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Article

An evaluation of the 'bottom-up' implementation of the *Active at school!* programme in Quebec, Canada

Véronique Gosselin, Noémie Robitaille, and Suzanne Laberge

School of Kinesiology and Physical Activity Sciences, Université de Montréal, Station Downtown, Montréal, Québec H3C 3J7, Canada

*Corresponding author. E-mail: Veronique.Gosselin.1@UMontreal.ca

Summary

The lack of physical activity (PA) amongst children is a public health concern in many industrialized countries. School-based daily physical activity (DPA) policies are a promising intervention for increasing PA levels amongst children. Informed by a logic model framework, this study examines the factors associated with meeting a 'top-down' DPA objective in the context of a 'bottom-up' implementation of a school-based DPA initiative in Quebec, Canada. An online survey assessing school-level inputs, outputs and outcomes was sent to all participating schools (415). Crude odds ratios (ORs) and 95% confidence intervals (CIs) were calculated using logistic regression to evaluate potential associations between factors (inputs and outputs) and the school's adherence to providing at least 60 minutes of DPA (outcome). Adjusted ORs (AORs) and 95% CIs were calculated using a multivariate logistic regression to identify the best set of factors to predict adherence to the DPA objective. A total of 404 schools completed the questionnaire, amongst which 71% reported meeting the DPA target by implementing school-tailored activities. Three factors were identified as the best set of school inputs and outputs to predict meeting the objective: financial resources (per student) (AOR = 1.02; 95% CI 1.01–1.03), a shared vision amongst the school-team members that PA benefits learning outcomes (AOR = 1.94; 95% CI 1.04–3.19) and having conducted a detailed situational analysis (AOR = 1.89; 95% CI 1.00–3.58). Given that 'bottom-up' implementation might favour the development of policies that are more acceptable to stakeholders, our results should be considered by decision-makers and school administrators when implementing DPA initiatives.

Lay summary

The lack of physical activity (PA) amongst children is a public health concern in many industrialized countries. School-based daily physical activity (DPA) policies are a promising intervention for increasing PA levels amongst children. The primary purpose of this study was to examine the school-level factors of Quebec's *Active at school!* initiative, whose goal was to encourage elementary school teams to develop and implement tailored mobilizing strategies and activities for providing 60 minutes of DPA to their students. Our results suggest that the school team's perception of PA benefits on learning outcomes, the financial resources (per student) provided to the school, and a locally conducted situational analysis at the beginning of the implementation process are significant predictors of meeting the DPA objective. The secondary aim of our study was to explore whether the factors were different according to the geographical setting of the schools. Conducting a situational analysis was shown to be of particular importance for urban schools but did not seem to play a pivotal role for rural schools, suggesting that different organizational culture and population characteristics may be at work when implementing a bottom-up initiative in these two contexts.

Keywords: school-based physical activity, daily physical activity policy, DPA, elementary school, Implementation

INTRODUCTION

The lack of physical activity (PA) amongst children is a public health concern in many industrialized countries. For instance, national surveys in the USA (Child & Adolescent Health Measurement Initiative [CAHMI], 2019), UK (UK Active Kids, 2018) and Canada (ParticipAction, 2020) report that fewer than one in five children (5–17 years old) are meeting the international PA recommendation of 60 minutes of

moderate-to-vigorous daily physical activity (DPA) (WHO, 2010). Also worrying is that, compared with their urban peers, rural children are less likely to meet PA recommendations (Button *et al.*, 2020; Umstattd Meyer et al., 2016a, 2016b). Improving PA levels in youth is critical, as regular PA in school-aged children is associated with numerous physical and mental health benefits (Janssen and Leblanc, 2010; Biddle *et al.*, 2018; Carson *et al.*, 2017) and available evidence supports a causal relationship between PA and cognitive functioning in young people (Biddle *et al.*, 2018). Schools are an optimal setting to promote PA and health, providing an opportunity to reach a vast majority of children from all socio-economic backgrounds and facilitate the adoption of healthy behaviours from early childhood (Langford *et al.*, 2015; Batista *et al.*, 2019). Yet despite their ideal setting, many school-based PA interventions in real-world conditions throughout the world led to limited success (Cassar *et al.*, 2019). Given that the level of implementation is linked to efficacy and outcomes (Naylor *et al.*, 2015), understanding what affects the implementation of school-based PA interventions in real-world settings is critical.

Since 2005, five Canadian provincial governments (Ontario, Alberta, Manitoba, British Columbia and Saskatchewan) have adopted policies for schools to promote initiatives aimed at providing a minimum amount of DPA to children (Olstad *et al.*, 2015). A recent study of key stakeholder perspectives on the development, adoption and implementation of the five Canadian DPA policies revealed that each of the policies was developed and adopted using a top-down approach by the province's Ministry of Education and implemented using a bottom-up approach by the schools, meaning that the policies allow schools flexibility in meeting the needs of local educators and students (Campbell *et al.*, 2020). The study concluded that, according to the stakeholders, despite the mandatory nature of the policies and the flexibility in implementation, they were poorly implemented. Other studies that evaluated the implementation of the Canadian DPA policies reached the same conclusions (Kennedy *et al.*, 2010; Mâsse *et al.*, 2012; Stone *et al*, 2012; Hobin *et al.*, 2013; Watts *et al.*, 2014; Weatherson *et al.*, 2017). Barriers and facilitators to DPA implementation in Canadian schools have been identified in the literature (the most frequent being related to *environmental context and resources, beliefs about consequences* and *social influences*) (Weatherson *et al.*, 2017) and a systematic review from an international perspective pinpointed that school-level, organizational factors (e.g. managerial support and coordination with other agencies) as well as perceptions regarding the need for and benefits of a school-based PA intervention are key determinant of successful implementation (Cassar *et al.*, 2019). However, to our knowledge, no study has taken a close look at how the school teams mobilize their members and develop tailored activities to meet a top-down DPA target in the context of a bottom-up implementation. A better understanding of these mechanisms could help schools develop innovative and adapted interventions to increase their students' level of PA and help policy-makers in creating the conditions for the school teams to adhere to their DPA objective. From a more general standpoint, it could also help to address an important challenge regarding the implementation of intervention within real-world conditions worldwide, namely how to adapt complex interventions in order to meet local needs in different contexts (Pfadenhauer *et al.*, 2016).

