



## Implementation of physically active lessons: A 2-year follow-up

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### ABSTRACT

Combining physical activity and academic content is a promising way to improve health and academic learning in schoolchildren. This paper examined the continuation of physically active lessons (PAL) in five Norwegian elementary schools, two years after a 10-month intervention period, which consisted of weekly minimum 2 x 45 min of PAL. Data were collected through semi-structured interviews with nine teachers and five school leaders. The Level of Use instrument was used to assess how the teachers integrated PAL into the school day. Two years after the intervention period, seven of nine teachers conducted PAL regularly, on average one lesson per week. Teachers' implementation progress varied from struggling with logistics, to stable routine and creative adaption. Perceived benefits for the children, active leadership, and ongoing implementation support seem important for continuation. Introduction of PAL as a school development project, systematic planning from the onset and a gradual introduction of PAL, can be an effective strategy for continuation and long-term sustainability. In addition, the Level of Use instrument was useful to better understand which support mechanisms are needed at different stages in the implementation of PAL.

### 1. Introduction

It is well known that regular participation in physical activity (PA) is beneficial for children's physical and mental health (Janssen & LeBlanc, 2010). PA interventions are being implemented in schools with increasing frequency, and research supports their short-term effectiveness (Naylor et al., 2015). However, continuation and long-term sustainability of PA interventions in schools have been shown to be very difficult (McKay et al., 2015; Naylor et al., 2015), in particular due to schools' focus on academic performance over health related outcomes (Bartholomew & Jowers, 2011; Cothran, Kulinna, & Garn, 2010). Combining PA and academic content, so called physically active lessons (PAL), is a promising way of increasing children's PA levels and academic related outcomes, such as attention, cognitive function and academic achievement, without reducing academic time (Norris, Shelton, Dunsmuir, Duke-Williams, & Stamatakis, 2015; Watson, Timperio, Brown, Best, & Hesketh, 2017).

The "Active School" programme started in the city of Stavanger, Norway in 2013, with the primary aim of increasing children's physical activity levels during school. The key intervention component was PAL,

mainly performed outdoors, with a minimum of two 45-min sessions per week. While previous school-based PA intervention have mainly focused on promotion of children's health, PAL are designed to achieve a dose of PA sufficient to improve health, while also improve the approach to learning, to better align with teachers and school leader's needs. In addition, the "Active School" programme consisted of weekly 5 x 10 min active breaks and 5 x 10 min physically active homework.

Implementation can generally be defined as the way in which a programme is put into practice and delivered to participants (Durlak & DuPre, 2008). The process is ongoing, cyclical, and follows three phases described as initiation, implementation and continuation (Fullan, 2016; Greenberg, Domitrovich, Gracyk, & Zins, 2005). Continuation is an extension of the implementation phase and refers to *whether the change gets built in as an ongoing part of the system or disappears by way of decision to discard or through attrition* (Fullan, 2016 p.55). For the present study, continuation refers to the work the schools have done after the implementation period, and the extent to which PAL has been integrated into the school's daily schedule and become a regular part of the school's practice. According to Fullan (2016) it is important to acknowledge a realistic time frame of the change process, and expect that it will take at

Abbreviations: PAL, physically active lessons; PA, physical activity; CBAM, concerns based adoption model; LoU, level of use.

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least 3–5 years from initiation until the change has been incorporated into the school's daily schedule and has become regular part of the school's practice.

In the present study, the Concerns Based Adoption Model (Hall & Hord, 2015), specifically designed to describe and measure change initiatives for educators, was used as a conceptual framework to shed light on continuation of PAL. This model is built on the premise that change is a process through which individual teachers growth from nonuser, to mechanical use, to creative adoption and refinement, as they gradually learn, come to understand and become skilled and competent in use of new instructional practices like PAL. Thus, a teacher's professional development is a critical component embedded in the change process. Furthermore, the Concerns Based Adoption Model is based on systemic change theory, recognises implementing change in school as multifaceted, and involves the complex and dynamic interplay between people, organisations, systems and process. Implementing change in the classroom is ultimately a personal, individual decision by teachers (Hall & Hord, 2015). Therefore, their motivation to continue teaching PAL depends on their experience of positive mastery of their actions, which might contribute to strengthened self-efficacy beliefs, which also affect behaviour (Bandura, 1977). Furthermore, teachers' efforts need to be perceived beneficial for the pupils (Domitrovich et al., 2008). Since what the teachers do in the classroom are connected to the broader school and system, teachers are better able to continue change when there are support systems in place for continued learning, supportive school leadership and alignment between district policy context and the innovation (Greenberg et al., 2005).

Previous research has emphasised the importance of examining the organisational capacity required to achieve change (Durlak & DuPre, 2008). An organisation's capacity is its knowledge, skills, attitudes, and motivation to implement innovations, which exist at the individual, organisational and community levels (Wandersman et al., 2006, p. 786). There is a distinction between general and innovation-specific organisational capacity (Flaspohler, Duffy, Wandersman, Stillman, & Maras, 2008). General organisational capacity refers to the overall function that is associated with the school's ability to implement or improve any innovation (e.g., effective leadership, a clear vision, good infrastructure, available resources, and the staff's ability to act collectively). Innovation-specific organisational capacity refers to human, technical and resource conditions necessary to implement a particular innovation (e.g., skills, ability and motivation). While a school may have the capacity to implement innovations in general, it may not be able or willing to implement a specific innovation like PAL. Hence, a school's capacity for building sustainable change implies effective leadership, individual teacher's knowledge and skills in how to effectively use PAL, motivation to continue the effort, and structures necessary to develop a learning organisation that focuses on children's learning, health and well-being.

