

January 2012

Physical Activity during Full-Day and Half-Day Kindergarten

Lauren Talley
University of Victoria, BC

Ryan Cook
University of Victoria, BC

Patti-Jean Naylor
University of Victoria, BC

Vivienne Anne Temple
University of Victoria, BC

Follow this and additional works at: <https://pdxscholar.library.pdx.edu/nwjte>



Part of the [Education Commons](#)

Let us know how access to this document benefits you.

Recommended Citation

Talley, Lauren; Cook, Ryan; Naylor, Patti-Jean; and Temple, Vivienne Anne (2012) "Physical Activity during Full-Day and Half-Day Kindergarten," *Northwest Journal of Teacher Education*: Vol. 10 : Iss. 1 , Article 14. DOI: <https://doi.org/10.15760/nwjte.2012.10.1.14>

This open access Article is distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License \(CC BY-NC-SA 4.0\)](#). All documents in PDXScholar should meet [accessibility standards](#). If we can make this document more accessible to you, [contact our team](#).

Physical Activity during Full-Day and Half-Day Kindergarten

Lauren Talley, Ryan Cook, Patti-Jean Naylor, and Vivienne Anne Temple
University of Victoria, BC

Abstract

The aim of this study was to compare the physical activity levels of children during full-day and half-day kindergarten. Of the 47 children who participated in this study, 22 (girls = 50%) attended full-day kindergarten and 25 (girls = 40%) attended half-days. Actigraph activity monitors were used to assess physical activity and sedentary behavior of the children. We found that children were more active during full-day kindergarten. The rates of light-intensity physical activity were significantly higher during full-day kindergarten. However, levels of moderate-to-vigorous physical activity (MVPA) were quite low, and efforts to promote MVPA would be beneficial.

Physical activity is any bodily movement produced by the contraction of skeletal muscle that increases energy expenditure above a basal level (Caspersen, Powell, & Christenson, 1985). However, most guidelines for physical activity focus on a sub-set of physical activity referred to as moderate-to-vigorous physical activity or MVPA. For children, moderate-intensity physical activity equates with activities that are at least four times the intensity of rest (Troost, Loprinzi, Moore, & Pfeiffer, 2011). Brisk walking is indicative of this intensity of physical activity among children (Mattocks et al., 2007). Both the *Activity Guidelines for Americans* (U.S. Department of Health and Human Services, 2008b) and the *Canadian Physical Activity Guidelines* (Canadian Society for Exercise Physiology, 2011) recommend that children accumulate at least 60 minutes of MVPA per day.

It has also been recognized that a lack of physical activity, or sedentary behavior, is a separate and independent predictor of health risk (Ekelund et al., 2006; Wong & Leatherdale, 2009). As a result, reducing sedentary behaviors such as watching television and using the computer or playing video games have become a priority. Limiting recreational screen time to no more than two hours per day and reducing sedentary (motorized) transport is recommended in both Canada and the USA (American Academy of Pediatrics, 2006; Tremblay et al., 2011). The recently published Canadian sedentary behavior guidelines also recommend limiting extended sitting and reducing time spent indoors throughout the day (Tremblay et al.).

There is strong evidence that people who are physically active “have higher levels of health-related fitness and a lower risk profile for developing a number of disabling medical conditions than do people who are inactive” (U.S. Department of Health and Human Services, 2008a, E-22). For children and youth, the major benefits of physical activity are improved: cardiorespiratory and muscular fitness, cardiovascular and metabolic health biomarkers, bone health, body composition, and mental health (Janssen & LeBlanc, 2010; U.S. Department of Health and Human Services, 2008a). These benefits are largely associated with participation in MVPA (U.S. Department of Health and Human Services, 2008a); however, light-intensity physical activity is also associated with healthier body composition and weight status among children (Kwon, Janz, Burns, & Levy, 2011; Stone, Rowlands, Middlebrooke, Jawis, & Eston, 2009).

Despite the noted health benefits of physical activity, levels of physical activity among children are low (Active Healthy Kids Canada, 2010) and have been declining over the past several decades (Knuth & Hallal, 2009). Presently, only 9% of boys and 4% of girls are meeting the Canadian guideline of 60 minutes of MVPA daily (Colley et al., 2011). Most boys and girls, particularly young children, are not in a position to control access to physical activity opportunities. The physical and social environments in which they spend time have a powerful influence on their participation in healthful behaviors (Dooris et al., 2007); including their physical activity behaviors (Bower et al., 2008; Dowda, Pate, Trost, Almeida, & Sirard, 2004; Finn, Johannsen, & Specker, 2002; Pate, Pfeiffer, Trost, Ziegler, & Dowda, 2004). It is therefore important that parents, care-providers, and teachers provide access to environments that foster physical activity and encourage children to be active.

