All listed barriers from the questionnaire and the open text responses were included in the analysis. Responses were categorized as either a barrier or non-barrier according to the Likert scale result. Responses of ‘extremely important,’ ‘very important,’ and ‘moderately important’ indicated that the listed item was a perceived barrier, whereas responses of ‘not important’ and ‘not at all important’ indicated that the listed item was not a perceived barrier. In addition to the questions related to barriers to implementation of the PA policy, variables specific to participant background including gender, job position, work experience, and years of PE teaching were examined in this study (dependent variables). Descriptive statistics (frequency and percentage scores) were calculated for each barrier mentioned in the questionnaire, and these barriers were subsequently arranged according to the four levels of the SEM (e.g., knowledge, which was placed under the individual environment of the SEM). Findings were examined by a co-author and discussed. Any discrepancies were resolved by consensus between the two authors. To test for potential selection bias, a comparison was made between responders and non-responders using Fisher’s exact test (Kim, 2017). The comparison was based on gender, work experience, and PE teaching experience.

Questionnaire data was extracted from the worldwide online system Research Electronic Data Capture (RedCap) and exported to STATA 15 (College Station, TX). Descriptive statistics were calculated for all barriers mentioned in the questionnaire, and barriers were subsequently arranged under categories referring to the different levels within the SEM. Fisher’s exact test investigated the association between each of the barriers and gender, job position, work experience, and PE teaching experience, respectively. The level of significance was set at $p<0.05$. The quantitative
analysis was of primary importance in this study, because it consisted of data from all study participants.

**Interviews (qualitative data).** To ensure consistency, all interviews were conducted and transcribed by the lead author. All interviews were transcribed verbatim directly into NVivo Version 11.4.3 (London, UK), resulting in 231 pages, Times New Roman size 12, and with 1.15 spacing (68, 86, and 77 pages for principals, deputy principals, and leading teachers, respectively) of raw transcription data. Data coding was also performed using NVivo software to extract key categories and quotes.

The data analysis was carried out as a two-step process. Firstly, all interviews were read and played through at least twice by the lead author. All emerging barriers were marked, titled with a note summarizing the main issue (e.g., facilities, time, or knowledge) and extracted from the interviews. Quotes were extracted if the interview participant commented that the factor affected school staff’s implementation of the national PA policy. Secondly, a deductive coding based on the different levels of the SEM was conducted, arranging all extracted quotes according to the four levels of the SEM. The arrangement according to the SEM was based on the note attached to each quote (e.g., facilities, which was placed under physical environment of the SEM). Findings from both steps of the analysis were examined by a co-author and critically discussed. Any discrepancies were resolved by consensus between the two authors.

Afterwards, a pen profile was developed from the interview data to represent an overall analysis of the barrier outcomes and frequencies of these outcomes (Knowles, Parnell, Stratton, & Ridgers, 2013). A pen profile is a form of content analysis which provides an efficient representation of key themes from the data analysis demonstrating examples of verbatim data and frequency data as opposed to all raw data themes recorded using more traditional content analysis procedures (Knowles, 2009). Quotes were subsequently used to expand the profile and highlight emergent
themes (Knowles et al., 2013; Mackintosh et al., 2011). For the purpose of this analysis, the number of times each specific barrier was mentioned across all the interviews was presented in a diagram (see Figure 1). This provided an indication of the prevalence of each barrier. If a participant mentioned the same barrier at different times within the interview, the barrier was counted separately. Thus, the total frequency coded to each category represents the proportion of interview time spent discussing each barrier. Links across barriers and levels within the SEM were marked with dotted arrows. The importance of barriers was deducted from those listed most frequently in the questionnaire. The qualitative analysis of the interviews was of secondary importance in this study, because it consisted of data from a small sampling (n=11) of the total number of study participants (N=243). Findings from the qualitative analysis were primarily used to elaborate on the quantitative findings.