There is a growing movement to develop and implement classroom-based PA intervention to increase children's physical activity level in school. While several studies have reported on factors affecting implementation of active breaks within lessons (Gately, Curtis, & Hardaker, 2013; Goh, Hannon, Webster, & Podlog, 2017; McMullen, Kulinna, & Cothran, 2014), to date only a small number of studies have examined factors specifically affecting implementation of PAL (Author et al., 2018; Martin & Murtagh, 2015, 2017; McMullen, Martin, Jones, & Murtagh, 2016; Mwaanga, Dorling, Prince, & Fleet, 2018; Quarmby, Daly-Smith, & Kime, 2018). In these studies children's positive response, teachers' self-efficacy and competence, time and space constraints, leadership and support were identified as factors affecting implementation. In general, few studies have focused on the continuation of school-based PA intervention after completion of the research study. The TAKE 10! programme (Goh et al., 2017) examined continuation of a movement integrating programme, and reported that scheduling into the weekly routine, children's request for the program, and collaboration among teachers were factors associated with continuation. Cooper, Bumbarger, and Moore (2015) studied a variety of programmes, included

classroom-based prevention programmes (none were explicit PA programmes), across different communities, and found that sustainability planning from the onset, good program fit, well-trained staff and implementation support were key predictors of program sustainability.

Studies providing greater understanding of teachers' ability to implement, and highlighting contextual factors facilitating the continuation and long-term sustainability of PAL are needed (Martin & Murtagh, 2015). Such knowledge can contribute to improving design and implementation of PAL interventions aimed at increasing children's PA level and learning in school. Thus, this paper examined the continuation of PAL in five Norwegian elementary schools, two years after a 10-month cluster randomised controlled PAL intervention was implemented. The study aimed to answer the following research questions: 1) What were the teachers' use of PAL at two-year follow-up? 2) What are the factors affecting continued use of PAL?

## 2. Methods

### 2.1. Design and participants

The follow-up study was, due to received funding, conducted two years after completion of the intervention. Data was collected through individual semi-structured interviews. This approach is recognised as a flexible and potentially knowledge producing dialog (Brinkmann, 2018). The goals of the interviews were to assess teachers' current use of the program and explore factors that contribute to continuation of PAL. School leaders recruited seventeen motivated fifth grade teachers who were willing to participate in the Active school intervention, and fifteen participated to completion. These 15 teachers were invited to participate in the follow-up study, but only 9 teachers (3 men and 6 women) agreed to participate. Six were unavailable due to maternity leave, job termination (retirement, quitting) or sick leave. These 9 teachers represented all 5 intervention schools (1–3 teachers from each school). Five school leaders from the intervention schools participated in the follow-up study. The schools, in a Norwegian context ranging from large (300–550 children) to small (100–150 children), were from both urban and suburban areas of the city. To safeguard confidentiality, some information that would enable identification of schools is omitted. For example, one of the schools piloted the intervention in 2012. Although this was possibly an important aspect of continuation, we do not identify which school this was. All participants received written information about the study, and were informed about their rights as participants before the interviews.

### 2.2. Intervention

During the Active School study, PAL was mainly carried out in the schoolyard, and could be integrated into any school subject in the curriculum. The academic focus was on repetition and memorisation of knowledge learned in earlier class. For a more detailed description of the intervention, see Author et al. (2018). The implementation strategy in the Active School study can be described as an integrated model combining a top-down and bottom-up approach (Fullan, 2016). Prescribed details were made by the project team, such as duration and frequency of the activities, and how to combine easily organised PA activities with academic content. Members of the Active School project team assisted in the implementation procedures and regularly attended meetings with participating teachers throughout the school year to encourage flexibility, experimentation and local ownership. Prior to implementation, seventeen intervention teachers participated in a pre-intervention seminar to gain skills and be shown examples of ways to organise the intervention. Fifteen teachers participated in a midway seminar, which focused on teachers' experiences regarding combining physical activity and academic content, and the teachers developed and shared new PAL during the 10-month intervention period.

2.3. Data collection

Semi-structured individual interviews with teachers and school leaders were conducted to gather information about teachers' current use and factors affecting continued use of PAL. Examples of questions asked were: *Are you using the Active School programme? Why did you continue/discontinue the programme? What do you see as the strength and weakness of the programme? What helped you to continue the programme? What difficulties did you encounter in continuance the programme? Are you working with colleagues in your use of the programme? What is important for you in order to continue using the programme?* School leaders were asked about how the school has worked with continuation of the programme, and how they managed leadership in this matter. All interviews were conducted between March and May 2017, at a time and location convenient to each participant (e.g., classroom or office). Each interview lasted on average 49 min (range 23–75 min) for the teachers, and 43 min (range 29–62 min) for the school leaders.

2.4. Analysis of interview data

The interviews were recorded and transcribed verbatim. Thematic analyses (Braun & Clarke, 2006), inspired by Moustakas's (1994) psychological phenomenology, were used to analyse the data. This type of phenomenology focuses on the descriptions and the common meaning of a phenomenon such as the participants' experience of continuation of PAL (Creswell & Poth, 2018). A central aspect of qualitative analysis is data condensation, which refers to the process of making data stronger by selecting, focusing, simplifying and abstracting data from the full body of transcripts (Miles, Huberman, & Saldaña, 2014). All text from the interviews was read through several times to get a general understanding of the data. A short summary of each interviews was written. Similarities and differences in participants' responses were identified. We combined an inductive and deductive approach in the analyses. The former ensured that themes identified were strongly linked to the data themselves, following Braun and Clarke's (2006) six-step analytic process (familiarisation with the data, generating initials code, searching for themes, reviewing themes, defining and naming themes, and producing the article). For the latter, a deductive analysis informed by Levels of Use (Hall, Dirksen, & George, 2006) was employed as this allowed for a more detailed analysis of teachers' behaviour and knowledge regarding continuation of PAL. To assist the data analyses, the computer program QSR NVivi11 was used. Themes and categorisation were discussed with the co-authors to secure trustworthiness (Brinkmann, 2018). The quotations were subsequently translated from Norwegian to English.

