

# Academically Oriented Activity Breaks for First-Grade Chilean Students: Development and Pilot Testing Effectiveness

Juliana Kain, MPH<sup>1</sup> , Alejandra Ortega, MS<sup>1</sup> ,  
María Luisa Garmendia, PhD<sup>1</sup>, Camila Corvalán, PhD<sup>1</sup>,  
Paola Marambio, MS<sup>2</sup>, Joanna Rojas, MS<sup>1</sup>, Camila Muñoz, BS<sup>1</sup>,  
and Barbara Leyton, MS<sup>1</sup>

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## Abstract

We developed and pilot tested the effectiveness of a physically active academic program, Active Breaks (AB), whose objective is to increase school time moderate/vigorous physical activity (MVPA) among first graders, through daily 15-minute bouts of MVPA, at the beginning of the first lesson. Initially, 240 cards including one game each were developed and tested in first-grade students from 16 schools in Santiago. Trained observers and school teachers assessed the time, ease, and feasibility of implementation for each card. Barriers and facilitators to implementation were obtained from semistructured interviews to 14 teachers (out of 16). In eight schools ( $n = 556$  students), we compared school time MVPA (with accelerometers) at baseline and follow-up, using test of proportions. One-hundred and twenty cards (games) complied with all aspects. AB were implemented 50% of the time with a duration of 14 minutes ( $SD = 5$ ). More than 90% of the time, teachers felt competent to conduct AB, and children understood the instructions and enjoyed the activity. The main facilitators included teachers liking physical activity and considering it important, support of principal and school staff, and conducting AB inside the classroom. Barriers included teacher's workload and having to conduct AB during the first lesson. During the 4-month period of implementation, MVPA increased by 1.5 and 1.2 percentage points in boys and girls, respectively. The set of 120 cards is easy and feasible to implement. Moreover, preliminary results suggest they could be effective in increasing MVPA during school time, although studies with longer follow-ups are needed to assess the validity of these findings.

## Keywords

barriers, facilitators, MVPA, physical activity lessons, school children

Although there is plenty of evidence that physical activity (PA) in children has numerous health benefits (Janssen & Leblanc, 2010), young children in most developing and developed countries do not meet the daily guideline of 60 minutes of moderate and vigorous physical activity (MVPA) or, alternatively, any kind of PA for 15 minutes of every waking hour (Pate et al., 2015).

Chile has one of the highest obesity rates in the world; nationally representative data from 2018 show that among 6-year-old children, 24.4% are obese and 26% overweight (JUNAEB, 2018). The PA situation is also very deficient, as shown by the global initiative called Physical Activity Report Card, which rated it with an “F” (fail; Aguilar-Farias et al., 2016).

Physically fit children are not only healthier but also have a better cognitive development (Carson et al., 2016), and as shown by several studies, the implementation of interventions to increase children's PA level, designed so as not to increase teachers' academic load, have a better probability of being accepted by the school (Norris et al., 2015).

<sup>1</sup>Universidad de Chile, Santiago, Chile

<sup>2</sup>Universidad Central de Chile, Santiago, Chile

### Corresponding Author:

Juliana Kain, INTA, Universidad de Chile, Avenue El Libano 5524, Macul, Santiago de Chile 1025000, Chile.

Email: jkain@inta.uchile.cl

A type of intervention that targets these two objectives is the so-called “Physically-Active Lessons,” which can contribute in increasing school time MVPA and curricular learning, by having children perform short bouts of PA during regular lessons. One of the first programs to integrate academic instruction with PA was “Take 10,” developed by ILSI Research Foundation in 2001 in the United States. It promotes daily 10 minutes of PA in children from first to fourth grades during regular lessons. Apart from being implemented in several schools in the United States, it has also been tested in China, the United Kingdom, Brazil, and Chile. An overall evaluation after 10 years of implementation showed that teachers were willing and able to implement it (on average 4.2 days/week) with positive outcomes in PA, body mass index, and academic scores (Kibbe et al., 2011).

