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Title

Physical education in secondary schools located in low-income communities: Physical activity levels, lesson context and teacher interaction.

Abstract

Objectives

Physical education (PE) plays an important role in contributing to students' physical activity (PA); however, moderate-to-vigorous PA (MVPA) within PE is lower than recommended. Little is known about the PA levels of students from disadvantaged schools within PE. This study aimed to describe: i) the PA levels of students from disadvantaged secondary schools during PE lessons, ii) the lesson context and teacher interactions occurring during PE, and iii) the associations between teacher, school or PE lesson characteristics with student physical activity levels in PE.

Design

Cross-sectional study of 100 Grade 7 PE lessons across 10 secondary schools.

Methods

System for Observing Fitness Instruction Time (SOFIT) was used to assess student PA, lesson context, and teacher interaction. Teacher and school characteristics were collected via survey. Mean proportion of lesson time was used to describe PA, lesson context and teacher interaction. Associations between each outcome variable and each characteristic were examined using 2-sample t-tests, ANOVAs and linear regression.

Results

Thirty-nine percent of PE lesson was spent in MVPA, and less than 10% spent in VA. Lessons in schools in urban areas included significantly more MVPA than rural areas ($P = 0.04$). Male teachers and more experienced teachers conducted lessons with significantly more VA than female and less experienced teachers ($P = 0.04$ and 0.02). MVPA was also higher in lessons conducted by more experienced teachers.

Discussion

PA during PE lessons within disadvantaged secondary schools is below international recommendations. Male teachers, more experienced teachers and schools in urban regions teach more active lessons.

Key words: physical activity, physical education, school, moderate-vigorous physical activity (MVPA), lesson context

Introduction

An hour of moderate- to vigorous-intensity physical activity (MVPA) per day is important for preventing non communicable diseases, improving strength and endurance as well as improving self-esteem ¹. Yet only 20% of adolescents from across 105 countries meet the recommended one hour of MVPA each day ¹. Studies have found adolescents from disadvantaged backgrounds are less likely to meet physical activity recommendations than those from higher socio-economic backgrounds ².

Schools represent key settings for promoting physical activity in adolescents ³. Within schools, quality physical education (PE) programs are considered an important medium to provide opportunities for physical activity and are key to successful school-based physical activity interventions ³. In the United States' (US), 50% of PE lesson time spent in MVPA has been recommended ⁴. A systematic review of physical activity levels in middle and high schools reviewed 40 studies and concluded that students typically engage in MVPA for only 27% - 47% of lesson time. The mean MVPA across the 10 observational studies was 27% of lesson time ⁵.

The majority of studies examining student activity levels in PE have been conducted in the US ^{6,7,8,9} with few studies conducted in Australia ^{10,11,12}. In the Australian studies, MVPA in secondary school PE has been inconsistent. In a small study of 19 secondary school PE lessons observing Grade 10 students, 34.8% of the lesson was spent in MVPA ¹². Dudley and colleagues ¹⁰, observed 81, Grade 7 PE lessons within eight culturally and linguistically diverse secondary schools catering to a large proportion of disadvantaged students. The study concluded that 56.9% of lesson time was spent in MVPA ¹⁰. In a 12 month follow-up, no significant decline in MVPA within PE was observed, however VA had significantly declined ¹¹. Other than these studies, there is a scarcity of literature focusing on activity levels during PE in disadvantaged communities. Given the evidence gaps, this study aimed to describe: i)

the physical activity levels of secondary school students in PE classes, ii) the lesson context and teacher interactions occurring during school PE lessons, and iii) the associations between teacher, school or PE lesson characteristics with student physical activity levels in PE.

Methods

A cross-sectional study involving observation of PE lessons within 10 secondary schools in disadvantaged areas in the state of New South Wales (NSW), Australia was undertaken from March to July 2012. The study area encompassed urban and rural areas ¹³, had lower indices of socio-economic status than the state ¹⁴ and had a population of approximately 65000 children aged between 12 and 15 years (17.6% of the NSW population) ¹⁵. Within NSW, PE in secondary schools is taught by qualified PE teachers and is compulsory from Grade 7 to Grade 10.

