The Daily Physical Activity (DPA) Policy in Ontario: Is It Working? An Examination Using Accelerometry-measured Physical Activity Data

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ABSTRACT

Objective: In 2005, the Ontario Ministry of Education announced a policy requiring that all elementary students be provided with opportunities to participate in a minimum of 20 minutes of sustained moderate-to-vigorous physical activity (MVPA) each school day during instructional time. To the authors' knowledge, this policy has never been formally evaluated. In a form of natural experiment with Project BEAT, we explored within 16 Toronto District School Board schools the proportion of children who participate in DPA, and the proportion who achieve sustained MVPA within these sessions; these are the objectives of this article.

Methods: Consent was given by 1,027 parents/guardians for their children to participate (boys, n=478; girls, n=549). Physical activity (PA) was measured using accelerometry and classroom schedules collected to identify sessions of DPA. The frequency of DPA and number and duration of sustained bouts of MVPA (≥ 5 min) were computed and explored relative to PA levels and health outcomes.

Results: Fewer than half of the participating children were provided with DPA every day and not a single child engaged in sustained MVPA for ≥ 20 minutes. On the more positive side, children who engaged in DPA every day were significantly more active than their peers. Those accumulating at least 1 bout of MVPA were more active and likely to meet PA guidelines, and fewer of these children were overweight.

Conclusion: The majority of schools are not meeting the DPA policy. However, as the frequency and intensity of DPA increases, so do positive health outcomes. This paper provides supporting evidence that when this policy is implemented, the intended health benefits are achievable.

Key words: Accelerometer; children; health; policy; school

La traduction du résumé se trouve à la fin de l'article.

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On October 6, 2005, the Ontario Ministry of Education (OME) announced a policy requiring that "all students in Grades 1 to 8, including students with special needs, be provided with opportunities to participate in a minimum of twenty minutes of sustained moderate-to-vigorous physical activity (MVPA) each school day during instructional time".¹ Daily Physical Activity (DPA) had to be scheduled during instructional time and could occur in a variety of locations (i.e., classrooms, outdoors, the gymnasium and multi-purpose rooms). Full implementation of policy No.138, "Daily Physical Activity in Elementary Schools, Grades 1-8", was to occur by the end of the 2005-06 school year; the goal of the policy was to enable all elementary students to improve or maintain their overall health and wellness. The policy is similar to one endorsed in Alberta (<http://education.alberta.ca/teachers/resources/dpa.aspx>) and another in British Columbia (http://www.bced.gov.bc.ca/dpa/dpa_requirement.htm).

Ontario houses 4,020 publicly funded elementary schools, serving over 1 million children and youth across the province. With the potential to impact so many children and youth, Ontario's DPA policy is indeed a significant public health intervention given the importance of physical activity to health in children.² This policy has now been in place for six years; however, to the authors' knowledge, it has never been formally evaluated. More specifically, there have been no investigations as to whether schools are successfully structuring DPA into daily timetables, and whether children are in fact acquiring a minimum of 20 minutes of sustained MVPA during

these sessions. Evidence-based policies must be designed, implemented and evaluated on an ongoing basis. Evaluation helps ensure that these policies are "optimally effective and maximally utilized".³ The effectiveness of DPA is critical to evidence-based health policy and to justifying ongoing implementation of the policy.

From January 2010 to June 2011, a large-scale, multidisciplinary and mixed-method study was conducted, examining how the built environment influences school travel modes of elementary school-children in Toronto (Project BEAT; www.beat.utoronto.ca). The study was cross-sectional in nature. A total of 16 Toronto District School Board schools were involved and 1,027 parents/guardians gave consent for their children to participate (boys, n=478; girls, n=549). Physical activity was measured using accelerometry, and classroom schedules were collected to identify sessions of DPA (including Physical Education (PE)) across the school week. The collection of these data provided the opportunity to explore within

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Conflict of Interest: None to declare.

