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ORIGINAL PAPER

# Lessons learned from Action Schools! BC—An ‘active school’ model to promote physical activity in elementary schools

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Received 14 January 2006; received in revised form 14 June 2006; accepted 16 June 2006

## KEYWORDS

School;  
Physical activity;  
Program evaluation;  
Children

**Summary** The ‘active school’ model offers promise for promoting school-based physical activity (PA); however, few intervention trials have evaluated its effectiveness. Thus, our purpose was to: (1) describe Action Schools! BC (AS! BC) and its implementation (fidelity and feasibility) and (2) evaluate the impact of AS! BC on school provision of PA. Ten elementary schools were randomly assigned to one of the three conditions: Usual Practice (UP, three schools), Liaison (LS, four schools) or Champion (CS, three schools). Teachers in LS and CS schools received AS! BC training and resources but differed on the level of facilitation provided. UP schools continued with regular PA. Delivery of PA during the 11-month intervention was assessed with weekly Activity Logs and intervention fidelity and feasibility were assessed using Action Plans, workshop evaluations, teacher surveys and focus groups with administrators, teachers, parents and students. Physical activity delivered was significantly greater in LS (+67.4 min/week; 95% CI: 18.7–116.1) and CS (+55.2 min/week; 95% CI: 26.4–83.9) schools than UP schools. Analysis of Action Plans and Activity Logs showed fidelity to the model and moderate levels of compliance (75%). Teachers were highly satisfied with training and support. Benefits of AS! BC included positive changes in the children and school climate, including provision of resources, improved communication and program flexibility. These results support the use of the ‘active school’ model to positively alter the school environment. The AS! BC model was effective, providing more opportunities for ‘more children to be more

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active more often'' and as such has the potential to provide health benefits to elementary school children.

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## Introduction

Obesity and physical inactivity have been linked to a host of chronic diseases including cardiovascular disease, hypertension, stroke, type II diabetes and osteoporosis.<sup>1</sup> Childhood obesity almost tripled in Canada between 1986 and 1991<sup>2</sup> and 56% of Canadian youth aged 12–19 years are physically inactive.<sup>3</sup> The annual costs of physical inactivity and obesity in Canada, are US\$ 5.3 billion and 4.3 billion, respectively.<sup>1</sup> The human burden of preventable chronic diseases and the potential impact of these on the sustainability of the health care system highlight the importance of public health efforts to target known risk factors. As physical activity (PA) and obesity are known to track from childhood to adolescence<sup>4,5</sup> and, to a lesser degree, through to adulthood,<sup>6–8</sup> the growing years may represent the best opportunity to intervene to establish healthy lifestyle behaviours.

Children spend a substantial amount of their waking hours in school and schools reach children across a wide spectrum of ethnic and socio-economic strata.<sup>9</sup> Therefore, researchers and policy-makers have identified schools as critical settings for intervention.<sup>9,10</sup> The comprehensive school health program (CSHP) model has been proposed as a means to address child health.<sup>11</sup> Both the CSHP<sup>12,13</sup> and the Health Promoting Schools<sup>14</sup> models rely on a range of activities integrated within the 'whole school', rather than on classroom-based health or physical education (PE), exclusively.<sup>15</sup> Physical activity researchers have described this as an 'active school' model, where opportunities for PA are maximized and reinforced through the curriculum, school environment, community links, school policies and school culture.<sup>9,16,17</sup> Other important principles of these models are context-specific planning and coordination, involvement of community partners and parents, evaluation integrated within the planning cycle and intersectoral action.<sup>15,18</sup>

Previous, effective school-based interventions have included additional PA sessions,<sup>19</sup> modified PE to increase moderate to vigorous PA<sup>20</sup> and utilized PE specialists.<sup>21</sup> However, in the province of British Columbia (BC), Canada, only 25% of elementary schools devote the recommended 10% of curriculum time to PE and, on average, schools offer only 80 min/week of PE.<sup>22</sup> Thus, the 'active school'

model may provide additional opportunities for PA and warrants evaluation.<sup>9</sup>

Thus, we developed, implemented and evaluated an 'active school' model for elementary school-based PA promotion: Action Schools! BC (AS! BC). Developed in BC, AS! BC incorporated key aspects of comprehensive school health and sought systemic change through knowledge exchange and multi-level, intersectoral partnerships.<sup>23</sup> The overall aim of AS! BC was to enhance the PA level of children by increasing opportunities for children to be physically active throughout the school day. Thus, our specific objectives are to describe the: (1) AS! BC model and its implementation, (2) impact of the model on school provision of PA opportunities, (3) intervention fidelity and (4) feasibility of the model and implementation issues.