2.5. Level of use

To describe teachers' current use of PAL, the Level of Use instrument (Hall et al., 2006), adapted from the Concerns Based Adoption Model (CBAM) (Hall & Hord, 2015) was used. This model moves beyond the dichotomous, bipolar use/nonuser of programs by creating a hierarchy called Level of Use, which measures the teacher's growth from nonuser, to mechanical use, to routine use, and to creative local adaptation and refinement. Each level describes a very different set of actions and related understanding about the programme and its use. Teachers at the mechanical level often focus on their day-to-day use of the programme without consideration of how the programme affects their students. Teachers at the routine level are one step further in implementation, where usage is stable but lacks plans for improvement. Teachers at the refinement level consider how the programme affects the children and make adaptations with this in mind.

The teachers' own descriptions of their behaviour regarding use of the programme were compared against level descriptions from the Level of Use instrument (Hall et al., 2006). The eight Levels of Use are described in Table 1. Each participant's individual Level of Use was

Table 1

The eight Levels of Use (LoU) of an innovation.

LoU	Level name	Subcategory	Description
0	Nonuse	Nonuse	Individual has little or no knowledge about the intervention or no intention of using the intervention
I	Orientation	Nonuse	Individuals has or is getting information regarding the use of the innovation
II	Preparation	Nonuse	Individual is preparing him or herself for the first use of the intervention
III	Mechanical	Self-focused User	Individual focuses the most effort on the short-term, day-to-day use of the innovation with little time for reflection.
IVA	Routine	Self-focused User	Individual has established a way to use the intervention. Changes are made for the benefit of user and children, as a part of the regular pattern of use.
IVB	Refinement	Self-focused User	Individual varies the use of the intervention to increase the impact on students within his or her immediate sphere of influence. Variation is based on knowledge of both short and long-term consequences for students
V	Integration	Impact focused user	Individual collaborates with others to reach a higher level of result and impact
VI	Renewal	Impact focused user	Individual re-evaluates the quality of the use of the intervention, seeks major modification or alternatives to the present innovation to achieve increased impact on students, examines new developments in the field, and explores new goals for self and the system

Adapted from: *Measuring Implementation in School* (Hall et al., 2006, p.5).

analysed in relation to seven behavioural categories: knowledge, acquiring information, sharing, assessing, planning, status reporting, and performing (Table 2). A final assessment of an individual's overall Level of Use was made by considering responses to the seven categories holistically by using a Level of Use rating sheet (Hall et al., 2006).

In the context of this study, a past user who is no longer actively using the programme was considered to be at the "nonuse" level. Past users were assessed from description of previous use. A teacher who is currently teaching PAL was considered to be a "user". A teacher using the program, but who is not sharing ideas and resources with colleagues, was considered to be a "self-focused user". At the "self-focused" levels of use, the focus is not only on the teachers themselves, but also on the

Table 2

Behavioural categories for the Level of Use.

LoU category	Description
Knowledge	That which the user knows about characteristics of the intervention, how to use it, and consequences of its use
Acquiring Information	Solicits information about the intervention in a variety of ways, including questioning resource persons, corresponding with resource agencies, reviewing printed materials, and making visits.
Sharing	Discusses the intervention with others. Shares plans, ideas, resources, outcomes, and problems related to use the intervention
Assessing	Examines the potential or actual use of the intervention or some aspects of it. This can be a mental assessment or can involve actual collection and analysis of data.
Planning Status	Designs and outlines short- and long-range steps to be taken during the process of intervention adoption (e.g., align resources, schedules, and activities) and meets with others to organise and/or coordinate use of the intervention.
Reporting	Describes personal stand at the present time, in relation to use of the intervention.
Performing	Carries out the action and activities entailed in operationalising the intervention

Note. From *Measuring Implementation in Schools: Levels of Use* (Appendix E, pp. 79–81) by Hall et al., 2006.

impact of the intervention on the students within their immediate sphere of influence. To be categorised as an “impact-focused user”, a teacher should share ideas and resources with other teaching colleagues and school leaders, to achieve a collective impact on children’s health and learning. In contrast, a teacher who is simply disseminating information about the programme cannot be considered to be at this level.

### 3. Results

#### 3.1. Teachers’ level of use

Seven of nine teachers still used PAL two years after the intervention period. Teachers’ current teaching grade, age of their pupils, average time used for physically active lessons and its content are presented in Table 3.

Some of the teachers reported that they sometimes used PAL when they conducted compulsory physical activity, which is 40 min/week in fifth through seventh grades. Two teachers did not continue with PAL after the intervention period. Reasons for discontinuation of PAL included lack of encouragement, competing demands, and the experience that both the teacher and the children had tired of the activities. Teacher 1 said: “I felt that the students got a bit tired of physically active lessons because it was many of the same activities, so I might be a bit tired myself too.”

Two teachers had reached overall Refinement Level of Use (adapt to context), five had reached Routine Level of Use (stable without adaptations), and two had moved from Mechanical Level of Use (struggling with practical solutions) to Nonuse. The results showed that the same teacher could be on a different level in relation to the different categories (Table 4).

#### 3.2. Factors influencing the continuation of PAL

Three main themes were identified during the analysis as factors influencing the continuation of PAL: benefits for the children, time constraints, and class management.

##### 3.2.1. Benefits for the children

The teachers in this study frequently referred to the perceived benefits for the children as a reason for teaching PAL and being what motivated them to continue the effort. PAL tasks were often conducted

with children divided into groups in which they needed to cooperate to answer the tasks. A consistent pattern perceived by the teachers was that children learned from each other, and that PAL in this way was an important contribution to children’s learning. Teacher 6 said: “The children learn so much from each other when they have to find the answer together, and that’s a good learning experience and has been such a good motivation for me to continue with physically active lessons, since I can see that it works.” Most of the teachers mentioned children’s need to be introduced to a variety of teaching approaches, especially for those children who do not benefit as much from the traditional sedentary classroom. Another factor that seemed to influence the teachers’ continued use of PAL was the children’s enjoyment and wellbeing during the PAL lessons. Teacher 9 mentioned: “The children think it is fun; it’s a lot more fun to run in the schoolyard than sit in a math class. Moreover, most of the teachers mentioned that PAL increased children’s concentration and motivation for learning. One teacher had experienced that the time of the day when PAL was conducted was crucial for the children’s learning outcomes. Teacher 4 said: “We have physically active lessons at the end of the day, the first hours of the day work very well without the students needing to be in activity, but if we go outdoors after the lunch break, they learn more than in the classroom. “

