

New South Wales
Health Promotion Demonstration
Research Grants Scheme

PHYSICAL ACTIVITY FOR
EVERYONE



PHYSICAL ACTIVITY FOR EVERYONE

OUTCOMES OF A MULTI-COMPONENT
SCHOOL-BASED PHYSICAL ACTIVITY
INTERVENTION FOR ADOLESCENTS

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List of abbreviations

BMI	Body mass index
BMI-Z	Body mass index z-score
CATI	Computer-assisted telephone interview
CI	Confidence interval
CPM	Counts per minute
HPE	Health and physical education
HPS	Health-promoting schools
ICC	Intra class correlation
INT\$	International dollars
MVPA	Moderate-vigorous physical activity
NCD	Non-communicable disease
NHANES	National Health and Nutrition Examination Survey
NSW	New South Wales
PDHPE	Personal Development, Health and Physical Education
PE	Physical education
PA	Physical activity
PA4E1	Physical Activity 4 Everyone
RCT	Randomised controlled trial
SCT	Social Cognitive Therapy
sd	standard deviation
SOFIT	System for Observing Fitness Instruction Time
VPA	Vigorous physical activity
WHO	World Health Organization
WC	Waist circumference

Abstract

Background and aims

Physical inactivity has been described as a primary cause of most chronic conditions, as important as both tobacco and obesity as a major modifiable risk factor for chronic diseases. The economic burden of physical inactivity globally is INT* \$53.8 billion. Despite this, as few as 20% of adolescents globally meet current physical activity recommendations, with socio-economically disadvantaged adolescents less likely to be physically active. Given evidence suggests physical activity levels throughout adolescence track into adulthood, effective interventions targeting socio-economically disadvantaged adolescents are warranted. Comprehensive school-based physical activity interventions have the potential to impact on physical activity levels, yet few such interventions have targeted socio-economically disadvantaged adolescents. As a result, development of cost-effective school-based physical activity interventions targeting socio-economically disadvantaged adolescents is a public health priority.

Methods

The primary aim of this study was to evaluate a 24-month, school-based physical activity intervention in a trial targeting a cohort of Grade 7 students attending schools located in socio-economically disadvantaged communities (Physical Activity 4 Everyone (PA4E1)). The PA4E1 intervention was evaluated using a cluster randomised controlled trial (RCT) involving 1100 adolescents (Grade 7, mean age 12.0 years at baseline) from five intervention and five control schools located in the Hunter, Central Coast and Mid North Coast regions of New South Wales, Australia. The two year multicomponent intervention was guided by socio-ecological theory and the Health Promoting Schools Framework, incorporating seven physical activity strategies and six implementation support strategies. The three physical activity strategies implemented across the curriculum were teaching strategies to increase physical activity in physical education lessons, student physical activity plans and enhanced school sport programs; the two school environment strategies were recess/lunchtime activities and school physical activity policy; and two broader school environment strategies were linking schools with community physical activity providers and linking with parents. Six additional strategies supported school implementation of the physical activity intervention strategies including an in-school physical activity consultant, leadership and executive support, teacher training, resources, prompts and intervention implementation performance feedback.

The primary outcome was mean duration of moderate-to-vigorous physical activity (MVPA) minutes per day assessed using Actigraph (GT3X) accelerometers at baseline, and 12- and 24-months post randomisation. Additional physical activity outcome measures included: mean minutes per day of vigorous and moderate activity, counts per minute, % wear time spent in MVPA, vigorous and moderate activity, in-school and out-of-school physical activity. Secondary outcome measures were weight, body mass index (BMI), and BMI Z-score. In addition, a cost-effectiveness evaluation was undertaken whereby intervention costs and incremental cost-effectiveness ratios were calculated for both physical activity and adiposity. Physical activity and weight status data were analysed using repeated measures linear mixed models with models developed for the baseline to 12-month period, as well as baseline to 24-month period.

*International dollars (same value as USD).

Results

Parental consent was provided for 1233 of the 1468 Grade 7 students from participating schools. At baseline, 1150 students wore an accelerometer (mean age 12.0 years, 54% female), with 965 providing at least three days of valid wear data (83% of accelerometer wearers, 78% of those with consent). At 24-month follow-up, 985 students wore an accelerometer (mean age 14.0 years, 57% female), with 441 of these (45%) providing valid wear data.

At both 12- and 24-month follow-up there was a significant group-by-time effect in favour of the intervention group for MVPA. At 12-month mid-intervention follow-up, students in the intervention group participated in 3.85 minutes (95% CI = 0.79, 6.91) more MVPA per day than students in the control group. At 24-month follow up students in the intervention group participated in 7.02 minutes (95% CI = 2.68, 11.36) more MVPA per day ($p = \leq 0.01$) than students in the control group. The mean duration of daily MVPA increased by 4.39 minutes for intervention group students and decreased by 2.63 minutes for control group students. The intervention group students participated in 2.53 minutes more vigorous physical activity ($p=0.03$, 95% CI = 0.27- 4.79) and 4.5 minutes more moderate physical activity ($p\leq 0.01$, 95% CI = 1.98, 7.03) than the control group students at 24-months post randomisation.

At 12-month mid intervention, there was a significant group-by-time effect for weight (mean difference= -0.90kg) and BMI (-0.28kg/m²) in favour of the intervention group. At 24 months, there were statistically significant group-by-time effects for weight (mean difference= -0.78 kg, 95% CI = -1.40; -0.16, $p=0.03$) and BMI (mean difference= -0.28, 95% CI = -0.50,-0.06, $p=0.01$) in favour of the intervention group. The intervention cost was AUD\$329,952 over 24 months. The incremental cost-effectiveness ratio per additional minute of MVPA per day was AUD\$56 (\$35-\$147) and AUD\$563 (\$282-\$3,942) per 10% reduction in BMI z-score.

Conclusion

The PA4E1 trial showed the intervention was effective in not only reducing the decline in physical activity among adolescents attending schools located in socio-economically disadvantaged areas, but in increasing physical activity in comparison to a decrease in the control group. In addition, the intervention had a significant positive effect on adiposity and BMI. The findings suggest that implementation of the intervention by socio-economically disadvantaged secondary schools has the potential to reverse the decline in physical activity in this population group at a relatively small marginal cost. Further understanding of the mechanisms for implementation of the program at scale is required to contribute towards achieving health gains at a population level. The results of the trial suggest an opportunity for the dissemination of the evidence-based program to a larger number of schools. Measuring the sustainability of the intervention, inclusive of effect on both student level outcomes and school practice implementation level outcomes, is suggested.

Study protocol for the 'Physical Activity 4 Everyone' trial

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STUDY PROTOCOL

Open Access

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

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Abstract

Background: Adolescence is an established period of physical activity decline. Multi-component school-based interventions have the potential to slow the decline in adolescents' physical activity; however, few interventions have been conducted in schools located in low-income or disadvantaged communities. This study aims to assess the effectiveness of a multi-component school-based intervention in reducing the decline in physical activity among students attending secondary schools located in disadvantaged communities.

Methods/Design: The cluster randomised trial will be conducted with 10 secondary schools located in selected regions of New South Wales, Australia. The schools will be selected from areas that have a level of socio-economic status that is below the state average. Five schools will be allocated to receive an intervention based on the Health Promoting Schools framework, and will be supported by a part-time physical activity consultant placed in intervention schools who will implement a range of intervention adoption strategies. Study measures will be taken at baseline when students are in Year 7 (12–13 years) and again after 12- and 24-months. The primary outcome, minutes of moderate- to-vigorous- intensity physical activity per day and percentage of time in moderate- to vigorous-intensity physical activity (MVPA), will be objectively assessed using accelerometers (Actigraph GT3x+). Group allocation and intervention delivery will commence after baseline data collection. The intervention will continue during school terms through to 24-month follow-up.

Discussion: The study will provide evidence regarding the effectiveness of a multi-component school-based intervention that includes an in-school physical activity consultant targeting the physical activity levels of adolescents in disadvantaged Australian secondary schools.

Trial registration: Australian New Zealand Clinical Trials Registry ACTRN12612000382875.

Keywords: Physical activity, Adolescents, School, Randomized controlled trial

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Background

Being physically active can prevent numerous chronic diseases including coronary heart disease, obesity, some types of cancers such as colorectal and breast cancers, and improve muscle strength and fitness and aspects of mental health [1,2]. Despite such benefits, population surveys from the United States of America and the United Kingdom have found that only 15.3 percent of 13–18 year olds [3] in the United States of America and as few as 0–7 percent of 11–15 year olds [4] from the United Kingdom being physically active to a sufficient level to improve health. Similarly, the proportion of Australians adolescents aged 13 to 17 years that meet the recommended amount of physical activity is around 15 percent [5].

The transition into adolescence is a recognised period of physical activity decline. Research suggests that moderate to vigorous physical activity drops by up to seven percent per year between the ages of 9 to 15 years, so that by age 15 the majority of adolescents no longer meet the recommended daily amount of activity [6,7]. In addition, the physical activity decline associated with adolescence is steeper among youth from disadvantaged or low income communities [8,9]. Reducing this decline is an important health priority as inactivity tends to track into adulthood [10].

Schools are a key setting for the promotion of physical activity as they have existing curricula, infrastructure, policies and resources to promote physical activity [11] and are also able to reach those from all backgrounds [12]. The effectiveness of multi-component school based physical activity interventions, particularly those that include links to families and communities, has consistently been demonstrated in reviews [13–19]. However, recent reviews of school based physical activity interventions, have identified only three studies focusing on low income groups [13,20–22] each targeting children of primary school age (i.e. aged 6 to 12 years) rather than adolescents.

Schools located in disadvantaged communities face a number of challenges in implementing whole of school physical activity programs, including student, teacher and parent disengagement and high staff turnover [23–26]. In addition, Australian research indicates students from lower socio-economic or disadvantaged backgrounds face barriers in physical activity participation including lack of parental support, cost of school sports, time available for school sport and choice and variety of physical activities offered at school [27,28]. A review of the effectiveness of physical activity interventions in disadvantaged groups, although not specific to schools, concluded that interventions underpinned by a theoretical framework were more likely to be successful, and suggested the importance of focussing on a range of areas including social and professional supports and increasing the length of the intervention period [18]. The Health Promoting Schools (HPS) framework [29] has an emphasis on intervention across a

range of areas including school curriculum, school environment and ethos, and partnerships with community and parents. In order to address the challenges of intervening within disadvantaged schools, in addition to the introduction of health strategies, the explicit incorporation of strategies to support intervention adoption within schools has been suggested to be important [24,30,31]. Such strategies can include teacher professional learning, on-going teacher support, availability of credible leadership and opinion leaders, provision of resources and prompts, and monitoring and feedback of intervention adoption [24,30,31].

Given the lack of multi-component intervention studies that target physical activity levels among adolescents from lower income or disadvantaged groups, the aim of this study is to determine whether a multi-component physical activity intervention implemented in disadvantaged secondary schools can reduce the decline in physical activity associated with adolescence.

Methods/Design

Study design

This study will employ a cluster randomised controlled design (Figure 1).

The research will be conducted and reported in accordance with the requirements of the Consolidated Standards of Reporting Trials (CONSORT) Statement [32,33]. A randomly selected sample of disadvantaged secondary schools in the study region will be invited to participate. The schools will be randomly allocated to receive a multi-component intervention to be implemented during school terms and to commence after baseline data collection, or to a control group. Data will be collected from students at baseline (when students are in their first year of high school, aged 12–13 years), and from the same cohort of students after 12-months (midpoint) and 24-months post baseline data collection. The primary outcome will be minutes per day and percentage of time in moderate- to vigorous-intensity physical activity (MVPA) at 24-month follow-up.