Implementation of Full-Day Kindergarten in BC

In 2008 the Province of British Columbia committed to assess the feasibility of implementing full school day kindergarten for five-year-olds (The Honourable Steven L. Point, 2008). The government committed \$365 million over three years to implement full-day kindergarten for all eligible children by September 2011 (Ministry of Education, n.d.). Starting in 2010, the BC Ministry of Education began a two-year process of phasing in access. The aim was to have up to 50% enrolment in full-day kindergarten in the first wave (i.e. the 2010-11 school year) and complete access in 2011-12. During the first wave, where approximately 50% of the children were in half-day kindergarten and 50% in full-day; the BC Principals' and Vice-Principals Association sponsored a research project examining teachers', administrators', and parents' perceptions of the first year of 'full-day K' (BC Principals' and Vice-Principals' Association, 2011). Teachers' perceived there was a "gift of time" that allowed extension and enhancement of the children's school experiences. Opportunities for active play were mentioned frequently, as one administrator commented:

There are definitely more play times in the day and I see teachers changing the way that they structure the day. Students are getting more time for gross motor skill development and play outside more during the day and in the gym. Teachers tend to take more time to reinforce skills. The number of field trips has increased, even if this only looks like a nature walk. (p.69)

Parents were also supportive of the emphasis of the full-day programs, including the "active physical play activities" (p.16).

There is considerable evidence that children who experience full-day kindergarten demonstrate higher end-of-year academic and social development compared with children who experience half-day kindergarten (e.g. Lee, Burkam, Ready, Honigman, & Meisels, 2006; Votruba-Drzal, Li-Grining, & Maldonado-Carreno, 2008). A recent synthesis of the research evidence demonstrated that compared to half-day kindergarten, full-day kindergarten was associated positively with academic achievement, self-confidence, and children's ability to work/play with others (Cooper, Allen, Patall, & Dent, 2010). These positive benefits exist irrespective of children's academic backgrounds or the features of their schools (Lee et al., 2006). However, outcomes in the physical domain have received virtually no attention.

Only one study has examined outcomes of full-day kindergarten compared with half-day kindergarten in the physical domain. Markovic and Bogdanovic (2010) assessed changes in balance, upper and lower body strength, speed, and object control (i.e. rolling a ball) of 118 kindergarten children in the Republic of Serbia. Both boys and girls in the full-day kindergarten ($n = 69$) showed significantly greater levels of lower body strength, speed, and balance (boys only) compared with the half-day kindergarten group.

Given the importance of physical activity for children's health and well being, the demonstrated positive academic and social benefits of full-day kindergarten, and the lack of research on the impact of full-day kindergarten on the physical domain; the aim of this study was to examine the physical activity levels of children during full-day and half-day kindergarten. As children were at school for different lengths of time; we examined the rates of moderate-vigorous physical activity, light-intensity physical activity, and sedentary behavior per minute of time at school. In concert with the testimonies of BC teachers about a 'gift of time' we hypothesized that the level of physical activity would be higher during full-day kindergarten. Further, we explored whether children in half-day kindergarten were more or less active in their half-day at home compared with their half-day at school.

Method

Participants

Kindergarten children (5 – 6 years-of-age) were recruited from six schools in one school district on Vancouver Island, British Columbia, Canada. Three of these schools offered full-day kindergarten and three offered half-day kindergarten. Approval for this study was granted by the University Human Research Ethics Board and the school district. Written informed consent was obtained from parents and children provided assent. Parents of 106 children consented to their child's participation in this study. Fifty-nine of these children did not meet the minimum wear time criteria for the activity monitor, therefore the final sample was $n = 47$. Of these, 22 (girls = 50%) attended full-day kindergarten and 25 (girls = 40%) attended half-days.