Table 1. Presenting Project BEAT Results (n=16 Toronto District School Board schools) According to the School Implementation Continuum for Daily Physical Activity (DPA)¹

Indicators	Stage 1	Stage 2	Stage 3
Schedule	Students are occasionally given opportunities to be physically active during the 300 minutes of instructional time. 16% of children sampled were occasionally given opportunities to be physically active (1-2 days per week) during the 300 minutes of instructional time.	Students are often given opportunities to be physically active each day for 20 minutes during the 300 minutes of instructional time. 34% of children sampled were often given opportunities to be physically active (3-4 days per week) for 20 minutes during the 300 minutes of instructional time.	Students are always given opportunities to be physically active each day for 20 minutes during the 300 minutes of instructional time. 49% of children sampled were given an opportunity to be physically active each day for 20 minutes during the 300 minutes of instructional time. Out of the 16 schools sampled, 3 provided this opportunity in every Grade 5 and 6 classroom. Out of the 71 Grade 5 and 6 classrooms sampled, 27 (38%) provided this opportunity.
Quality of daily physical activities	Very few students are physically active for the full 20 minutes. Just 19% of children sampled attained at least 1 sustained bout (≥5 minutes) of MVPA during scheduled DPA.	Some students are physically active for the full 20 minutes. Not a single child sustained MVPA for a minimum of 20 minutes during scheduled DPA; the longest recorded bout lasted 18 minutes.	All students are physically active for the full 20 minutes. N/A

these schools the proportion of children who participate in DPA, and the proportion who manage to achieve sustained MVPA within these sessions; these are the objectives of this article.

METHODS

Participants

A total of 1,027 parents/guardians gave consent for their children to participate in Project BEAT. Accelerometer-measured physical activity data were collected on a total of 1001 children, and their height and weight measurements were taken. Of these 1,001, 85.5% had at least 3 weekdays and 1 weekend of valid data (n=856; boys=389, girls=467). This article is therefore based on 856 participants, aged 10 to 12 years (11.1±0.6 years), who met the inclusion parameters. Using age- and sex-specific body mass index (BMI) cut-points provided by the International Obesity Task Force,⁴ participants were classified as: normal weight, overweight or obese.

Measurement of physical activity

Children's physical activity was objectively measured for seven days using accelerometry (ActiGraph GT1M; Pensacola, FL).⁵ For inclusion in data analysis, each child was required to wear the accelerometer a minimum of 10 hours for at least three weekdays and one weekend day.⁶ Time spent at various levels of movement intensity was classified according to published thresholds in children.⁷ These were used to determine levels of physical activity during school days and during the school day period. The school day period was identified using start and end times from classroom timetables, which were collected from all participating teachers. Physical activity variables of interest included total physical activity (counts·day⁻¹), mean counts (counts·min⁻¹) and minutes of moderate-to-vigorous activity (MVPA). Classroom schedules were used to identify scheduled times for DPA and PE. Teachers were informed ahead of time of the importance of providing accurate information with regard to when children were participating in DPA and PE for the week that physical activity was being measured. Classroom schedules were collected after the measurement week, in case teachers needed to make any amendments to their typical schedule.

Table 2. Characteristics of Accelerometer-measured Physical Activity According to Frequency of Daily Physical Activity (DPA) per School Week

	Frequency of DPA	
	Low (0-4 days/week)	High (5 days/week)
Total sample (number)	433	423
TPA _{WD}	422,429 (124,245)	460,778 (135,477)*
MC _{WD}	437.5 (140.9)	463.9 (166.4)*
MVPA _{WD}	30.2 (13.8)	34.1 (16.1)*
MVPA _{SD}	15.1 (7.3)	18.0 (8.8)*

Mean (standard deviation) presented; significantly higher in those getting 5 days/week, *p<0.05

WD=weekday; SD=school day

TPA_{WD} = total physical activity (counts·day⁻¹; weekdays); MC_{WD} = mean counts (counts·min⁻¹; weekdays); MVPA_{WD} = minutes of moderate-to-vigorous physical activity (weekdays); MVPA_{SD} = minutes of moderate-to-vigorous physical activity (school day)

Table 3. Percentage Attaining 1 or More ≥5-minute Bouts of MVPA During Scheduled Daily Physical Activity (DPA) per School Week, and Average Duration (min) of ≥5-minute Bouts of MVPA, by Gender