## Methods

### Action Schools! BC model

Development of the AS! BC model has been described previously.<sup>23</sup> Several critical components of the AS! BC model are described in Table 1 and the implementation model is outlined in Fig. 1. The AS! BC model provided tools for schools and teachers to create individualized Action Plans that increased PA opportunities across six Action Zones: (1) School Environment, (2) Scheduled PE, (3) Classroom Action, (4) Family and Community, (5) Extra-curricular and (6) School Spirit (Fig. 1). The AS! BC model provided generalist teachers with training and resources to operationalize their Action Plan with the ultimate goal of providing students with 150 min of moderate intensity PA per week. This corresponds to the BC Ministry of Education and Canadian curriculum guidelines for PE.<sup>24,25</sup> In the Scheduled PE Zone, AS! BC supported the existing PE curriculum and additional physical activity opportunities were provided during the school day.

AS! BC is a choice-based, whole school model. Teachers were asked to provide students with a minimum dose of 15 additional minutes of PA each school day (75 min per week) in the Classroom Action Zone and students "snacked on physical activity" throughout the school day. Teachers undertook a variety of activities including skipping,

**Table 1** Key components of the Action Schools! BC (AS! BC) model

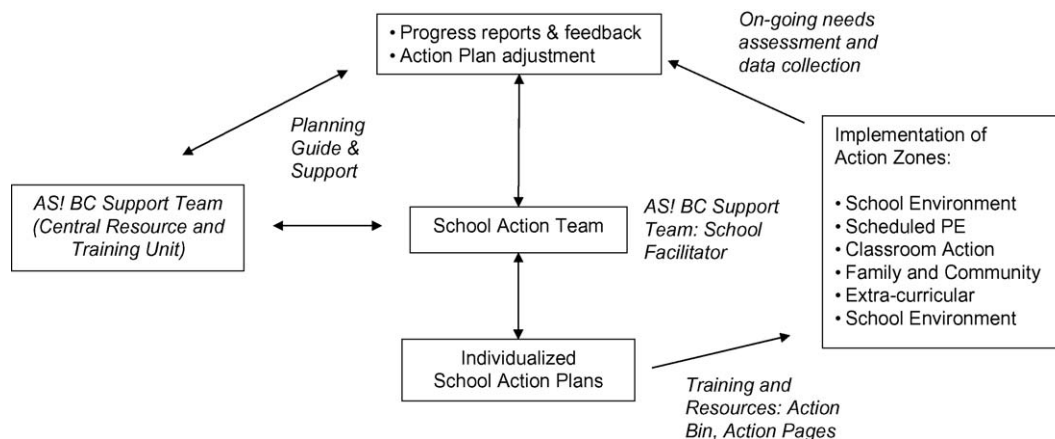
Component	Description
AS! BC Support Team	A central technical support unit that provided developed and provided AS! BC resources (training workshops, written materials, Classroom Action Bins, school newsletter inserts for families) and ongoing consultation (on-site and telephone) to administrators, teachers and the School Action Team
AS! BC School Facilitators	Two elementary school teachers seconded by the AS! BC Support Team to provide training, support and advice to the schools and liaise between the Support Team and the school Action Team
School Action Team	A committee of school stakeholders (e.g. interested intermediate grade teachers, administrators, parents, health, sport/recreation practitioners) that created and supported implementation of the Action Plan
Planning Guide for Schools and Teachers	A set of inventories and worksheets that guided teachers and the School Action Team to identify school priorities and create their Action Plan
Action Pages	A resource directory using curriculum organizers to link teachers, coaches, or community instructors with recommended and available resources
Classroom Action Bin	A storage bin for the classroom filled with playground balls, videos, skipping ropes, exercise bands, strength grippers and teaching resources that supported the Action Plan