As is the case in other Canadian provinces, Quebec has a high rate of inactivity amongst young people, as approximately one child in five aged between 6 and 11 years old does not achieve half of the recommended time of PA (Institut de la statistique du Québec, 2020). In 2017, the province launched its first policy on sports, PA and leisure (Ministère de l'Éducation et de l'Enseignement supérieur [MEES], 2017), which included legislative provisions mandating the integration of 60 minutes of DPA within all elementary schools (Kindergarten–Grade 6) by 2022 (MEES, 2018). To support the schools in their DPA implementation, a specific programme, *Active at school!* (*À l'école, on bouge!* [Measure 15023]) was concomitantly launched (MEES, 2019). This programme provides financial resources over 3 years to participating schools to implement opportunities for students to be active 60 minutes every school day (including physical education [PE] classes). Schools participated on a voluntary basis, and regional school boards oversaw the selection of the schools and the allocation of the financial resources provided by the Ministry. Participating schools are encouraged (but not mandated) to assign at least one in-school PA promoter (generally a PE teacher, but schools can also decide to assign a principal or another member of the school team) whose role is to mobilize the school team to develop its own action plan in order to integrate daily active time. The programme can be characterized as a top-down objective with a bottom-up implementation. Indeed, the school teams (including the in-school PA promoter) have the autonomy to develop a custom action plan and various types of interventions (e.g. schedule in-class active breaks or lead physical activities during recess) adapted to their needs and existing resources to meet the target set by the government (60 minutes of DPA). Hence, assessing the implementation of the *Active at School!* programme provides the opportunity to better understand how school teams

use additional resources to develop tailored activities and meet a top-down DPA target.

Given the bottom-up nature of the programme, we used a bottom-up evaluation method (Maye *et al.*, 2020), also referred to as 'theory of change' (Anderson, 2000), to study the inputs and outputs developed by the schools to improve (make a change) the amount of active time provided to their students. We, therefore, drew a logic model framework to study the linkage between the resources (inputs) and activities (outputs) and outcomes of the programme.

A logic model framework is commonly used for planning and evaluating public health interventions and health promotion programmes (Center for Disease Control and Prevention [CDC], 2018; Center for Community Health and Development, 2021). It provides a visual representation of how the resources (inputs) and set of activities (outputs) will support the achievement of the programme goals (outcomes), in other words, bring about (or lead to) a change. In other words, the logic model unpacks the components and subcomponents of a programme to reveal the inner workings of a programme (Peyton and Scicchitano, 2017), providing the hypothesis of how a programme is supposed to work to achieve intended results. If a programme is not implemented according to design, then there may be issues reaching programme outcomes. As such, a logic model becomes a useful tool to better understand and assess programme implementation (McLaughlin and Jordan, 1999). Figure 1 presents the main school-level factors (inputs, outputs and outcomes) included in the logic model of *Active at school!* This model guided our identification of the various elements potentially used by the school teams (inputs) to develop tailored organizational activities (outputs) and meet the objective of providing 60 minutes of DPA opportunities for their students (outcome).