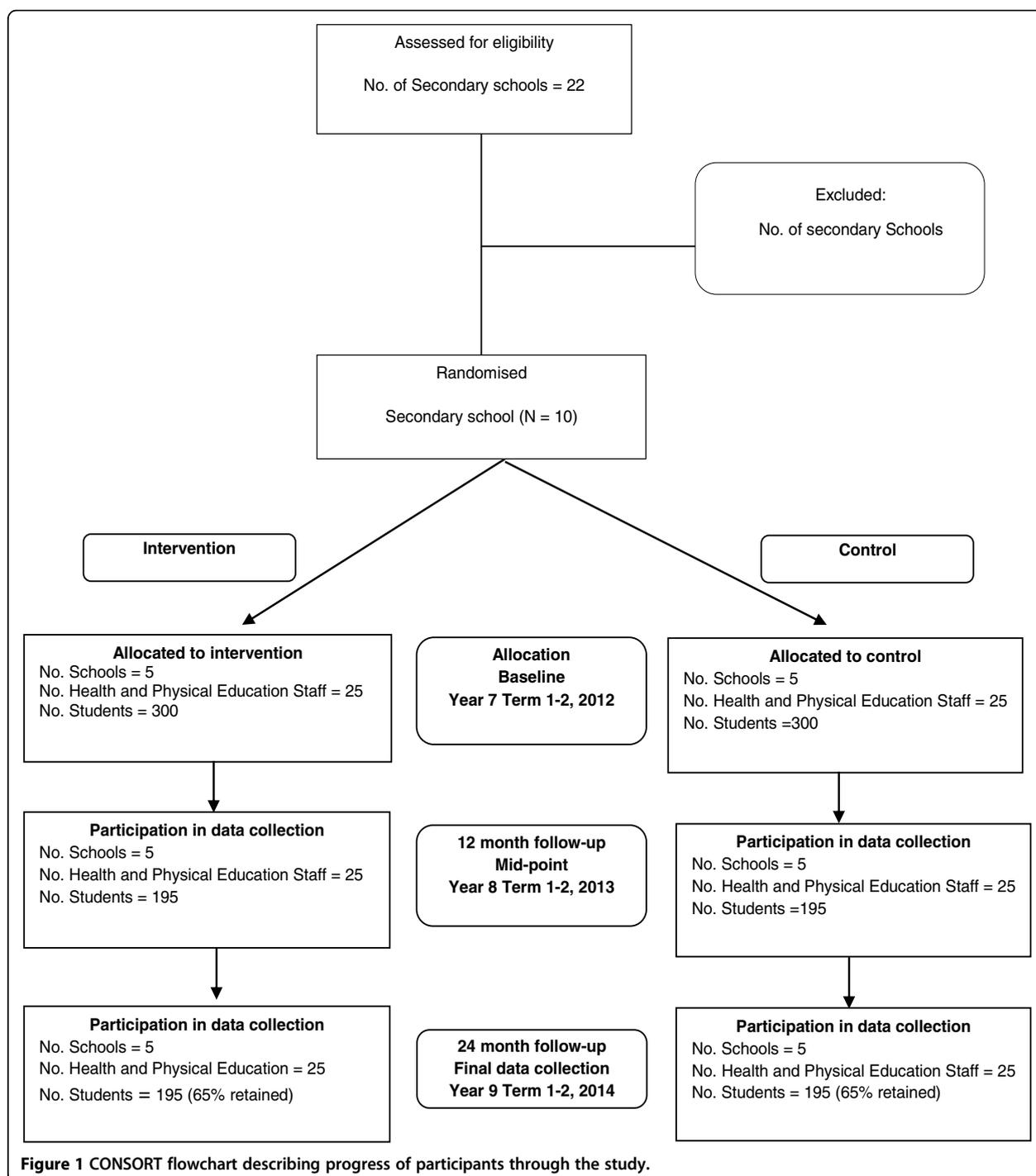
Setting

The study will be conducted in the Hunter, Central Coast and Mid North Coast regions of the state of New South Wales, Australia. These regions encompass major city and regional areas (ARIA) [34]. The regions have lower indices of socio-economic status than New South Wales [35] and a population of approximately 64,188 children aged between 12 and 15 years (17.6%) [35].

Sample/ Participants

Secondary schools

Secondary schools in New South Wales cater for students aged from about 12 (Year 7) to 18 (Year 12) years old.



Students are required to undertake 300 hours of Health and Physical Education each year, from Year 7 to Year 10 [36,37]. Students also have opportunities to engage in physical activity through school sport (averaging 2 hours per week) [38]. Physical Education is taught by qualified Health and Physical Education teachers.

Of the secondary schools within the study region, those that meet the following criteria will be eligible to

participate in the study: Government and Catholic schools; schools with postcodes ranked in the bottom 50% of New South Wales postcodes based on the Socio-Economic Indexes For Australia (SEIFA) [39]; have between 120–200 Year 7 students (to meet sample size requirements); and are not participating in other major physical activity or health intervention studies. Ten schools will be recruited.

Students

All Year 7 students in participating schools will be eligible to participate in the study measurement. Classes catering for students with severe physical and mental disabilities will be excluded.

Recruitment procedures

Schools

Prior to recruitment, the study will be promoted to school sector Regional Directors within the NSW Department of Education and Communities (DEC) and the relevant Catholic school Dioceses to gain their support. A random number function in Microsoft Excel will be used to determine the order in which the eligible secondary schools are approached to participate. Invitations to participate will be sent to the 10 randomly selected schools. If a selected school declines, an additional letter will be sent to the next eligible school on the list, until 10 schools accept the invitation to participate.

A letter will be sent to selected schools, detailing the study and inviting participation. Approximately two weeks after the invitation letter is sent to the school, the Principal will be contacted by phone by a member of the research team. A face-to-face meeting will be requested with both the Principal and the Head Health and Physical Education teacher to outline the requirements of the study and request consent.

Random allocation of schools

Eligible schools will be classified into two strata based on geographic location (regional or major city) [34]. Research indicates that location may contribute to the varying physical activity levels of adolescents [40]. Four consenting schools will be obtained from the major city strata and six from the regional school strata. Participating schools will be randomly allocated using block randomization (1:1 ratio) to the intervention or control condition using a computerized random number function. Randomization will be undertaken by a statistician not involved in contacting schools or in the study intervention or assessment and will occur after baseline data collection to reduce participation bias from students, teachers and researchers. The school Principal will receive a letter from the study team indicating to which group the school has been allocated. Data collectors will be blinded at baseline and where possible at 12 and 24-months data collection.

Students

All Year 7 students in the participating schools will be provided an information package that will contain a letter outlining the study and a consent form for parents asking for consent for their child to participate in the study data collection. Parents will be provided with a telephone number where they can leave a message if

they do not want to be prompted about consent or do not want their child to participate in the measurement component of the intervention. Two weeks following distribution of the information package, parents who have not returned a consent form or left a message indicating they do not wish to be contacted, will be telephoned by staff employed through the education sector and asked if their child can participate in study measurement. A replacement consent form will be sent to parents providing verbal consent.

A number of strategies that have been used successfully in similar research will be adopted in an effort to maximise parent and student consent. These include having a designated recruitment co-ordinator, promoting the research prior to requests to participate, disseminating materials to maximise parent engagement, and issuing reminders to parents using a variety of methods including phone calls and letters [28,38,41].

Physical activity intervention

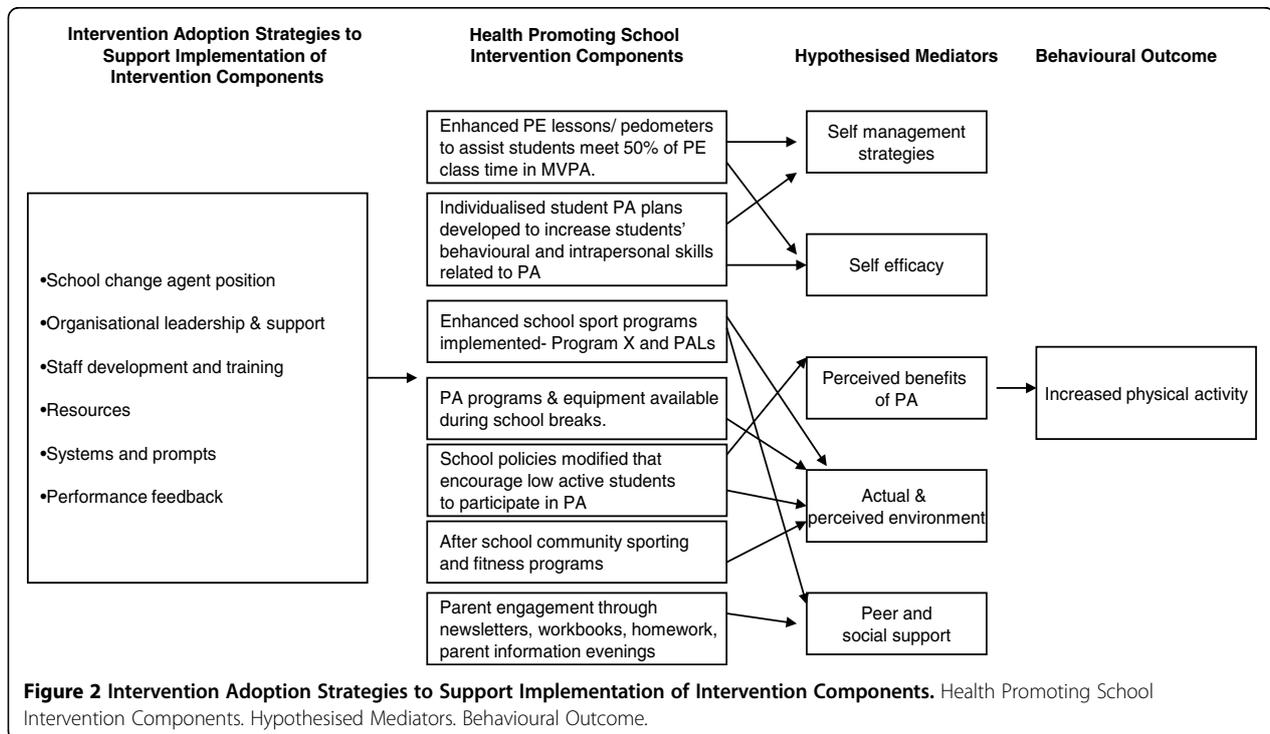
Theoretical framework and physical activity content

Consistent with recommendations from reviews to maximise the effectiveness of school-based physical activity studies, the intervention has been guided by social cognitive [42] and social-ecological theories [43] and will be implemented using the World Health Organisation's (WHO) Health Promoting Schools framework. This framework includes strategies that address the school curriculum, school environment and community [14,29,44-46].

Figure 2 shows the seven physical activity intervention strategies that schools will be facilitated to implement, and the strategies that will be used to increase the extent of intervention adoption. A further description of the physical activity intervention strategies within the Health Promoting Schools framework domains is as follows.

Formal curriculum

1. Implementation of teaching strategies to maximise student activity levels within Physical Education classes. Schools will aim to meet 50% of Physical Education class time in MVPA for their students, a standard recommended by the US Centres for Disease Control (CDC) and Prevention [47]. Health and Physical Education teachers will receive training and resources to assist in maximising moderate- vigorous physical activity, including workshop style sessions that will incorporate a facilitated process for reflection on levels of MVPA in lessons and changing teaching practices to enhance levels of activity. In addition to this training, regular pedometer-based lessons and curriculum material will be introduced to assist teachers [48-50].



- Development and monitoring of annual individual student physical activity plans in health and physical activity that include: long- and short-term personal goals for improving or maintaining regular physical activity; specific actions and timelines to achieve those goals; fitness assessments; methods to be used to record actions and assess progress; and rewards for achieving goals [51]. Health and Physical Education teachers will be responsible for co-ordinating the development and monitoring of individual physical activity plans. Consistent with the CDC guidelines, students will be encouraged to review their physical activity plans and modify the content regularly [11]. Students will also be given small incentives when their personal goals have been met (such as balls, wrist bands, drink bottles).
- Implementation of enhanced school sport programs for all students. All students will be scheduled to participate in age appropriate 10-week programs during school sport while they are in Years 7, 8 or 9. The school sports programs will be based on *Program X* and Physical Activity Leaders (*PALs*), both of which have been shown to be efficacious in adolescents [48,52]. These single sex programs include; health-related fitness activities, pedometers for self-monitoring, lunch-time activities, information for parents and interactive seminars [38,48,52]. The programs have been designed to meet the needs of low-active students, and are known to be acceptable

and appropriate for such students and improve psychological outcomes [53]. The program content is relevant to all students, and year-wide implementation as a sport option will ensure no student is stigmatised.