Data collected for this study formed part of the baseline measurements of an intervention trial (*Physical Activity 4 Every1*) ¹⁶. The study was approved by the Hunter New England Human Research Ethics Committee (Ref No. 11/03/16/4.05), University of Newcastle (Ref No. H-2011-0210), NSW Department of Education and Communities (SERAP 2011111), Maitland Newcastle Catholic School Diocese and Broken Bay Catholic School Diocese.

All Government and Catholic secondary schools catering to students aged between 12 (Grade 7) and 18 (Grade 12) years within the study region, were eligible if; school postcode ranked in the bottom 50% of NSW postcodes based on the Socio-Economic Indexes For Australia (SEIFA), as a proxy for socioeconomic status ^{14, 2} they had between 120-200 Grade 7 students; were not participating in other physical activity studies.

Recruitment of schools has been outlined elsewhere ¹⁶. Briefly, Principals were sent a letter inviting participation. Two weeks after receipt of the letter, a trained research assistant contacted the Principal to schedule a time for an interview where consent was obtained. Ten

schools were recruited. A two-week data collection period was assigned to each school, occurring from March to June 2012.

A schedule of all Grade 7 PE lessons was obtained. The first 10 PE lessons scheduled for Year 7 within the schools' allocated data collection period were selected. All lessons were eligible for inclusion and a variety of lessons were observed including dance, basketball, athletics, gymnastics and soccer. Where cancellations occurred due to inclement weather and other school activities (such as excursions or sporting carnivals) the next scheduled lesson was selected. If 10 lessons could not be observed within the two-week data collection period, the next available lesson scheduled on the timetable was observed. PE classes were co-educational.

Data were collected using the System for Observing Fitness Instruction Time (SOFIT) ¹⁷.

SOFIT is an observational tool that has been calibrated using heart rate monitors and validated using accelerometers ¹⁸. SOFIT provides simultaneous recordings of student activity levels, the lesson context in which they occur and teacher interactions regarding the promotion of physical activity.

Three observers undertook SOFIT training involving lecture style and practical components and field practice within a secondary school. After the initial training, observers undertook certification involving the completion of a test, requiring at least 85% inter-rater reliability on all variables on three precoded 'gold-standard' videotaped lessons. Inter-rater reliability checks were undertaken at each school (one lesson per school n=10%), whereby two observers independently coded the same students simultaneously using synchronised audio recordings. The level of inter-rater reliability agreements was 96% for student activity levels, 87% for lesson context and 87% for teacher interaction.

To determine the physical activity level of a lesson, five students were selected based on the order in which they arrived at class, using procedures outlined in the SOFIT manual. Students were observed for four consecutive minutes, before the focus moved to the next student ¹⁷. The fifth selected student was selected as a backup in case one student could no longer be observed ¹⁷. Useable lesson length was calculated from the time 51% of students were ready to commence the lesson and the same proportion had completed the lesson. At the end of each lesson, a summary of lesson activity levels were calculated using methods described in the SOFIT manual ¹⁷. To determine lesson context, the observer determined how lesson time was being allocated to the majority of the class (51% or more) at each 10-second interval. Teacher interaction was coded by the observer based on if the teacher promoted physical activity, fitness or motor skills during the interval ¹⁷.

The SOFIT observational tool was used to categorise the physical activity intensity of a PE lesson as; lying down, sitting, standing, walking or very active (VA). The SOFIT observational tool was also used to measure the lesson context (management, knowledge, fitness, skill practice, game play, other (free play), and teacher interactions within PE lessons (in class physical activity promotion, out of class physical activity promotion or no physical activity promotion).

At the completion of the SOFIT observation, teacher characteristics were recorded. Teachers reported their qualifications (permanent PE specialist teacher, casual PE specialist teacher or non-specialist PE teacher from another subject area) and years of PE teaching experience. Teacher gender was recorded by the observer.

To obtain the school characteristics, school postcode was acquired from the school website. Class rolls obtained from the Head PE teacher were used to determine class characteristics including class size and the number of male and female students per class.