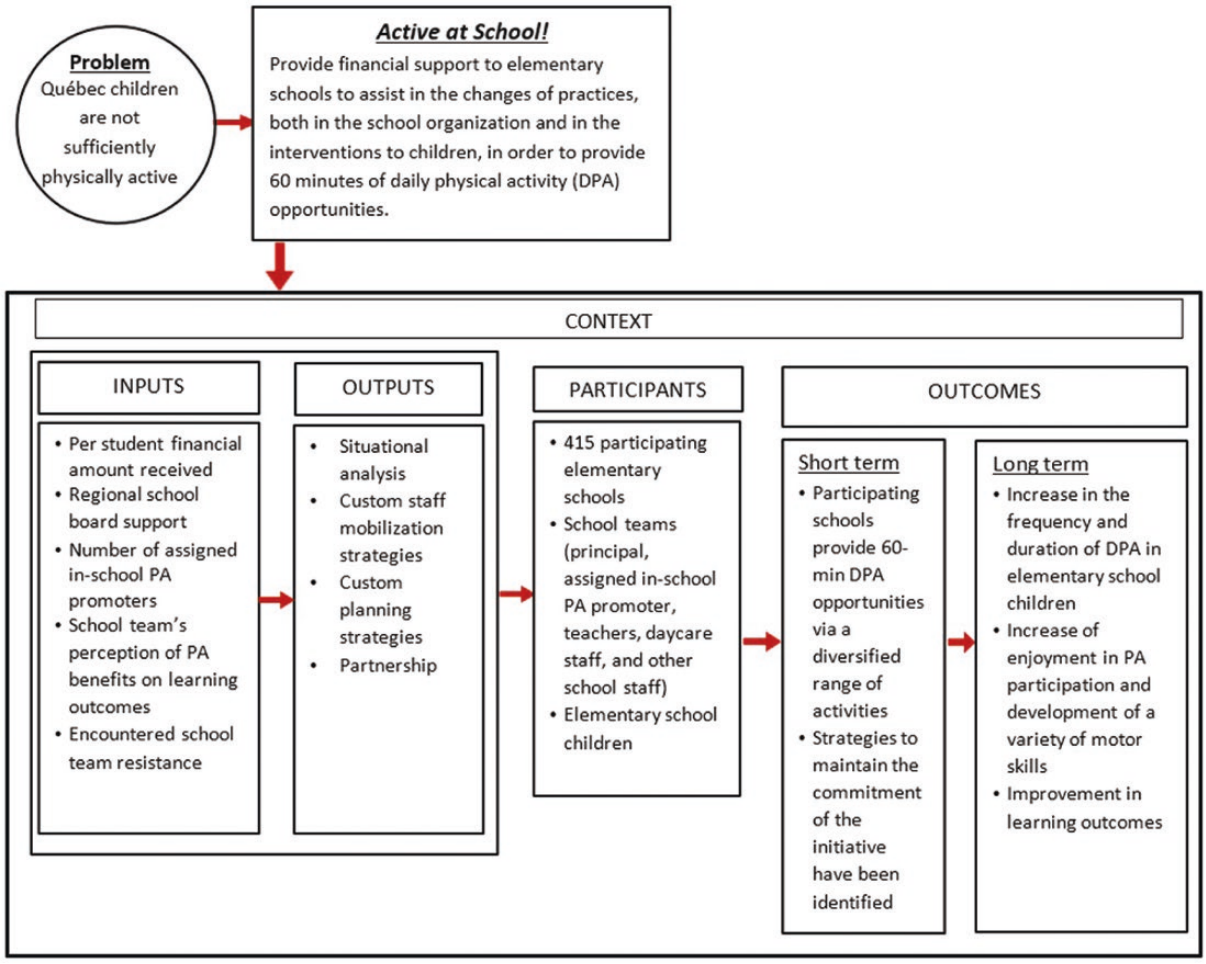

Figure 1: Logic model of the implementation of the *Active at school!* programme.

Informed by this logic model, the primary aim of the current study was to assess which inputs and outputs are associated with meeting the objective of providing 60 minutes of DPA opportunities (outcome). Additionally, given that rural children are less likely than their urban counterparts to meet PA recommendations, the secondary aim of the study was to explore whether there are distinctive strategies, in terms of inputs and outputs, associated with the schools' geographic setting.

METHODS

Participants and procedure

For its first year of implementation (2017–2018 school year), a maximum of 450 participating schools had been set by the Ministry (due to budget restriction); 415 expressed their willingness to join the programme. All 415 participating schools were recruited for the study (no sampling). An online questionnaire (described in the next section) was sent by the government to each participating school. The online platform of the government was used to facilitate communication with the schools. School principals and the assigned PA promoters were asked to answer the questionnaire jointly. Schools were free to answer or not. Ethical approval was obtained from the author's institutional Ethics Board.

Instrumentation

A literature review of DPA policies informed the development of our questionnaire, which comprised about 80 questions and sub-questions grouped into five themes: school characteristics, attitudes of the various stakeholders towards the programme (support, involvement and resistance), school mobilization strategies for implementing the programme, activities used by schools to provide DPA opportunities and, finally, the average number of minutes of DPA opportunities provided. Two elementary school academic advisors assessed the face validity of the questions and the answer choices. The questionnaire was adjusted accordingly. A total of 10 independent variables, identified in the inputs (6 variables) and the outputs (4 variables) of the logic model (Figure 1), were used to examine the factors associated with a school's reported adherence to providing the 60 minutes of DPA opportunities. The main outcome (dependant) variable was the proportion of schools that reported providing ≥60 minutes of DPA opportunities to their students. Accordingly, we dichotomized the original continuous variable (average number of minutes provided) into <60 and ≥60 minutes. All outcome variables were measured separately based on grade level (K–grade 2; Grades 3–4; Grades 5–6). Distinctive characteristics between grade levels were found while analysing the data. Due to the length constraint, the current study focuses on grades 3–4 (8- to 10-year-old children). Finally, to explore the differences between geographic settings, the postal codes of the participating schools were used to classify schools as urban or rural. All variables are described in Table 1.

Data analysis

Three sets of statistical analyses were performed using SPSS version 25. First, descriptive statistics were computed for all variables and all participating schools as well as separately for urban and rural schools. ANOVA (for continuous variables) and chi square (for categorical variables) were used to verify whether there were differences between the two settings. Second, crude odds ratios (ORs) and 95% confidence intervals (CIs) were calculated using logistic regression to evaluate potential associations between each factor (inputs and outputs) and the school's adherence to providing 60 minutes of DPA. To verify whether these associations varied according to geographic setting, geographic interactions for each factor were formally tested; results are presented separately for urban and rural schools if interactions were statistically significant. Finally, adjusted ORs and 95% CIs were calculated using a multivariate logistic regression to identify the set of schools' inputs and outputs that best predicts adherence to the DPA objective. All input and output variables were included in the regression, except for highly correlated variables (per-student amount received, total amount received, and number of students as well as school team's perception of PA benefits on learning outcomes and encountered school team resistance). For these variables, the per-student amount received, which combines the other two variables, and the school team's perception of PA benefits on learning outcomes were used. The reason for this last decision is that this variable showed stronger associations with the outcome variable than the encountered school team resistance in the bivariate analyses. Two more variables (Regional school board support and Partnership) were excluded from the multivariate regression as they showed high p value in the bivariate analyses ($p = 0.650$ and $p = 0.566$) and were therefore considered as not relevant in predicting the outcome variable. Given the lower number of schools in the rural setting compared with the relatively high number of predictors included in the multivariate model, the multivariate logistic regression was performed for all schools and not separately for urban and rural schools to preserve sufficient statistical power. We considered $p \leq 0.05$ as significant for all statistical analyses.