School ethos and environment

- Modification of school policies that encourage low-active students to be more physically active [54]. The policies within each intervention school will be reviewed with the aim of establishing policies that enhance physical activity, and modifying existing policies that may be inhibiting activity. School policies that promote single sex Physical Education classes, modified Physical Education uniforms for girls, mandatory Physical Education and sport, provision of equipment and staff supervision in breaks have been shown to enhance physical activity [55].
- Implementation of daily physical activity programs for students during school breaks including increasing the availability of facilities and equipment. Intervention schools will be offered equipment and supervised activities in recess and lunch breaks. Supervised activities have been shown to increase the participation of students in recess and lunchtime activities [56]. Through participation in the enhanced sport programs (ie. Program X and PALs), the

intervention aims to train students to lead the recess and lunchtime activities over the course of the intervention.

Partnerships and Services

6. Implementation of accessible after-school physical activity programs through linkages with community sporting groups and/or organisations from the fitness industry [54,57]. Links will be established between the school and the broader community to enhance the physical activity opportunities available to students outside of school hours. The types of links established will be based on the criteria used in other physical activity interventions [38,58].
7. Parent engagement: Strategies will encourage parents to; increase their adolescent's physical activity, be active with their adolescent at home and in the community [59,60]. Regular information will be sent to parents via existing schools newsletters, school website and program newsletters to support the activities occurring within the school. The materials will inform parents of school-based strategies, promote newly established community links and provide ideas to support physical activity outside of school hours. The newsletters will also aim to provide information on physical activity recommendations and strategies to encourage participation, including parent role modelling.

Intervention adoption strategies

The lack of explicit intervention adoption strategies has been highlighted as a limitation of school based physical activity interventions [13]. To increase the extent of school adoption of the intervention, seven strategies will be used to support implementation of the physical activity components. These strategies are based on literature shown to facilitate the adoption of school based interventions, change service delivery practices of organisations and build capacity of an organization [25,30,31,61-64]. These include:

1. *Change agent position (in-school physical activity consultant)*: A Health and Physical Education teacher will be located within each school for one day per week over the intervention period to support the planning, and implementation of the program under the guidance of the school Principal and the Head Health and Physical Education teacher. This is consistent with previous research showing that location of a physical activity expert within a school can increase the amount of MVPA in Physical Education lessons [57].
2. *Establishing leadership and support*: A committee will lead and oversee the implementation of the intervention within each school. This role could be taken on by an existing school committee or a new school committee could be established with representatives from the school executive, health and Physical Education staff, staff from other key learning areas, students, parents and community. The committee, with the guidance of the in-school consultant will develop an intervention implementation plan. Meetings will be suggested to occur quarterly. Schools will also be asked to nominate a school co-ordinator whom the in-school consultant can work closely with for the duration of the project with the aim of handing over to this person when the research trial has been completed. Presentations will be given to all school staff in addition to the Health and Physical Education teachers and parents. These presentations will provide a means of gaining support for the project, providing input into the implementation and also inform the school community of progress. School Principals and Health and Physical Education head teachers will be encouraged to provide leadership via raising the program at staff meetings, attending the school committee meetings and approving and implementing supportive policy changes.
3. *Staff Training*: Training from credible professionals has been shown to be an effective implementation support strategy [18,61]. Teachers will be provided with training in the physical activity components relevant to their role in implementation. Health and Physical Education teachers will specifically be trained to deliver Physical Education lessons that increase students MVPA. Training and tips will be regularly provided by the in-school physical activity consultant and further professional development sessions will be held twice a year (4 sessions in total over the intervention). The training will be a series of practical learning workshops designed to foster skill development where schools can jointly share their experiences in implementing the strategies, rather than a didactic lecture style format. Teachers from across the whole school will also be invited and trained to deliver the enhanced school sports programs [48,52].
4. *Resources*: Schools will receive an intervention manual including material to implement the Physical Education lesson strategies, enhanced sports and physical activity programs during school breaks, and material on other strategies. Schools will also receive physical activity equipment such as elastic tubing resistance devices, pedometers, active electronic games consoles, skipping and boxing equipment. In addition to the resource kit provided to schools, additional small promotional incentives such as shirts

and lanyards will be provided to teachers upon the introduction of curriculum based strategies. Small promotional incentives (balls, wrist bands, water bottles etc.) will also be given to students upon reaching their personal physical activity goals, for participating in recess and lunchtime activity and completing the enhanced school sports programs.

5. *Prompts*: The physical activity consultant will provide prompts such as emails, reminders in meetings and markings on calendars to teaching staff to undertake intervention strategies. The physical activity consultant will also work with schools to identify ways to build prompts into school communication processes and documents such as electronic calendar reminders and agenda items in meetings.

6. *Intervention adoption performance feedback*:

Principals and Head Health and Physical Education teachers at each school will be given feedback on progress on each physical activity intervention strategy against agreed standards at the end of each school term (quarterly). The feedback reports will also include suggestions and offer support on how to improve performance.

Control schools

Control schools will participate in the measurement components of the study only. Control schools will be offered one day of teacher relief funding at each data collection point (baseline, mid-point and follow-up) to reimburse the school for their time in assisting with data collection. Control schools will also be offered the physical activity equipment pack, all developed intervention materials and the results of the study at the end of the intervention period.

Data collection procedures and measures

All data will be collected at three time points: baseline; 12- and 24-months. Students will wear an accelerometer to record physical activity levels, undertake an on-line survey, and have anthropometric measures taken. The accelerometers and instructions for use will be distributed to students at school within class time, at the same time as students complete the online survey and have anthropometric measures taken.

Outcome measure- physical activity levels

The primary outcome will be student physical activity defined as mean minutes of MVPA. Percentage of time spent in MVPA will also be calculated to adjust for individual accelerometer wear time.

Objectively measured physical activity data will be collected via accelerometers (Actigraph GT3X+ and GT3X model). Accelerometry provides an objective, valid and reliable way of measuring physical activity in young people

[65-67]. Students will be asked by trained research assistants to wear the accelerometers during waking hours for seven consecutive days. The accelerometers will be attached to an elastic belt and worn over the right hip. Raw data will be collected and stored in 15 second epochs. Student data will be analysed if accelerometers are worn for ≥ 600 minutes on ≥ 3 days [68]. The Evenson cut-points will be used to categorize different intensities of physical activity [69]. Students will also be asked to keep activity monitoring logs for the seven-day period when the accelerometers were being worn. To improve compliance, students will be sent a text message each morning reminding them to wear the accelerometer [28,38]. Student and/ or parent mobile phone numbers will be requested via the consent form.

Student characteristics

An online survey, which will take approximately 30 minutes, will be undertaken to assess student socio-demographic characteristics (age, gender, Aboriginal or Torres Strait Islander status and postcode of residence), self-reported physical activity [70], physical activity mediators [28,71].

Anthropometric data

Anthropometric data including height and weight will be collected. Research assistants will be trained in measuring height, weight (used to calculate body mass index; BMI) and waist circumference using the International Society for the Advancement of Kinanthropometry (ISAK) procedures [72]. Weight will be measured in light clothing without shoes using a portable digital scale (Model no. UC-321PC, A&D Company Ltd, Tokyo Japan) to the nearest 0.1 kg. Height will be recorded to the nearest 0.1 cm using a portable stadiometer (Model no. PE087, Mentone Educational Centre, Australia). Waist measurement will be taken as the narrowest point between the inferior rib border and the iliac crest. Using a flexible but inelastic tape measure, the waist measure will be recorded to the nearest 0.1 cm. Two recordings will be taken and then the average will be used. The physical assessments will be conducted in a sensitive manner, with student measurements taken behind a privacy screen. Body mass index (BMI) will be calculated as weight/height squared (kg/m^2). Weight status will be determined using International Obesity Taskforce definitions [73].

School outcomes/Process measures

Data regarding school policies and practices that enhance student physical activity will be collected at baseline and follow-ups via a school environment survey completed by the Head Health and Physical Education teacher at intervention and control schools. Based on existing surveys [74], the survey will focus on school policies and practices that enhance student physical activity including questions

relating to school equipment and facilities, recess and lunch activities and rewards and punishments related to physical activity.

In addition, observational assessments of randomly selected Physical Education classes in both intervention and control schools will be undertaken at each time point to measure physical activity levels, lessons context and teacher interactions [75]. The observational tool, SOFIT (System for Observing Fitness Instruction Time), has been used in similar studies to assess physical activity levels in Physical Education classes [57]. Trained research assistants will conduct the assessments on the same weeks that student data collection is occurring.

Data will be collected by project staff throughout the intervention period to assess the extent of intervention adoption and implementation fidelity in intervention schools.

Sample size

Based on an estimate of 50% of Year 7 students consenting and providing usable accelerometer data, each school should yield at least 60 students (based on at least 120 Year 7 students). This will provide at least 300 students per group. Based on an estimated 65% of the cohort providing usable data at follow-up, there will be at least 195 students per group at 24-month follow-up. Previous studies have been used to estimate the standard deviation of mean daily minutes MVPA per group (17.1) [28] and the Intra Class Correlation coefficient (ICC) (0.01) [76]. After adjustment for the design effect of 1.38, it is estimated the effective sample size will be at least 141 students per group. With this sample size, with 80% power and an alpha level of 0.05 the study will be able to detect a difference in the mean daily MVPA between experimental and control students of +/- 5.73 minutes at follow-up.

Statistical analysis – primary outcome

Analyses using cluster-level summaries are more robust than analyses based on individual-level data when there are less than 15 clusters per treatment arm [77]. Therefore the primary outcome for this study will be analysed by calculating the change in the mean number of minutes of moderate to vigorous physical activity within each school and then comparing the school-level means of the intervention group with the school-level means of the control group using a two sample t-test. The main analysis will be conducted with all available data using the intention to treat principle and sensitivity analyses conducted under various assumptions about the missing data mechanism [78]. Per protocol analyses will also be performed where appropriate.

Discussion

Despite a recent increase in school-based physical activity interventions, few have targeted adolescents living in

low-income communities [9,14,79]. To the research team's knowledge, this is the first study targeting both boys and girls in disadvantaged communities that has used a whole of school approach to physical activity promotion in this cohort and uses an objective physical activity measure. This approach combines strategies shown to be effective in increasing or maintaining physical activity for both boys and girls, and also for enhancing activity for students classified as low-active. The intervention also incorporates strategies known to facilitate intervention adoption, including the use of an in-school physical activity consultant to be placed in intervention schools for the intervention period. This support strategy is designed to overcome a number of barriers reported to inhibit school based interventions such as providing adequate training and resources, enhancing communication, providing ongoing and regular support to teachers implementing the intervention and gaining leadership and support from the school executive, parents and the community [24,80,81]. The study has also been designed with a longer follow-up period.

The study can contribute to the literature by identifying whether the intervention approach can increase physical activity or reduce the decline in physical activity among adolescents living in low income communities.

Abbreviations

PA: Physical activity; PA4E1: Physical activity for everyone; CATI: Computer assisted telephone interview; HPS: Health promoting schools; MVPA: Moderate-to-vigorous physical activity; HPE: Health and physical education.

Competing interests

The authors declare that there are no competing interests.

Authors' contributions

JW, PJM, DRL, LC, LW, KG obtained funding for the research. All authors contributed to developing the intervention and data collection protocols and materials, and reviewing, editing, and approving the final version of the paper. RS, JJ, NN and LD organized and conducted all of the assessments. All authors accept full responsibility for, and have read and approved the final manuscript.

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'Physical Activity 4 Everyone' school-based intervention to prevent decline in adolescent physical activity levels: 12 month (mid-intervention) report on a cluster randomised trial

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ABSTRACT

Background Adolescence is a recognised period of physical activity decline, particularly among low-income communities. We report the 12-month (midpoint) effects of a 2-year multicomponent physical activity intervention implemented in disadvantaged secondary schools.