Other studies that were conducted later showed that “encouraging teachers to integrate PA into the classroom can significantly improve both PA as well as academic performance” (Erwin et al., 2011, p. 456; Grieco et al., 2009). This is a big challenge, because implementing PA programs successfully largely depends on the teachers’ perceptions, attitude, and motivation, so achieving change in their behavior is a critical aspect of this type of intervention. It is therefore recommended that these interventions be framed within behavior change models. The evidence also shows that apart from teacher’s characteristics, other barriers include time constraints, academic pressure, and lack of support from school staff (Kahan, 2008).

Although there can be consensus that physically active lessons are a novel way of introducing PA during school time, it is important to have evidence that its implementation is effective in reaching recommended PA guidelines. Recently, in a systematic review by Norris et al. (2015), which included seven studies with physically active lessons, there was an increase in PA during school time. Of these, four studies determined PA with accelerometers showing an overall improvement in two of them, while in the third study, PA increased among the least active girls and only among the normal-weight children in the last study. As discussed by the authors, there is no clear evidence of the effectiveness of this type of intervention on PA, as studies were mostly done in the United States, used different devices to determine PA, and most measured it only during school time.

In 2017, we developed and pilot tested a physically active academic program for low-income students in first grade. We named it Active Breaks (AB), and its objective was to increase daily school time MVPA by providing children with culturally appropriate games to be performed for 15 minutes daily at the beginning of the first lesson. In contrast to the Take 10 program, which is conducted in three bouts of 10 minutes each and includes games associated with three subjects, AB was developed to be implemented during the first lesson and is associated with six subjects taught in first grade. This pilot study involved four stages: (a) developing the educational material (cards) to be used when conducting AB,

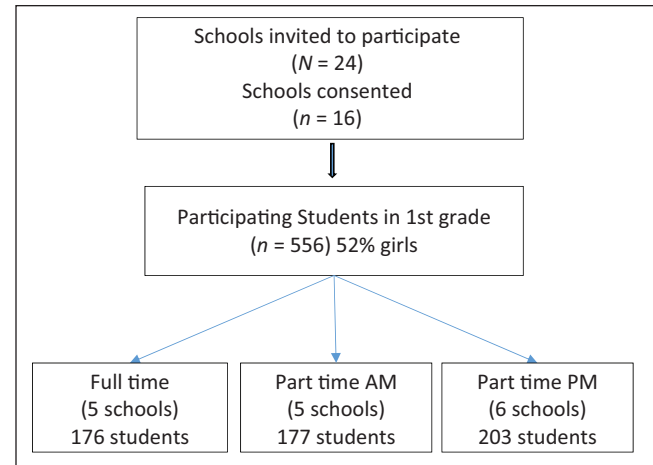


Figure 1. Sample flowchart.

(b) implementation of the program, (c) reporting barriers and facilitators to implementation, and (d) pilot testing the effectiveness of the program on PA intensity during school time.

The objective of this article is to document the process of developing and implementing AB and determine the change in school time MVPA after implementing this program.

## Method

We used both quantitative and qualitative methodologies with an iterative approach that includes a constant review of the initial strategy and simultaneous data collection and analysis, in order to adapt the outcome to the participant’s realities on the field and better fulfill the research objectives.

Because the Ministry of Education ranks every public school in terms of their percentage of vulnerable children (based on anthropometric and socioeconomic characteristics), we were able to select schools with a high proportion of low-income children (JUNAEB, 2019). We invited 24 public schools from two geographical areas of Santiago; 16 accepted, eight from each area. As shown in Figure 1, some children attended school the whole day, while the rest half day, either morning or afternoon. If the school had more than one first-grade class, the school principal selected the one that would participate.

### Development of the Educational Material (Cards)

**Data Collection.** To define the design and content of the cards, we first conducted two focus groups (about 1.5 hours each) with eight participating school teachers (Morgan, 1998). Specifically, they were consulted on the most popular games for 6-year-old children, how best to write the instructions, the type of illustrations, and where to place them on the card.