chair aerobics, hip-hop dancing, playground circuits and resistance exercises with exercise bands. Bounce at the Bell,<sup>26</sup> designed to enhance bone health, was a mandatory component of Classroom Action in the evaluation phase. Children performed 5–10 jumps, 3 times a day (at the morning, noon and end of day school bell), 4 days a week.<sup>26</sup> All activities required minimal equipment and could be performed in the classroom, hallway or on the school playground. Teachers received teacher-on-call support to attend a Classroom Action training session (half-day) from the AS! BC Support Team and School Facilitators (Table 1) and had access to further training on professional development days and by telephone consultation (on request). Each teacher received a Planning Guide, a copy of the Action Pages and a Classroom Action Bin (Table 1). The Classroom Action Bin remained in each teacher’s classroom and

contained equipment and resources to facilitate Classroom Action activities. Resources were gender inclusive and designed for children at all skill levels.

**Study design and recruitment**

We undertook a 16-month cluster randomized comparison trial. We recruited elementary schools from two BC School Districts. We gave presentations at District principals’ meetings and from a pool of 103 schools, 20 schools (19%) volunteered to participate. To discriminate between schools who were already undertaking physical activity initiatives from those who were not, we used results from the 2002 BC Ministry of Education Satisfaction Survey<sup>27</sup> which assessed parent and student satisfaction with current school PA on a 5-point Likert scale (5 = very satisfied). From the pool of 20 volunteer schools,



**Figure 1** Implementation model for Action Schools! BC (AS! BC) at the school level.

we invited those schools ( $n=11$ ) with satisfaction score that ranked 3 or lower to participate. One principal withdrew his school (before randomization) after determining there was a chance their school could be randomly selected as a control school.

Following recruitment, 10 schools were stratified by size (<300 or >300 students) and geographic location and randomly assigned to a Usual Practice (UP, three schools) or Intervention ( $n=7$ ) [Liaison (LS, four schools) or Champion (CS, three schools)] condition. *In the LS condition*, teachers had weekly contact with the School Facilitator who would come to the classroom to provide mentorship and demonstrate activities. Also, Classroom Action Bins were enhanced with specific resources as requested. *In the CS condition*, Classroom Action Bins contained a basic set of resources. The School Facilitator for CS schools provided the initial training and provided support to the designated 'champion' teacher (a teacher willing to activate and support their colleagues). Support was not provided to each classroom in CS. *In UP schools*, teachers were asked to carry-on with their typical delivery of PA and PE.

The intervention was conducted over 11 months and began after student baseline testing was completed (February–April 2003). Phase I (April–June 2003) and Phase II (October 2003–May 2004) of the intervention were separated by a 2-month summer holiday. Training of Intervention teachers took place before the start of Phases I and II. The Clinical Research Ethics Board at the University of British Columbia and the School Districts approved this study.

## Participants

For the purpose of this study, Grades 4–6 were included. Forty-two (100%) Grades 4 and 5 teachers consented to participate in Phase I and 49 (98%) Grades 5 and 6 teachers consented to participate in Phase II (23 taught Grade 5 in both phases). We also recruited children in these grades to participate in an evaluation of multiple health outcomes. The student cohort is not the focus of the present study, however, and this group is described elsewhere.<sup>28–31</sup>

## Measurements

### School level

We obtained school and class size, socio-economic profile and proportion of English as a second language (ESL) students from District Reports pub-

lished by the BC Ministry of Education.<sup>32</sup> At baseline, all schools completed a set of needs assessment inventories which included an Action Inventory that addressed current physical activity practices across the six Action Zones and a School Health Inventory (SHI) that addressed current school policies relating to health and physical activity. In particular, the SHI (a modified version of the School Health Index developed by the Centers for Disease Control and Prevention<sup>33</sup>) required schools to provide the weekly frequency and duration of PE.

### Physical activity delivered

We asked teachers at Intervention schools to complete weekly Activity Logs during Phases I and II. Teachers recorded daily, the type, frequency and duration (minutes) of PA implemented in the classroom, in PE or in the other Action Zones. Activity Logs were collected monthly by the School Facilitators. Teachers at UP schools completed a modified version of the Activity Log.