Measurement of Physical Activity

The GT1M Actigraph activity monitor (Actigraph, LLC; Fort Walton Beach, FL) was used to quantify physical activity every 15 seconds. The device is small, lightweight, and unobtrusive. It detects normal human motion in a single vertical axis. The Actigraph monitor provides valid assessments of physical activity of young children (Troost et al., 2011; Trost, Pate, Freedson, Sallis, & Taylor, 2000). The monitors were attached to adjustable elasticized bands and worn over a hip. The children were asked to wear the monitor for seven days from 8am to 8pm; and the minimum criterion for inclusion in present study was 80% wear time between 8:00am and 4:00pm, or a total of at least 6.4hours, for at least 4 of the 5 school days.

To compare participation in physical activity for full-day and half-day kindergarten, we examined the rates of physical activity and sedentary behavior per minute of time at school. More specifically, eight hours were included in the analysis for full-day kindergarten (i.e. 8:00am - 4:00pm); and four hours for half-day kindergarten (i.e. morning kindergarten: 8:00am - 12:00am, afternoon kindergarten: 12:01pm - 4:00pm). These times included some time for commuting to and from school. For morning half-day students, out-of-school wear time was the four afternoon hours; and the reverse applied for the afternoon half-day students.

Data Treatment and Analysis

Data from the activity monitors were uploaded to the KineSoft software program (Esliger & Finlay, 2010) to determine the total number of minutes spent in sedentary, light, and moderate to vigorous physical activity (MVPA). Age-specific cutoffs corresponding to activity intensity were applied using metabolic equivalents (METs). Sedentary activity was defined as less than 1.5 METs, light activity between ≥ 1.5 and <4 METs and MVPA as ≥ 4 METs as established by Trost et al. (2011). We also examined the amount of physical activity performed at ≥ 3 METs, as this has been used as a more liberal measure of moderate-intensity physical activity in several previous studies of physical activity in children (Freedson, Poher, & Janz, 2005; Nettlefold et al., 2011; Puyau, Adolph, Vohra, & Butte, 2002).

A multivariate analysis of variance (MANOVA) was used to examine the dependent measures: light activity, MVPA, and sedentary behavior with kindergarten type (i.e. full-day vs. half-day) as the factor. A univariate analysis was also conducted to examine the proportion of physical activity classified as ≥ 3 METs i.e. three times the energy cost of rest. A second MANOVA was conducted comparing in-school vs. out-of-school activity for the half-day kindergarten children only. Means and standard deviations were also computed for the dependent measures. Overall daily physical activity and sedentary behavior of full-day and half-day kindergarten children was also examined using a MANOVA. All analyses were performed using SPSS® 19 for Windows (SPSS Inc., 2010).

Results

The rates per minute of sedentary behavior, light activity, MVPA, and moderate physical activity at ≥ 3 METs for half-day and full-day kindergarten children are shown in Table 1. The MANOVA showed a significant overall effect for full-day vs. half-day as suggested by Wilk's lambda (Neal & King, 1969) of .833 with $F(2, 44) = 4.396$, $p = .018$. Results of univariate F tests for each dependent variable are presented in Table 1. Compared with half-day participants, there was significantly greater rate of participation in light-intensity physical activity and a significantly lower rate of sedentary behavior among full-day participants. There was no difference in MVPA at 4 METs; however at ≥ 3 METs full-day children participated in physical activity at a significantly higher rate $F(1,46) = 8.93$, $p = .005$. On average, full-day participants were sedentary for 324.0 min, participated in light-intensity physical activity for 151.7 min, and MVPA (≥ 4 METs) for 4.3 min of the school day. At ≥ 3 METs, children in full-day kindergarten participated in approximately 48 minutes of physical activity during the school day.

The second MANOVA examined whether children in half-day kindergarten were more or less active during the four hours in-school compared to four hours out-of-school. The MANOVA showed a significant overall effect as suggested by Wilk's lambda of .834 with $F(2, 47) = 4.674$, $p = .014$. Descriptive statistics and the results of univariate F tests for each dependent variable are presented in Table 2. Children had higher rates of light-intensity activity and lower levels of sedentary behavior, out-of-school. There was no difference in MVPA measured as ≥ 4 METs;

Table 1

Rate per minute of physical activity and sedentary behavior for half-day and full-day kindergarten students

	Full-day (<i>n</i> = 22)		Half-day (<i>n</i> = 25)		<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Sedentary (< 1.5 METs)	0.675	0.054	0.719	0.053	.006
Light activity (≥ 1.5 <4 METs)	0.316	0.053	0.271	0.050	.004
MVPA (≥ 4 METs)	0.009	0.004	0.010	0.019	.869
≥ 3 METs	0.101	0.027	0.075	0.033	.005

however children were significantly more active out of school at ≥ 3 METs ($p = .026$). Overall daily (8 hours in-school and out-of-school) physical activity and sedentary behavior did not differ between full-day and half-day students; Wilk's lambda = .961, $F(2, 44) = 0.883$, $p = .421$.