Table 1: Description of variables

Variable	Description	Categories
Geographical setting	The geographical location of the school	'Urban' 'Rural'
Input variables		
Number of students in the school	The total number of students in the school	Continuous variable [21–990]
Total amount received (CA$) by the school	The amount received (CA$) by the school during the first year of the programme's implementation	Continuous variable [3306–70 000]
Per-student financial amount (CA$) received	The total amount received (CA$) divided by the number of students in the school.	Continuous variable [12.91–214.94]
Regional school board support	The school board support variable was intended to determine whether schools were supported by the academic advisor at their respective regional school boards.	'Yes' 'No'
Number of in-school assigned PA promoters	The number of PA promoters assigned by the school principal to develop programme-tailored strategies and activities.	'1' '2 or more'
School team's perception of the benefits of PA on learning outcomes	The question pertaining to this variable was: 'What proportion of the members of your school team consider that PA has a positive effect on young peoples' learning outcomes?' Choices were: 'About one quarter', 'About half', 'About three quarters', 'Nearly all' and 'Don't know'. Given the very small proportion of schools that checked the first three choices, these were merged into a single category: 'Part of the team'. 'Don't know' was withdrawn from the analysis.	'Nearly all' 'Part of the team'
Encountered school team resistance	The resistance variable was evaluated with the question: 'Did you encounter resistance on the part of school team members?' Choices were: 'No', 'Yes, from a minority of members', 'Yes, from about half the members' and 'Yes, from more than half the members'. The three 'Yes' choices were merged into a single category.	'Yes' 'No'
Output variables		
Situational analysis	The question for this variable was: 'At your school, did you analyze the situation before developing means to increase the length and frequency of students' PA?' Choices were: 'Yes, in detail', 'Yes, but not in detail', 'No, because we already had detailed information' and 'No, for other reasons'. The two negative responses were merged to create a variable with three categories.	'No' 'Yes, not detailed' 'Yes, detailed'
Planning strategies score	The score for planning the implementation of the actions corresponded to the number of planning components that were selected by respondents from a list of seven choices: identifying a list of actions to implement, creating a timeline, developing a budget, appointing a leader, having access to additional human resources, targeting classes with interventions and follow-up mechanisms. Each component was worth one point. A higher total score indicated more detailed planning.	Continuous variable [0–7]
Mobilization score	A mobilization score was calculated by adding the number of mobilization strategies implemented to increase the amount of time students are physically active. Respondents could check all the strategies used among the 9 listed. These included freeing up involved staff time, special school team meetings around implementing the programme, time provided to the various stakeholders, information sessions about the programme, information sharing about the various resources available, formation of a follow-up committee, and items added to the agenda of statutory meetings for the purpose of mobilizing the entire school team. One point was awarded for each strategy implemented. A higher total score indicated a stronger mobilization.	Continuous variable [0–9]
Partnership	The partnership variable was measured using the question 'Did you collaborate/ partner with other schools, school boards or local stakeholders to facilitate implementation of the programme?'	'Yes' 'No'

Table 1. Continued

Variable	Description	Categories
Main outcome variable	**Description**	
School-reported provision of ≥60 minutes of DPA opportunities	The question 'For how many minutes per day on average do all students have the opportunity to be active?' was used to calculate the average number of minutes of DPA opportunities for each academic cycle. The number of minutes was recoded into two categories: 'less than 60 minutes' ('No') and '60 minutes or more' ('Yes') to take into account the objective of the programme, which is to ensure at least 60 minutes of DPA.	'Yes' 'No'
Additional outcome variables	**Description**	
Activities chosen and implemented by the participating school to increase DPA opportunities	A series of questions was dedicated to understanding the range of activities chosen and implemented by the school teams to increase DPA opportunities during the first year of the programme. Activities were listed and respondents could check whether or not the school implemented the activity. Additionally, an open-ended question allowed respondents to report on other implemented activities that were not previously listed.	'Yes' 'No' and qualitative data

RESULTS

A total of 404 out of 415 participating schools completed the questionnaire, of which 68% were located in an urban setting (Table 2). Taken all together, 71% of the schools reported meeting the objective of providing 60 minutes of DPA opportunities to their students. This proportion was larger for rural than for urban schools (81.1% vs. 66.9%, $p = 0.006$). The most frequently implemented activities were PA activities at day care services (93.8%), in-class brain breaks (89.6%) and in-class active learning activities (76.7%). Increasing the number of minutes dedicated to PE classes (6.5%) and to outdoor recesses (9.6%) was the least popular. Regarding inputs, urban schools received, on average, more financial resources than rural schools to implement the programme ($17 895.38 vs. $10 693.30, $p < 0.001$) as well as more support from their regional school board (71.5% vs. 59.4%, $p = 0.015$). However, when considering the number of students, the financial amount received by rural schools was greater ($72.61 vs. $52.80 for urban schools, $p < 0.001$). Urban schools encountered more school team resistance towards the programme than rural schools (52.5% vs. 34.3%, $p = 0.001$). However, urban schools displayed higher mobilization scores than rural schools (5.4 vs. 4.9, $p = 0.015$), which means that urban schools implemented, on average, more mobilization strategies to bring about DPA opportunities in their school (such as freeing up involved staff time, holding special school team meetings about the programme or forming a follow-up committee; see Table 1).