All analyses were undertaken in SAS (version 9.3) statistical software (SAS Institute Inc., Cary, NC, USA). School postcode categorized the school's locality as either 'rural' (those schools in outer regional, remote and very remote areas), or 'urban' (those in regional cities and inner regional areas)¹³. The physical activity levels of PE lessons was calculated as the mean proportion of lesson time spent: lying, sitting, standing, walking, very active (VA) or MVPA (walking and very active combined).

To determine if physical activity levels, lesson context or teacher interaction outcomes were associated with teacher, school or lesson characteristics, the mean value for each outcome variable was calculated for each of the following subgroups: teacher qualification (permanent PE specialist teacher, casual PE specialist teacher, non-specialist PE teacher from other subject area), teacher gender, school location (urban, rural), lesson size (small <35 students, large 35 or more students) and lesson composition (mostly girls 60%+ girls, equal spread, mostly boys 60%+ boys). Associations between each outcome variable and each teacher, school and lesson characteristic were examined using 2-sample t-tests or ANOVA. Teacher experience was treated as a continuous variable and the association between each outcome and years of experience analyzed using linear regression. Statistical significance was at $p \leq 0.05$.

Results

All schools and teachers agreed to be observed resulting in 100 practical PE lessons (10 per school) being included in the study. The mean observed lesson length was 50 minutes (SD =13.9). Of the observed PE lessons, 52% were taught by male teachers, 72% were taught by permanent specialist PE teachers and the mean teaching experience was 11.2 years.

Table 1 shows the mean proportion of lesson time for each physical activity category. Overall, 39.3% of a PE lesson was spent in MVPA, and 9.0% was spent in VA. Of the 100 observed

lessons, 23% spent at least half of the lesson time in MVPA. Almost a quarter of the lessons spent at least 25% in skill practice and 33% spent more than 35% of the lesson time promoting physical activity.

Insert Table 1.

Table 2 outlines the teacher characteristics associated with activity levels, lesson context and teacher interactions. Male teachers conducted lessons with a higher proportion of VA than females (10.2% v 7.6% $p = 0.04$). Lessons conducted by male teachers compared with female teachers had a lower proportion of the lesson spent standing (29.3%, v's 35.3% $p = 0.04$). More experienced teachers conducted lessons with significantly more MVPA ($p = 0.01$) and VA ($p = 0.01$) compared to less experienced teachers. For each ten year increase in teaching experience, lessons had 3.5% more MVPA and 1.5% more VA. More experienced teachers also spent less lesson time in management (-0.4, $p = <0.01$), more time in fitness (0.54, $p = <0.01$) and more time promoting activity to the class (0.31, $p = 0.02$).

Teacher type was significantly associated with lesson context. Permanent specialist teachers spent a higher proportion of lesson time (15.4%) in fitness activities compared with casual specialist teachers (4.3%) and non-specialist PE teachers (3.3%) ($p = 0.02$). The reverse was noted for the game play, with non-specialist PE teachers spending a higher proportion of lesson time in this context compared with casual and permanent specialist teachers (45.4% v's 32.1% v's 27.3% respectively, $p = 0.04$). More experienced teachers spent a higher proportion of lesson time in fitness activities ($p = <0.01$) and less time in management ($p = <0.01$).

Insert Table 2.

Table 3 shows school and lesson level characteristics associated with activity levels, lesson context and teacher interactions. PE lessons in schools located in urban regions were characterised by more time in MVPA (42.9% v's 37.0%, $p = 0.04$) and VA (10.7% v's 7.8%, $p = 0.02$) compared with rural areas. Lessons in urban schools also spent more time in fitness activities compared with rural schools (17.0% v's 8.6%, $p = 0.03$). Classes with larger numbers of students were more sedentary than those with smaller numbers (34.4% v's 25.7%, $p = 0.02$). Smaller classes were associated with a higher proportion of lesson time in knowledge ($p = 0.02$) and skill practice ($p = 0.003$). Lesson gender composition was not significantly associated with student physical activity levels, lesson context or teacher interaction ($p > .05$).

Insert Table 3.