Trustworthiness. Lincoln and Guba’s (1985) four criteria of trustworthiness were followed during the data analysis process: credibility, transferability, dependability, and confirmability (Shenton, 2004). Methodological triangulation was used by gathering both quantitative and qualitative data in a sequential mixed methods approach, ensuring credibility of the study (Begley, 1996). Transferability was accommodated by involving 31 representative schools for the questionnaire and 11 representative schools for the interviews (Greene, 2007). To ensure dependability, authors critically questioned the analysis being discussed until an acceptable consensus was reached. The first author then cross-examined the data in reverse to assure dependability of the data obtained (Denzin, 1989; Hansen, 2006). Lastly, researcher triangulation was used throughout the qualitative analysis to compensate for single-researcher bias and ensure confirmability of the qualitative analysis (Denzin, 1970; Hansen, 2006).

Results
In total, 215 teachers and 29 school management team members (19 principals and ten deputy principals) completed the questionnaire. Females comprised almost 62% of the study population among teachers and 45% among school management team members. Most teachers had more than ten years of work experience (63%), and half of the study population in both groups (teachers and school management team) had some PE teaching experience. No significant differences were found between responders and non-responders in terms of gender \( (p > 0.8) \), work experience \( (p > 0.85) \), or PE experience \( (p > 0.3) \).

In the following section, results from the questionnaire and interviews are presented in combination and discussed in terms of the SEM categories. A total of 12 barriers were identified in the questionnaire: lack of belief in the effect of PA, knowledge, student motivation, support from school management, chaos, lack of common understanding of PA, access to facilities, school design, lack of time for preparation, time due to curricular demands, motivation, and resources for education. A total of 11 barriers were identified in the interviews: lack of knowledge, student motivation, belief in the effect of PA, chaos and noise, lack of common definition of PA, facilities for PA, weather, lack of motivation, priority, time, and school structure. The majority of the identified barriers across the two data sources were identical, resulting in a total of 15 different barriers: (a) three at the SEM individual level, (b) three at the SEM social level, (c) three at the SEM physical level, and (d) six at the SEM organizational level (see Table 2 and Figure 1). The most prominent barriers in the questionnaire were lack access to facilities and materials, school design, lack of motivation, lack of resources for education, lack of time for preparation, and lack of time due to curricular demands. Due to overlap in the responses from the interviews, access to facilities and materials and school design were grouped into one overall category called facilities for PA. For the same reason, time for preparation and time due to curricular demands were grouped into an overall category labelled lack of time, whereas lack of motivation and lack of resources were grouped into an overall...
category labelled *lack of motivation*. The following section provides an in-depth description of the three most prominent barriers in the questionnaire. Data from the interviews is used to elaborate on each barrier.

Lack of Time – Organizational Environment of the SEM. The most prominent barrier in the questionnaire was lack of time (80.8%), which also was mentioned ten times in the interviews. Results from the Fisher’s exact test showed no significant association between time as a barrier for the implementation and gender ($p>0.9$), work experience ($p>0.2$), or PE teaching experience ($p>0.9$). A significant difference was found for job position ($p<0.02$), with more teachers experiencing time as a barrier for implementing PA compared to principals and deputy principals.

Time was identified as a barrier as it related to extra time used to prepare for the PA sessions and time taken from the curriculum. Preparation time was reduced by 35% with the Danish school reform and school staff were now required to substantiate and complete additional paperwork with the implementation of the school reform, which they also were expected to do during their preparation time. Furthermore, new initiatives were continually introduced, forcing school staff to prioritize their time for preparation. One informant said, “…it requires a new mindset and you don’t bother when you also have to (…), and there are just so many new initiatives all the time” (Teacher 1). Thus, time for preparation seems to be linked to priority ($n = 4$), because school staff feel a huge time pressure to accommodate all the initiatives and do not have the time to acquaint themselves with all new initiatives. One informant further elaborated: “There are a lot of good materials, but it requires you to have the essential amount of time to find the materials and to acquaint yourself with how to use it. I miss having time for that” (Teacher 2).
In general, the interviewees believed that implementing PA as part of the curriculum was meaningful, although some perceived that PA removed valuable time from the curriculum. Implementing PA seemed time consuming, because the time spent organizing the environment prior to conducting each PA class session (e.g., 5-10 minutes) would end up being a lot of time wasted on a yearly basis. Thus, school staff perceived that the curriculum was too packed to spend time on PA.