The geographical setting was significantly related to meeting the DPA objective in the simple analysis, with rural schools being 2.12 times more likely than urban schools to report meeting the 60 minutes objective (Table 3). Other factors that proved to be statistically significant in the simple analysis were the per-student amount received, the school team's perception of PA benefits on learning outcomes, encountered school team resistance and having conducted a detailed situational analysis (which means that the school formally analysed its local situation regarding PA before developing tailored means to increase the length and frequency of students' PA) (Table 3). Geographic interaction was statistically significant ($p = 0.005$; not presented in the table) for the output variable *Situational analysis* and marginally significant ($p = 0.075$; not presented in the table) for the *Planning strategy score*. Urban schools that had conducted a detailed situational analysis at the beginning of the implementation were 3.23 times more likely than urban schools that had not conducted one to report meeting the DPA objective, whereas the variable was not statistically significant for rural schools (Table 3).

Three factors were identified by the multivariate model as the best set of schools' inputs and outputs to predict meeting the DPA objective. The per-student financial amount received is one of them: schools that received more financial resources (per student) reported better adherence to the 60-minute DPA objective than schools that received less (adjusted OR = 1.01; 95% CI 1.001–1.025) (Table 4). The school team's perception that PA benefits learning outcomes also appeared to significantly contribute to meeting the objective. Schools where nearly all the school team members recognized that PA benefits learning outcomes were 1.83 (95% CI 1.05–3.20) times more likely to meet the DPA objective than schools for which only part of the school team

Table 2: Descriptive statistics and rural–urban differences

		Total *n* = 404	**Urban *n* = 276**	**Rural *n* = 128**	**Urban (U) – Rural (R) differences (*p* value[a])**
Geographic setting	Urban (% of schools)	68.3	—	—	—
	Rural (% of schools)	31.7	—	—	—
Input variables					
Number of students in the school	Mean	316	375	187	U > R (< 0.001***)
	Standard deviation	183	177	118	
	Min–Max	21– 990	28–990	21–648	
Total amount received ($) by the school	Mean	15 613.53	17 895.38	10 693.30	U > R (<0.001***)
	Standard deviation	8 114.27	8 424.46	4 591.69	
	Min–Max	3 306.00–70 000.00	3 717.00–70 0000.00	3 396.00–30 306.00	
Per-student amount received ($)	Mean	59.07	52.80	72.61	R > U (<0.001***)
	Standard deviation	31.25	24.62	39.03	
	Min–Max	12.94–214.94	12.94–199.92	13.81–214.94	
Regional board support	Yes (% of schools)	67.7	71.5	59.4	U > R (0.015*)
Number of in-school assigned PA promoters	1 (% of schools)	65.8	63.4	71.1	U = R (0.444)
	2 or more (% of schools)	34.2	36.6	28.9	
Encountered school team resistance	Yes (% of schools)	46.8	52.5	34.3	U > R (0.001**)
School team's perception of PA benefits on learning outcome	Nearly all (% of schools)	78.0	77.4	79.2	U = R (0.696)
	Part of the team (% of schools)	22.0	22.6	20.8	
Output variables					
Situational analysis	Yes, in a detailed manner (% of schools)	40.8	42.0	38.3	U = R (0.463)
	Yes, but not in a detailed manner (% of schools)	31.9	32.6	30.5	
	No (% of schools)	27.2	25.4	31.3	
Planning strategy score	Mean	3.5	3.5	3.5	U = R (0.899)
	Standard deviation	2.1	2.1	2.3	
	Min–Max	0–7	0–7	0–7	
Mobilization score	Mean	5.2	5.4	4.9	U > R (0.004**)
	Standard deviation	1.7	1.6	1.7	
	Min–Max	1–9	1–8	1–9	
Partnership	Yes (% of schools)	61.0	61.8	59.4	U = R (0.640)
Main outcome variable					
School-reported provision of ≥60 minutes of DPA opportunities	Yes (% of schools)	71.4	66.9	81.1	R > U (0.006**)

Table 2. Continued

		Total $n = 404$	Urban $n = 276$	Rural $n = 128$	Urban (U) – Rural (R) differences (p value[a])
Activities chosen, developed and implemented by the participating school to increase DPA opportunities					
Increasing the number of minutes dedicated to outdoor recesses	Yes (% of schools)	9.6	9.9	8.9	U = R (0.096)
Increasing the number of minutes dedicated to PE classes	Yes (% of schools)	6.5	5.3	8.9	U = R (0.425)
Implementing in-class brain breaks	Yes (% of schools)	89.6	91.4	85.7	U = R (0.257)
Implementing in-class active learning activities	Yes (% of schools)	76.7	77.5	75.0	U = R (0.327)
Implementing active assemblies	Yes (% of schools)	74.0	73.0	75.2	U = R (0.264)
Implementing physical activities in day care services	Yes (% of schools)	93.8	95.9	89.3	U = R (0.054)
Implementing active corridors	Yes (% of schools)	47.5	52.4	36.4	U = R (0.125)
Implementing other activities	Yes (% of schools)	18.8	19.6	17.2	U = R (0.697)

[a]ANOVA (for continuous variables) and χ^2 (for categorical variables) tests were used to verify whether there were differences between the urban and rural settings.

members acknowledged these benefits. Finally, having conducted a detailed situational analysis (adjusted OR = 1.96; 95% CI 1.04–3.67) was the only output that proved to be a significant predictor of meeting the DPA objective, compared with not conducting one.