Methods A cluster randomised trial was undertaken in 10 secondary schools located in disadvantaged areas in New South Wales, Australia. Students in Grade 7 were recruited, with follow-up in Grade 8. The intervention was guided by socioecological theory and included seven physical activity strategies, and six implementation adoption strategies. The primary outcome was mean minutes of moderate-to-vigorous physical activity (MVPA) per day assessed using Actigraph GT3X accelerometers. Outcome data were analysed using repeated measures linear mixed models.

Results At baseline, 1150 (93%) students participated in the data collection (mean age 12 years, 48% boys) and 1050 (79%) students participated at 12-month follow-up. By the 12-month follow-up, the six implementation adoption strategies had been used to support schools to deliver four of the seven physical activity elements. There was a significant group-by-time interaction for mean minutes of MVPA per day in favour of the intervention group (adjusted difference between groups at follow-up=3.85 min, 95% CI (0.79 to 6.91), $p \leq 0.01$), including significantly more vigorous physical activity (2.45 min, $p \leq 0.01$), equating to 27 min more MVPA per week.

Summary At 12-month follow-up, the intervention had reduced the decline in physical activity among adolescents from disadvantaged schools. The intervention may assist students to meet physical activity guidelines.

BACKGROUND

Participation in adequate physical activity has numerous physical and psychological health benefits.¹ Despite this, the proportion of adolescents who are adequately active is consistently low, with as few as 20% meeting physical activity guidelines of 60 min MVPA per day.² International data indicate a significant inverse association between physical activity and socioeconomic status (SES), with adolescents from disadvantaged backgrounds experiencing a steeper decline in physical activity.^{3,4}

As physical inactivity tends to track into adulthood, reducing this decline is a public health priority.⁵

Schools provide access to almost all adolescents over extended periods of time.^{6–8} Schools have qualified staff such as physical education (PE) teachers, resources including sporting equipment and facilities, and a mandate to implement curriculum that promotes physical activity.⁸ Based on a number of systematic reviews,^{9–12} there is evidence that school-based interventions are effective in increasing the proportion of students who are physically active, the length of time spent being active, and student fitness levels.^{9,10,13,14} However, such evidence is primarily focused on children of elementary school age (5–12 years), with very few studies focusing on adolescents.⁹

Systematic reviews of physical activity interventions for children and adolescents^{9–12} conclude that interventions were more likely to be successful if they were multicomponent, longer in duration and based on theory.^{9,10} Such reviews recommended that future trials include the use of an objective measure of physical activity, measurement of total daily physical activity, use clear intervention implementation strategies, focus on low-socioeconomic groups, focus on interventions targeting adolescents, have an intervention duration spanning greater than 12 months, and employ longer follow-up.

Of the fourteen interventions targeting school-based physical activity in adolescents, only five studies have specifically targeted disadvantaged secondary school students. Of these, three have tested single sex interventions, and the studies did not demonstrate a positive intervention effect on physical activity.^{16–18} The two remaining intervention trials both used an objective measure of physical activity and were able to demonstrate an intervention effect. However, both interventions were of short duration, 17 weeks¹⁹ and 6 months, respectively.²⁰

Given the limited number of effective interventions targeting greater physical activity among adolescents from disadvantaged backgrounds, the primary aim of this study was to report on the 12-month, mid-intervention impact of a 2-year multicomponent physical activity intervention implemented in disadvantaged secondary schools, which aimed to reduce the decline in physical activity associated with adolescence. Subgroup analyses for sex, baseline weight status and baseline activity level are also reported.

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student physical activity plans, (3) enhanced school sport for all students (to be delivered in Grade 8);^{20 30} 'School Ethos and Environment'—(4) school physical activity policies, (5) offering physical activity in school breaks (lunch and recess); 'Partnerships and Services'—(6) linking schools to community physical activity providers, (7) parent engagement. By 12-month follow-up, implementation duration within intervention schools ranged from two to three school terms (each term was 10 weeks in duration). Implementation of four of the seven physical activity strategies started (strategies 1, 2, 5, 7 above).

Figure 1 summarises the physical activity strategies delivered, the adoption strategies used to facilitate their delivery and the desired standard and dose delivered within the first 12 months of the intervention period. In the first 12-month period, two curriculum-based strategies started, including teaching strategies to maximise activity in PE and the development of individualised student physical activity plans. To facilitate adoption, PE teachers were provided training on strategies to maximise physical activity in PE, prompted by the change agent to teach pedometer-based lessons and support students to complete personalised physical activity plans, were given resources (such as templates and instructions for use) to support students in developing personal activity plans, and given feedback on activity levels in PE based on SOFIT observations. One strategy targeting the school ethos and environment started within the first 12-month period. Offering physical activity in school breaks (lunch and/or recess) started in each school twice per week. Schools were provided equipment, including a variety of balls, hoops and ropes in a secure locked box to facilitate the start of these activities. The final strategy to start within the first 12-month period focused on parent engagement, whereby hard copy newsletters and websites were used to provide parents with updates in the programme being implemented at school plus articles about ways to support students to be active outside of the school. To facilitate the adoption of these physical activity strategies, schools established committees to oversee the changes and were provided with feedback reports outlining the schools progress towards programme adoption at the end of each term. Meetings were held with school executives, PE teachers and the school change agent to communicate the content of each feedback report.

Comparison

Schools allocated to the control group participated in the measurement components of the study only. They were asked to continue with their usual physical activity practices, including time table-based Health and Physical Education lessons, school sport, breaks for recess and lunch and any scheduled professional development for teachers.

Data collection procedures

Data collection was undertaken by trained research assistants, blinded to group allocation. Baseline data were collected from March to June 2012, and 12-month follow-up data (mid-intervention) data collected from the same cohort of students 12 months later in March–June 2013. The average duration between baseline and follow-up measurements for all schools was 12 months.

Measures

Outcome measures: physical activity levels

Physical activity was measured using accelerometers (Actigraph GT3X+ and GT3X models).^{31–33} Mean minutes of MVPA per day was the primary outcome. Additional outcome measures

included: (1) percentage of time spent in MVPA per day (calculated to adjust for individual wear time), (2) mean minutes per day and percentage wear time for moderate physical activity, (3) mean minutes per day and percentage of wear time in vigorous physical activity, (4) accelerometer counts per minute (CPM). Counts were collected in 15 s epochs and CPM calculated by dividing the total counts per day by the minutes of wear time. The proportion of students meeting physical activity guidelines of 60 min of MVPA/day has also been reported.

Accelerometers and instructions for use were distributed to students within class time when students also completed an online survey and had anthropometric measures taken. Students were requested to wear the accelerometer over the right hip during waking hours for seven consecutive days. Student and parent mobile numbers were collected via the consent form, and these were used to text daily reminders to wear the accelerometer. Student data were included in the analysis if the accelerometer was worn for ≥ 600 min on ≥ 3 days.³⁴ Non-wear time was defined as 30 min of consecutive zeros.³⁵ The Everson cut-points were used to categorise different intensities of physical activity.³⁶

Anthropometric data

Student anthropometric data, including height, weight (used to calculate body mass index (BMI)) and waist circumference was collected in duplicate using the International Society for the Advancement of Kinanthropometry (ISAK) procedures.³⁷ Weight was measured in light clothing without shoes using a portable digital scale (Model no. UC-321PC, A&D Company Ltd., Tokyo, Japan) to the nearest 0.1 kg. Height was recorded to the nearest 0.1 cm using a portable stadiometer (Model no. PE087, Mentone Educational Centre, Australia). Weight status (BMI) was determined using International Obesity Taskforce definitions.³⁸ Waist measurement was taken at the narrowest point between the inferior rib border and the iliac crest, using a flexible but inelastic tape measure. Waist circumference was recorded to the nearest 0.1 cm.

Student characteristics

Students completed an online survey that assessed student socio-demographic characteristics, including age, sex, Aboriginal or Torres Strait Islander status, and postcode of residence. The online survey also included other measures that were not included in the current paper (eg, physical activity mediators).

Process measures

A process evaluation was conducted to determine if the intervention was delivered (fidelity) and received (reach) as intended. At the 12-month follow-up, PE teachers completed a pen and paper survey that assessed intervention fidelity by asking about delivery of three physical activity strategies; implementing pedometer-based PE lessons and termly student physical activity plans with their classes, and whether the school offered recess and/or lunch activities. The school change agent also retained records of intervention implementation at each school. These records were used to determine if programme strategies were implemented to the desired standard outlined in figure 1. This included records of lessons in which pedometers had been used, personal PA plans developed by students, recess and/or lunch physical activities run at each school, and information in newsletters. Students in the intervention group completed online survey items at 12-month follow-up that aimed to assess the reach of three intervention strategies: pedometer-based PE lessons, termly physical activity plans, and availability of recess

and/ or lunch activities. The school change agent also kept records of the adoption strategies implemented by schools, including committee meetings held, teacher training attendance, equipment/resources received by schools and prompts sent to teachers.

Sample size calculations

Based on an estimate of 120 students per school and 50% of year 7 students consenting, it was estimated each school should yield at least 60 students, providing at least 300 students per group.^{39 40} Based on 65% of the cohort providing usable data at 24-month follow-up, it was estimated that there would be at least 195 students per group at follow-up.⁴¹ Previous studies were used to estimate the SD of mean daily minutes MVPA per group (17.1)⁴² and the intraclass correlation coefficient (ICC; 0.01).⁴³ After adjustment for the design effect of 1.38, the effective sample size was estimated to be at least 141 students per group. With this sample size, 80% power and an α level of 0.05, the study was able to detect a difference in the mean daily MVPA between intervention and control students of ± 5.73 min at follow-up.

Statistical analysis

All analyses were conducted using SAS V9.2 (SAS Institute Inc, Cary, North Carolina, USA). Summary statistics were created for the variables of interest (student sex, age, aboriginality, height, weight, BMI, activity level, SES) and accelerometer wear time. T tests were used to determine if students who provided data at 12-month follow-up differed to those that only provided baseline data on the following characteristics—sex, baseline age, weight status and physical activity level. Significance levels were set at $p \leq 0.05$.

Physical activity change

Analyses followed intention-to-treat principles. Analysis of the primary outcome (minutes of MVPA/day), and of the additional physical activity outcome variables (% of wear time spent in MVPA/day; mean minutes and % wear time in moderate physical activity and vigorous physical activity and accelerometer CPM) were facilitated through a linear mixed model (LMM). These statistical models are preferable as they are robust to the biases of missing data.⁴⁴ A three-level hierarchical model was used to capture the correlations in the data with random intercepts for repeated measures (level-1) on individuals (level-2) and clustering within schools (level-3). LMM analysis was used to determine whether the change in physical activity between intervention and control groups differed significantly after 12 months, assessed through an interaction term between group (intervention vs control) and time (baseline vs follow-up). The data were analysed assuming data were 'missing at random'. Descriptive statistics were used to describe the proportion of students in each group meeting the physical activity guidelines of 60 min MVPA per day.

Subgroups analyses

Sex, baseline weight status and baseline activity level were the variables chosen a priori as these are common moderators of energy balance interventions.⁴⁵ Students' baseline BMI were categorised into two groups: 'underweight/healthy weight' and 'overweight/obese' based on the Cole cut-points.³⁸ Baseline student activity level was categorised as those who obtained 60 min or more of MVPA per day (meeting the guidelines), and those with less than 60 min of MVPA each day (not meeting the physical activity guidelines). We included moderator interaction

terms in the above LMM separately for all potential moderators and presented the results by mediator subgroup if the test for three-way interaction term (group \times time \times moderator) was significant at the liberal 20% threshold.⁴⁶

Process measures

χ^2 Square analyses were used to assess whether student responses to process variables differed by student subgroups of sex, baseline physical activity level and baseline weight status ($p=0.05$).