Moreover, implementing PA within the curriculum sometimes required moving to another space or rearranging the classroom, which also seemed to take away valuable time from the curriculum. One informant mentioned: “When you only have 45 minutes of teaching each week it [PA] takes away a lot of time. Especially if you have to move to another space to do the activity” (Teacher 2). Thus, time used to move from one space to another was perceived as taking valuable time away from the curriculum and was a decisive factor for some school staff choosing to skip PA as part of the curriculum. Lack of time seems to be linked to lack of knowledge (n=16) and motivation (n=7) for organizing PA without taking away too much time from other content areas within the curriculum or moving from one space to another in an efficient manner to reduce wasted time.

Lack of Facilities for PA – Physical Environment of the SEM. The second most prominent barrier in the questionnaire was lack of facilities for PA (69.3%), and this fell under Physical Environment within the SEM. Results from the Fisher’s exact test revealed no significant association between lack of facilities as a barrier for implementation and job position ($p>0.2$), gender ($p>0.2$), PE teaching experience ($p>0.4$), or work experience ($p>0.4$), respectively.

Facilities for PA identified by the participants were the movement-related structures that surrounded the schools including playgrounds, gymnasiums, soccer fields, and common rooms. Interview data indicated that many schools lacked PA facilities when planning for activities outside the classroom. Two informants even expressed a need to rent public or sports club facilities in order
to accommodate not only the new PA policy but also the required PE classes for all students. Renting facilities was mentioned as a costly circumstance for schools, which consequently entailed a focus on prioritization of the existing facilities so that as many classes as possible were able to use the existing facilities for PE.

At a minimum, all schools had access to a school gymnasium. More interviewees mentioned, however, that the school gymnasium was often already occupied when they had planned activities requiring the use of their school PA facilities. Thus, school staff often experienced not being able to run the lessons as planned. As one of the informants mentioned:

Sometimes I want to use the gym facilities to do PA which is not possible within the classroom. But then the gym is already occupied when we arrive. (…). And when you have to do PA within the classroom you need to move tables and chairs, which is time consuming (Teacher 3).

Thus, a lack of facilities seems to be linked to priority (n=4), such as scheduling access to existing PA facilities, and the aspect of spending money on renting public or sports club facilities. Some schools tried to utilize the existing facilities in alternative ways, but the school design made it challenging. One informant expressed:

It’s an old classic 60s school built with a long corridor (…). Once I visited a school where they had an indoor running track. Well, with a walk track and a running track. So, why not just let us run inside, if we have the possibility for it. But that has to do with the design of our school (Principal 1).

Alternative use of facilities requires a creative way of thinking and understanding in planning PA in unfamiliar surroundings, which for some school staff could be challenging due to lack of motivation (n=7) and knowledge (n=16) on how to organize PA in alternative settings. Thus, lack
of facilities seems to keep some school staff from planning PA, because they lack knowledge on how to use the existing facilities (e.g., classrooms or common rooms).

**Lack of Motivation – Organizational Environment of the SEM.** Lack of motivation was the third most prominently identified barrier in the questionnaire (64.2%). Results from the Fisher’s exact test revealed no significant association between lack of motivation for the implementation of PA and job position ($p>0.6$), gender ($p>0.5$), or work experience ($p>0.06$). A significant difference was found for PE teaching experience ($p<0.01$). Those participants with no PE teaching experience felt less inspired to implement PA in the curriculum than those who had PE teaching experience.