### Intervention fidelity

Intervention schools prepared Action Plans (APLans) including activities in each Action Zone for April–June 2003, September–December 2003 and January–June 2004. We then coded APlan activities into Action Zones. In addition, Activity Log data were coded into Action Zones and counted. We assessed fidelity by comparing actual to prescribed amount of physical activity delivered, actual versus potential number of weeks logged and by examining the planned and implemented activities coded across the six zones.

### Feasibility of delivering the Action Schools! BC model

To address the question of whether administrators (school principals or vice-principals), teachers, students and parents were satisfied with the intervention and to identify facilitators and barriers to model delivery we evaluated training workshops, administered feedback surveys and conducted focus groups. We also conducted interviews with the School Facilitators to identify issues critical to implementation of AS! BC. Each is described below.

### Administrators

We conducted semi-structured telephone interviews with administrators ( $n=7$ ) from Intervention schools mid-way through the study (February–

**Table 2** Minutes per week of physical activity for Usual Practice (UP,  $n=3$ ), Champion (CS,  $n=3$ ) and Liaison (LS,  $n=4$ ) schools during Phases I and II and for the overall study

	Condition	Minutes per week of physical activity
Phase I: April 2003 to June 2003	UP	157.9 (134.1, 181.7)
	CS	193.4 (168.8, 217.9) <sup>a</sup>
	LS	180.7 (159.1, 202.4)
Phase II: September 2003 to June 2004 <sup>b</sup>	UP	91.4 (70.7, 112.2)
	CS	137.8 (117.0, 158.6) <sup>c</sup>
	LS	154.8 (136.6, 173.0) <sup>c</sup>
Overall: April 2003 to June 2004	UP	104.6 (82.9, 126.3)
	CS	147.5 (125.8, 169.2) <sup>c</sup>
	LS	159.7 (140.8, 178.7) <sup>c</sup>

Values are mean (95% confidence interval).

<sup>a</sup> CS > UP,  $p=0.04$ .

<sup>b</sup> Phase II < Phase I (across all schools),  $p < 0.001$ .

<sup>c</sup> CS and LS > UP,  $p < 0.001$ .

March 2004). Administrators described facilitators and barriers to implementation of AS! BC, their school's response to AS! BC, lessons learned, suggestions for improvement and facilitators and challenges to sustainability.

### Teachers

We assessed overall satisfaction with AS! BC training using a six-item questionnaire administered after all AS! BC led workshops including the initial training sessions that evaluated Intervention teachers' satisfaction with workshop content and delivery, perceived usefulness of the training, confidence to implement and intention to use what they learned. All Intervention teachers also completed a feedback survey at the end of the study. Teachers were asked to indicate their satisfaction with resources (written and equipment) and support on a 5-point Likert scale (5 being highest).

At each of the 10 schools, we conducted two semi-structured focus groups (December 2003 and June 2004) with all participating teachers. Intervention teachers were asked (1) what factors helped or hindered implementation and (2) what changes were a result of AS! BC. UP teachers were asked to describe any changes made in school-based PA.

### Children

Children ( $n=26$ ) from five willing Intervention schools (three LS and two CS) were recruited by their principal to participate in a focus group at the end of the study (May–June 2004). Principals were asked to recruit a mix of children to represent the "keen" and "not so keen" individuals. Children were asked about their perceptions of AS! BC, their favourite and least favourite activities and changes

they made personally or that they observed in their school.

### Parents

During the same time period (May–June 2004), we conducted semi-structured focus groups with parents ( $n=16$ ) who were also recruited by the principals from the same five Intervention schools. Principals were asked to recruit a mix of parents to represent the "keen" and "not so keen" individuals. Parents described any information received about AS! BC, their perceptions about the importance of PA in the school and the impact of AS! BC on their child's school and life.

### AS! BC School Facilitators

To identify the critical issues that affected implementation we conducted semi-structured telephone interviews with the School Facilitators ( $N=2$ ) each month. Schools Facilitators reflected on highlights of the month, lessons learned and on anything that may have impacted implementation of the model.