RESULTS

Sample

Ten schools were recruited to the study, which included four Government and one Catholic secondary school in the intervention group and control group. Thirty-three PE teachers (100%) in intervention schools completed the pen and paper survey. Parental consent was received from 1233 of the 1468 (84%) year 7 students. Figure 2 outlines the flow of participants from recruitment to 12-month follow-up. Baseline characteristics of the 1150 students who wore an accelerometer (93% of those with parental consent) are outlined in table 1.

At baseline, 78% of those students who wore an accelerometer provided at least three days of valid accelerometer data (965/1150). At 12-month follow-up, 1050 students wore an accelerometer and 61% of these students provided at least 3 days of valid accelerometer data (643/1050). We found baseline weight and age were predictive of drop out at 12 months, with higher BMI and younger students more likely to drop out ($p \leq 0.001$ and $p \leq 0.001$, respectively). A sensitivity analysis was conducted on the main outcome, adjusting for baseline weight and age, with minimal difference in the result detected; therefore, unadjusted results are presented.

Individual level physical activity changes

Physical activity outcomes from baseline to 12-month follow-up are presented in table 2. At 12-month follow-up, students in the intervention group participated in statistically significant more minutes per day of MVPA than students in the control group (adjusted difference=3.85 min (0.79 to 6.91), $p=0.01$).

The intervention group spent significantly more time in vigorous activity each day (adjusted difference=2.45 min (0.90 to 4.00), $p \leq 0.01$), but not moderate physical activity. The percent time spent in MVPA (0.5% (0.11 to 0.90)) and vigorous activity (0.3%) (0.12 to 0.52)) also differed significantly between groups at 12 month follow-up ($p=0.01$ and $p \leq 0.01$, respectively) in favour of the intervention group. Mean accelerometer CPM was significantly different between groups at 12-month follow-up in favour of the intervention group (31.02 CPM, (9.05 to 53.00), $p=0.01$). The proportion of students meeting the physical activity guidelines were 33% at baseline and 34% at 12-month follow-up in the intervention group, and 34% at baseline and 28% at 12-month follow-up in the control group.

Changes in physical activity from baseline to follow-up across subgroups (sex, baseline weight status and baseline activity level)

The subgroup interaction term indicated time by intervention effects that differed by subgroup for each variable: sex ($p \leq 0.01$), baseline weight status ($p \leq 0.01$) and baseline physical activity status ($p \leq 0.01$); therefore subgroup analyses were progressed for each. The 12-month physical activity analyses by

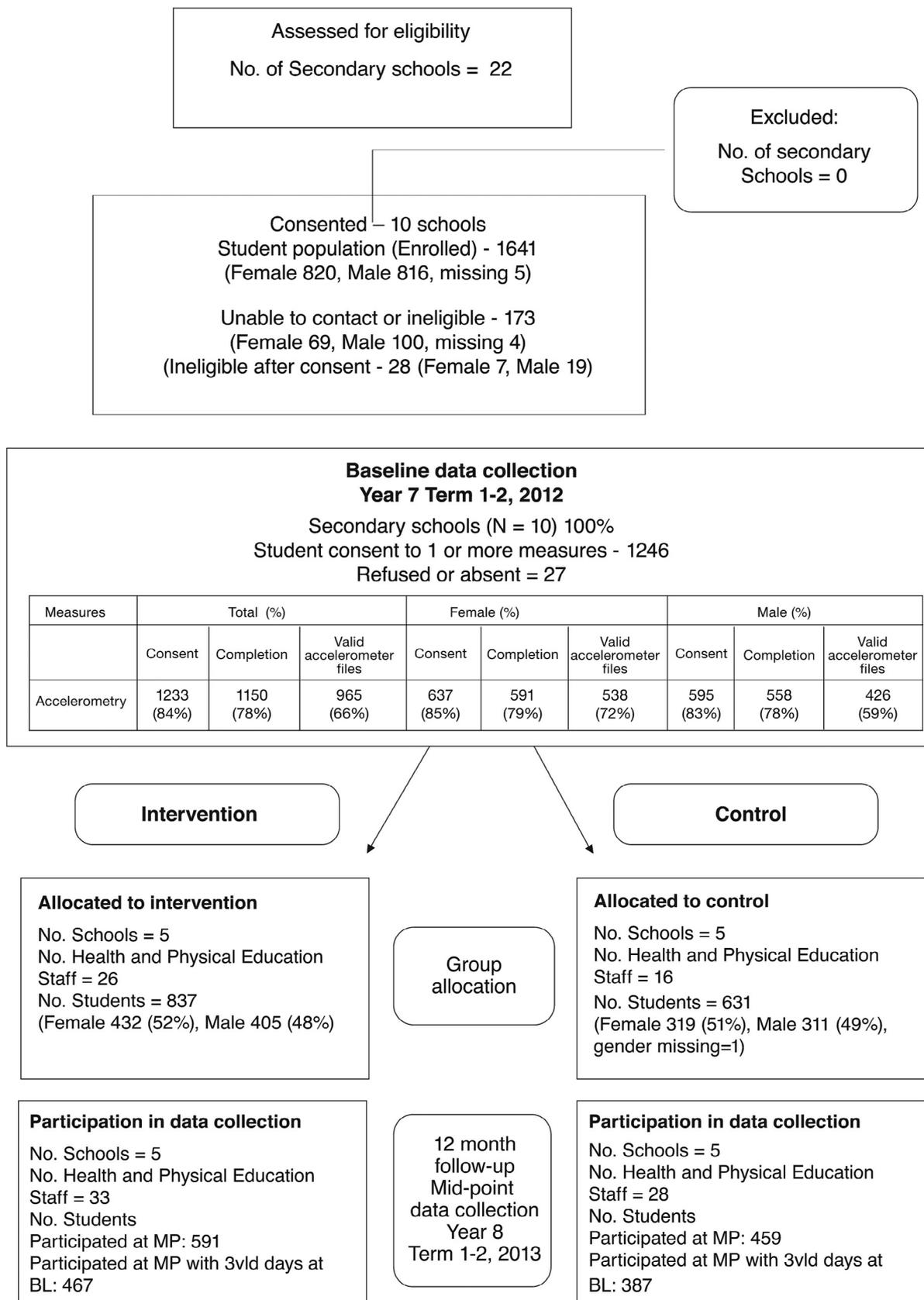


Figure 2 CONSORT flow chart describing progress of participants through the study.

Table 1 PA4E1 sample characteristics at baseline

Characteristic	Intervention group	Control group
Number/total participants	645	505
Boys*	290	239
Girls*	317	254
3 vld days	524	435
Mean age (years)	12.0	12.0
Aboriginal and/or Torres Strait Islander (%)	5.3	7.8
Height, (mean m)	157.1	156.8
Weight, (mean kg)	49.3	50.0
<i>Student BMI category, (%)</i>		
Underweight/healthy weight		
All students	77.5%	74.0%
Boys	78.3%	74.4%
Girls	77.2%	73.7%
Overweight/obese		
All students	21.8%	26.0%
Boys	21.9%	24.4%
Girls	22.9%	26.9%
<i>Student activity level</i>		
Active (≥ 60 min MVPA/day)		
All students	33%	33%
Boys	50%	42%
Girls	48%	40%
Low active (<60 min MVPA/day)		
All students	67%	67%
Boys	50%	58%
Girls	52%	60%
<i>Socioeconomic status</i>		
Low SES	57.8%	61%
<i>Accelerometer wear time</i>		
Mean minutes per day	793.6	804.6

*Does not add to total students (n=645) due to 38 students having gender missing. BMI, body mass index; MVPA, moderate-to-vigorous physical activity; PA4E1, Physical Activity 4 Everyone; SES, socioeconomic status.

subgroup are reported in table 3. A greater effect was observed in male students in the intervention group compared with the control group on mean minutes of MVPA per day (6.47 min (1.24 to 12.95), $p=0.02$) and percentage of wear time spent in MVPA (0.9%, $p=0.02$). No significant differences between groups for females were observed at 12-month follow-up. There

were no detected differences between intervention and control based on weight status or activity level detected.

Process measures

Table 4 outlines process evaluation data collected from teachers and students at 12-month follow-up. At 12-month follow-up, 95.5% of teachers reported using pedometers to increase activity levels in PE, 70.3% reported incorporating student personal physical activity plans each term and providing feedback to students on these plans, and 75% reported the school offered organised physical activity at recess and/or lunchtimes, at least twice per week. The school change agent records showed that all schools had started use of the pedometers in PE classes, with four of the five schools (80%) using them with the desired frequency (figure 1). Similarly, while all schools had administered student physical activity plans at least once, three (60%) had administered these as per the desired termly standard (2 or 3 per student). All schools had implemented recess and/or lunch activities at least once per week, and four (80%) had these implemented at least twice per week. All schools had provided parents with additional information regarding physical activity via newsletters and the school website with the requested termly frequency.

At 12-month follow-up, 92.7% of students reported being offered pedometer-based PE lessons at least twice per term, 51.6% reported completing a personal physical activity plan at least once, and 55.8% reported that the school offered organised physical activity at recess and/or lunch. When the results were compared for male and female students, and for students grouped according to baseline weight and physical activity status, the only statistically significant difference was that male students were more likely than female students to report the school offered recess and/or lunch physical activities (61.5% vs 50.9% ($p=0.03$); table 4).

The adoption strategies outlined in figure 1 were being used consistently in all intervention schools. All schools had formed committees to oversee the implementation of physical activity strategies and had at least 2–3 meetings; the school change agent attended each school for 1 day per week and all schools had at least one staff member attend the professional development (range 1–4 staff). The school change agent sent weekly prompts to PE teachers encouraging pedometer-based PE lessons and completion of student physical activity plans. A range of equipment to facilitate recess and/or lunch activities and a storage box were delivered to each school, and feedback

Table 2 Changes in physical activity from baseline to 12-month follow-up (minutes MVPA, % wear time in MVPA, % meeting PA Guidelines)

Outcome	Intervention			Control			Intervention-Control Adjusted difference between treatment group (95% CI)	Group \times time p value
	BASELINE (n=524)	MIDPOINT (n=352)	p Value	BASELINE (n=435)	MIDPOINT (n=288)	p Value		
<i>Minutes of physical activity (mean min/day)</i>								
Total MVPA	53.3	54.2	0.55	53.6	50.8	0.07	3.85 (0.79 to 6.91)	0.01*
Vigorous activity	16.6	18.0	0.07	16.9	16.2	0.37	2.45 (0.90 to 4.00)	0.002
Moderate activity	36.7	36.2	0.52	36.7	34.6	0.02	1.41 (–0.50 to 3.33)	0.15
Counts per minute	482.2	476.2	0.58	486.1	452.3	0.002	31.02 (9.05 to 53.00)	0.01
<i>Percentage of wear time</i>								
Percentage MVPA	6.7	6.9	0.44	6.7	6.4	0.10	0.50 (0.11 to 0.90)	0.01
Percentage vigorous	2.1	2.3	0.05	2.1	2.0	0.40	0.32 (0.12 to 0.52)	0.001
Percentage moderate	4.6	4.6	0.70	4.6	4.4	0.04	0.18 (–0.06 to 0.43)	0.15

Table 3 Changes in physical activity from baseline to follow-up (12 months) by subgroup (gender, weight status at baseline and activity level at baseline) (Mean minutes of MVPA per day, % wear time in MVPA, % meeting physical activity guidelines)