Lack of motivation was mentioned seven times in five interviews. The respondents reported that they lacked materials and resources to obtain knowledge on how to organize PA to support the curriculum. Organizing PA within the curriculum was challenging for some school staff, because it was a new way of thinking and structuring teaching. Lack of motivation for some school staff resulted in the implementation of non-curricular PA in order to accommodate the policy. One informant expressed: “Some teachers find it really difficult [to plan activities supporting the curriculum] and they have resorted to going for a walk around the school – which is also movement” (Deputy principal 1). Thus, lack of motivation seems to be linked to lack of knowledge (n=16) on how to organize PA that supports the curriculum, and priority (n=4), such as allocating resources for education and motivational materials for all school staff.

Two informants further concurred that some students lacked motivation for PA, making it even more challenging to implement PA to support the curriculum. Students in lower secondary grades were especially difficult to motivate for PA, because students feel awkward being active, linking lack of motivation to lack of student motivation (n=17). One informant expressed, “Give us
a range of tools for what to do to plan PA supporting the curriculum. Because that’s what’s missing” (Teacher 3). Thus, school staff lack motivation on how to plan PA that students want to actively take part in.

Discussion

To solve long-term implementation challenges, it is important to gain a wider understanding of barriers to successful implementation of a national school PA policy. This study provides a comprehensive exploration of barriers to the implementation of a national PA policy from the perspectives of school staff in Danish public schools. A total of 15 barriers were identified when implementing the national PA policy. Three barriers in particular were found in the questionnaire and elaborated in the interviews: lack of facilities for PA, lack of inspiration, and lack of time. These insights echo themes that were highlighted in previous studies evaluating barriers for PA implementation in schools. In the present study, these three main barriers for implementation appeared at two different levels within the SEM, at the physical level and especially at the organizational level.

At the SEM physical level, lack of facilities for PA (e.g., classrooms, gymnasium facilities, common rooms) was identified as the most prominent barrier to implementing PA. This finding is reflective of the wider literature, where lack of space, equipment, and indoor and outdoor facilities have been identified as impeding implementation of PA in schools (Nathan et al., 2018; Weatherston, Gainforth, et al., 2017). Lack of facilities necessitate creative use of existing facilities, making demands on school staff’s knowledge in organizing PA. PA facilities are not however essential to successful implementation. Instead, all school staff need to be better trained to use the classroom and existing facilities. Professional development could also help school staff to initiate PA activities while moving from one location to another, instead of experiencing the time required to move as a waste of time. So, school staff need professional development and motivation in order to eliminate facilities as a barrier for implementation.
At the organizational level, a lack of motivation and time were the most apparent barriers identified. Lack of motivation was likely related to student motivation, knowledge, and priority. This finding is reflected in previous literature indicating that school staff who are uncomfortable in teaching PA as part of the curriculum need motivational materials, education, and training in order to overcome this barrier (Durlak & Dupre, 2008; Mâsse et al., 2012; Weatherson, McKay, et al., 2017).

Previous studies have also stated that PA management skills and motivation are important to succeed in the implementation of PA (Goh et al., 2013). Thus, professional development is needed to help school staff improve PA management skills, as school staff are a major source of influence in providing PA as part of the curriculum. Moreover, in order to feel comfortable with teaching PA, school staff need a range of motivational materials. These materials need to be at different progression levels, starting out with desk-side activities, and as school staff become more comfortable with the implementation of PA, they can progress to more advanced activities (e.g., orienteering race while solving math problems; McMullen et al., 2014). Other studies have found that knowledge sharing among school staff could facilitate using PA in the curriculum (Brown & Elliott, 2015). Knowledge sharing, however, is not sufficient when mandating all school staff take part in the implementation. School staff need continued professional support in order to gain motivation and a range of materials with concrete PA ideas to organize PA that supports the academic curriculum (Mâsse et al., 2012). This is especially important when teaching older students who seem to be more difficult to motivate.