Based on the results of the focus groups, a team formed by four physical education (PE) teachers, one classroom

teacher, two anthropologists, one dietitian with expertise in health promotion, and one graphic designer developed each card. These include one game each so that children can accumulate a high proportion of MVPA, during approximately 15 minutes and contain illustrations and indications to the teachers on how to conduct AB plus an explanation on how the game is associated with a specific learning objective. They are intended to be delivered at the beginning of the first lesson (as requested by the funding agency) associated with the learning objectives of six subjects taught in first grade (Spanish, Math, Natural Sciences, Social Sciences, Music, and English). The number of cards is related to the number of days the specific subject is normally taught during the first lesson.

Initially 240 cards were developed of which 185 (selected by the teachers) were validated. This process consisted in applying these cards and consulting teachers on the children's level of participation, if the instructions were clear, if they liked the games and illustrations, if the activity was moderate, if it was related to the curricular objective, and if it was culturally pertinent and nonsexist in its language or type of game.

**Data Analysis.** The focus groups were recorded and transcribed for further qualitative content analysis, and the results were an input to develop the 240 cards to be implemented by the trained teachers.

The data collected through the implementation process were also analyzed using content analysis to reach consensus between the most liked, used, and overall pertinent cards according the teachers' checklists, and develop the final set of 120 cards.

### **Implementation of the Program**

**Teacher Training.** We hired four PE teachers (research teachers) to help with training and monitoring implementation. Participating teachers completed two workshops (6 hours each). They were female primary school teachers, aged 25 to 60 years with no additional training in physical education.

During the first workshop, we delivered topics related to the benefits of PA and presented the initial draft of 240 cards. Immediately afterwards, participating teachers began implementing AB supported by the research teachers who visited each school twice a week during the first month to explain, correct or answer technical questions.

The second workshop was conducted at the end of the first month to discuss their experience on the implementation. For the following 3 months, research teachers visited each school once a week.

**Data Collection.** Data were collected throughout the implementation period (4 months) from participating teachers, research teachers, and our research team (specifically on characteristics of the school environment), while barriers/

facilitators were assessed using in-depth interviews administered to participating teachers.

**School teachers.** The 16 participating teachers completed 844 logs; these logs included the following quantitative and qualitative aspects (the latter collected using a Likert-type scale):

- The time AB began and ended
- The card number used (shows the subject of the class being taught and the game)
- Positive and negative aspects of the card
- Teachers' appreciation of AB conducted during the week
- Teachers' perception of students' motivation and enjoyment

**Research teachers.** The four research teachers filled in 186 logs during the implementation period. These logs included the following:

- Number of students present in the classroom
- Number of participating students during AB
- Location (inside the classroom or yard)
- Teachers' attitude and motivation
- Inquiries by teachers on how to interpret the instructions on the card

**School environment.** In order to characterize the potential environmental factors associated with how AB were conducted, two members from our research team visited each school twice and collected data using the nonparticipant observation technique (Canales, 2006; Flores, 2012). Data were collected on school infrastructure, characteristics of the classroom and the yard, and interaction between principals and students with participating teachers.

**Data Analysis.** Data were analyzed and reported using descriptive statistics (frequency [%] for categorical data or mean [standard deviation] for continuous data).

### **Barriers and Facilitators to Implementation**

**Data Collection.** Using semistructured questionnaires (Canales, 2006; Flores, 2012), we interviewed 14 (out of 16) participating teachers at the end of the study with the aim of collecting data on barriers and facilitators to implementing AB. Questions included teacher's personal data, self-competence to implement activities related to movement, daily experience at school (routine, interpersonal relations, PA opportunities), and perception on AB (practical and logistic issues, recommendations). The goal was to understand actual conditions in the contexts and terms of the participants to engage in further decisions accordingly (Denzin & Lincoln, 2005; Flores, 2012; Guba, 1990).

**Data Analysis.** Both instruments were transcribed literally and stored digitally, assigning them a code. They were analyzed using the qualitative content analysis technique and the Atlas ti 7 software (Charmaz & Belgrave, 2012). The approximation to the data was carried out in an inductive way in two stages, following the methodology of the grounded theory (Strauss, 2002). The first one is an open coding, where all the topics are identified in the discourses even if they were not previously considered in the formulation of the study, and then, in a second stage using axial coding, relationships were established between the emerging codes and those issues raised from the design, in order to achieve a more comprehensive understanding of the data.