Subgroups	Outcome	Intervention			Control			Intervention-Control Adjusted difference between treatment group (95% CI)	Group× time p value
		BASELINE (n=524)	MIDPOINT (n=352)	p Value	BASELINE (n=435)	MIDPOINT (n=288)	p Value		
Gender									
Males	MVPA (min per day)	62.7 (22.54)	66.3 (27.19)	0.17	59.4 (23.32)	56.6 (19.81)	0.27	6.47 (−1.84 to 14.78)	0.02*
	Percentage of wear time in MVPA	8.0 (2.89)	8.5 (3.72)	0.19	7.5 (2.88)	7.2 (2.57)	0.34		
Females	MVPA (min per day)	46.6 (16.45)	45.7 (15.50)	0.55	48.9 (17.63)	45.8 (17.71)	0.09	−0.94 (−5.62 to 3.74)	0.35
	Percentage of wear time in MVPA	5.8 (2.06)	5.8 (1.98)	0.74	6.1 (2.21)	5.7 (2.17)	0.14		
Weight status at baseline									
Underweight/ healthy weight	MVPA (min per day)	54.9 (21.83)	54.9 (21.98)	0.98	55.4 (21.72)	53.1 (19.22)	0.25	1.82 (−4.22 to 7.87)	0.10
	Percentage of wear time in MVPA	6.9 (2.84)	6.9 (2.89)	0.95	6.9 (2.71)	6.7 (2.48)	0.52		
Overweight/obese	MVPA (min per day)	49.8 (17.82)	50.3 (21.23)	0.88	49.3 (19.47)	44.7 (15.68)	0.12	1.74 (−5.80 to 9.29)	0.29
	Percentage of wear time in MVPA	6.2 (2.07)	6.4 (2.79)	0.63	6.2 (2.49)	5.5 (1.88)	0.07		
Activity level at baseline									
Active	MVPA (min per day)	76.9 (16.70)	78.7 (21.06)	0.43	77.1 (15.49)	75.4 (13.52)	0.41	4.54 (−1.22 to 10.30)	0.12
	Percentage of wear time in MVPA	9.6 (2.31)	10.1 (2.97)	0.16	9.5 (2.11)	9.3 (1.89)	0.65		
Inactive	MVPA (min per day)	41.9 (10.80)	41.7 (11.50)	0.77	41.5 (10.67)	41.2 (11.55)	0.77	−0.21 (−2.42 to 1.99)	0.85
	Percentage of wear time in MVPA	5.4 (1.44)	5.3 (1.54)	0.53	5.3 (1.49)	5.2 (1.52)	0.71		

MVPA, moderate-to-vigorous physical activity.

reports outlining progress against each strategy were delivered and discussed with school executives and the head PE teacher at the end of each school term.

DISCUSSION

We report the 12-month mid-intervention findings from a multi-component physical activity intervention implemented in disadvantaged secondary schools. At 12-month follow-up, students attending intervention schools participated in nearly 4 min more MVPA per day than control group students. To some readers,

this may not sound like a clinically meaningful difference. However, it represents 27 min more of MVPA over the course of a week.

Small, but clinically significant effect at 1 year

Research in children and adolescents has identified a dose-response relationship between the total volume of MVPA and a reduction in cardiometabolic risk; therefore, any increase in MVPA has public health benefit.⁴⁷ Students in the intervention group participated in significantly more vigorous activity and

Table 4 Intervention fidelity and reach at 12-months follow-up

Process measure category	Physical activity strategies implemented from baseline—12-month follow-up		
	Formal curriculum		School ethos & environment Recess and lunchtime activity (%)
	Active PE lessons (%)	Personal physical activity plans (%)	
Fidelity (teacher report n=33)	95.5*	70.3†	75.0‡
Reach (student report n=600)			
All students	92.7§	51.6¶	55.8**
Student sex			
Female students	93.2	49.6	50.9*
Male students	95.0	54.0	61.5*
Student activity level			
Active students	96.3	56.8	59.9
Inactive students	93.6	47.8	52.6
Student weight status			
Healthy weight students	95.3	50.3	55.5
Overweight/obese students	94.4	52.8	56.2

*Teacher reports conducting pedometer-based lessons.

†Teacher reports assisting student complete a personal PA plan each school term.

‡School reports running recess and/or lunch activities.

§Students recall using pedometers in PE.

¶Students recall completing personal physical activity plans.

**Students recall having organised recess and/or lunchtime physical activities available.

PA, physical activity; PE, physical education.

spent a greater proportion of time in MVPA and vigorous activity each day. We suggest that this magnitude of change in physical activity, particularly the increase in vigorous activity, is clinically meaningful, and may facilitate the prevention of chronic disease such as type 2 diabetes and obesity.^{48–50}

The results displayed at 12 months extend the results described in a meta-analysis of physical activity interventions in children and adolescents;⁵¹ however, most interventions focus on children and few on adolescents. As a result, the effect size seems larger than other school-based interventions targeting adolescents. Of the interventions targeting adolescents that have been effective,^{19 20 52–54} two studies published mid-intervention findings, both of which showed no significant intervention effect.^{53 52} Other school-based interventions targeting adolescents demonstrated positive postintervention findings in favour of the intervention group, with effect sizes ranging from 1.9 min of MVPA per day after 2 years of intervention in the TAAG study,⁵³ 3.5 min MVPA per day for males only in the 2-year study by Haerens *et al*,⁵² and 50 accelerometer CPM after the 20-month Health in Adolescence study (HEIA).⁵⁴

More recently, three interventions^{16–18} have specifically targeted adolescents from lower socioeconomic backgrounds; however, none have shown a significant intervention effect on MVPA. Given the challenges in conducting intervention research targeting disadvantaged adolescents and schools, a positive mid-intervention effect demonstrates potential to intervene with this target group.

Innovations in this study

The PA4E1 intervention differed from previous trials as it focused on students attending schools located in disadvantaged areas, targeted the whole school community while incorporating strategies to engage low-active students. In addition, the PA4E1 intervention was longer in duration, and included a school change agent position within a set of clear adoption strategies. Including explicit implementation strategies, as recommended in systematic reviews,^{10 15} may explain our positive findings.

In particular, the change agent, someone located within the school 1 day per week to support schools in implementing the physical activity strategies (not to deliver them) is novel. Schools often report time and demanding workloads as barriers to implementing intervention strategies.^{55–57} The addition of a change agent aims to overcome these barriers, and maximise intervention reach and fidelity. The addition of a further three physical activity strategies to the PA4E1 intervention in the second phase of intervention, may enhance the likelihood of sustained success. Systematic reviews have concluded that study duration, study size and positive mid-intervention results are associated with a significant intervention effect at follow-up.⁵¹

Limitations

As subgroup analyses were exploratory due to limited power, results should be seen as suggestive and interpreted with caution. At 12-month follow-up, the results were only statistically significant for boys—the intervention appeared to be effective for male students, but there was no significant effect among females. These results are in contrast to a systematic review by Yildirim⁴⁵ finding girls responded better to interventions than boys. If our midpoint assessment holds true, it would have

health implications as female students who participate in less MVPA per day are less likely to achieve the daily physical activity guidelines and reduce their activity throughout adolescence at a faster rate.⁵⁸

Although programme records showed that recess and lunch activities were offered in all intervention schools, girls were less likely to report that their school offered organised recess and lunchtime physical activities compared to boys; a substantial proportion of both sexes were not aware of the activities. As physical activity during recess and lunch has been reported to contribute as much as 40% towards daily physical activity recommendations,⁵⁹ the introduction of recess and lunchtime activities that are more evident to students, especially those that appeal to girls, seems an important consideration for future research. However, our mid-intervention results may also indicate girls take longer to respond to interventions than boys.

Strengths

The strengths of this study include the group randomised controlled design, use of an objective measure of physical activity, the focus on disadvantaged populations and the multicomponent socioecological design. However, there are limitations. Obtaining valid accelerometer data in this age group was challenging,⁶⁰ as has been discussed elsewhere.⁶¹

Although a high proportion of students who participated in baseline also participated at midpoint (84%), only 61% of the baseline sample provided at least three days of valid data at 12 months. This decrease, however, seems consistent with other studies for this target group.^{16 54} Lubans *et al*⁶² found that although 79% to 85% of the baseline sample was retained after 12 months, only 53.5% of the sample of disadvantaged girls provided three or more days of valid accelerometer data. Similarly, only 64% of students in the HEIA study in Norway provided useable accelerometer data at the 20-month postintervention.⁵⁴ Although accelerometers are considered the optimal method for measuring physical activity, compliance to protocols among the students, particularly disadvantaged students, has been documented as a challenge.^{13 63} The study did not assess maturation status, which is known to impact on physical activity levels of adolescents.⁶⁴

In summary, the mid-intervention effects of PA4E1 demonstrates the potential to implement a multicomponent school-based intervention in disadvantaged secondary schools. We will report 24-month follow-up as that is the primary outcome of the study.

What are the new finding?

- ▶ School-based physical activity interventions targeting adolescents from disadvantaged schools are feasible and can produce meaningful physical activity effects.
- ▶ Interventions with positive mid-intervention effects are more likely to have significant effects at follow-up and therefore, the Physical Activity 4 Everyone intervention shows promising signs for impacting on physical activity levels of disadvantaged adolescents.
- ▶ At mid-intervention, the intervention appears to be impacting more on male students.

How might it impact on clinical practice in the near future?

- ▶ Multicomponent school-based interventions that include strategies across the domains of the socioecological framework, such as increasing physical activity level in physical education, recess and/or lunch activities and linking with parents can improve physical activity levels of disadvantaged adolescents.
- ▶ Intervention adoption strategies appear important particularly in this setting/population.

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The Physical Activity 4 Everyone Cluster Randomized Trial

2-Year Outcomes of a School Physical Activity Intervention Among Adolescents

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Introduction: Few interventions have been successful in reducing the physical activity decline typically observed among adolescents. The aim of this paper is to report the 24-month effectiveness of a multicomponent school-based intervention (Physical Activity 4 Everyone) in reducing the decline in moderate to vigorous physical activity (MVPA) among secondary school students in disadvantaged areas of New South Wales, Australia.

Study design: A cluster RCT was conducted in five intervention and five control schools with follow-up measures taken at 24 months post-randomization.

Setting/participants: The trial was undertaken within secondary schools located in disadvantaged communities in New South Wales, Australia.

Intervention: A multicomponent school-based intervention based on the Health Promoting Schools Framework was implemented. The intervention consisted of seven physical activity promotion strategies that targeted the curriculum (teaching strategies to increase physical activity in physical education lessons, student physical activity plans, and modification of school sport program); school environment (recess/lunchtime activities, school physical activity policy); parents (parent newsletters); and community (community physical activity provider promotion). Six additional strategies supported school implementation of the physical activity intervention strategies.

Main outcome measure: Minutes per day spent in MVPA, objectively measured by accelerometer.

Results: Participants (N=1,150, 49% male) were a cohort of students aged 12 years (Grade 7) at baseline (March–June 2012) and 14 years (Grade 9) at follow-up (March–July 2014). At 24-month follow-up, there were significant effects in favor of the intervention group for daily minutes of MVPA. The adjusted mean difference in change in daily MVPA between groups was 7.0 minutes (95% CI=2.7, 11.4, $p < 0.002$) (analysis conducted December 2014–February 2015). Sensitivity analyses based on multiple imputation were consistent with the main analysis (6.0 minutes, 95% CI=0.6, 11.3, $p < 0.031$).

Conclusions: The intervention was effective in increasing adolescents' minutes of MVPA, suggesting that implementation of the intervention by disadvantaged schools has the potential to slow the decline in physical activity.

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Introduction

Adequate physical activity reduces the risk of a range of non-communicable diseases.^{1,2} Despite this, only 20% of adolescents accumulate the necessary amount to meet the recommended 60 minutes of moderate to vigorous physical activity (MVPA) per day.² Physical activity declines by 7% per year during adolescence,³ and the decline is higher among those from disadvantaged backgrounds.⁴ However, few interventions have targeted this high-risk group.^{5,6}

Comprehensive school-based physical activity interventions have been endorsed by health and education authorities as a strategy for promoting physical activity.⁷⁻¹⁰ Systematic reviews of studies in schools indicate that physical activity interventions are effective in increasing the proportion of students meeting physical activity guidelines,¹¹ physical activity duration,^{5,11,12} and improving fitness and fundamental movement skills.¹¹⁻¹⁴

In the most recent Cochrane systematic review of school-based physical activity interventions,¹¹ only 14 of 44 targeted secondary schools. Two of these targeted schools in lower-SES areas,^{15,16} with one showing an intervention effect.¹⁵ A further three trials published since targeted either low-SES girls only^{17,18} or low-SES boys only.¹⁹ However, none resulted in significant intervention effects for physical activity.¹²

Given the limited evidence, a trial was undertaken to determine whether a multicomponent physical activity intervention implemented in secondary schools in disadvantaged communities (Physical Activity 4 Everyone [PA4E1]) was effective in reducing the decline in MVPA among students. As previously reported, mid-intervention results were promising, with significant effects in favor of the intervention group for daily minutes of MVPA (adjusted mean difference in change between groups, 3.9 minutes, 95% CI=0.79, 6.91, $p < 0.01$).²⁰ This paper reports the 24-month effectiveness of the PA4E1 intervention in reducing the decline in MVPA among secondary school students in disadvantaged areas. The secondary aim is to explore the impact of the intervention on five additional MVPA-based measures.