DISCUSSION

The primary purpose of this study was to examine the school-level factors (inputs and outputs) used to apply Quebec's *Active at school!* initiative aimed at encouraging elementary school teams to develop and implement tailored mobilizing strategies and activities to provide 60 minutes of DPA to their students. Our results suggest that the school team's perception of PA benefits on learning outcomes (input), the financial resources (per student) provided to the school (input), and locally conducting a situational analysis at the beginning of the implementation process (output) are significant predictors of meeting the DPA objective. The secondary aim of our study was to explore whether the factors associated with meeting the objective differed according to the geographical setting of the schools. We found that conducting a situational analysis seems to be of particular importance for urban schools while it does not seem to play a pivotal role for rural schools, suggesting that different organizational cultures and population characteristics may be at work in these two geographical contexts when implementing a bottom-up initiative. Considering these results, we amended the logic model presented in the introduction (see Figure 2).

School teams' awareness of the benefits of PA on learning outcomes

School team perception of PA benefits on learning outcomes was shown to be a strong predictor of providing 60 minutes of DPA opportunities to the students. This result is consistent with the existing literature (Allison *et al.*, 2016; Bennett *et al.*, 2016; Baker *et al.*, 2017; Mâsse *et al.*, 2012; Abi Nader *et al.*, 2019) reporting that teachers are more receptive to integrating PA interventions in their classroom if it improves their class management and their students' learning dispositions. Previous studies have also shown that teachers are more

Table 3: Separate associations of inputs, outputs and school-reported provision of ≥60 minutes of DPA

	School-reported provision of ≥60 minutes of DPA(*n*= 404)		
	Yes (%)	Crude OR (95% CI)	*p* value
Geographical setting			
Urban (Ref.)	66.9	—	-
Rural	81.1	2.12 (1.23–3.65)	0.007**
Input variables			
Number of students in the school	[a]	0.99 (0.99–0.99)	<0.001***
Total amount received ($) by the school	[a]	1.00 (1.00–1.00)	0.065
Per-student financial amount received	[a]	1.02 (1.01–1.03)	0.002**
Number of in-school assigned PA promoters			
1 (Ref.)	68.9	—	0.169
2 or more	75.8	1.41 (0.86–2.31)	
Regional school board support			
No (Ref.)	72.8	—	0.650
Yes	70.5	1.12 (0.68–1.85)	
School team's perception of PA benefits on learning outcome			
Part of the team (Ref.)	59.7	—	0.008**
Nearly all	75.4	2.06 (1.21–3.52)	
Encountered school team resistance			
Yes (Ref.)	66.3	—	0.042*
No	76.1	1.62 (1.02–2.58)	
Output variables			
Situational analysis			
Urban schools (n = 276)			
No (Reference)	50.8	—	0.003**
Yes, not detailed	66.7	1.65 (0.91–2.98)	0.060
Yes, detailed	76.9	3.23 (1.65–6.33)	0.001**
Rural schools (n = 128)			
No (Reference)	85.3	—	0.133
Yes, not detailed	88.6	1.34 (0.33–5.47)	0.687
Yes, detailed	71.4	0.43 (0.14–1.38)	0.156
Planning strategy score			
Urban schools (n = 276)	[a]	1.13 (0.99–1.29)	0.070
Rural schools (n = 128)	[a]	1.05 (0.72–1.12)	0.328
Mobilization score	[a]	0.94 (0.82–1.08)	0.352
Partnership			
No (Ref.)	69.9	—	0.566
Yes	72.7	1.15 (0.72–1.84)	

Notes: Geographic interactions for each factor (input and output) were formally tested and results are presented separately for urban and rural schools if interactions were statistically significant.
Abbreviations: OR, odds ratio; CI, confidence interval; DPA, daily physical activity.
*$p \leq 0.05$
**$p \leq 0.01$
***$p \leq 0.001$.
[a]Not applicable for continuous variables

Table 4: Adjusted ORs with 95% CIs for school-reported provision of ≥60 minutes of DPA based on geographical setting, inputs and outputs

	School-reported provision of ≥60 minutes of DPA (n = 404)		
	Yes (%)	Adjusted OR (95 % CI)	p value
Geographical setting			
Urban (Ref.)	66.9	—	0.084
Rural	81.1	1.73 (0.93–3.21)	
Input variables			
Per-student amount received	[a]	1.01 (1.001–1.025)	0.030*
Number of in-school assigned PA promoters			
1 (Ref.)	68.9	—	0.054
2 or more	75.8	1.69 (0.99–2.87)	
School-team's perception of PA benefits on learning outcome			
Part of the team (Ref.)	59.7	—	0.033*
Nearly all	75.4	1.83 (1.05–3.20)	
Output variables			
Situational analysis			
No (Ref.)	62.9	—	0.103
Yes, not detailed	73.6	1.58 (0.84–2.95)	0.214
Yes, detailed	75.3	1.96 (1.04–3.67)	0.036*
Planning strategy score	[a]	1.03 (0.90–1.17)	0.685
Mobilization score	[a]	0.91 (0.77–1.06)	0.229

Abbreviations: OR, odds ratio; CI, confidence interval; PA, physical activity; DPA, daily physical activity.
*$p \leq 0.05$
**$p \leq 0.01$
***$p \leq 0.001$
[a]Not applicable for continuous variables.