Discussion

This is one of the first studies to describe the physical activity levels, lesson context and teacher interactions occurring during PE lessons within disadvantaged secondary schools. . Students spent on average 39% of PE lesson time in MVPA and less than 10% of lesson time in VA. Approximately 30% of lesson time was spent in management and virtually no time spent promoting out of class physical activity. The study also aimed to determine if teacher, school and lesson level characteristics were associated with physical activity levels, lesson context or teacher promotion of physical activity in PE. Male teachers and more experienced teachers conducted lessons with significantly more VA than female and less experienced teachers. Schools located in urban areas also had significantly more physically active PE lessons than schools located in rural areas.

The results of our study were consistent with data from a systematic review of middle and high schools internationally which showed when methods of assessing MVPA were combined, 40% of PE lesson time was spent in MVPA ⁵. The MVPA levels observed in our study were less than the recommended 50% of lesson time in MVPA ⁴, with 39% of a PE lesson being spent in

MVPA. The current study found students spent more time sitting and standing and less time in MVPA than other Australian studies looking at activity levels in PE ^{10,12}. The inclusion of some all-boys lessons within the sample may have increased the average MVPA for the previous study, as Dudley ¹⁰ found 70.2% of these lessons were spent in MVPA.

The MVPA levels observed in our study may over-represent physical activity levels in PE, as MVPA varies depending on assessment method. Studies directly comparing methods have shown observational techniques tend to show MVPA as consistently higher than accelerometer-assessed MVPA ¹⁹. This occurs as observational techniques such as SOFIT including walking as MVPA, which is considered low intensity activity when assessed via accelerometer. Given PE lessons may be one of the few opportunities students from disadvantaged areas have to engage in physical activity, low levels of MVPA in PE lessons are concerning.

In the current study, a large proportion of each lesson (close to 30%), was spent in lesson management. Studies have reported lesson management to typically range from 15 to 26% of lesson time ²⁰. The high percentage of time spent in management may be common within PE lessons in Australia or may indicate that teachers in schools from disadvantaged areas may require more management time due to poorer classroom behaviour ²¹. Further data is needed to determine this. Physical activity is lowest during administrative and management activities, and should therefore be minimized²². Through strategies such as teacher professional learning that focuses on class organization, management and instruction, and supplementing usual PE lessons with high-intensity activity, MVPA can increase by as much as 24% ²³.

Skill instruction, at 13% of lesson time, was higher than observed in the previous studies in Australian secondary schools ¹⁰. As developing movement skill competence has been associated with greater physical activity ²⁴ it appears particularly important from a pedagogical

and public health perspective to ensure this aspect of lesson context is given a greater focus²⁵.

One of the aims of PE is to instil knowledge, skills and attitudes to enable lifelong physical activity^{5, 23}. Consistent with research conducted in middle²⁶ and secondary schools¹⁰, less than 1% of time was spent promoting out of class physical activity. In-service, pre-service training and interventions aiming to increase activity should focus on improving this. Including community based strategies, such as linking with sporting organizations, within school physical activity interventions could complement and reinforce the broader remit of PE to instil lifelong activity.

The secondary aim of this study was to explore the teacher, school and lesson level characteristics associated with student physical activity levels, lesson context and teacher interaction within school PE lessons. More experienced teachers conducted lessons with significantly more MVPA and VA than less experienced teachers. In addition, male teachers conducted lessons with significantly more VA than female teachers. This is in contrast to other research studies exploring the impact of teacher gender on student physical activity levels. Early research by McKenzie in elementary school PE lessons showed no difference in intensity of activity in lessons led by gender²⁷. Research in middle school girls also failed to show an association between physical activity levels, lesson context and teacher gender²⁶. In contrast, studies by Barnett²⁸ and Skala²² concluded VA and MVPA, was significantly higher in female-led lessons.

Research exploring the impact of specialist versus non-specialist PE teachers on students MVPA, have primarily been conducted within elementary schools. Morgan et al²⁹ identified non-specialist teachers often lack confidence to teach PE. As a result, non-specialist PE teachers spent a higher proportion of the lesson in game play. Although game play can lead

to highly active PE lessons, game play without a focus on skill development, tactics, spatial awareness and decision making lacks the pedagogy aspect of PE.