The barrier mentioned most often was lack of time, including time for preparation of PA and time taken away from other curricular demands. This finding is reflected in the broader literature (Allison et al., 2016; Nathan et al., 2018; Weatherson, Gainforth, et al., 2017; Weatherson, McKay, et al., 2017). School staff have to prioritize within the academic curriculum to adhere to the policy.
In particular, there has been increasing pressure placed on teachers to improve academic performance (e.g., standardized test scores), and some teachers perceive time spent in the classroom to be more beneficial compared to time spent on PA (Owen et al., 2016). Interestingly, none of the previous studies have identified time for preparation as a barrier for implementation of PA. This variation could possibly be due to preparation time being included in lack of time due to curricular demands in previous studies. Another explanation could be that a new working provision, containing a new structure of working hours, was introduced for teachers in Denmark in continuation of the school reform. Time for preparation was reduced, making Danish school staff much more aware of efficient use of their preparation time. Some activity breaks that do not require much time for preparation do already exist, but school staff need to be aware of this in order to use them as a helpful tool (Daly-Smith et al., 2018).

Practical Implications

The Danish school reform was designed by politicians who understand elements of the provision but may lack the operational knowledge of the school environments and the barriers that may exist. The Danish Government outlined school responsibilities for monitoring the implementation of the PA policy. These findings suggest that schools cannot be solely responsible for accommodating the policy. An implementation strategy involving all levels within the SEM is needed in order to succeed. Lounsbery, McKenzie, Morrow, Monnat, and Holt (2013) conceptualized an ecological model illustrating how PA policies at the state, municipal, and school levels can affect the school environment and children’s PA. They highlighted how comprehensive state policies can impact policies at a municipality level, which can then affect school policies and the school environment. Thus, developing an implementation strategy at a governmental level ensuring policy coverage at all levels within the SEM would be beneficial.
In line with the SEM (Brofenbrenner, 1977; Sallis et al., 2006), findings from the pen profile showed that most barriers were linked to one or more barriers, indicating that they cannot be seen as isolated factors. Most barriers were categorized at the organizational level within the SEM, but likely related to barriers within the individual level. Yet school staff at the individual level do not have the authorization to overcome barriers within the organizational level, because it often requires resources for which they are not responsible. So, how do school staff deal with the implementation of a top-down PA policy?

Findings from the present study indicate that school staff need a helping hand in order to overcome the identified barriers and accommodate the policy. Previous research has endorsed the value of a school leadership team or an internal ‘champion’ at each school to overcome planning and program organization issues (Brown & Elliott, 2015; Cooper et al., 2016; Morgan & Hansen, 2008). This team or internal ‘champion’ should rely on scientifically based evidence and support from administrators in order to overcome potential pushback or resistance from school staff (Cooper et al., 2016). Furthermore, they could be responsible for facilitating workshops, education, and ongoing training for school staff, which has been recognized as crucial for sustainable implementation (Mâsse et al., 2012; Nathan et al., 2018; Weatherson, Gainforth, et al., 2017). Training could be supplemented by a range of motivational materials to reduce time spent on preparation (Quarmby, Daly-Smith, & Kime, 2018). Likewise, to overcome the time barrier, the team or the internal ‘champion’ could support scheduling PA into timetables and shared decision-making (e.g., staff involvement, local ownership), ensuring structuring of PA and a common PA strategy at a school level, which has previously been identified as an important organizational practice supporting implementation (Brown & Elliott, 2015; Durlak & Dupre, 2008; Nathan et al., 2018). A common strategy could also be used for organizing structured knowledge sharing among school staff to continuously upgrade their knowledge (Langille & Rodgers, 2010; Morgan & Hansen, 2008). The
A local PA leader would support sustained implementation (Mâsse et al., 2012; Weatherson, Gainforth, et al., 2017). Lastly, the team leader could be responsible for developing a direct feedback loop at each school between policy, its implementation, and its upstream and downstream effects (Cooper et al., 2016). Continuous feedback would help schools enhance the implementation, identifying positive effects and challenges, enabling an adjustment of the implementation strategy.