### Statistical analysis

To account for the clustered study design (schools were the unit of randomization), we used a mixed linear model to compare physical activity delivered (minutes per week) between groups during Phases I and II and for the overall study. Group was designated as the fixed effect and school as the random effect and a Group  $\times$  Phase interaction term was included. Data were analyzed with STATA (Version 9.0; StataCorp, TX, USA). Median compliance (and the interquartile range) with Activity Logs was determined for Phases I and II. Action Plan, work-

shop evaluation and teacher feedback survey data were coded and entered into SPSS for descriptive analysis. We used NVivo 7.0<sup>34</sup> and an editing analysis approach with open coding to analyze focus group and interview text. As patterns and themes emerged from text units, axial coding and clustering were used to generate themes.<sup>35</sup>

## Results

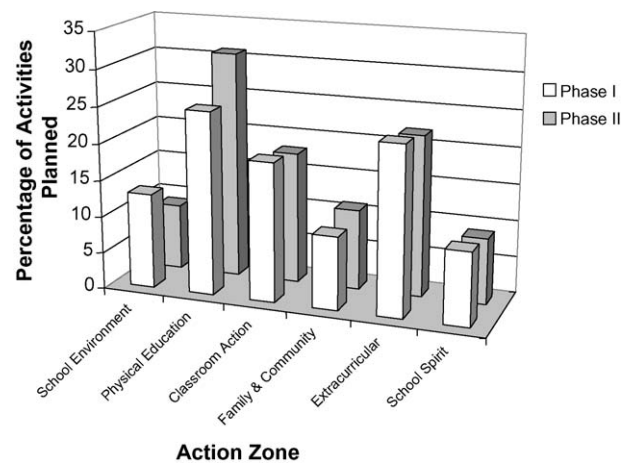
### Descriptives

AS! BC schools represented a broad socio-economic and cultural spectrum. Average annual family income in the two districts was US\$ 52,152 CDN. This was below the provincial average (US\$ 54,840 CDN). Approximately 26% of families had incomes below US\$ 30,000 CDN per year. Average ( $\pm$ S.D.) school and class size were 433 (116) and 28 (3) students, respectively. Across all 10 schools, approximately 41% of children were English as a Second Language (ESL) students and 61% of children spoke a language other than English at home (primary language spoken was Chinese).

### Physical activity delivered

At baseline, all Intervention schools and two UP schools reported on their School Health Inventory that PE was provided to intermediate grades less than 90 min per week. One UP school reported that PE was provided more than 90 min (but less than 150) minutes per week. The Action Inventory confirmed this with the average response indicating that 80 min of PE was the primary source of PA.

Average minutes of PA delivered by teachers across conditions are provided in Table 2. In Phase I, CS schools delivered significantly more minutes of PA per week than UP schools (+35.4 min/week; 95% CI: 1.25–69.7). There was no significant difference in minutes delivered between LS and CS schools or between LS and UP schools. Across all schools, minutes of PA delivered during Phase II was significantly less than Phase I (–48.8 min/week; 95% CI: –57.7 to –39.9). During Phase II, minutes of PA delivered was significantly greater in LS (+63.4 min/week; 95% CI: 35.7–91.0) and CS (+46.4 min/week; 95% CI: 8.1–86.8) schools than UP schools. Delivery of PA was not significantly different between LS and CS schools. Similarly, for the overall study period, minutes of PA delivered was significantly greater in LS (+67.4 min/week; 95% CI: 18.7–116.1) and CS (+55.2 min/week; 95% CI: 26.4–83.9) than UP schools. There was no significant difference between LS and CS schools.



**Figure 2** Percentage of activities planned across the six Action Zones for Intervention schools during Phase I (April–June 2003) and Phase II (October–May 2004). Data were obtained from the Action Plans.

### Intervention fidelity

From APlans, activities were planned across all six Action Zones but more often in PE or extra-curricular time (Fig. 2). School Environment Zone activities included painting playground markings on tarmac, fundraising for more Classroom Action Bins and incorporating further PA-related training into scheduled professional development days. Physical Education Zone activities included introducing new sports into PE and having local sport and recreation organizations provide equipment and lessons for students. In the Classroom Action Zone, the most common activities were Bounce at the Bell and hip-hop dance supported by an ‘‘Energy Blast’’ video. Family and Community Zone activities included the parent-led Walking/Wheeling Wednesday and sport and motivational presentations like wheelchair basketball and the Esteem Team. Extra-curricular Zone activities included starting new PA clubs such as Kilometre Club and Hip-Hop Dance Club. Examples of School Spirit Zone activities included community PA-related fund raisers (e.g., fun runs or Jump Rope for Heart) and PA sessions at school assemblies.