##### 3.2.2. Time commitment

Most of the teachers perceived PAL lessons to be best suited for repetition and memorisation of knowledge learned in earlier class. When the focus was teaching new knowledge, the teachers experienced classroom teaching as more effective. As a consequence, they conducted PAL less frequently. Teacher 7 mentioned: “The children have few math lessons and I think we don’t really have time for much repetition and drilling, and therefore I prefer to teach in the classroom, it is more effective.” Most of the teachers mentioned lack of time for preparing PAL lessons as a challenge. However, two teachers had experienced the opposite. Teacher 1 said: “When we have done it many times, it does not take more time to prepare a physically active lesson, you will find smart ways to do it.”

##### 3.2.3. Class management

Most of the teachers mentioned class management as a challenge when conducting PAL outside in the schoolyard. One teacher expressed a tension between the teachers’ need for control and the benefits for the children. Teacher 8 said: “If you have a troubled class, the need to have control in the classroom may be greater than the need for variation in the

**Table 3**

Teachers’ current teaching grade, age of their pupils, average time used for physically active lessons and its content.

School	Teacher	Teaching grade (children’s age in years)	Physically active lessons (average pr week)	Content
A	1	6 (10–11)	45 min	Various forms of relay, where the students worked in groups with academic content in Norwegian, math or social science. The academic focus was on repetition and memorisation of knowledge learned in earlier class.
	2	7 (11–12)	Not continued	
	3	7 (11–12)	Not continued	
B	4	7 (11–12)	25 min	Integrated PA in all subjects in the curriculum. Content was organised as group activities like relay and bingo, to enhance collaboration among children. Used also PAL to assess the children’s learning outcomes and to introduce new knowledge.
	5	4 (8–9)	20 min	
C	6	7 (11–12)	25 min	Integrated PA in math, Norwegian, English, social science, science and arts. All activities were organised as group assignments to enhance collaboration among children. The academic focus was on repetition and memorisation of knowledge learned in earlier class
		3		
D	7	7 (7–8)	45 min	Integrated PA in math. All content was organised as group assignment. PAL was used for both learning new knowledge and repetition of knowledge learned in earlier class. Used sometimes PAL when conducting general PA (a requirement added by the Norwegian government in 2001).
		7		
E	8	7 (11–12)	15 min	Integrated PA in math and science. The activities was mainly relays. All content was organised as group assignment. The academic focus was on repetition and memorisation of knowledge learned in earlier class.
F	9	7 (11–12)	45 min	Integrated PA inn math. The activities were mainly relays, and the academic content were organised as group activities

teaching method, because it is more difficult to control the children outside.”

### 3.2.4. Leadership and support

The data associated with these themes provides insight into school leadership support and involvement after the intervention period. All the principals expressed a positive attitude towards PAL. However, only at school B had the principal been actively involved in the continuation phase. PAL had been incorporated into the school plans for the upcoming four-year period, included into teachers’ work plans, with time scheduled for experience exchange among the entire staff group. An “enthusiast” had also been allocated time for guidance of other colleagues new to PAL. According to the principal at school B, PAL is a didactic method that is suitable for reaching the school’s goal of using varied teaching methods. The principal reflected that the perception that children learn most effectively in the classroom is deeply rooted among teachers: *“This way of working requires a different methodology than traditionally practiced by schools. Teachers learn to think about teaching as giving knowledge, and they believe this happens inside a classroom, that’s a part of the school culture.”* At the other four schools, the principals were not actively involved in the continuation phase. The main reason for not taking an active leadership was that other educational tasks, highlighted in the municipal strategy plan for school improvement and the overall national curriculum, were given priority. The principal at school A mentioned: *“We have had so many processes that we must pass through in reading, writing and numeracy, and we have not had time for this (PAL) because the subjects have become a priority.”* However, it was obvious that some of the teachers felt they did not receive the needed support from the leadership. Teacher 7 expressed it this way: *I feel I’m a little bit alone in this, there are many nice words from the leadership, but there is no cooperation about this (PAL), we have to figure it out ourselves.* The teachers at school A, C, D and E, called for the school leaders to include PAL into their work plans. There were two issues. First, it would be easier to “keep in mind”. Second, it would be easier to coordinate with colleagues regarding scheduling, which topic is best suited, lesson sharing, and facilitation of shared responsibility. For example, teacher 2 expressed it this way: *“it is difficult to maintain the enthusiasm if there are no other colleagues who also use the teaching method.”* Some of the teachers mentioned that it was a challenge when they got new colleagues who were not skilled in teaching PAL. Teacher 9 said: *“It is challenging to further develop physically active lessons when one gets new colleagues who have not used the method before.”*

## 4. Discussion

The aim of the study was to investigate teachers’ use of PAL two years after the intervention period, and factors affecting continued PAL use. The main findings of the study were that seven of nine teachers conducted PAL on average one lesson per week, two years after the intervention period. Teachers’ implementation progress (Level of Use) varied from struggling with logistics, to stable routine, to adaptation with focus on children’s outcome. At the individual teacher level, the main reason for continuation of PAL was the perceived benefits for the children. Time constraints and class management were factors associated with how frequently they conducted PAL. At the organisation level, active leadership, continuous implementation support and building PAL into school infrastructure, seem important for continuation and long-term sustainability.