Another recommendation from previous implementation research is to develop and deploy data systems to monitor policy implementation and effectiveness (Cooper et al., 2016). A data system could also help schools in providing knowledge and data on the effectiveness of their implementation strategy. However, a data system needs to be developed as an aid for school staff to improve their work with the implementation, not as a supervision tool.

Allocating time for development of school strategies, structured knowledge sharing, and establishing a school leadership team or an internal ‘champion’ to conduct workshops, training, support education, and develop a feedback loop however is costly for schools. Thus, governmental and municipal support is needed to increase the level of resources offered to schools in terms of structural and financial support and professional development opportunities (Morgan & Hansen, 2008). Otherwise, implementation of a national PA policy will be difficult for most schools to accomplish successfully.

Governments could also consider making PA a mandatory course in pre-service teacher education, ensuring that all future teachers are acquainted with implementing PA in a classroom setting.
during their educational training experience. However, these recommendations require a high degree of commitment, motivation, and allocation of resources, particularly from government, but also municipalities, school management, and teachers in order to succeed in implementation of a national PA policy in schools. Penney and Evans (2005) state that policies are usually made by certain individuals in the upper echelons of organizations, systems, or the state to be implemented by others at levels or sites ‘below.’ In such a conception, teachers become the last and least important link in the chain (Flintoff, 2003). Yet, all individuals involved must be supportive of the initiative, taking responsibility for the implementation (Brofenbrenner, 1977). If individuals at the government, municipal, and school management levels do not understand the complexity of the implications for implementation, the policy may not be implemented as intended (Brown & Elliott, 2015). Hence, individuals at all levels (government, municipalities, school management, teachers) have a role to play, and given the interconnecting nature of these influences, individuals are likely to transform or re-interpret the policy in numerous ways, which Penney and Evans (2005) call ‘policy slippage.’ Moreover, studies have criticized top-down policies, because they contend that such approaches may actually prevent real change from occurring as teachers adopt innovations in order to survive and resist the new changes when they do not believe in the changes (Sparkes, 1990). In studies of the implementation of the top-down National Curriculum Physical Education (NCPE) in England and Wales, teachers simply adapted, recreated, or modified curriculum to fit their beliefs and values, and limited changes in pedagogical practices were noted (Curtner-Smith, 1999). Therefore, Penney and Evans (2005) argue for a more fluid conception of policy based on interaction between content and context (e.g., inviting schools to take part in the policy development). So, to ensure buy-in of all municipalities, school management, and teachers, information sessions and materials that would have illustrated the ideas of the PA policy from a government perspective could have been beneficial before
making the final decision on behalf of all schools (Quarmby et al., 2018). As such, municipalities, school management, and teachers would have had the opportunity to contribute with different perspectives within each level of the SEM, leading to a common implementation strategy and helping develop a sustainable PA policy accommodating the national PA policy. Such procedures are not common when introducing new policies, however.

The present findings could be highly valuable for governments, municipalities, schools, and other non-governmental organizations concerned with promotion of PA in schools. However, it is important to emphasize that the policy for 45 minutes of daily PA in schools was merely a single fragment of an ambitious and comprehensive school reform. The Danish school reform consisted of eight initiatives that every school was to adhere to. So, PA could be of lesser importance for some teachers, especially when teaching other subjects and not having confidence in leading PA. Thus, it would be wrong to conclude that the recommendations presented in this study per se would induce successful implementation of a PA policy.