During Phase I, median compliance with Activity Logs was 67% (IQR: 58–75%) across UP schools, 75% (IQR: 67–83%) across CS schools and 67% (IQR: 46–75%) across LS schools. During Phase II, median compliance with Activity Logs was 97% (IQR: 89–100%) across UP schools, 94% (IQR: 88–96%) across CS schools and 100% (IQR: 94–100%) across LS schools. For the overall intervention period, Intervention schools delivered two-thirds of the prescribed 15 min of additional daily PA.

## Feasibility of delivering the Action Schools! BC model

Workshop training was highly rated by Intervention teachers and 95% were very or extremely satisfied. Ninety-eight percent were very or extremely satisfied with workshop delivery. Following the workshops, 75% of teachers indicated they would use workshop content and 70% were confident to very confident in their ability to utilize activities in their classroom. Sixteen percent were somewhat confident. Seven teachers (8%) did not intend to use the workshop content in their classroom.

*Teachers* (91%) were highly satisfied with the components of AS! BC. They ranked their satisfaction with resources and the Support Team as 4 or 5. Data from teacher focus groups, showed that the School Facilitator helped teachers feel more comfortable and that the hands-on instruction and school visits were helpful.

“... It gave me confidence to carry out my obligations at least in the PE part of my responsibilities. And that was due to the workshops and the material. ... I had a wealth of information at my fingertips that I normally wouldn't be able to think of.”

Key themes and sample quotes from teachers, administrators and School Facilitators illustrate benefits/impacts, facilitators and barriers to implementation of the AS! BC model (Table 3). Positive change in students and the school climate was a common theme for administrators and teachers. Themes that emerged from School Facilitators and teachers overlapped substantially. Themes that crossed both groups were well-resourced implementation (facilitator), competition for curriculum time, teacher overload and coordination (barriers). Administrators also emphasized the importance of support from the Support Team (6/18 passages) and staff buy-in (5/18 passages).

*Children* in the focus groups were highly aware of the program and the evaluation and thought it was “fun”. Each child liked and disliked something different about AS! BC activities: emphasizing the need for variety and choice. Themes that emerged when the children talked about the impact of AS! BC were increased PA in class, recess and at home and children felt they were healthier, stronger, happier and tried harder.

“Like (AS! BC) helped me a lot because like before I wasn't that active. And now I am like the activist kid in the whole family.”

*Parents* felt that provision of PA at school was very important. They emphasized the importance

of their children being introduced to new activities:

“my daughter didn't play badminton before ... plus because (some) kids don't have it at their home, they have to do it at school.”

They also voiced that PA helped day to day learning and that it was a life long skill. Parent awareness of the initiative was mixed, ranging from one parent seeing it on a TV program to others just remembering the recruitment letter or hearing comments from their children. Parents felt that AS! BC needed to be promoted more with families. Parents also had mixed opinions about the impact. One parent wondered,

“what is the difference between this and recess?”

Parent response to the program was perceived as positive by teachers and administrators.

“the parent community in turn has responded by giving us funds for extra PE equipment, playground equipment. They have helped us do some of our runs in terms of supervision for safety.”

*Administrators* further emphasized the need for communication, the importance of both making PA a school goal and resources as key lessons learned. School Facilitators emphasized the importance of providing time for teachers to familiarize themselves with resources, communication and promotion, working with teacher's comfort levels and being flexible.

## Discussion

Action Schools! BC (AS! BC) utilized an 'active school' approach to increase opportunities for children to be more physically active within school. AS! BC Intervention schools provided students approximately 10 extra minutes of PA per day. There was one significant discrepancy in this finding with the UP schools performing as well as the LS schools in Phase I. This may have resulted from seasonal variations in the provision of PA (most of the schools were entering track and field season and one UP school practiced every day) combined with the short measurement time period. Although some researchers<sup>21,36</sup> have questioned the clinical significance of small increases in PA, others<sup>37</sup> would argue that small changes in whole populations have population health significance. Indeed, if incremental changes are made in all settings, the likelihood of achieving health benefits increases. Previous school-based PA research has also demonstrated the importance of school-based PE as a contribu-