receptive to PA promotion programmes when these do not conflict with the teachers' fundamental role and working conditions (Jourdan *et al.*, 2011; Bennett *et al.*, 2016; Baker *et al.*, 2017). Our findings add to this existing literature by highlighting that, in the context of bottom-up DPA implementation, a strong shared vision amongst the school team members about the positive impact of PA on children's learning outcomes seems critical to meeting the DPA target. We found that schools where nearly all the school team members recognized that PA benefits learning outcomes were almost twice as likely to meet the DPA objective than schools in which only some of the school team members acknowledged these benefits (Table 4). It is also worth noting that schools where only part of the school team was aware of the benefits of PA (compared with nearly all the team) encountered more resistance towards the programme ($p < 0.001$). Since the mobilization of the school team is key to the development of school-tailored activities in the context of a bottom-up implementation, it is possible that a shared vision about the potential benefits of DPA is of particular importance. Sustained effort should be made by policy-makers, regional school boards, principals, and local champions to inform all school team members of the benefits of PA on students' learning outcomes and class management. Moreover, qualitative data collected during the study suggested that implementing activities aimed at nurturing a shared vision amongst the school team members might benefit from being tailored to the specific context of the schools. For example, some participating schools used a portion of the financial resources provided by the programme to free up a PE teacher who went from class to class to explain the importance of DPA to teachers. Other schools acquired information videos on the effects of PA on children's brains. Future studies could examine what strategies are effective at creating a shared vision of the benefits of DPA in the context of elementary schools.

Per-student amount received

We found that the allocation of financial resources was a significant predictor of meeting the objective of

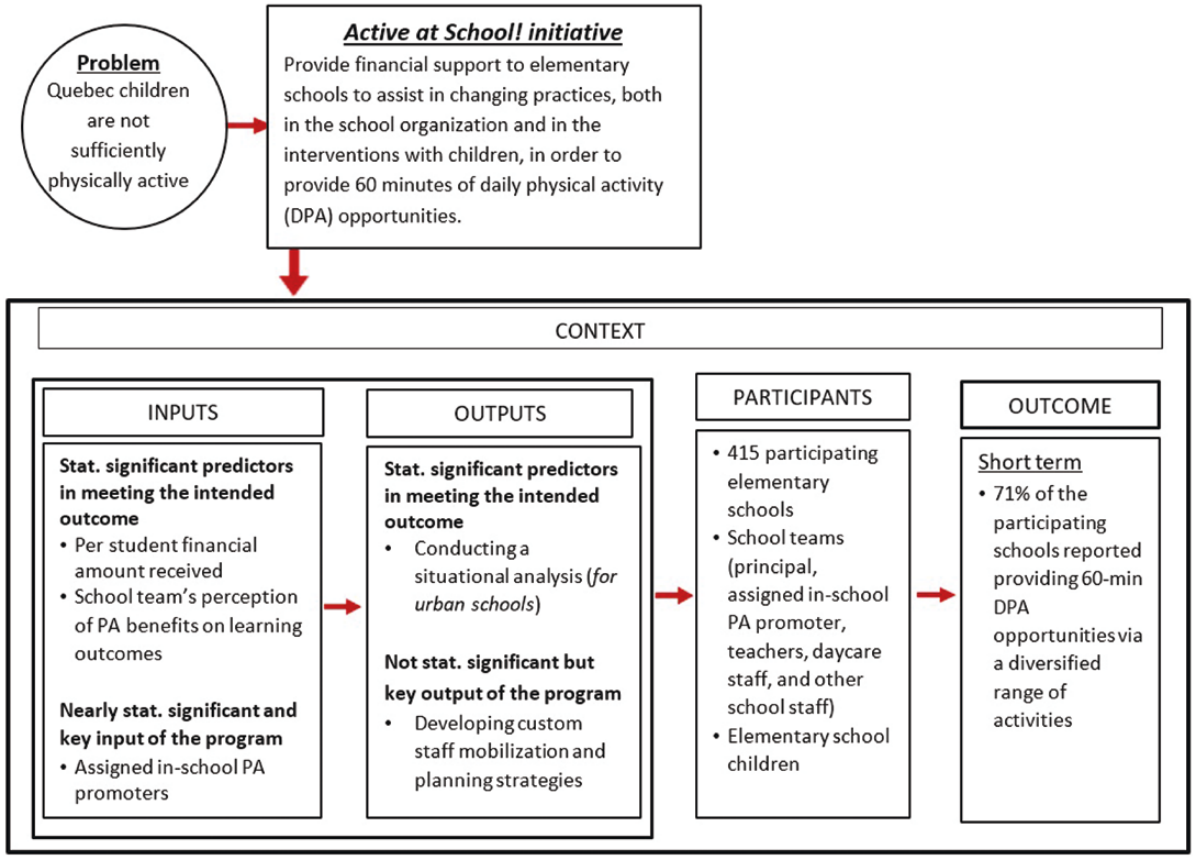

Figure 2: Revised logic model of the implementation of the *Active at school!* programme.

providing at least 60 minutes of DPA. Weatherson *et al.* (2017) conducted a review of the barriers and facilitators to the implementation of school-based PA policies in Canada and found that *environmental* context and resources (i.e. time, space, facilities, equipment and ideas) were a frequent barrier to implementation while financial resources were not highlighted. It is possible that the specific mechanics of the *Active at school!* programme (bottom-up implementation) made financial resources key for the participating schools. Indeed, financial resources allocated to the schools were to be used by school teams to implement new practices, both at the level of the school organization (e.g, setting up a committee, appointing an in-school leader) and the interventions themselves (e.g. scheduling in-class active breaks or leading physical activities during recess). The resources could also be used to pay transportation costs, buy new equipment and offset other costs. As indicated, participating schools were free to develop their own action plans and select the new practices that were appropriate for them within the constraints of the financial resources provided. Previous research (Inchley *et al.*, 2007) evaluating the process of a bottom-up implementation programme in Scotland found similar results. The authors observed that the financial support provided to the schools proved to be of importance not just for practical reasons, but also as a means of empowerment because schools were able to spend the money as they wished, as long as it could be shown to be helpful in attaining the project's aims. The authors highlighted that it promoted a sense of ownership of the programme, facilitating its implementation.