Table 2

Physical activity and sedentary behavior in- and out-of-school for half-day kindergarten students

	In-School		Out-of-school		<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Sedentary (< 1.5 METs)	0.719	0.053	0.668	0.068	.005
Light activity (≥ 1.5 <4 METs)	0.271	0.050	0.322	0.067	.003
MVPA (≥ 4 METs)	0.010	0.019	0.009	0.007	.894
≥ 3 METs	0.075	0.033	0.096	0.034	.026

Discussion

The aim of this study was to compare children's rate of physical activity and sedentary behavior during full-day and half-day kindergarten. We found that children were more active during full-day kindergarten than half-day kindergarten. The rates of light-intensity physical activity and moderate physical activity when it was defined as ≥ 3 METs were significantly

higher during full-day kindergarten. Conversely children were more sedentary during half-day kindergarten. Children in full-day and half-day kindergarten accumulated approximately 48 minutes and 18 minutes of physical activity respectively during their time at school, when the definition of moderate was more liberal (3 METs or greater). A little over 2½ hours of light-intensity physical activity (≥ 1.5 and <4 METs) was accumulated by children in full-day kindergarten at school. These results are both significant and meaningful. Both higher levels of light-intensity physical activity and lower levels of sedentary behavior have been associated with positive health benefits for children (Kwon et al., 2011; Tremblay et al., 2011).

However, when a more stringent definition was used (≥ 4 METs) the rates of MVPA were not significantly different between full-day and half-day kindergarten and the level of MVPA for both groups was quite low. Full-day children were accumulating slightly over 4 minutes and half-day just over 2 minutes of MVPA at school. Similarly, half-day children accrued only 2 minutes of MVPA out-of-school using this definition. The Canadian guidelines for physical activity for children aged 5 – 11 years recommend a minimum of 60 minutes of MVPA per day. Moderate-intensity physical activity elicits a cardiovascular response; that is, a higher heart rate (McManus, 2007) and a behavioral indicator of MVPA at 4 METs is brisk walking; but can also include running, jumping, hopping, skipping, climbing, or other activities that use large muscle groups. It is clear from our results that the children accrued very little MVPA at intensities of 4 METs or greater. The health benefits of participation at higher intensities are above and beyond those for light-intensity physical activity; particularly in terms of enhanced cardiorespiratory fitness and bone health (U.S. Department of Health and Human Services, 2008a). Fostering MVPA is an important goal for healthy child development. Given the length of time children spend at school each day, facilitation of higher rates of MVPA at greater than 4 METs would be very beneficial.

We also explored whether children in half-day kindergarten were more or less active in their half-day at home compared with their half-day at school. The findings clearly show that children were less active and more sedentary at school. Half-day kindergarten children were less active at school than the full-day kindergarten children and also less active at school than at home. These findings intimate that teachers of half-day kindergarten may be experiencing a cramped curriculum and thus physical activity and gross motor development was a lower priority. As Cooper et al. (2010) suggested, a major advantage of full-day kindergarten is less hurried instruction. It would seem that full-day kindergarten also afforded more opportunities for physical activity. Interestingly, when the children's total daily physical activity was considered irrespective of their context (i.e. at school or at home); there were no differences in physical activity and sedentary behaviour between the groups. This suggests that the half-day kindergarten children were 'making up' for their inactivity at school by being more active when not at school.

Our findings are consistent with teachers' perceptions that full-day kindergarten provided a 'gift of time' and administrators' perceptions that children were more active in full-day kindergarten (BC Principals' and Vice-Principals' Association, 2011). Previous research has shown that teachers of full-day kindergarten classes report spending only about one-third more time on 'instruction' than those who teach half-day classes (Lee et al., 2006). The remaining time is used to diversify and extend children's experiences. Some of the teachers of full-day kindergarten in our study informally reported including more physical activity during the school day. For example, at one of the three full-day kindergarten schools, children participated in a 'kilometre club'. All children walked ½ kilometre with their teacher after morning recess and

another ½ kilometre after lunch. This is the type of activity that would fall in the 3 – 4 MET range i.e. slightly below the ‘brisk walk’ threshold; but it would contribute to the higher overall rates of physical activity among full-day kindergarten children.