	Number of ≥5-minute Bouts of MVPA				Duration (min)
	1	2	3	4	
	% of Participants				
Total (n=165)	74.5	18.2	3.7	3.6	7.1 (2.6)
Boys (n=88)	70.5	20.5	3.4	5.6	7.3 (2.5)
Girls (n=77)	79.2	15.6	3.9	1.3	6.9 (2.9)

The number of days with scheduled DPA and PE were summed to give an overall score (DPA_{total}; maximum of 5 days per school week*). Accelerometer data were used to compute the number (frequency) and average length (duration) of sustained bouts of MVPA (i.e., those lasting 5 or more minutes) during scheduled DPA sessions.

Statistical analyses

Frequency of DPA

Relationships between the frequency of scheduled physical activity (DPA_{total}) and accelerometer-measured characteristics of physical activity (total physical activity, mean counts and minutes of mod-

* For the purpose of this article, sessions of DPA and PE are combined and presented as simply DPA.

Table 4. Characteristics of Accelerometer-measured Physical Activity of Children Who Attain at Least One ≥5-minute Bout of MVPA During Scheduled Daily Physical Activity (DPA) (n=165) and of Those Who Do Not (n=691)

Characteristic	Group	
	No Bouts	At Least One Bout
Total sample (number)	691	165
Age (years)	11.1 (0.6)	11.0 (0.6)
Height (cm)	147.4 (8.9)	147.2 (7.0)
Weight (kg)	42.2 (10.2)	38.7 (8.6)*
BMI (kg/m ²)	19.2 (3.6)	17.7 (3.0)*
BMI category (%)†		
Normal weight	67.3	86.1*
Overweight/Obese	32.7	13.9*
Physical activity measure		
TPA _{WD}	423,386 (126,369)	516,735 (124,682)*
MC _{WD}	434.4 (149.3)	518.3 (157.7)*
MVPA _{WD}	29.6 (13.5)	42.5 (16.9)*
MVPA _{SD}	14.9 (7.0)	23.3 (9.3)*
% attaining an average of 60+ minutes of MVPA across weekdays	2.6	17.0*
% attaining 60+ minutes of MVPA on at least 1 day	29.4	53.3*

Mean (standard deviation) presented; significantly different from reference group (no bouts), *p<0.01

† International Obesity Task Force classification⁴

WD=weekday; SD=school day

TPA_{WD} = total physical activity (counts·day⁻¹; weekdays); MC_{WD} = mean counts (counts·min⁻¹; weekdays); MVPA_{WD} = minutes of moderate-to-vigorous physical activity (weekdays); MVPA_{SD} = minutes of moderate-to-vigorous physical activity (school day)

erate-to-vigorous physical activity (MVPA) accumulated during weekdays (WD) and during the school day (SD)) were examined using Pearson product moment correlations, and a series of independent-samples t-tests were used to determine whether there were differences according to level of DPA participation: a) Less than 5 days per week and b) 5 days per week.

Bouts During DPA

A series of independent-samples t-tests were used to explore the number of bouts accumulated and the average length of bouts accumulated by gender. Weekday and school day levels of physical activity and the proportion meeting current physical activity recommendations for health, between those children who accumulated at least 1 bout of MVPA during scheduled DPA and those failing to accumulate any bouts, were also explored. Differences between estimates were tested for statistical significance at p<0.05.

RESULTS

Frequency of DPA

Of the 856 participants with valid accelerometer data, just under half (49%) engaged in DPA every day of the school week. A total of 16.6% engaged in DPA on 2 days, 17.9% on 3 days, and 16.1% on 4 days. These results are presented according to the OME School Implementation Continuum for Daily Physical Activity (Table 1) which appears in the resource guide for elementary school principals.⁸

Frequency of DPA was positively associated with total physical activity, mean counts and accumulated minutes of MVPA during weekdays (r=0.10 to 0.13, p<0.01), and accumulated minutes of MVPA during the school day period (r=0.19, p<0.01). Those children who participated in DPA every day had significantly higher total physical activity, the overall intensity of their activity was

Figure 1. Proportion of bouts (%) lasting 5 to 10 minutes, 10 to 15 minutes, and ≥15 minutes, by gender

greater, and they accumulated significantly more minutes of moderate-to-vigorous activity across school days (MVPA_{WD}) and during the school day period (MVPA_{SD}) (p<0.05, Table 2).