### **Effectiveness of Active Breaks**

**Data Collection.** Of the 16 participating schools, we selected eight, taking into account geographical area and school schedule. In each school, we determined the variation in school time PA of participating first-grade students in days with no physical education lessons. At baseline, accelerometers (Actigraph GT3X, Actigraph LLC, Pensacola, FL) were worn one school day by 170 children (50% girls). The devices were placed on the right hip with an elastic belt that was removed when the school day ended. At follow-up, we placed the accelerometers on the same children, on average, for four school days per child, so as to determine PA intensity when different cards were used (a total of 543 observations on days including AB). Accelerometers were programmed to record at a 15-second epoch length, which has been used in most studies including young children (Migueles et al., 2017).

**Data Analysis.** Cut-points to define PA intensity were determined by counts per minutes (cpm): sedentary (0-204), light (205-976), moderate (977-1527), and vigorous ( $\geq 1528$ ; Butte et al., 2014; Verbestel et al., 2015). The data were processed with ActiLife 6 Software from Actigraph. We determined categories of PA intensity during school time on the same children, by sex at baseline (no AB) and the average PA intensities during 4 days, which included AB (follow-up). We compared in each sex, PA intensity (in minutes) at baseline with that at follow-up, using paired *t* test; a *p* value  $< .05$  was considered as significant. Stata 15 was used for the analyses.

## **Results**

### **Development and Implementation of the Program**

After the process was completed, a total of 120 cards compiled with all aspects named previously (Figure 2 shows an example), either with the original design or with modifications suggested by the teachers. Because schools had different

schedules, initially we sought to determine if there were differences in the implementation process by schedule; however, when we compared the results separately and analyzed the interviews with teachers, we observed that differences were mostly related with teacher engagement, staff commitment, and school characteristics rather than schedule (not shown). So we present the results as average for all schools divided into those obtained from classroom and research teachers (Table 1).

AB in the 16 schools were planned to be delivered during 73 days. Participating teachers filled in 72% of the logs. On average, AB were conducted 50% of the time, 2.5 times a week ( $SD = 0.7$ ); their mean duration was 14 minutes ( $SD = 5$ ) and 75% of the time they were conducted during the first class. They were mostly conducted indoors (68% of the time) with teachers being very participative (75% of the time). It is worth noting that classroom teachers reported that almost in every class, children were motivated to participate; however, the average percentage of children actively participating was 70% (as shown by the research teachers). Cards related to Math and Language were used more frequently (20.4% and 18.8% of the total set, respectively), because those two subjects were taught more often during the first lesson. The main reasons school teachers did not conduct AB were lack of time (30.4%), suspension of classes and/or modification of the activity by school authorities (27.3%), and trained school teacher was absent (16.3%; data not shown).

### **Barriers and Facilitators to Implementation**

From the results of the in-depth interviews administered to teachers and the recording of observations, categories were established that can be considered either as barriers or facilitators. Although the questionnaire administered contained the following items: teachers' personal information and motivation to participate in the AB project, school environment and infrastructure (day-to-day activities and workload, PA, interpersonal relations), and experience implementing AB in terms of the card's content and how would they improve them. We also present results from aspects that came up spontaneously during the interviews (teaching methods and schedule) that we consider important to show.


**Infrastructure.** The school infrastructure in general was adequate. As expected, in classrooms with more space, teachers could implement AB with greater fidelity. Although sometimes teachers had to share the yard when conducting AB, this was not considered as an important barrier. Access to a roofed yard was regarded as a facilitator, especially if it was located near the classroom.

**Teacher Workload.** The overload of teaching tasks was regarded as a barrier to every teacher, since preparation on

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## MANY ANIMALS

OAT 8 - OA 3

**ACTIVITY**

**Initial questions:** What animals do we know? Which is your favorite one?

**Teacher's task:** Invite the children to form a circle in order to name different animals in English and represent them through a motor skill. Each imitation should be done moving towards the center of the circle and then move backwards to where it started. The teacher begins with rhythmical applauses, naming one animal in Spanish and then with all the children repeat the name in English.