This study was limited to one school district in British Columbia and a sample of children whose parents agreed that their children’s physical activity could be monitored for one week. Therefore these findings should be treated as preliminary. As full-day kindergarten is now available for all five-year-olds in the province of British Columbia; we cannot repeat or expand on these findings. However, we cautiously suggest that in the first year of implementation, children in full-day kindergarten participated in light-moderate intensity physical activity at a significantly higher rate than half-day kindergarten children; and conversely they were less sedentary. In an era where children are experiencing record low levels of physical activity and record high levels of overweight and obesity it is important that schools strive to maintain these higher levels of physical activity during full-day kindergarten. It is also important that children participate in MVPA that elevates their heart rates and breathing rates as these activities afford additional health benefits.

References

- Active Healthy Kids Canada. (2010). *Healthy Habits Start Earlier Than You Think. The Active Healthy Kids Canada Report Card on Physical Activity for Children and Youth*. Toronto, ON.
- American Academy of Pediatrics. (2006). Policy statement: Active healthy living: Prevention of childhood obesity through increased physical activity. *Pediatrics*, *117*, 1834-1842.
- BC Principals’ and Vice-Principals’ Association. (2011). *Full day kindergarten in British Columbia. Taking the Pulse Full Day K in British Columbia Year One. Twelve case studies*. Vancouver, BC: BCPVPA.
- Bower, J. K., Hales, D. P., Tate, D. F., Rubin, D. A., Benjamin, S. E., & Ward, D. S. (2008). The childcare environment and children’s physical activity. *American Journal of Preventive Medicine*, *34*, 23 - 29.
- Canadian Society for Exercise Physiology (2011). Canadian Physical Activity Guidelines for Children 5 -11 Years. *Journal*. Retrieved from <http://www.csep.ca/english/view.asp?x=804>
- Caspersen, C. J., Powell, K. E., & Christenson, G. M. (1985). Physical activity, exercise, and physical fitness: Definitions and distinction for health-related research. *Public Health Reports*, *100*, 126-131.
- Colley, R. C., Garriguet, D., Janssen, I., Craig, C. L., Clarke, J., & Tremblay, M. S. (2011). Physical activity of Canadian children and youth: Accelerometer results from the 2007 to 2009 Canadian Health Measures Survey. *Statistics Canada, Catalogue no. 82-003-XPE • Health Reports*, *22*(1), 1-9.
- Cooper, H., Allen, A. B., Patall, E. A., & Dent, A. L. (2010). Effects of full-day kindergarten on academic achievement and social development. *Review of Educational Research*, *80*(1), 34-70.
- Dooris, M., Poland, B., Kolbe, L., de Leeuw, E., McCall, D. S., & Wharf-Higgins, J. (2007). Healthy settings: Building evidence for the effectiveness of whole system health promotion--Challenges and future directions. In D. V. McQueen & C. M. Jones (Eds.), *Global perspectives on health promotion effectiveness* (pp. 327-352). New York, NY:

Springer Science + Business Media.