Compared with rural areas, schools in urban areas conducted lessons with significantly more MVPA and VA. Schools located in metropolitan areas may have better access to ongoing training and professional development and may attract more experienced staff ³⁰.

The study has some limitations. Firstly, data presented is from a cross sectional study therefore no causal relationship can be established. Secondly, a broad definition of disadvantage, based on school location within the bottom fifty percent of the state has been used. We are therefore unsure if the findings are generalizable beyond these schools. Further work examining activity levels PE in disadvantaged and non-disadvantaged schools is warranted. Finally a large number of associations have been tested. While this may have resulted in some significant results due to chance, the intent of the analysis was exploratory.

Conclusions

Although PE lessons have the potential to contribute significantly to students' overall physical activity, this study demonstrates that PE is not currently reaching its full potential in assisting students to meet their recommended daily amount of physical activity. This is one of the first studies internationally to describe the physical activity levels of secondary school students within PE lessons in disadvantaged areas. Of concern, MVPA makes up a little more than a third of a PE lesson. A third of the lesson was also spent in lesson management. As school PE has the potential to make an important contribution to disadvantaged students' daily physical activity level, improving the quality of PE should be a high priority.

Practical Implications

- MVPA within PE in disadvantaged schools appears to be low.

- Given PE provides a valuable opportunity for students attending disadvantaged school to acquire MVPA, improving activity levels in PE is a priority.
- Reducing the amount of lesson time spent in management is a priority.
- Further research on increasing active learning time in secondary schools located in disadvantaged areas is warranted.

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References

1. Hallal PC, Andersen LB, Bull FC, et al. **Global physical activity levels: surveillance progress, pitfalls, and prospects.** *Lancet* 2012;380:247-257.
2. Hardy LL KL, Espinel P, Cosgrove C, et al. **NSW Schools Physical Activity and Nutrition Survey (SPANS) 2010: Full Report.** Sydney NSW Ministry of Health.; 2011.
3. Bassett DR, Fitzhugh EC, Heath GW, et al. **Estimated energy expenditures for school-based policies and active living.** *Am J Prev Med* 2013;44:108-113.
4. Centers for Disease C, Prevention. **Strategies to Improve the Quality of Physical Education.** In: *Services US Department of Health and Human Services*, ed.2010.
5. Fairclough S SG. **Physical Activity Levels in Middle and High School Physical Education: A Review.** *Pediatr Exerc Sci* 2005;17:217-236.
6. McKenzie TL, Catellier DJ, Conway T, et al. **Girls' activity levels and lesson contexts in middle school PE: TAAG baseline.** *Med Sci Sports Exerc* 2006;38:1229-1235.
7. McKenzie TL, Sallis JF, Prochaska JJ, et al. **Evaluation of a two-year middle-school physical education intervention: M-SPAN.** *Med Sci Sports Exerc* 2004;36:1382-1388.
8. Bevans KB, Fitzpatrick LA, Sanchez BM, et al. **Physical education resources, class management, and student physical activity levels: a structure-process-outcome approach to evaluating physical education effectiveness.** *J Sch Health* 2010;80:573-580.
9. Springer AE, Kelder SH, Byrd-Williams CE, et al. **Promoting energy-balance behaviors among ethnically diverse adolescents: overview and baseline findings of The Central Texas CATCH Middle School Project.** *Health Educ Behav* 2013;40:559-570.
10. Dudley DA, Okely AD, Cotton WG, et al. **Physical activity levels and movement skill instruction in secondary school physical education.** *J Sci Med Sport* 2012;15:231-237.
11. Dudley DA, Okely AD, Pearson P, et al. **Changes in physical activity levels, lesson context, and teacher interaction during physical education in culturally and linguistically diverse Australian schools.** *Int J Behav Nutr Phys Act* 2012;9:114.
12. Brown TaH, BV. **Student physical activity and lesson context during physical education.** *Asia-Pacific Journal of Health, Sport & Physical Education* 2005;52:17-23.
13. Australian Bureau of Statistics. **Statistical Geography Volume 1- Australian Standard Geographical Classification (ASGC).** Canberra: Commonwealth of Australia; 2006.
14. Australian Bureau of Statistics. **Technical Paper:Census of Population and Housing: Socio-Economic Indexes For Australia (SEIFA).** Cat. no 2039.0.55.001. In: Australia. Co, ed. Canberra 2001.
15. Australian Bureau of Statistics. **Population Estimates (HOIST).** Sydney: NSW Ministry of Health; 2012.