1. "We are cats!" (They move using 2 legs and 2 hands without the support of knees towards the center, they stretch like a cat and then to the original position).
2. "We are birds!" (They run lifting the knees towards the breast and beating their arms like wings, come back running moving their arms like landing).
3. "We are fishes!" (They move following curved lines with the hands over the heads simulating a fin and come back in the same way).
4. "We are penguins!" (They move with the arms next to their body simulating fins and moving slowly like penguins come back running with the arms backwards bending slightly towards the front).
5. "We are horses!" (they move galloping lifting the knees and come back galloping sideways).
6. "We are dogs!" (They move with 2 legs and 2 hands with the support of knees, barking).
7. Each child chooses their favorite animal and names it in English and later imitates it with the rest of the class.




Figure 2. Example of a card.



**Table 1.** Quantitative and Qualitative Variables Collected During the Implementation of Active Break Program.

No. of teachers who answered the questions	<i>n</i>	%	<i>M</i>	<i>SD</i>
School teacher logs ( <i>n</i> = 844)				
Active Breaks implemented	525	62.2		
Days/week of Active Breaks implemented, number of days			2.5	0.7
% time teachers felt they could perform Active Break	473	90.0		
% time children understood the instructions	486	92.6		
% time children were very motivated in participating	507	96.6		
Active Breaks conducted during first class of the day	389	74.0		
Duration of Active Breaks, minutes			14.0	5.9
Location (% Active Breaks conducted inside the classroom)	358	68.1		
Research PE teacher logs ( <i>n</i> = 186)				
% time the teacher is actively involved in the Active Break	140	75.0		
% of children actively participating in the Active Break	130	70.0		

Note. PE = physical education.

how to conduct them sometimes had to be done after school, thus leaving little time to plan the implementation: “. . . in general, I prepare classes for the kids at home. I do not have time to do this at school” (Teacher 8). A strategy proposed by the participants is to incorporate the program when developing their annual planning.

**Teaching Methods.** This refers to the approaches, techniques, and strategies used to teach curricular contents. While classrooms were decorated in a similar way, differences were observed on the quality and availability of materials. How class contents were delivered depended on teachers’ characteristics and engagement and children’s interests, resulting in two categories: a traditional one (quiet children and unidirectional teaching) or a dynamic one (more participative and open to include different strategies such as games). The last one was considered a facilitator to implement AB.

**Motivation.** If teachers had a positive perception on physical activity and a healthy lifestyle, they were more motivated to implement the program with greater fidelity: “. . . I found that the project is very organized. If children are always sitting for example, giving them fifteen minutes of exercise is good for their health” (Teacher 15).

**Relations and Support.** This aspect indicates the process of approximation and contact between researchers and teachers. Support from research teachers and training was considered very valuable, since they contributed to understanding the card’s content and how to conduct AB. One of the barriers though was the lack of support from administrative and other school staff to implement the program.

**Design and Content of the Cards.** The design and content of the cards were found to be suitable, as each one presented one game, thus allowing teachers to show the children the

illustrations on how to perform the games. “[The children] like the drawings, they want to look at them, they want to browse through the cards” (Teacher 1).

Although activities presented in the form of games were attractive for both teachers and children, information collected from the logs and some interviews indicated that when AB finished, some children were restless. This constituted a difficulty for some teachers if they considered that this behavior affected the subsequent learning process because “in order to understand what they are going to do, we need them to be calmer” (Teacher 7), while for other teachers this behavior became a facilitator: “I think that more activity is good, [ . . . ] it’s true that they become very excited, but also mentally and are eager to participate” (Teacher 4).

**Schedule.** Performing AB during the first 15 minutes of the school day often became a barrier, especially in schools with full-time or morning schedules, because other activities could be programmed to be executed during the first class. On the other hand, when teachers decided when to implement AB, based on aspects such as no interference with other academic activities and children’s behavior; this was regarded as a facilitator:

. . . last Wednesday we did the bicycle, [ . . . ] when we finished the school day, [usually they don’t want to do anything during the last class, but they ended motivated]. So, we can occupy the cards not only during the first class, but also during the last one. (Teacher 1)

### Effectiveness of Active Breaks

Tables 2 and 3 show PA intensity in terms of minutes and percentage during school time at baseline and follow-up in boys (Table 2) and girls (Table 3). Around 90% of the time, first graders were either sitting or in light activity. At baseline, boys engaged on average 10% of the time in MVPA