- Dowda, M., Pate, R. R., Trost, S. G., Almeida, M. J., & Sirard, J. R. (2004). Influences of preschool policies and practices on children's physical activity *Journal of Community Health, 29*, 183-196.
- Ekelund, U., Brage, S., Froberg, K., Harro, M., Anderssen, S. A., Sardinha, L. B., et al. (2006). TV viewing and physical activity are independently associated with metabolic risk in children: The European Youth Heart Study. *Plos Medicine, 3*, e488-e488.
- Esliger, D. W., & Finlay, E. (2010). KineSoft. Denver, CO: KineSoft Software.
- Finn, K., Johannsen, N., & Specker, B. (2002). Factors associated with physical activity in preschool children. *Journal of Pediatrics, 140*, 81-85.
- Freedson, P. S., Pober, D., & Janz, K. F. (2005). Calibration of accelerometer output for children. *Medicine & Science in Sports & Exercise, 37*, S523-S530.
- Janssen, I., & LeBlanc, A. G. (2010). Systematic review of the health benefits of physical activity and fitness in school-aged children and youth. *International Journal of Behavioral Nutrition and Physical Activity, 7*, 1-40.
- Knuth, A. G., & Hallal, P. C. (2009). Temporal trends in physical activity: A systematic review. *Journal of Physical Activity and Health, 6*, 548-559.
- Kwon, S., Janz, K. F., Burns, T. L., & Levy, S. M. (2011). Association between light-intensity physical activity and adiposity in childhood. *Pediatric Exercise Science, 23*(2), 218-229.
- Lee, V. E., Burkam, D. T., Ready, D. D., Honigman, J., & Meisels, S. J. (2006). Full-day versus half-day kindergarten: In which program do children learn more? *American Journal of Education, 112*(2), 163-208.
- Markovic, Z., & Bogdanovic, Z. (2010). The influence of half and full day stay on motor abilities of pre school children. *Sport Science, 3*(1), 47-52.
- Mattocks, C., Leary, S., Ness, A., Deere, K., Saunders, J., Tilling, K., et al. (2007). Calibration of an accelerometer during free-living activities in children. *International Journal of Pediatric Obesity, 2*, 218-226.
- McManus, A. M. (2007). Physical activity - a neat solution to an impending crisis. *Journal of Sports Science & Medicine, 6*(3), 368-373.
- Ministry of Education. (n.d.). Full School Day Kindergarten. Retrieved 25 October, 2011, from http://www.bced.gov.bc.ca/early_learning/fdk/.
- Neal, R., & King, P. (1969). Comparison of a multivariate and a configural analysis for classifying engineering students. *Journal of Counseling Psychology, 16*, 563-568.
- Nettlefold, L., McKay, H. A., Warburton, D. E. R., McGuire, K. A., Bredin, S. S. A., & Naylor, P. (2011). The challenge of low physical activity during the school day: At recess, lunch and in physical education. *British Journal of Sports Medicine, 45*(10), 813-819.
- Pate, R. R., Pfeiffer, K. A., Trost, S. G., Ziegler, P., & Dowda, M. (2004). Physical activity among children attending preschools *Pediatrics, 114*, 1258-1263.
- Puyau, M. R., Adolph, A. L., Vohra, F. A., & Butte, N. F. (2002). Validation and calibration of physical activity monitors in children. *Obesity Research, 10*, 150-157.
- SPSS Inc. (2010). IBM SPSS Statistics (Version 19). Somers, NY.
- Stone, M. R., Rowlands, A. V., Middlebrooke, A. R., Jawis, M. N., & Eston, R. G. (2009). The pattern of physical activity in relation to health outcomes in boys. *International Journal of Pediatric Obesity, 4*(4), 306-315.
- The Honourable Steven L. Point. (2008). Speech from the Throne. from http://www.gov.bc.ca/premier/2008_throne_speech/index.html

- Tremblay, M. S., LeBlanc, A. G., Kho, M. E., Saunders, T. J., Larouche, R., Colley, R. C., et al. (2011). Systematic review of sedentary behaviour and health indicators in school-aged children and youth. *International Journal of Behavioral Nutrition and Physical Activity*, 8(98).
- Trost, S. G., Loprinzi, P. D., Moore, R., & Pfeiffer, K. A. (2011). Comparison of accelerometer cut points for predicting activity intensity in youth. *Medicine & Science in Sports & Exercise*, 43(7), 1360-1368.
- Trost, S. G., Pate, R. R., Freedson, P. S., Sallis, J. F., & Taylor, W. C. (2000). Using objective physical activity measures with youth: How many days of monitoring are needed? . *Medicine And Science In Sports And Exercise* 32, 426-431.
- U.S. Department of Health and Human Services. (2008a). Physical Activity Guidelines Advisory Committee Report. Part E. Integration and Summary of the Science. from http://www.health.gov/paguidelines/Report/E_integration.aspx#_Toc200004157
- U.S. Department of Health and Human Services (2008b). Physical Activity Guidelines for Americans, Available from <http://www.health.gov/paguidelines/>
- Votruba-Drzal, E., Li-Grining, C. P., & Maldonado-Carreno, C. (2008). A developmental perspective on full-versus part-day kindergarten and children's academic trajectories through fifth grade. *Child Development*, 79(4), 957-978.
- Wong, S. L., & Leatherdale, S. T. (2009). Association between sedentary behavior, physical activity, and obesity: Inactivity among active kids. *Preventing Chronic Disease*, 6, 1-13.

Acknowledgement

This research was funded in part by a University of Victoria SSHRC Internal Research Grant.