Situational analysis

Having conducted a detailed situational analysis was another predictor of meeting the objective of providing 60 minutes of DPA opportunities. Evaluation grids distributed by school board academic advisors were used to encourage schools to identify opportunities for being active already available to students and the availability or lack of resources to increase them. Often considered to be one of the first steps in planning a project, a situational analysis is nonetheless often overlooked because of either a lack of time or a perception that the situation is already

well understood. We found that only about 40% of schools conducted a detailed situational analysis pertaining to PA opportunities, and this proportion did not differ based on the geographical setting (Table 2). However, our results suggest that the impact of conducting one differs according to the geographical setting. Our analysis (Table 3) showed that among the urban schools, those that had conducted a detailed situational analysis were three times more likely to report meeting the DPA target than those that had not conducted any, whereas the association was not statistically significant for the rural schools. Based on previous studies accounting for the specific characteristics of the urban environment (Shearer *et al.*, 2012; Hobin *et al.*, 2013; Peralta *et al.*, 2019), we hypothesize that a larger population and greater cultural diversity may represent additional barriers to implementation. It is possible that conducting a situational analysis allows the schools to better understand and identify their specific needs in terms of PA, which might raise awareness and initiate readiness for the programme within the school team. Our results showed that the encountered resistance to implementing new DPA opportunities was more prevalent in urban settings (52.5% vs. 34.3% in rural), which might explain the importance of more rigorous planning for urban schools. These results add to the limited literature comparing rural and urban schools' DPA implementation. Only a few researchers have investigated the implementation of DPA measures in schools across rural and urban settings in Canada. Our findings contradict those of Hobin *et al.* (2013) for adolescents, which showed that various features of the school environment in rural settings were associated with lower opportunities for students to be physically active. A recent systematic review (Pfledderer *et al.*, 2021) also highlighted that school-based PA interventions conducted in rural settings posed greater challenges than in urban settings. As an important body of research indicates that rural children have few opportunities for extended PA outside of school (Barnidge *et al.*, 2013; Umstattd Meyer et al., 2016a, 2016b; Button *et al.*, 2020), the role of schools is critical in providing access to PA in this setting. Our results highlighted that the school team's perception of PA benefits on learning outcomes and the financial resources (per student) provided to the school were key to meeting the DPA target for rural schools. It is also possible that the bottom-up implementation used by the *Active at school!* initiative nurtured a sense of ownership of the programme. Although more research is needed to gain a comprehensive understanding of the specific facilitators and processes available to rural school teams intending to increase the provision of DPA opportunities for their students, as well as the challenges they face, we believe our findings might still be useful to inform the development of future school-based DPA programme in this setting.

Limitations

Our study had a number of limitations. First, there was a potential risk of selection bias because schools participated on a voluntary basis in implementing the *Active at school!* programme. Participating schools might already be very committed to promoting PA in their schools. Thus, the high level of school teams' readiness noted in our study may not be representative of the attitude of schools across the province with regard to increasing DPA opportunities. Second, social desirability bias could also have influenced the information reported; since the questionnaire was sent by the government, some respondents may have been inclined to answer in a way that would be viewed favourably. Hence, it is possible that the number of schools who reported reaching the 60-minute target may be overestimated in the study. Regardless, our analyses are still valuable to better understand the inner-working of the programme. Third, the average minutes of opportunities of DPA were self-reported by the school administrator and the in-school PA promoters; no validation was possible. We assume that, for the most part, the values indicated were accurate, or that the bias was similar for all the participating schools. Moreover, it cannot be assumed that providing opportunities to be physically active will automatically result in students participating in the activities. Measuring the rate of participation was beyond the scope of this study. Future research is needed to examine the rate of participation of students in the programme and discrepancies in participation levels. Finally, the adjusted ORs that we obtained for the three statistically significant factors are relatively small (Table 4), indicating that the strength of the associations between the factors and the outcome variable is low. Future research is, therefore, needed to further understanding of the facilitators available to school teams to increase the provision of DPA opportunities, as well as the challenges they face. Given that our quantitative model provided limited (although useful) insights, qualitative research might be useful to gain a better understanding of these factors.

CONCLUSION AND IMPLICATIONS

Informed by a logic model framework, this study examined the school-level factors associated with meeting the 'top-down' DPA objective of Quebec's *Active at school!* initiative. The goal of this initiative

was to support elementary school teams in implementing tailored activities ('bottom-up' implementation) to provide 60 minutes of DPA to their students. We found that a strong shared vision among the school team members about the positive impact of PA on children's learning outcomes and the financial resources (per student) provided to the school were significant predictors of meeting the DPA target. Although a detailed situational analysis is often skipped due to lack of time, developing detailed planning based on an understanding of needs and the resources available also appeared to be a critical factor for success in urban settings. As bottom-up implementation is a prevalent approach for DPA policies in Canada (Campbell *et al.*, 2020), and given that this type of implementation might favour the development of policies that are more acceptable to stakeholders (Bambra *et al.*, 2005) in other countries as well, these factors should be considered by decision-makers and school administrators to facilitate adherence to school-based PA policies.

Ethics information

Ethical Committee approval was obtained in Canada from Health Research Ethical Committee of Université de Montréal.

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