**Table 3** Facilitators and barriers to implementation: key themes and sample quotes by Intervention teachers ( $n=28$ ), administrators ( $n=7$ ) and Action Schools! BC (AS! BC) School Facilitators ( $n=2$ )

Focus group participants	Themes ( $\pm$ )	Sample quotes
Teachers	<i>Benefits</i>	<p>"I think when you do a lot of games and so on in your classroom I think that helps to create sort of a climate of belonging and so on ... and even from our point of view, our interactions with the kids perhaps too, is a little more positive because we are doing all these sort of interesting things"</p> <p>"...it's a good way of building community ..."</p> <p>"but I think the most important thing that happened to me was it made me aware that I need to do a bit more" and "You know even personally, like I have joined a gym, you know, like God I have never exercised in my life! You know"</p> <p>"I think it really encouraged me to truly explore the potential of physical activity beyond just using the gym twice a week" and "it has become part of my teaching, the physical activity ... The kids like it"</p> <p>"It's the complexity of school as a place where teachers are under constant pressure to meet the curriculum, to assess, evaluate, do the paper work"</p> <p>"Sometimes equipment and not having the equipment we needed to do some of the things that we wanted to try to be new"</p>
	<ul style="list-style-type: none"> <li>Increased student PA</li> <li>Fitness/awareness of PA</li> <li>Parental awareness</li> <li>Teacher camaraderie and cooperation</li> <li>Student leadership</li> <li>Enhanced interactions with students</li> <li>Personal change</li> </ul>	
	<i>Facilitators</i>	
	<ul style="list-style-type: none"> <li>Access to resources</li> <li>An obligation and permission to devote class time to PA</li> <li>The positive response of the students</li> <li>The design of the model (flexibility) and the related supports</li> </ul>	
Administrators	<i>Barriers</i>	<p>"a little shot in the arm of what we can do to provide that for all of the students, in a way that can fold pretty comfortably into just every day school"</p> <p>"The kids have really benefited from it and I think that people see that"</p> <p>"Well I think one of the main things has been the Action School support from the teacher and the resources. Those have been big"</p>
	<ul style="list-style-type: none"> <li>Teacher constraints (moving a class from classroom to classroom, competing curriculum, needing some preparation time, report cards and remembering)</li> <li>Needing a supportive school environment</li> <li>Physical barriers (appropriate footwear and clothing, poor weather, video player not in the class)</li> </ul>	
	<i>Benefits</i>	
	<ul style="list-style-type: none"> <li>Increased awareness of PA</li> <li>Staff acceptance of the initiative</li> <li>Positive changes in the students</li> <li>Positive school climate</li> </ul>	
	<i>Facilitators</i>	
	<ul style="list-style-type: none"> <li>Resources</li> <li>Parent support</li> <li>Communication</li> <li>Starting small</li> </ul>	

Table 3 (Continued)

Focus group participants	Themes ( $\pm$ )	Sample quotes
AS! BC School Facilitators	<b>Barriers</b> <ul style="list-style-type: none"> <li>• Scheduling and coordination</li> <li>• Time constraints</li> <li>• Teacher attitudes</li> <li>• Space limitations</li> <li>• Language and culture</li> <li>• Government support</li> </ul>	<i>"In terms of barriers, not enough time. Not enough time for planning, not enough time for teachers meeting together and trying to work things out"</i>
	<b>Benefits</b> <ul style="list-style-type: none"> <li>• Witnessing the benefits of the program</li> </ul>	<i>"That sense that things are starting to snowball . . . Like there are always people who are gung ho right from the start . . . . But now we are starting to get the stragglers pulled in. And that feels good"</i>
	<b>Facilitators</b> <ul style="list-style-type: none"> <li>• Weather</li> <li>• Children's response</li> <li>• Teachers' support</li> <li>• Flexibility of the model</li> <li>• Provision of resources</li> </ul>	<i>"Somebody who never taught dance before to feel comfortable enough to start without me"</i>
	<b>Barriers</b> <ul style="list-style-type: none"> <li>• Weather</li> <li>• Teacher overload</li> <li>• Limited teacher time to familiarize with the resources provided</li> <li>• Lack of teacher belief in the priority of PA</li> <li>• Lack of communication</li> </ul>	<i>"I see a difference in their ability to engage in a task and it is becoming part of (their) routine like math and science and social studies. And that for me is the biggest thrill because we are all of a sudden taking these generalist teachers who maybe didn't like PE in the beginning um for the most part . . ."</i>
	<ul style="list-style-type: none"> <li>• Accessibility of some activities (e.g. video, fast access to outdoor</li> <li>• Space if class was on the third floor, etc.)</li> <li>• Students' inappropriate clothing</li> </ul>	<i>"The feelings that teachers have that there is not enough time. That there are too many learning outcomes in the curriculum"</i>
		<i>"I find that it is a problem that kids are not required to dress appropriately. I have kids running around in sandals and thongs, and undone shoes, and shoes that do not fit, and no socks, and big floppy baggy pants, and chains hanging off them, and it just gets in the way"</i>