**Table 2.** Comparison of Physical Activity Intensity During School Time After Implementing AB in Boys.

PA intensity during school time	Baseline		Follow-Up	
	Minutes, <i>M</i> ( <i>SD</i> )	%	Minutes, <i>M</i> ( <i>SD</i> )	%
Sedentary	174.9 (44.3)	53.5	165.5 (41.4)	51.7
Light	118.1 (30.0)	36.5	116.1 (24.4)	36.8
Moderate	21.4 (8.3)	6.5	23.3 (6.9)	7.4*
Vigorous	11.4 (8.4)	3.5	13.1 (7.0)	4.2*
MVPA	32.75 (15.1)	10	36.4 (12.5)	11.5*

Note. *n* = 84. AB = Active Breaks; MVPA = moderate + vigorous physical activity; PA = physical activity.

\*Significant difference in mean minutes between follow-up and baseline, paired *t* test.

(32.8 minutes) while girls only 25.8 minutes or 7.7% of total school time. At follow-up, MVPA increased similarly in both sexes (on average 3 and 2.6 minutes in boys and girls, respectively). Significant differences were observed in MVPA between baseline and follow-up (due to both moderate and vigorous PA in boys in moderate PA in girls).

## Discussion

The most important results of this study show that through a rigorous process that involved both quantitative and qualitative research tools, we developed a set of 120 cards containing games associated with the learning objectives of six subjects taught in first grade to be conducted daily at the beginning of the first lesson. Although these were planned to be delivered every day, on average, they were implemented 50% of the time; mostly because of time constraints, teachers who taught the first lesson were not the participating teachers, so they were untrained and other activities that demanded the whole lesson time such as tests and holidays (results not shown). The average duration of AB was close to the expected time (14 minutes), teachers felt competent 90% of the time to implement AB and reported that children were very motivated in participating. Information regarding the proportion of time teachers were actively involved and the percentage of children participating actively were high, 75% and 70%, respectively.

Because schools constitute a key setting in promoting PA (Kriemler et al., 2011), it is very important to identify and

target the barriers to implementation. In this study and similar to others reported elsewhere, these mostly relate to teachers and school characteristics (Naylor et al., 2015; Russ et al., 2015). The first ones include being convinced of the importance of PA for health reasons and cognition, previous training, perceived self-competence, academic load, and motivation. Among the school characteristics, the most important ones are support of stakeholders and availability of facilities to conduct AB.

Teachers play a critical role on integrating and encouraging increased physical activity. They are expected to serve as models so barriers and facilitators to implementation should be addressed from the beginning, especially during the training process (Dyrstad et al., 2018).

The only study that integrated short bouts of PA into the curriculum of Chilean students was implemented in 2013 in Santiago (Mardones et al., 2017). Its objective was to test the suitability to implement the Take 10 program (translated into Spanish and adapted to local conditions) in 89 first-grade students and determine changes in anthropometry, blood pressure, and hand grip strength after 3 months of implementation with constant supervision. A lack of space was reported as the main barrier. Because of the short period of implementation, no significant differences were found in the health parameters.

Similar interventions include one in Canada in which some provinces have implemented a PA program that provides 30 minutes of daily PA at school, on days without a PE lesson

**Table 3.** Comparison of Physical Activity Intensity During School Time After Implementing AB in Girls.

PA intensity during school time	Baseline		Follow-Up	
	Minutes, <i>M</i> ( <i>SD</i> )	%	Minutes, <i>M</i> ( <i>SD</i> )	%
Sedentary	189 (138.5)	57.8	185 (135.2)	57.1
Light	114 (34.0)	34.5	108.9 (27.5)	34.0
Moderate	16.4 (7.9)	4.9	18.3 (6.1)	5.7*
Vigorous	9.4 (7.7)	2.8	10.1 (4.9)	3.2
MVPA	25.8 (14.6)	7.7	28.4 (9.6)	8.9*

Note. *n* = 86. AB = Active Breaks; MVPA = moderate + vigorous physical activity; PA = physical activity.