Bouts during DPA

Just 19.3% of participants (n=165) accumulated at least 1 sustained (≥5 min) bout of MVPA during scheduled DPA across the school week. The proportion ranged across the 16 participating schools (0 to 45%). The majority of children (74.5%) accumulated 1 bout across the school week, with 18.2% and 3.7% accumulating 2 and 3 bouts, respectively; just 6 children (3.6% of sample) accumulated 4 bouts across the school week. A similar proportion of boys (n=88) and girls (n=77) accumulated at least 1 bout; the proportion acquiring more than 1 bout did not differ by gender.

Bouts, on average, lasted 7.1 minutes; duration did not differ according to gender (boys: 7.3 min, girls: 6.9 min; p>0.05, Table 3). The majority of all bouts lasted between 5 and 10 minutes in duration (85%; boys=85%, girls=86%); just 4% of bouts lasted 15 or more minutes in duration (Figure 1). No bouts lasted 20 or more minutes in duration; the longest recorded lasted 18 minutes. While no child sustained MVPA for 20+ minutes during a scheduled session of DPA, 9 participants (1% of total sample, n=856) were able to accumulate at least 15 minutes of MVPA through multiple shorter bouts (2 or more lasting <20 minutes in duration) on 1 day of scheduled DPA.

In comparison to children who did not achieve any sustained bouts of MVPA during scheduled DPA, those who achieved at least 1 bout had greater total physical activity, the intensity of their activity was higher, and they accumulated significantly more minutes of MVPA across the school week and within the school day period (p<0.05, Table 4). Furthermore, a significantly greater proportion accumulated at least 60 minutes of MVPA on one or more days of the week, and more attained an average of 60+ minutes of MVPA across the school week. Those achieving at least one bout also had lower BMI scores, and fewer were classified as overweight/obese (Table 4).

DISCUSSION

The objective of this paper was to evaluate whether the Ontario Ministry of Education's Daily Physical Activity (DPA) policy is being

effectively implemented in elementary schools. The results are based on a small convenience sample of schools ($n=16$) that engaged in a larger study (Project BEAT) in the Greater Toronto Area (GTA). This sampling limitation should be considered in the context that all schools in Ontario should be fully implementing the DPA policy. It is one of the only studies conducted to date that provides objectively measured feedback to key stakeholders about DPA implementation.

Fewer than half of children sampled were provided with a session of structured physical activity in instructional time every day of the school week. During these sessions, not a single child engaged in sustained MVPA for 20 or more minutes in duration. Just 1% of all children sampled were able to achieve 15+ minutes of MVPA through multiple, shorter bouts, and only for one scheduled session of DPA. It seems that even when multiple, shorter bouts of MVPA are allowed, the majority of children (99%) fail to achieve the requirement. It is possible that sessions of DPA might have occurred but were not recorded on the classroom schedules. However, teachers were asked to specifically record all sessions of PE/DPA for the same week that children's physical activity behaviour was being measured. This should have minimized error.

On average, bouts of MVPA lasted 6 or 7 minutes, with the vast majority (nearly 90%) under 10 minutes. The habitual physical activity patterns of children are very different from those of adults. Children typically accumulate activity in short, sporadic bursts, whereas adult patterns are less sporadic and more continuous. Early accounts based on direct observation of children's physical activity behaviour indicate that around 95% of all bouts are <10 seconds in duration; as intensity increases, bout length decreases; in fact, very few bouts of MVPA are sustained for 10+ minutes.⁹ More recent evidence generated from accelerometer data confirms these findings.^{10,11} Asking schools to create an environment in which children sustain moderate or greater intensity activity for 20 or more continuous minutes does not reflect children's typical physical activity patterns; it could also be logistically challenging. Accordingly, the DPA policy may need to be reviewed to move emphasis away from 'sustained' MVPA to the accumulation of shorter bouts of MVPA as a means of attaining the 20-minute criteria.

