



Original research

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



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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.

Conclusions: 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.

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1. 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

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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^{6–9} with few studies conducted in Australia.^{10–12} 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.

2. 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 state¹⁴ and had a population of approximately 65,000 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^{2,14} they had between 120 and 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' video-taped 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-s 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 categorised 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

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