\*Significant difference in mean minutes between follow-up and baseline, paired *t* test.

(Weatherson et al., 2017). It also identified barriers and facilitators to implementation using 14 domains that help categorize behavioral and environmental aspects influencing implementation results. Among the most important barriers, they reported lack of time and space, bad weather, teacher workload, and lack of school support, while among the facilitators they identified student enjoyment and improved learning.

A recent systematic review by Norris et al. (2015) dealing with methods and results reported by 11 studies that implemented physically active lessons mostly implemented in elementary schools found that although overall PA increased in most studies, the evidence was not clear if these lessons had an impact on MVPA. Regarding educational outcomes, the authors of this review found that because studies determined these effects using very different outcomes, ranging from “on-task behavior” to curricular knowledge, it was not possible to obtain conclusive evidence on the validity of this association.

The change in MVPA over the implementation period (4 months) is comparable to that obtained in the “Virtual Traveller” intervention (Norris et al., 2018) applied in 10 schools for 8-year-old English children and consisting in 10-minute breaks (three times per week). After 6 weeks of intervention, PA assessed with accelerometers (different devices and cut-points as the ones we used) showed significant reductions in their secondary outcomes (sedentary time and light PA during school time). In our study, sedentary minutes declined by 10 and 4 minutes in boys and girls, respectively, which is the same reduction obtained in the Virtual Traveller Intervention.

One of the important strengths of this study is that although the research team has a vast experience on active games associated with the curriculum, they took into account the results of the focus groups with participating teachers for the initial and final selection of the games. Through the continuous monitoring of the implementation process, we were able to observe and support teachers in order to obtain feedback on how teachers perform the activities (attitude, motivation, and engagement), the degree of children’s participation, which cards they liked/disliked, and the location where AB were conducted. With data collected from different sources plus the results of the in-depth interviews with participating teachers, we believe that these cards include games with an overall moderate PA intensity, that teachers know how to interpret, are enjoyable to both teachers and children in first grade, and can be conducted in typical classrooms found in Chilean public schools. These results emphasize the need to engage in multi sectoral work between education and health in schools in order to achieve positive outcomes.

Results from individual interviews provide an overall vision on barriers and facilitators to implementing AB. Using an iterative qualitative design, focusing on the participants from an interdisciplinary perspective contributed in developing a culturally relevant strategy. Finally, because most published studies on active lessons are based in the United States

(Norris et al., 2015), Active Breaks based on culturally appropriate cards makes it easier to be accepted by local school authorities.

We acknowledge that PA intensity measured only once at baseline may not reflect the true average time of the different PA categories; however, these were determined on days with no PE lesson and its distribution is very similar to that reported in 2016 for 5-year-old Chilean children from public schools (Kain et al., 2017). In that study, average MVPA minutes during school time was 35.1 and 26.1 for boys and girls, respectively, compared with 32.8 and 25.8 obtained in our study.

One of the most important limitations is that this program was not included when teachers elaborate their annual planning, around 2 months before the beginning of the school year. This is probably the main reason why AB were implemented half of the time, as teachers had to integrate them to their already planned activities. Because of time constraints, we were unable to inform the parents about the characteristics of the program and although they were informed by the teachers, it would have been important to contact them personally before AB began and at follow-up, so as to obtain their opinion about the program and other aspects that influence their child’s PA. In addition, we did not develop games for children with physical disabilities; in the future these would have to be included.

## Conclusions

Creating the set of 120 cards included in AB and assessing the process of delivering them to first-grade students attending public schools is the first stage. We consider important to determine in a larger sample which cards are used more often and determine the MVPA accumulated by the children when engaging in AB, based on those cards. In addition, we recommend that teachers conduct AB when deemed appropriate during the school day. Although preliminary results on effectiveness are positive, a randomized controlled study including a larger sample, program delivered at least over 1 school year, and measurements collected on several days would provide real evidence of AB’s contribution to increasing school time MVPA. Last, future research should determine not only if MVPA increases with AB but also if it affects learning.

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## ORCID iDs

Juliana Kain  <https://orcid.org/0000-0002-4303-9824>

Alejandra Ortega  <https://orcid.org/0000-0002-3990-0538>

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