tor to total PA levels and has shown that extra-curricular PA is not related to the provision of PA/PE during the school day.<sup>38,39</sup>

Key findings from the AS! BC process evaluation demonstrated that a 'whole school' approach was both feasible and highly acceptable to promote PA in elementary schools. AS! BC invested in generalist teachers as the primary point of entry into the school and we provided teachers with the resources, training and support they required to develop and deliver an Action Plan. The results highlighted the positive influence of this investment strategy. Previous school-based trials have

also highlighted the need to provide incentives for teacher participation<sup>40</sup> and adequate equipment.<sup>41</sup> Administrator support has also been emphasized as critical for success of school-based PA and healthy eating models.<sup>41</sup>

The positive attitude of students created a supportive social context that clearly influenced teachers' willingness to implement components of the AS! BC model. A benefit worth investigating further within a workplace health promotion model is positive teacher lifestyle change and enhanced staff camaraderie. Dowda et al.<sup>41</sup> found that teacher PA levels were related to active classroom promotion.

Our results highlight the importance of reaching out to and improving the involvement of parents, as parents did not always understand the objectives of AS! BC. AS! BC did not seek change in the family environment, where as other studies have specifically targeted them for behaviour change.<sup>42,43</sup> AS! BC provided a set of school newsletter inserts for schools with a focus on ‘Family and Community’ and presented to the PAC at the outset of the project to encourage them to support health promotion initiatives in the school. Each school varied in its approach to parental involvement in activities. More intensive outreach to the parents could include ensuring their participation on the action planning team, implementing school/family health events and workshops and health-related homework activities that involved the whole family.

We identified challenges of tracking and evaluation. These have been identified by others.<sup>43</sup> Central to these studies are high quality measures of dose of PA delivered. Thus, it is essential to involve teachers and administrators in the planning stage and identify practices and processes that are acceptable to them. We achieved this by undertaking a one day facilitated brainstorming and planning session during the development stage of the trial. The AS! BC Support Team also convened a School Advisory Committee that provided ongoing feedback for course adjustments. We also invited teachers, principals and higher level administrators from within the public education sector to sit on the AS! BC Provincial Advisory Committee.

These results support integrating PA across the school day and engaging school communities and generalist teachers to positively alter the school environment. The AS! BC model was effective, providing more opportunities for ‘‘more children to be more active more often’’ and as such has the potential to provide health benefits to elementary school children. The importance of assessing the impact of these school level changes on the health behaviour of children served by the school is highlighted. Future research should examine the feasibility and impact of increasing the ‘dose/amount’ of prescribed intervention within and across zones as well as enhancing the objective measurement of PA delivered specifically in each zone.

### Practical implications

- Teachers who received Action Schools! BC training and resources provided on an average 55–67 more minutes of physical activity per week than Usual Practice schools.

- Satisfaction with training and support was high. Benefits of the model included positive changes in the children and school climate, provision of resources, improved communication and program flexibility.
- The AS! BC model was effective, feasible and highly acceptable for promoting physical activity in elementary schools and as such has the potential to provide health benefits to elementary school children.

### Acknowledgements

We express our sincere gratitude to all of the students, parents, teachers, administrators and community stakeholders who participated in AS! BC and special thanks to the AS! BC Support Team led by Bryna Kopelow and Jennifer Fenton of JWSporta. We acknowledge the British Columbia Ministry of Health, 2010 Legacies Now, BC Ministry of Tourism, Sport and the Arts and the Provincial Health Services Authority for project funding.

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