### 4.1. Teachers’ level of use two years after the intervention period

Two teachers at School A, had reached a Mechanical Level of Use during the intervention, but terminated PAL after the intervention period. This level is characterised by focus on the short-term day-to-day use of the program, focus on management and organisation, with little time for reflection on content, children’s response, and the potential benefits (Hall et al., 2006). It is reasonable to assume that the teachers at the Mechanical Level of Use had not been able to move beyond struggling with the logistics, and this may have been a contributing factor to teacher fatigue and discontinuation of PAL after the intervention period. According to Hall and Hord (2015) it is imperative to find time and give facilitative assistance regarding managing the logistics so the teachers can move further in their learning process. The teachers who had discontinued PAL also had the impression that the children were bored due to lack of variation in the activities. According to Greenberg et al. (2005), children’s “acceptability” is an important factor affecting teachers’ motivation and commitment to the change process. The perception by the teachers that the children were less engaged in the lessons could have an impact on teachers’ self-efficacy and motivation to continue teaching PAL. Teachers’ self-efficacy is known to be an important factor affecting the implementation process (Dimitrovich et al., 2008).

Most of the teachers had continued teaching PAL at a Routine Level of Use. The individuals at this level know how to use the innovation with minimal effort and stress, they are satisfied with current use, and have

**Table 4**  
Individual teachers’ Level of Use, regarding PAL, at two-year follow-up.

Level of Use Categories	School A Level name	School B Level name	School C Level name	School D Level name	School E Level name
Knowledge	T1: Routine	T4: Refinement	T6: Refinement	T7: Refinement	T8: Refinement
	T2: Mechanical	T5: Refinement			T9: Refinement
Acquiring Information	T3: Mechanical	T4: Routine	T6: Routine	T7: Routine	T8: Routine
	T1: Routine	T5: Refinement			T9: Routine
	T2: 0 (Mechanical)				
Sharing	T3: 0 (Mechanical)	T4: Routine	T6: Routine	T7: Routine	T8: Routine
	T1: Routine	T5: Routine			T9: Routine
	T2: 0 (Mechanical)				
Assessing	T3: 0 (Mechanical)	T4: Refinement	T6: Refinement	T7: Routine	T8: Refinement
	T1: Routine	T5: Routine			T9: Routine
	T2: Mechanical				
Planning	T3: Mechanical	T4: Refinement	T6: Routine	T7: Routine	T8: Routine
	T1: Routine	T5: Routine			T9: Routine
	T2: 0 (Mechanical)				
Status Reporting	T3: 0 (Mechanical)	T4: Refinement	T6: Routine	T7: Routine	T8: Routine
	T1: Routine	T5: Refinement			T9: Routine
	T2: 0				
Performing	T3: 0	T4: Refinement	T6: Routine	T7: Routine	T8: Routine
	T1: Routine	T5: Refinement			T9: Routine
	T2: 0 (Mechanical)				
	T3: 0 (Mechanical)				

**Note.** Former users Level of Use in parenthesis. T1=teacher 1.

no plans for making changes (Hall et al., 2006). If teachers remain at a Routine Level of Use without further development of the lessons, this may cause both teachers and students to get bored, resulting in either eventual abandonment of PAL, or use of PAL primarily as an ad-hoc activity to create wellbeing and provide a break in sedentary sessions. An interesting finding in the present study was that 6 of the 9 teachers were at the Refinement Level of Use when it came to the knowledge category. This means that the teachers had knowledge of how PAL affects the children and reflected on alternative ways to use PAL for increasing children's outcome, but they did not make any plans for realising these potential benefits for the future. This is worrying since teachers who are not able to evolve the activities over time, will most likely quit the activities because they get boring. This is also supported by Durlak and DuPre (2008) who found that teacher and student involvement could decrease when the interventions are not perceived as "new and exciting" anymore. Encouraging and facilitating teachers to continue to change and evolve the lessons may prevent PAL from being abandoned.

Two teachers at school B had reached Refinement Level of Use. Users at this level explore and experiment with alternative combinations of the innovation with existing practice to maximise children's involvement and outcome (Hall et al., 2006). This indicates that these two teachers were able to build PAL into their normal activity in the school, which Fullan (2016) considers a precondition for long-term change. None of the teachers in the present study had reached an Impact-focused Level of Use. This level requires teachers to collaborate for the purpose of collectively improving children's outcome (Hall et al., 2006). The results showed that all the teachers were at the Routine level when it came to the sharing category. This means that they discussed PAL with platitudes such as "everything is working well for me". The "Take 10" programme found that collaboration among teachers was a factor associated with continued use of the programme (Goh et al., 2017). For continuation and lasting change, we believe the nature of such collaboration needs to extend beyond organising the schedule and sharing PAL lessons and equipment. Teachers also need to share their experiences, reflect on educational theory and focus on children's learning outcome.

Because change is accomplished by individuals and is a highly personal experience (Hall & Hord, 2015), it is interesting to speculate why just some of the teachers moved to higher Levels of Use of PAL. Even though all the teachers volunteered to the Active School study teachers' motivation to participate were not known. Their motivation could be a result of external pressure from the principal, colleagues or parents which in turn may have influenced teachers' involvement in the change process. Some teachers might have a better understanding of the intervention principles, resulting in an easier implementation. Previous research have found that teachers characteristics like experience in teachers qualifications, years of teaching experience, and teachers' own PA-history had an impact on implementation of classroom-based PA (Cothran et al., 2010; Vazou & Skrade, 2014). Our data did not provide a basis to evaluate such issues comprehensively. Clearly, this is an area ripe for future research.

## 4.2. Factors influencing the continuation of PAL

Since children's activity in school is largely influenced by the teachers, teachers' attitudes play a central role in determining the sustainability of the change (Fullan, 2016) for teacher-directed interventions like PAL. In the present study, the teachers reported positive benefits for the children as an important reason for continuation of PAL. The advantages they mentioned included academic benefits, enjoyment, and increased PA.