16. Sutherland R, Campbell E, Lubans DR, et al. **A cluster randomised trial of a school-based intervention to prevent decline in adolescent physical activity levels: study protocol for the 'Physical Activity 4 Everyone' trial.** *BMC Public Health* 2013;13:57.
17. McKenzie T. **SOFIT (System for Observing Fitness Instruction Time). Generic Description and Procedures Manual.**2012.
18. McKenzie TL SJ, Armstrong CA. **Association between direct observation and accelerometer measures of children's physical activity during physical education and recess.** *Med Sci Sport Exerc* 1994;26:S143.
19. McClain JJ, Abraham TL, Brusseau TA, et al. **Epoch length and accelerometer outputs in children: comparison to direct observation.** *Med Sci Sports Exerc* 2008;40:2080-2087.
20. Jago R, McMurray RG, Bassin S, et al. **Modifying middle school physical education: piloting strategies to increase physical activity.** *Pediatric Exercise Science* 2009;21:171-185.
21. Hemphill. S A, Toumbourou. J.W, Smith. R,et al. **Are rates of school suspension higher in socially disadvantaged neighbourhoods? An Australian study.** *Health Promot J Aust* 2010;21:12-18.
22. Skala KA, Springer AE, Sharma SV, et al. **Environmental characteristics and student physical activity in PE class: findings from two large urban areas of Texas.** *J Phys Act Health* 2012;9:481-491.
23. Lonsdale C, Rosenkranz RR, Peralta LR, et al. **A systematic review and meta-analysis of interventions designed to increase moderate-to-vigorous physical activity in school physical education lessons.** *Preventive Medicine* 2013;56:152-161.
24. Barnett LM, Van Beurden E, Morgan PJ, et al. **Does childhood motor skill proficiency predict adolescent fitness?** *Medicine and Science in Sports and Exercise* 2008;40:2137-2144.
25. Morgan PJ, Barnett LM, Cliff DP, et al. **Fundamental movement skill interventions in youth: a systematic review and meta-analysis.** *Pediatrics* 2013;132:e1361-1383.
26. McKenzie TL, Catellier DJ, Conway T, et al. **Girls' activity levels and lesson contexts in middle school PE: TAAG baseline.** *Med Sci Sports Exerc* 2006;38:1229-1235.
27. McKenzie TL, Feldman H, Woods SE, et al. **Children's activity levels and lesson context during third-grade physical education.** *Res Q Exerc Sport* 1995;66:184-193.
28. Barnett LM, van Beurden E, Zask A, et al. **How active are rural children in Australian physical education?** *J Sci Med Sport* 2002;5:253-265.
29. Morgan PJ, Hansen V. **Classroom teachers' perceptions of the impact of barriers to teaching physical education on the quality of physical education programs.** *Res Q Exerc Sport* 2008;79:506-516.

30. White S. **Preparing teachers for rural and regional settings: the RRRTEC project.**
Curriculum Leadership Journal 2011;9.

Table 1. Mean and range of proportion of lesson time spent in different student activity levels, lesson contexts and teacher interaction.