Methods

Study Design, Setting, and Participants

A cluster RCT was conducted with secondary schools (five intervention, five control) in disadvantaged communities. Outcome

assessments were conducted with a cohort of students at baseline (Grade 7); 12 months (mid-intervention); and 24 months post-randomization follow-up. The primary outcome was objectively measured daily minutes of MVPA. Details of the study methods have been reported.²¹ The trial was registered with the Australian New Zealand Clinical Trials Registry (ACTRN1261200038287) and approved by the Hunter New England Area Human Research Ethics Committee (11/03/16/4.0) and the University of Newcastle Human Research Ethics Committee (H-2011-0210). The study adheres to the CONSORT and extension for cluster trials guidelines (www.consort-statement.org).

Schools were considered eligible for inclusion if they met the following criteria: Government or Catholic schools; had a SES score of ≤ 5 (lower 50% of New South Wales) based on postcode²²; had at least 120 Grade 7 students; and were not participating in other physical activity intervention studies. Recruitment and consent of schools occurred from October to December 2011, via face-to-face meetings with the school principal. Opt-in parental consent was required. A list of eligible schools was created from which schools were randomly selected until ten consented to participate.

A cohort of all students in their first year of high school (Grade 7) were invited to participate in the study via consent forms sent to parents. Students with severe mental or physical disabilities were excluded. Where signed parental and student consent forms were not received by the required date, parents were contacted via telephone by school-affiliated staff and asked for consent and to provide a signed consent form.

Physical education (PE) teachers in intervention schools were invited to participate in a survey at 24-month follow-up.

Random allocation of schools (cluster) to the intervention or control group was undertaken following baseline data collection by an independent statistician, using block randomization (1:1 ratio), based on a random number function.

Intervention

The intervention was guided by social cognitive²³ and social-ecologic theories²⁴ and utilized the WHO's Health Promoting Schools framework. The framework recommends strategies addressing the school curriculum, school environment, and partnerships and services.²⁵⁻²⁹

The intervention was delivered over seven to eight school terms (average, 24 months) and involved implementation of seven physical activity intervention strategies and six strategies to support implementation of the intervention (Appendix Figure 1, available online). The physical activity strategies were implemented progressively over the 24-month intervention period, with Strategies 3, 4, and 7 implemented in the final 12 months and the remaining strategies (1, 2, 5, and 6) throughout the whole intervention period. The six intervention implementation strategies were delivered throughout the intervention period (Appendix Figure 1, available online).

The physical activity intervention strategies consisted of the following strategies across the school curriculum, school environment, and partnerships and services:

1. Teaching strategies to maximize students' physical activity in health and PE lessons: PE teachers received training and resources to assist in maximizing MVPA during class time, including the use of pedometer-based lessons (two per term).^{15,30,31}
2. Development and monitoring of student physical activity plans within PE lessons: Students developed individual physical activity plans that set goals and actions and recorded progress against timelines, fitness assessments, and provision of rewards.³² Plans were to be reviewed and modified each term.⁷
3. Enhanced school sport program: All students participated in a 10-week program during school sport in Grade 8. The program, based on the effective Program X,¹⁵ included lessons and fitness activities focused on lifelong physical activity skills and knowledge.^{29,33}
4. Development/modification of school policies³⁴: School policies that aimed to enhance student physical activity were reviewed by the head PE teacher and in-school consultant with input from school executive.³⁵
5. Physical activity programs during school breaks: Schools were provided with physical activity equipment (e.g., balls, skipping equipment), and encouraged to offer supervised physical activity at recess and lunch on at least 2 days per week.³⁶
6. Promotion of community physical activity providers (community links)^{34,37}: Schools were supported to host a physical activity expo that promoted local physical activity providers to students in Grade 8.
7. Parent engagement^{33,38} information was sent to parents each term via newsletters and school website promoting physical activity and local providers.

In addition to the physical activity strategies, six intervention implementation strategies were based on evidence regarding their ability to facilitate the implementation of school-based interventions, change professional service delivery practices, or build capacity of organizations.^{12,39-45}

1. In-school physical activity consultant (change agent): A trained PE teacher was placed within each school for 1 day per week over the intervention period to support intervention implementation.³⁷
2. Establishing leadership and support: A school committee was established, or responsibility was added to an existing committee, to lead and oversee the intervention.
3. Teacher training: PE teachers were offered three practice learning workshops focused on delivery of lessons to increase students' MVPA. All PE teachers and teachers involved in the delivery of the enhanced school sports program were provided training.^{15,41,46,47}
4. Resources: Schools were provided with a manual outlining all physical activity intervention strategies and associated materials; physical activity equipment (e.g., pedometers, resistance devices); and promotional materials for teachers (e.g., shirts/lanyards) and students (e.g., balls, water bottles).
5. Prompts: The in-school consultant provided prompts to teaching staff to implement the intervention strategies via e-mail, electronic calendar reminders, and in meetings.

6. Intervention implementation performance feedback: Records kept by the in-school consultant were the basis of quarterly intervention implementation feedback reports. The results of observational audits of ten randomly selected PE lessons undertaken using the System for Observing Fitness Instruction Time were also provided on two occasions.

Schools allocated to the control group participated in the measurement components of the trial only and delivered physical activity teaching and promotion practices according to the PE curriculum and school-based initiatives.

Data Collection Procedures

Data were collected by trained research assistants blind to group allocation. Baseline data were collected in March–June 2012, and follow-up data collected after 12 months and again at 24 months (March–June 2014).

At baseline and 24-month follow-up, students wore an accelerometer (Actigraph GT3X+ and GT3X models) for 7 days during waking hours. Student characteristics were collected at baseline via an online survey.

The in-school consultant recorded delivery of all strategies. In addition, PE teachers and students in each intervention school completed a survey at 24-month follow-up that included items on intervention delivery and acceptability/perceived usefulness.

Measures

Accelerometer data were used to derive the primary physical activity outcome measure, mean student duration (minutes) of MVPA per day.

Secondary outcomes were minutes of vigorous physical activity (VPA) per day; minutes of moderate physical activity (MPA) per day; percentage of accelerometer wear time in MVPA per day; percentage of accelerometer wear time in VPA per day; percentage of accelerometer wear time in MPA per day; and mean daily accelerometer counts.

For all physical activity outcome measures, accelerometer non-wear time was defined as 30 minutes of consecutive zeroes.⁴⁸ Counts were collected in 15-second epochs and counts per minute calculated by dividing the total accelerometer counts by the minutes of wear time. The Evenson cut-points were used to categorize the intensity of physical activity (MPA or VPA).^{49,50} The online survey assessed student sociodemographic characteristics: age; sex; Aboriginal or Torres Strait Islander (or both) status; and residential postcode.

Anthropometric data (height and weight) were collected in duplicate by trained research assistants using the International Society for Advanced Kinanthropometry procedures.⁵¹ Students completed the measurements in light clothing without shoes. Weight was measured to the nearest 0.1 kg on a portable digital scale (Model no. UC-321PC, A&D Company Ltd, Tokyo Japan). Height was measured to the nearest 0.1 cm using a portable stadiometer (Model no. PE087, Mentone Educational Centre, Australia). BMI was calculated (weight in kg/[height in meters]²) and weight status determined using the International Obesity Taskforce definitions.^{52,53}

The in-school consultant records were used to determine the extent to which physical activity intervention and implementation

strategies were delivered to the desired standard (Appendix Figure 1, available online). The 24-month follow-up PE teacher survey assessed the delivery of the PE curriculum strategies (Strategies 1 and 2 in Appendix Figure 1, available online). The intervention group student online survey at 24 months assessed the reach of some physical activity intervention strategies (1, 2, and 4 in Appendix Figure 1, available online).

Sample Size

It was estimated that each school would yield at least 60 students at baseline, providing approximately 300 students per group.^{54,55} This assumed at least 120 Grade 7 students per school and 50% of them consenting and providing 3 days of valid accelerometer data⁵⁶ (analyses eligibility inclusion criterion). If 65% of the cohort provided usable data at 24 months, it was estimated that there would be at least 195 students per group.⁵⁷ Previous studies were used to estimate the SD of mean daily minutes of MVPA (17.1)⁵⁸ and the intraclass correlation coefficient (0.01).⁵⁹ After adjustment for a design effect of 1.38, the effective sample size was estimated to be 141 students per group. Based on ten schools, with this sample size, 80% power, and an α -level of 0.05, the study was able to detect a difference in the primary trial outcome, mean daily minutes of MVPA, between experimental and control students of ± 5.73 minutes at 24-month follow-up.

Statistical Analysis

All analyses were conducted using SAS, version 9.2, from December 2014 to February 2015. Summary statistics were used to describe all variables of interest. Logistic regressions with generalized estimating equation parameter estimation were used to determine if students who provided accelerometer data at both baseline and 24 months differed from those who provided only baseline accelerometer data in terms of sex; baseline age; weight status (underweight/healthy weight versus overweight and obese); and physical activity level (meeting physical activity guidelines versus not meeting physical activity guidelines). Significance levels for such analyses were set at $p < 0.05$.

Student data were included in the analyses if the accelerometer was worn for ≥ 600 minutes per day on any 3 days or more.⁶⁰⁻⁶² Analysis followed intention-to-treat principles. Analysis of the primary outcome measure (minutes of MVPA per day) and other physical activity outcomes was undertaken using a linear mixed model (LMM) approach. A three-level hierarchical model was used to capture correlations in the data with random intercepts for repeated measures (Level 1, mean minutes of MVPA per day at baseline, mid-point, and follow-up) on individuals (Level 2) and clustering within schools (Level 3, ten clusters, five intervention and five control). An independence structure was assumed for the residual variance-covariance matrix. Fixed effects in the model included treatment group (intervention versus control); time (baseline versus 24 months); and the interaction between treatment group and time. The containment method was used for degrees of freedom estimation. The LMM analyses sought to determine whether there was a difference in mean change from baseline to 24 months between groups in each outcome measure, assessed through an interaction term between groups.

Physical activity outcome data were analyzed assuming data were "missing at random." Sensitivity analyses were undertaken

for the primary outcome, initially adjusting for any variables on which students with and without 24-month follow-up accelerometer data were significantly different, and secondly, using multiple imputation.⁶³ Five imputed data sets were created using a two-step multiple imputation process: First, missing data were filled in to a monotone pattern using the Markov-chain Monte Carlo method; then, the remaining missing data were filled in using the regression method (where regression equations are used to predict the missing outcome values, using baseline values of the outcomes and baseline demographic variables). The five complete data sets were then analyzed using LMM per the primary analyses, and the estimates were combined using Rubin's method.

Descriptive statistics were used to describe the proportion of students in each group meeting the Australian Physical Activity guidelines for children and young people⁶⁴ of 60 minutes of MVPA per day.

Analyses assessed whether the intervention similarly affected the primary outcome measure (mean minutes of MVPA per day) and two secondary physical activity outcome measures (mean minutes of VPA per day and mean minutes of MPA per day) for students defined, a priori, in terms of three moderators of energy balance: sex, baseline BMI, and baseline physical activity level.⁶⁵ Students were categorized into two groups for baseline BMI ("underweight/healthy weight," "overweight/obese") based on Cole cut-points.⁶⁶ Students were categorized into two groups for baseline physical activity (≥ 60 minutes of MVPA per day, < 60 minutes of MVPA per day). The moderator variable interaction terms were included separately in the aforementioned LMM analyses for the relevant duration outcomes and, if the three-way interaction term (group X time X moderator) was significant at $p < 0.20$, separate LMM analyses for the moderator subgroups were undertaken for these variables.⁶⁷

Descriptive statistics were used to summarize in-school consultant record data regarding intervention strategy implementation, and intervention group PE teacher and student survey responses.