### 4.2.1. Academic benefits

One teacher specifically mentioned that after lunch break the children were more focused and learned better outdoors than in the classroom. Mahar et al. (2006) have shown that participation in PAL resulted

in a significant increase in time-on-task (TOT) (Grieco, Jowers, Errisuriz, & Bartholomew, 2016), for subsequent sedentary lessons. In order to achieve the possible benefits, it may be a good strategy to conduct PAL in between sedentary lessons. Consistent with previous research (Ma, Mare, & Gurd, 2014; Mahar et al., 2006), the teachers in this study reported that PAL appeared especially beneficial for children who typically found it more difficult to concentrate for longer periods in a sedentary classroom setting. The ASK study (Resaland et al., 2018) reported that PAL was associated with a significant increase in academic performance for low performing children. It is likely that PAL benefits children who usually perform less well in the traditional classroom. In this way, PAL can be an important contribution to creating variation in teaching approach, which is highlighted by the teachers as important due to children's different needs and response to various teaching approaches.

### 4.2.2. Enjoyment

An important reason for why the teachers had continued PAL was their observation of the children's enjoyment. Cothran et al. (2010) evaluated teachers' perception and attitude towards PA interventions, and found that teachers' willingness to engage was influenced by their concern for children's wellbeing. The children's enjoyment may be attributed to their engagement in group activities, which supports a previous finding that children experience enjoyment during positive social interactions with other children (Knowles, Parnell, Ridgers, & Stratton, 2013). These findings are crucial to the potential sustainability of PA since both children's and teachers' acceptance are important factors affecting implementation (Greenberg et al., 2005).

### 4.2.3. Increased physical activity

An interesting finding was that some of the teachers sometimes used PAL when they conducted general PA (a requirement added by the Norwegian government in 2001 to facilitate a more physically active school day). This requirement has a health promotion approach, and has been criticised for lack of content and qualified personnel to carry out PA (Skjåkdegård, Tjomsland Eikeland, Odberg, & Leversen, 2016). It is therefore reasonable to assume that PAL meets an already existing need (Fullan, 2016; Greenberg et al., 2005) for providing content and ways to organise general PA. Previous research has shown that not all teachers consider health promotion their responsibility (Cothran et al., 2010; Stylianou, Kulinna, & Naiman, 2016). As Greenberg et al. (2005) emphasises, implementers will not engage in an intervention or conduct a new program well if they do not feel it is within their job responsibility. It may be reasonable to assume that teachers are less willing to implement change if the content is not directly connected with teaching activities. This is also supported by the finding that less extensive intervention components without academic content (teacher-directed physically active recess, data not shown) were not continued after the research study ended. This result implies that, in the current study, PAL was perceived as relevant to the teachers' primary role as teachers, and may have contributed continuation of PAL.

### 4.2.4. Lack of time

During implementation of the RTC study ("Author", 2017), teachers were told to conduct PAL a minimum of 2 × 45 min per week. Consistent with previous research ("Author" et al., 2018; Quarmby et al., 2018), most teachers experienced this as a high intervention dose since planning the activities was demanding. The fact that the teachers who continued PAL carried out on average one session per week support this finding. Two teachers reported PAL to not be more time consuming to prepare than regular lessons. This finding indicates that time is a perceived barrier and knowledge and skills may contribute to decreasing the "lack of time" barrier. Most of the teachers reported PAL to be less suitable than the classroom for learning new knowledge, and they mentioned time needed to cover curriculum content as another important factor affecting how frequently they conducted PAL. In Norwegians

schools, as in other western schools, a tradition of didactic teaching exists as a result of a predominantly cognitive learning view, where emphasis is placed on learning activities in the classroom using sedentary learning activities and methods (Fullan, 2016; Ommundsen, 2014). It has been claimed that PAL represents a paradigm shift in current educational practice since the learning activities are based on a more constructivist and problem-based learning approach (Quarmby et al., 2018). It is therefore reasonable to assume that PAL challenges the teachers' perception of how children learn best. On the other hand, all the teachers mentioned that group collaboration was beneficial for children's learning, which is in line with a more constructivist approach. These findings indicate that the teachers in the present study experienced a tension between different teaching approaches, or may it reflect incorporated habits shaped by many factors at different levels, which affect teacher practice in school. Adopting a new teaching approach may be especially difficult in a school context, given that a teacher's practice in the classroom is largely based on his/her own previous experience from failure or success, and to a less degree on new knowledge, reforms and political changes (Jensen, 2007).

#### 4.2.5. Class management

Most of the teachers mentioned class management and need for control as a challenge compared to traditional classroom activities. At the same time, they acknowledged the children's need for PA breaks during the school day. This finding highlights a tension between children's need and the teacher's own need for control in the classroom. When PAL is reduced due to class management and control issues, students who would have benefitted most from the PAL method are most impacted. According to Johnson, Hays, Center, and Daley (2004), necessary skills and knowledge are important factors related to an individual's capacity to sustain interventions. Teachers' skills in developing PAL lessons based on curriculum content and devising strategies in outdoor class management, appear to be innovation-specific capacities (Flaspohler et al., 2008) required for this intervention.

#### 4.2.6. Leadership and support for continuation

Substantial research supports the importance of leadership in implementation change in school (Durlak & DuPre, 2008; Fullan, 2016; Greenberg et al., 2005; Hall & Hord, 2015). The principal at school B had been actively involved, acknowledged PAL as pedagogic approach, and worked systematically with continuation of PAL after the intervention period. The work included establishing routines for involving new teachers and indicates sustainable change, since staff turnover is emphasised as a particularly powerful factor undermining continuation (Fullan, 2016). The results suggest that school B had good general organisational capacity (Flaspohler et al., 2008), which refers to the overall function that is associated with the ability to implement or improve any innovation. However, at the other four schools, the implementation work became less systematic after the intervention period. An interesting finding is that the principals at schools A, C, D and E all mentioned their positive attitude towards PAL, but gave priority to development work related to basic skills like reading, writing and mathematics, highly recommended in the municipal strategy plan for school improvement and the overall national curriculum. The findings suggest that either PAL was not anchored organisationally at the individual school, but was mainly perceived as a health promotion intervention, or the principals had insufficient knowledge of implementation and what is needed for adaptation of new routines.