On the more positive side, children who engaged in DPA every day of the school week were significantly more active than their peers, both at school and outside of school. Furthermore, those who accumulated at least 1 bout of MVPA (sustained for at least 5 minutes) during DPA were significantly more active and more likely to meet PA guidelines, and fewer of them were overweight or obese. A potential consideration is the hierarchical structure of the data. Our research was interested in the occurrence of clustering (i.e., students who are exposed to regular DPA in a given school are more likely to have higher physical activity levels than those in schools that do not implement daily physical activity). Our finding of a positive relationship between DPA and PA during the school day independent of the entire day also strengthens the case for providing opportunities for daily PA during school time.

It is encouraging that children who manage to accumulate some form of sustained MVPA during sessions are more active over the course of the school day and the whole day compared to those who do not. Given that a greater proportion of these children also meet PA guidelines, and fewer have unhealthy weights, the delivery of regular and effective DPA could be quite promising as a physical

activity-enhancing strategy for children and youth. Our study is cross-sectional and therefore we can only speculate that regular and effective DPA might lead to healthier levels of physical activity and weight; it is a limitation that invites future longitudinal work.

CONCLUSION

The results show that the majority of schools are not meeting the required frequency (5 days) or intensity (sustaining moderate-to-vigorous physical activity for at least 20 minutes) of the DPA policy. A range of barriers to implementation have been addressed in previous work.^{12,13} However, our work demonstrates that the frequency and intensity of DPA is positively related to health behaviours/outcomes of students. While our design precludes us from determining cause and effect, a positive relationship between DPA and physical activity/health in children clearly exists. Longitudinal studies are needed to establish whether the intended positive benefits for students can be achieved when the policy is effectively implemented. Future investigations should also focus on schools that are succeeding, and identify barriers and facilitators to successful implementation.

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RÉSUMÉ

Objectif : En 2005, le ministère de l'Éducation de l'Ontario annonçait une politique exigeant que tous les élèves du primaire aient l'occasion de participer à au moins 20 minutes d'activité physique modérée à vigoureuse (APMV) soutenue chaque jour d'école pendant les heures de classe. À la connaissance des auteurs, cette politique n'a jamais été officiellement évaluée. Dans le cadre d'une expérience dans les

EVALUATING THE DAILY ACTIVITY POLICY

conditions naturelles menée avec le projet BEAT, nous avons analysé dans 16 écoles du Conseil scolaire du district de Toronto la proportion d'enfants pratiquant une activité physique quotidienne (APQ) et la proportion d'enfants atteignant un niveau soutenu d'APMV durant ces séances; ce sont là les objectifs de notre article.

Méthode : Mille vingt-sept parents et tuteurs ont consenti à ce que leurs enfants participent à l'étude (garçons, n=478; filles, n=549). Nous avons mesuré l'activité physique (AP) par accélérométrie et obtenu les horaires des classes pour identifier les séances d'APQ. La fréquence de l'APQ et le nombre et la durée des épisodes soutenus d'APMV (≥ 5 min) ont été calculés et analysés par rapport aux niveaux d'AP et aux résultats de santé.

Résultats : Moins de la moitié des élèves participants avaient droit à une séance d'APQ tous les jours, et absolument aucun ne pratiquait une APMV soutenue pendant ≥ 20 minutes. En revanche, les élèves qui pratiquaient une activité physique quotidienne étaient sensiblement plus actifs que leurs pairs. Ceux qui accumulaient au moins un épisode d'APMV étaient plus actifs et plus susceptibles de respecter les critères d'AP, et ces enfants étaient moins nombreux à être en surpoids.

Conclusion : La majorité des écoles ne respectent pas la politique d'APQ. Or, les résultats de santé positifs augmentent avec la fréquence et l'intensité de l'APQ. Les résultats de notre étude montrent que lorsque la politique est appliquée, les avantages escomptés pour la santé sont réalisables.

Mots clés : accéléromètre; enfant; santé; politique; école

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