Methodological Considerations

A strength of this study is the use of multiple data sources including both a questionnaire and interviews, as it provides a more comprehensive understanding of barriers that influence school staff’s implementation of a national PA policy. Using this method involving 31 representative schools for the questionnaire and 11 schools for the interviews strengthens the external validity of the study (Greene, 2007). Another strength was the use of the pen profile, which allowed a ‘reader-friendly’ presentation of a qualitative data set by using a quantitatively based analysis procedure (Mackintosh et al., 2011). The use of the SEM was also a strength (Sallis et al., 2006). However, because the SEM specifies multiple levels of influence, and there are multiple variables at each level, it may be difficult to determine which of the identified factors are the most important. Thus,
inclusion of the pen profile accommodates this limitation, providing the opportunity to link barriers across levels within the SEM.

The use of a deductive analysis process, using the SEM to structure the analysis, is also a limitation. Using an inductive approach would have led to a more open analysis, letting the data speak for itself (Atieno, 2009). Another limitation is the use of predefined barriers in the questionnaire. An inductive approach, asking respondents to write down their perceived barriers, could have shown other results. However, respondents were given the opportunity to fill in additional barriers in the open text format.

There was also a limitation in the main focus on barriers, excluding identification of facilitators for a policy implementation. Inclusion of facilitators for policy implementation would have strengthened the analysis, supporting the use of the SEM for accomplishing the implementation. Facilitators were excluded from the present study in order to focus on an in-depth exploration of barriers. Another limitation is use of an unvalidated questionnaire, but the questionnaire was developed and informed by reviewing relevant items from the validated TDF and was discussed and pilot tested.

Another limitation was that only the school management team members took part in the interviews. The teachers were unfortunately not able to take part in the interviews due to limited time allocated for taking part in the study. From the questionnaire, however, we found that there was no difference between school management team members and teachers regarding perceived barriers. Moreover, only one interview was conducted at each of the selected schools and only school management team members were interviewed. Interviews with teachers would have enabled a more detailed elaboration of each barrier, but inclusion of more interviews was not a possibility due to limited time for school staff to participate in the study. Furthermore, the main analysis was based on questionnaire data in which teachers were the main study population, which accommodates this
limitation. Moreover, no significant differences in findings from the questionnaire were observed between teachers, principals, deputy principals, and leading teachers.

**Conclusion**

Given that the effectiveness of school-based PA policies depends on their implementation, it is important to understand the challenges that school staff perceive in providing PA opportunities at schools. In this study, three key barriers were identified: lack of facilities, motivation, and time. Findings from the present study indicate that school staff require support in order to overcome the identified barriers and accommodate the policy. School staff could benefit from mandatory pre-service education, ongoing training, and motivational materials in order to succeed in the implementation of a PA policy. A school leadership team or an internal ‘champion’ responsible for supporting scheduling PA and structured knowledge sharing and facilitating workshops, education, and ongoing training was recommended in order to upgrade school staff’s skills and knowledge in organizing PA as part of the curriculum.

Findings suggest that schools cannot be solely responsible for accommodating such a policy. An implementation strategy involving all levels within the SEM is needed in order to succeed in the implementation. Governments need to develop and deploy national PA policies in cooperation with municipalities, schools, and school staff, giving participants an opportunity to contribute different perspectives. Involvement of consumers would minimize the complexity of the policy and help develop adjusted implementation strategies at all levels within the SEM. Otherwise, full implementation of a national PA policy will be difficult for most schools to accomplish successfully. Thus, governments need to allocate resources for municipalities and schools in order to ensure development of implementation strategies and professional development for all school staff when introducing a new policy requiring all schools to implement 45 minutes of daily PA within the school day.
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Conflicting interests

The authors declare no competing interests.

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*BMC Public Health, 14, 639.*


Figure 1. Results from the pen profile analysis. Barriers to implementation of PA as part of curriculum identified from the interviews.