### 5. Lesson learned

It seemed important for teachers' motivation for continuation that they perceived PAL as relevant to their role as teachers. For lasting change, we believe it is crucial that the teachers master the skill of evolving of the activities and content over time, and develop efficient strategies for managing classes in the schoolyard. Gradual inclusion of

the lessons and bringing teachers together to discuss educational theory and practice in relation to PAL can contribute to building teachers' capacity for sustainable change. Furthermore, school leadership must be involved and prioritise PAL, make plans, and follow up the work over time. If the intervention is kept going only by individual enthusiasts, it is likely PAL will disappear through attrition. We believe systematic planning from the onset, consideration of a school's capacity for change, and support in the continuation phase combined with teachers' opportunity for moving further in their learning process, seems of great importance for sustainable implementation of PAL. We also believe, considering the potential academic related benefits of PAL, it may be a good strategy to introduce PAL as a school development project and to gain support for PAL from a broader sphere of influence, such as at the community and policy levels.

### 6. Study limitations

There are also some study limitations readers should note. First, the Level of Use instrument is not a theory, and can therefore not provide an explanation of how different levels interact within a complex school context. The LoU instrument were applied in this study to provide a "snapshot" of nine teachers implementing PAL at a particular point of time. The LoU instrument could be used at several points in a longitudinal study to obtain a picture of the development pattern of change experience, thereby helping to understand the process of change. Another limitation was that we probably faced a group of motivated teachers who have been positively disposed to promoting PAL. Furthermore, the participants were aware that the first author who conducted the interviews was also a member of the "Active School" project team. This may have influenced them to respond more positively towards continuation of PAL than they would otherwise have done. Lastly, the findings were based on a small sample from one district in Norway, and cannot be generalised.

### 7. Conclusion

This study found that seven of nine teachers conducted PAL regularly on average one lesson per week two years after the intervention period. Teachers' implementation progress varied from struggling with logistics, to stable routine and creative adoptions. School-based interventions like PAL are often short-lived, and this paper provides valuable insight from both teachers' and principals' perspectives in shedding light on how school-based physical activity interventions like PAL can potentially last over time. Perceived benefits for the children, active leadership, and ongoing implementation support seem important for continuation. Furthermore, this study points to the usefulness of the Level of Use instrument to categorise and comprehend teachers' continuation of PAL. Specifically, the use of the instrument as a means of answering questions such as what supports mechanisms best suits teachers' needs at different stages. In this way, this study provides important knowledge that can be used to adjust the support provided in the current innovation, as well as to design future models for teacher training and implementation support.

### Authors' contribution

IS, SMD, SKE and PR contributed to the design of the study and planned the analysis. IS conducted, transcribed and coded the data. IS, SMD and SKE were involved in the data analysis. IS drafted the manuscript. All authors critically commented and revisited the text for its intellectual content and approved the submission of the final version.

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## Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests.

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## Appendix A. Supplementary data