Category	Lesson Context		
Student activity	Mean %	(SD)	Range
MVPA	39.3	14.6	6.25 – 75.7
Lying down	0.5	1.35	0.0 – 7.46
Sitting	27.8	16.1	0.0 – 83.0
Standing	32.2	14.8	0.9 – 68.7
Walking	30.4	11.7	6.3- 63.0
Very active (VA)	9.0	6.2	0.0 – 30.0
Lesson Context	Mean %		Range
Management	27.6	11.9	0.0 – 62.7
Knowledge	12.8	10.2	0.0 – 43.0
Fitness	12.0	18.4	0.0 – 72.0
Skill practice	13.1	18.6	0.0 – 89.6
Game play	31.2	26.9	0.0 – 100.0
Other (free Play)	3.3	9.4	0.0 – 80.4
Teacher Interaction	Mean %		Range
In class promotion of PA	28.6	13.3	5.2 – 64.3
Out of class promotion of PA	0.3	0.8	0.0– 6.4
No promotion of PA	71.2	13.5	34.8 – 94.9
Average useable PE lesson time in min	50 minutes		
Number of lessons with*:	% (n)		
>50% MVPA	23% (23)		
>25% skills practice	24% (24)		
>35% promotion of PA	33% (33)		

*CDC recommendation for activity levels in PE.

Table 2. Teacher level characteristics associated with student activity levels, lesson context and teacher interactions.

Category	Teacher Gender					Teacher Type							Years of experience	
	Male (N=52)		Female (N=48)		P^	Permanent PE Specialist (N=71)		Casual PE specialist (N=11)		Non-specialist PE teacher (N=17)		P#	Experience (N=99)	
Student activity	Mean %	SD	Mean %	SD		Mean %	SD	Mean %	SD	Mean %	SD		Estimate	P*
Lying down	0.8	1.8	0.1	0.4	0.01*	0.6	1.6	0.3	0.7	0.1	0.2	0.37	0.02	0.21
Sitting	28.1	15.0	27.5	17.3	0.86	26.9	13.6	27.3	24.9	30.7	19.1	0.69	-0,22	0.17
Standing	29.3	14.2	35.3	15.0	0.04*	32.2	15.0	32.5	17.2	32.5	17.1	0.99	-0.18	0.24
Walking	31.3	11.6	29.4	11.9	0.44	30.5	11.1	30.8	13.7	30.4	13.5	0.99	0.21	0.08
Very active	10.2	6.9	7.6	5.3	0.04*	9.5	6.5	9.1	7.2	6.3	3.9	0.16	0.16	0.01*
MVPA	41.4	15.1	37.1	14.0	0.14	40.0	14.2	39.9	20.1	36.7	13.6	0.71	0.36	0.01*
Lesson Context	Mean %		Mean %		P	Mean %		Mean %		Mean %		P	Estimate	P
Management	25.8	11.7	29.6	11.8	0.11	26.2	12.0	31.3	10.7	31.2	12.0	0.16	-0.40	<0.01*
Knowledge	11.5	10.1	14.2	10.3	0.19	13.5	10.3	12.4	10.	10.5	10.7	0.55	0.10	0.34
Fitness	13.3	20.2	10.3	17.0	0.44	15.4	20.5	4.3	10.8	3.3	4.8	0.02*	0.54	<0.01*
Skill practice	11.0	19.7	15.4	17.3	0.24	14.9	20.0	12.7	19.1	6.5	10.1	0.25	0.23	0.21
Game play	35.3	29.2	26.8	23.6	0.11	27.3	26.7	32.1	26.8	45.4	23.6	0.04*	-0.45	0.09
Other (free Play)	3.0	5.9	3.6	12.1	0.74	2.8	5.6	7.3	24.2	3.1	5.2	0.33	-0.02	0.81
Teacher Interaction	Mean %		Mean %		P	Mean %		Mean %		Mean %		P	Estimate	P
In class promotion of PA	30.3	14.2	26.8	12.2	0.19	30.6	13.6	27.3	9.0	19.9	11.1	0.01*	0.31	0.02*
Out of class promotion of PA	0.3	0.6	0.3	1.0	0.97	0.3	0.9	0.0	0.0	0.1	0.3	0.29	0.02	0.03*
No promotion of PA	69.5	14.3	73.0	12.4	0.19	69.0	13.7	72.7	9.0	80.0	11.1	0.01*	-0.33	0.01*
Useable PE lesson time in min	49.1	9.7	50.5	17.5	0.63	49.5	12.7	44.2	9.0	54.4	19.9	0.16	-0.04	0.73

[^] P values calculated via T-Test

[#] P values calculated via ANOVA

⁺ P value calculated via linear regression

Table 3. School and lesson level characteristics associated with student activity levels, lesson context and teacher interactions.