*T = teacher, P = Principal, DP = Deputy principal.
Table 1. Main Characteristics of the 31 Participating Schools and Classes

<table>
<thead>
<tr>
<th>Schools</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Historical projects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHAMPS (1&lt;sup&gt;st&lt;/sup&gt; to 6&lt;sup&gt;th&lt;/sup&gt; grade)</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>EYHS (3&lt;sup&gt;rd&lt;/sup&gt; and 9&lt;sup&gt;th&lt;/sup&gt; grade)</td>
<td>20</td>
<td>64.5</td>
</tr>
<tr>
<td>SPACE (5&lt;sup&gt;th&lt;/sup&gt; to 8&lt;sup&gt;th&lt;/sup&gt; grade)</td>
<td>5</td>
<td>16</td>
</tr>
<tr>
<td>NBBB (5&lt;sup&gt;th&lt;/sup&gt; to 8&lt;sup&gt;th&lt;/sup&gt; grade)</td>
<td>2</td>
<td>6.5</td>
</tr>
<tr>
<td>Region</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital Region</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Region Zealand</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Region North</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Central Denmark</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Southern Denmark</td>
<td>26</td>
<td>84</td>
</tr>
<tr>
<td>Number of students</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 600</td>
<td>15</td>
<td>48.4</td>
</tr>
<tr>
<td>400-600</td>
<td>9</td>
<td>29</td>
</tr>
<tr>
<td>&lt; 400</td>
<td>7</td>
<td>25.6</td>
</tr>
<tr>
<td>Parental income range*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ average school in Denmark</td>
<td>10</td>
<td>32</td>
</tr>
<tr>
<td>&lt; average school in Denmark</td>
<td>21</td>
<td>68</td>
</tr>
<tr>
<td>Age group distribution (n = 159 classes)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-preparatory classes</td>
<td>43</td>
<td>27</td>
</tr>
<tr>
<td>Intermediate classes</td>
<td>57</td>
<td>36</td>
</tr>
<tr>
<td>Lower secondary classes</td>
<td>59</td>
<td>37</td>
</tr>
</tbody>
</table>

*Published data from Statistics Denmark. Average income in Danish public schools were 37.000 US dollars per year.
Table 2. Results from the descriptive analysis of the questionnaire arranged within the different levels of the socio-ecological model.

<table>
<thead>
<tr>
<th>Barriers listed in the questionnaire</th>
<th>N (n = 244)</th>
<th>Total %</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Individual level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of belief of the effect of PA</td>
<td>82</td>
<td>33.5</td>
</tr>
<tr>
<td>Lack of knowledge</td>
<td>112</td>
<td>45.9</td>
</tr>
<tr>
<td>Lack of student motivation</td>
<td>113</td>
<td>46.3</td>
</tr>
<tr>
<td><strong>Social level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of support from school</td>
<td>65</td>
<td>26.6</td>
</tr>
<tr>
<td>management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chaos</td>
<td>9</td>
<td>3.7</td>
</tr>
<tr>
<td>Lack of common understanding of PA</td>
<td>4</td>
<td>1.6</td>
</tr>
<tr>
<td><strong>Physical level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of facilities for PA*</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Access to facilities</em></td>
<td>170</td>
<td>69.7</td>
</tr>
<tr>
<td><em>School design</em></td>
<td>168</td>
<td>68.9</td>
</tr>
<tr>
<td>Weather</td>
<td>2</td>
<td>0.8</td>
</tr>
<tr>
<td><strong>Organizational level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of time*</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Time for preparation</em></td>
<td>192</td>
<td>78.7</td>
</tr>
<tr>
<td>*Time due to curricular demands</td>
<td>202</td>
<td>82.8</td>
</tr>
<tr>
<td>Lack of motivation*</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Lack of motivation</em></td>
<td>155</td>
<td>63.5</td>
</tr>
<tr>
<td><em>Resources for education</em></td>
<td>158</td>
<td>64.8</td>
</tr>
</tbody>
</table>

*indicates the overall barriers that were developed based on the barriers listed underneath.