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## References

- “Author et al.” (2017).  
 “Author et al.” (2018).  
 Bandura, A. (1977). *Social learning theory*. Englewood Cliffs, N.J: Prentice Hall.  
 Bartholomew, J. B., & Jowers, E. M. (2011). Physically active academic lessons in elementary children. *Preventive Medicine, 52*, 51–54.  
 Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101.  
 Brinkmann, S. (2018). The interview. In J. W. Creswell, & C. N. Poth (Eds.), *Qualitative inquiry and research design: Choosing among Five traditions* (pp. 576–597). SAGE Publications.  
 Cooper, B., Bumbarger, B., & Moore, J. (2015). Sustaining evidence-based prevention programs: Correlates in a large-scale dissemination initiative. *Prevention Science, 16* (1), 145–157.  
 Cothran, D. J., Kulinna, P. H., & Garn, A. C. (2010). Classroom teachers and physical activity integration. *Teaching and Teacher Education: An International Journal of Research and Studies, 26*(7), 1381–1388.  
 Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five traditions* (4rd ed.). SAGE Publications.  
 Domitrovich, C. E., Bradshaw, C. P., Poduska, J. M., Hoagwood, K., Buckley, J. A., Olin, S., et al. (2008). Maximizing the implementation quality of evidence-based preventive interventions in schools: A conceptual framework. *Advances in School Mental Health Promotion, 1*(3), 6–28.  
 Durlak, J., & DuPre, E. (2008). Implementation matters: A review of research on the influence of implementation on program outcomes and the factors affecting implementation. *American Journal of Community Psychology, 41*(3), 327–350.  
 Flaspohler, P., Duffy, J., Wandersman, A., Stillman, L., & Maras, M. A. (2008). Unpacking prevention capacity: An intersection of research-to-practice models and community-centered models. *American Journal of Community Psychology, 41*(3–4), 182–196.  
 Fullan, M. (2016). *The NEW meaning of educational change* (5th ed.). Teachers College Press.  
 Gately, P., Curtis, C., & Hardaker, R. (2013). An evaluation in UK schools of a classroom-based physical activity programme - TAKE 10! ®: A qualitative analysis of the teachers' perspective. *Education for Health Change in Learning & Practice, 31*(4), 73–78.  
 Goh, T. L., Hannon, J. C., Webster, C. A., & Podlog, L. (2017). Classroom teachers' experiences implementing a movement integration program: Barriers, facilitators, and continuance. *Teaching and Teacher Education, 66*, 88–95.  
 Greenberg, M. T., Domitrovich, C. E., Gracyk, P. A., & Zins, J. E. (2005). *The study of implementation in school-based preventive interventions: Theory, research, and practice*. Rockville: U.S. Department of Health and Humane Services.  
 Grieco, L. A., Jowers, E. M., Errisuriz, V. L., & Bartholomew, J. B. (2016). Physically active vs. sedentary academic lessons: A dose response study for elementary student time on task. *Preventive Medicine, 89*, 98–103.  
 Hall, G. E., & Hord, S. M. (2015). *Implementing change. patterns, principles, and potes* (4th ed.). New Jersey: Pearson Education, Inc.  
 Hall, G. E., Dirksen, D. J., & George, A. A. (2006). *Measuring implementation in schools: Levels of use*. Austin, TX: Southwest Educational Development Laboratory.  
 Janssen, I., & LeBlanc, A. G. (2010). Systematic review of the health benefits of physical activity and fitness in school-aged children and youth. *The International Journal of Behavioral Nutrition and Physical Activity, 7*(1), 40.  
 Jensen, K. (2007). The desire to learn: An analysis of knowledge-seeking practices among professionals. *Oxford Review of Education, 33*(4), 489–502.  
 Johnson, K., Hays, C., Center, H., & Daley, C. (2004). Building capacity and sustainable prevention innovations: A sustainability planning model. *Evaluation and Program Planning, 27*(2), 135–149.  
 Knowles, Z. R., Parnell, D., Ridgers, N., & Stratton, G. (2013). Learning from the experts: Exploring playground experience and activities using a write and draw technique. *Journal of Physical Activity & Health, 10*(406).  
 Ma, J., Mare, L., & Gurd, B. (2014). Classroom-based high-intensity interval activity improves off-task behaviour in primary school students. *Applied Physiology Nutrition and Metabolism, 39*(12), 1332–1337.  
 Mahar, T. M., Murphy, K. S., Rowe, A. D., Golden, T. J., Shields, D. A., Raedeke, D. T., et al. (2006). Effects of a classroom-based program on physical activity and on-task behavior. *Medicine and Science in Sports and Exercise, 38*(12), 2086–2094.  
 Martin, R., & Murtagh, E. M. (2015). Preliminary findings of Active Classrooms: An intervention to increase physical activity levels of primary school children during class time. *Teaching and Teacher Education, 52*, 113–127.  
 Martin, R., & Murtagh, E. M. (2017). Teachers' and students' perspectives of participating in the “Active Classrooms” movement integration programme. *Teaching and Teacher Education, 63*, 218–230.  
 McKay, H. A., Macdonald, H. M., Nettlefold, L., Masse, L. C., Day, M., & Naylor, P.-J. (2015). Action Schools! BC implementation: From efficacy to effectiveness to scale-up. *British Journal of Sports Medicine, 49*(4), 210–218.  
 McMullen, J., Kulinna, P., & Cothran, D. (2014). Physical activity opportunities during the school day: Classroom teachers' perceptions of using activity breaks in the classroom. *Journal of Teaching in Physical Education, 33*(4), 511–527.  
 McMullen, J. M., Martin, R., Jones, J., & Murtagh, E. M. (2016). Moving to learn Ireland – Classroom teachers' experiences of movement integration. *Teaching and Teacher Education, 60*, 321–330.  
 Miles, M. B., Huberman, A. M., & Saldana, J. (2014). *Qualitative data analysis: A methods sourcebook* (3rd ed.). Los Angeles: Sage.  
 Moustakas, C. (1994). *Phenomenological research methods*. Thousand Oaks, Calif: Sage.  
 Mwaanga, O., Dorling, H., Prince, S., & Fleet, M. (2018). Understanding the management challenges associated with the implementation of the physically active teaching and learning (PATL) pedagogy: A case study of three Isle of Wight primary schools. *Managing Sport and Leisure, 23*(4–6), 408–421.  
 Naylor, P.-J., Nettlefold, L., Race, D., Hoy, C., Ashe, M. C., Wharf Higgins, J., et al. (2015). Implementation of school based physical activity interventions: A systematic review. *Preventive Medicine, 72*, 95–115.  
 Norris, E., Shelton, N., Dunsmuir, S., Duke-Williams, O., & Stamatakis, E. (2015). Physically active lessons as physical activity and educational interventions: A systematic review of methods and results. *Preventive Medicine, 72*, 116–125.  
 Ommundsen, Y. (2014). Physically active lessons in physical education. In I. M. Vingdal (Ed.), *Physically active lessons*. Oslo: Gyldendal Akademisk.  
 Quarmby, T., Daly-Smith, A., & Kime, N. (2018). “You get some very archaic ideas of what teaching is ...”: Primary school teachers' perceptions of the barriers to physically active lessons. *Education, 3-13*, 1–14.  
 Resaland, G. K., Moe, V. F., Bartholomew, J. B., Andersen, L. B., McKay, H. A., Andersen, S. A., et al. (2018). Gender-specific effects of physical activity on children's academic performance: The Active Smarter Kids cluster randomized controlled trial. *Preventive Medicine, 106*, 171–176.  
 Skjåkodegård, H. F., Tjomsland Eikeland, H., Odberg, A.-H., & Leversen, I. (2016). *Mapping of research and evaluation-introduction of 76 hours of physical activity in 5-7 grades*. Last accessed on May, 2019, available at: [https://mhfa.no/contentassets/35236a2c09b84d33b15cc652ca209842/rapport-2-2016\\_fysak-5-7-trinn\\_nasjona-lt-nter-for-mat-helse-og-fysisk-aktivitet-1.pdf](https://mhfa.no/contentassets/35236a2c09b84d33b15cc652ca209842/rapport-2-2016_fysak-5-7-trinn_nasjona-lt-nter-for-mat-helse-og-fysisk-aktivitet-1.pdf).  
 Stylianou, M., Kulinna, P. H., & Naiman, T. (2016). “...Because there's nobody who can just sit that long”: Teacher perceptions of classroom-based physical activity and related management issues. *European Physical Education Review, 22*(3), 390–408.  
 Vazou, S., & Skrade, M. (2014). Teachers' reflections from integrating physical activity in the academic classroom. *Research Quarterly for Exercise and Sport, 85*, 38.  
 Wandersman, A., Clary, E. G., Forbush, J., Weinberger, S. G., Coyne, S. M., Duffy, J. L., et al. (2006). Community organizing and advocacy: Increasing the quality and quantity of mentoring programs. *Journal of Community Psychology, 34*(6), 781–799.  
 Watson, A., Timperio, A., Brown, H., Best, K., & Hesketh, K. D. (2017). Effect of classroom-based physical activity interventions on academic and physical activity outcomes: A systematic review and meta-analysis.(Report). *The International Journal of Behavioral Nutrition and Physical Activity, 14*(1).  
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