Category	School Characteristic Location					Lesson characteristic Lesson size					Lesson Characteristic Lesson composition						
Student activity	Urban (N=40)		Rural (N=60)		P value	Small (35 students or less) (N=72)		Large (>35 students) (N=25)		P value	Mostly girls (60% + girls) (N=22)		Equal spread (N=63)		Mostly boys (60% + boys) (N=12)		P value
	Mean %	SD	Mean %	SD		Mean %	SD	Mean %	SD		Mean %	SD	Mean %	SD	Mean %	SD	
Lying down	0.6	1.4	0.4	1.3	0.53	0.6	1.5	0.2	0.5	0.25	0.3	0.9	0.5	1.3	0.9	2.1	0.42
Sitting	25.9	17.5	29.1	15.0	0.34	25.7	15.6	34.4	16.6	0.02*	28.4	13.4	28.8	17.2	22.5	16.4	0.44
Standing	30.1	16.0	33.5	16.9	0.26	33.6	13.4	28.0	18.4	0.12	33.9	14.0	31.1	15.2	34.5	15.6	0.64
Walking	32.2	11.1	29.2	12.1	0.21	31.0	10.9	28.2	14.0	0.30	29.1	11.5	30.6	12.3	30.9	10.3	0.87
Very active	10.7	6.7	7.8	5.6	0.02*	9.1	5.4	8.6	8.5	0.71	8.2	6.5	8.8	6.2	11.3	6.2	0.34
MVPA	42.9	14.0	37.0	14.7	0.04*	40.1	13.4	36.7	18.0	0.33	37.3	14.1	39.3	15.2	42.1	14.0	0.64
Lesson Context	Mean %	SD	Mean %	SD	P value	Mean %	SD	Mean %	SD	P value	Mean %	SD	Mean %	SD	Mean %	SD	P value
Management	25.7	9.4	28.9	13.2	0.19	27.1	10.8	29.9	14.0	0.20	28.4	14.8	27.6	10.5	27.8	12.1	0.96
Knowledge	14.3	11.1	11.9	9.6	0.25	14.4	10.4	9.0	8.9	0.02*	13.2	8.8	12.8	10.5	13.5	12.1	0.97
Fitness	17.0	20.1	8.6	16.6	0.03*	11.7	17.3	15.6	21.8	0.29	9.5	14.2	13.1	19.7	12.0	20.3	0.74
Skill practice	12.6	16.2	13.4	20.	0.81	16.6	19.8	3.8	10.5	0.003*	18.9	24.0	11.6	16.3	12.6	19.3	0.29
Game play	26.7	24.3	34.2	28.3	0.18	28.8	25.8	34.7	27.3	0.33	27.9	26.6	30.5	25.6	33.3	29.8	0.84
Other (free Play)	3.7	6.9	3.0	10.7	0.69	2.1	4.9	7.0	16.4	0.02*	2.0	4.4	4.4	11.4	0.8	1.8	0.35
Teacher Interaction	Mean %	SD	Mean %	SD	P value	Mean %	SD	Mean %	SD	P value	Mean %	SD	Mean %	SD	Mean %	SD	P value
In class promotion of PA	31.5	12.6	26.7	13.5	0.08	28.9	13.6	29.2	12.2	0.92	27.5	12.4	28.6	13.1	33.4	14.8	0.41
Out of class promotion of PA	0.5	1.2	0.1	0.3	0.03*	0.3	0.9	0.1	0.3	0.24	0.1	0.3	0.4	1.0	0.0	0.0	0.18
No promotion of PA	68.1	12.9	73.2	13.6	0.06	70.8	13.8	70.7	12.2	0.97	72.4	12.5	71.1	13.4	66.6	14.8	0.45
Range of useable PE lesson time in minutes	49.5	11.1	50.0	15.6	0.86	48.9	11.6	52.8	19.3	0.24	54.5	21.8	48.5	11.5	49.2	4.2	0.22