Results

Of 22 eligible schools, 13 were approached, 10 of which consented to participate (77%). Parental consent was obtained for 1,233 of the 1,468 Grade 7 students in the ten schools (84%) (Figure 1).

At baseline, 1,150 students wore an accelerometer, 84% of whom provided at least 3 days of valid accelerometer data (965/1,150). The 1,150 students represented 93% of students with parental consent. At 24 months, 985 students wore an accelerometer and provided anthropometric measures, and 441 (45%) of these provided at least 3 days of valid accelerometer data. The 441 students represented 36% of those with parental consent. Baseline characteristics of the 1,150 students who wore an accelerometer are shown in Table 1.

Age was the only characteristic associated with whether students provided accelerometer data at baseline only, or at both baseline and 24 months. Students who provided data only at baseline were younger than those providing data at both time points.

Table 1. Sample Characteristics at Baseline—Students Wearing an Accelerometer ($n=1,150$)

Characteristic	Intervention group	Control group
Total participants (n)	645	505
Gender (n) ^a		
Boys	312	246
Girls	333	258
3 valid days	530	435
Age, years (M)	12.0	12.0
Aboriginal and/or Torres Strait Islander (%)	5.3	7.8
Height, m (M)	157.1	156.8
Weight, kg (M)	49.3	50.0
Student BMI category (%)		
Underweight/healthy weight	78.3	73.3
Overweight/obese	21.7	24.7
Student activity level (%)		
Active (≥ 60 minutes MVPA/day)	33	33
Low active (< 60 minutes MVPA/day)	67	67
Accelerometer wear time	793.6	804.6
Mean minutes per day		

^aData on gender missing for one participant. MVPA, moderate-to-vigorous physical activity.

of the intervention group (95% CI=1.9, 10.7, $p < 0.005$). Similarly, sensitivity analysis results using multiple imputations were consistent with those of the primary analysis. The mean difference in change between groups of 6.0 minutes per day (95% CI=0.6, 11.3, $p < 0.031$) was in favor of the intervention group.

There were significant effects in favor of the intervention group for five of the six secondary physical activity outcomes: minutes per day of VPA, minutes per day of MPA, percentage wear time in MVPA and VPA, and total daily accelerometer counts. There were no significant intervention effects for percentage of wear time in MPA (Table 2).

The intraclass correlation coefficient values for the primary and secondary physical activity variables are reported in Appendix Table 2 (available online).

At the 20% significance threshold, the three-way subgroup interaction terms indicated that time by intervention effects differed only by sex for the primary outcome of daily minutes of MVPA, and the secondary outcome of daily

minutes of MPA. A greater effect was observed for male students in the intervention group compared with male students in the control group for minutes of MVPA per day (mean difference in change, 10.4 minutes, 95% CI=2.1, 18.8, $p < 0.01$) and minutes of MPA (6.2 minutes, 95% CI=1.7, 10.7, $p < 0.015$). A greater effect was also observed for female students in the intervention group compared to female students in the control group for minutes of MVPA per day (mean difference in change, 4.0 minutes, 95% CI=0.1, 8.0, $p < 0.05$) and minutes of MPA (2.9 minutes, 95% CI=0.1, 5.6, $p < 0.047$) (Appendix Table 1, available online).

At 24 months, program records indicated all five intervention schools implemented six of the seven physical activity strategies (Appendix Figure 1, available online). The exception was Strategy 5 (school policy), with four of five schools having developed a school policy. All intervention implementation strategies were delivered as planned.

In the 24-month survey of intervention group PE teachers ($N=35$), 88.9% reported using pedometers to increase activity levels in PE, and 58.8% reported incorporating student personal physical activity plans each term. Acceptability data from the PE teacher survey indicated 40.2% enjoyed teaching pedometer-based lessons, 65.6% reported such lessons helped students to increase their physical activity levels during PE, and 67.6% reported that assisting students to develop personal physical activity plans was a useful strategy.

At 24 months, in the survey of intervention group students ($n=409$), 90.9% reported using pedometers in PE lessons, 28.9% recalled developing a personal physical activity plan, and 56.9% reported participating in organized physical activity at recess or lunchtimes.

Discussion

This study assessed the effectiveness of PA4E1, a multi-component school-based intervention, in reducing the decline in physical activity among secondary school students. After 24 months, the intervention was effective in increasing daily MVPA in the intervention group compared with a decrease in the control group. As a result, students in the intervention group participated in 7 minutes more MVPA at 24 months compared with the control group. This outcome builds on a previously reported 12-month mid-intervention result of 3.9 minutes more MVPA.²⁰ The findings suggest that implementation of the intervention by schools in disadvantaged areas has the potential to reduce the decline in physical activity during adolescence.

The observed effect size for MVPA was greater than the aggregate effect size of 4 minutes more MVPA per day

Table 2. Changes in Physical Activity Outcomes From Baseline to 24-Month Follow-up (Midpoint Data Values Also Shown)

Outcome	Intervention			Control			Difference in change from baseline to follow-up between treatment group (95% CI)	Group X time p-value
	Baseline, M (95% CI) (n=524)	Mid-point, ^a M (95% CI) (n=352)	Follow-up, M (95% CI) (n=245)	Baseline, M (95% CI) (n=435)	Mid-point, ^a M (95% CI) (n=288)	Follow-up, M (95% CI) (n=191)		
Wear time (minutes/day)	796.1 (781.2, 811.1)	796.6 (779.7, 813.4)	832.9 (814.0, 851.9)	804.4 (788.6, 820.2)	799.7 (781.8, 817.6)	800.3 (779.6, 821.0)		
Counts per minute	483.4 (464.3, 502.4)	485.2 (464.7, 505.7)	460.2 (438.2, 482.2)	484.6 (464.6, 504.6)	455.2 (433.5, 476.8)	448.5 (424.9, 472.2)		
Mean total daily accelerometer counts	382,999 (364,464, 401,534)	378,882 (358,957, 398,807)	378,962 (357,546, 400,378)	387,946 (368,707, 407,185)	360,200 (339,358, 381,042)	351,081 (328,186, 373,976)	32,828 (8,157.9, 57,497)	0.009
Minutes of physical activity (minutes/day)								
Total MVPA	53.5 (49.6, 57.3)	54.7 (50.7, 58.8)	57.9 (53.6, 62.1)	53.5 (49.5, 57.4)	51.0 (46.8, 55.2)	50.8 (46.3, 55.4)	7.0 (2.68, 11.4)	0.005
Vigorous activity	16.5 (14.5, 18.6)	18.2 (16.0, 20.3)	19.7 (17.5, 22.0)	16.7 (14.6, 18.8)	16.1 (13.9, 18.3)	17.4 (15.0, 19.8)	2.5 (0.3, 4.8)	0.026
Moderate activity	37.0 (34.7, 39.2)	36.5 (34.2, 38.9)	38.1 (35.6, 40.6)	36.7 (34.4, 39.1)	34.9 (32.5, 37.4)	33.4 (30.8, 36.0)	4.5 (2.0, 7.0)	0.002
% wear time								
Percentage MVPA	6.8 (6.3, 7.2)	7.0 (6.6, 7.5)	7.0 (6.6, 7.5)	6.7 (6.3, 7.1)	6.5 (6.0, 6.9)	6.5 (6.0, 7.0)	0.4 (0.0, 0.9)	0.029
Percentage vigorous	2.1 (1.9, 2.3)	2.4 (2.1, 2.6)	2.4 (2.1, 2.6)	2.1 (1.9, 2.3)	2.0 (1.79, 2.29)	2.2 (1.97, 2.50)	0.1 (-0.12, 0.35)	0.009
Percentage moderate	4.7 (4.4, 4.9)	4.7 (4.4, 4.9)	4.7 (4.4, 4.9)	4.6 (4.3, 4.9)	4.4 (4.2, 4.7)	4.3 (4.0, 4.6)	0.3 (0.0, 0.6)	0.086

Note: Boldface indicates statistical significance ($p < 0.05$).

^aMid-intervention effects of the “Physical Activity 4 Everyone” school-based intervention.²⁰ MVPA, moderate-to-vigorous physical activity.

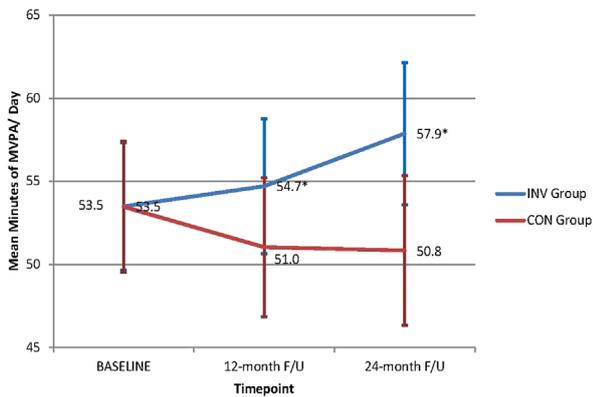


Figure 2. Mean minutes of MVPA per day for intervention and control group students at baseline and at 12-month (mid-point) and 24-month follow-ups.

*Significant difference between the intervention and control groups. MVPA, moderate-to-vigorous physical activity.

reported in a recent meta-analysis of objectively measured school-based physical activity interventions implemented for children and adolescents.⁶⁸ No previous intervention studies that have involved disadvantaged adolescent participants have reported a statistically significant effect using objectively measured MVPA at 12 months or more follow-up.¹⁵⁻¹⁹ No comparable trials have reported a significant MVPA effect for both male and female students separately, and for MPA and VPA separately.

The contrasting positive effects observed in this study relative to the findings of past interventions may be attributable to a number of the design elements: an extended intervention duration (average of 24 months)¹²; the use of a theory-based intervention; the inclusion of multiple physical activity promotion strategies^{11,12,20}; and the inclusion of multiple strategies, particularly the in-school physical activity consultant, to support school implementation of the intervention strategies.¹² No previous secondary school-based studies targeting disadvantaged adolescents have included all such intervention elements. The extent to which the inclusion of such elements contributed to the contrasting findings is unknown and requires further research.

The finding of a greater intervention effect on duration of MVPA activity at 24-month follow-up, compared with the previously reported 12-month result, strengthens previous suggestions that a dose-response relationship exists between length of intervention and extent of effect on adolescent physical activity.^{11,21} Further research is warranted to determine the incremental benefits of extending the length of intervention further, for example, implementation on a routine basis throughout the first 4 years of secondary schooling. In addition, further analysis to determine the impact of the intervention on weight status would add to the body of literature

regarding the merit of school-based physical activity intervention and obesity prevention.

The intervention had a significant and positive effect on daily MVPA for both male and female students. However, the intervention effect for male students appeared to be approximately 2.5 times that for female students. The MVPA levels of female students in the intervention group remained stable over the 24-month period, whereas they decreased for female students in the control group. By contrast, MVPA consistently increased for male students in the intervention group. As female students are less likely to participate in physical activity than male students,³ these findings suggest that additional intervention strategies targeting female students may benefit future interventions (e.g., single-sex PE lessons or sport, focus on non-competitive activity).^{69,70}

Limitations

The study has a number of strengths, including use of a cluster RCT design, extended intervention duration, objective measurement of physical activity, and the inclusion of a suite of intervention implementation strategies as recommended in past school-based physical activity reviews. A limitation of the study is the loss of participants at follow-up, with less than half of the students that initially consented providing accelerometer data at 24 months, a finding consistent with previous studies.^{14,17,71} Accelerometer compliance may be improved by the provision of compensation strategies such as monetary incentives, class points, rewards, and non-monetary incentives for wearing the accelerometer or for correct wear time, particularly for older students.^{57,72,73} Alternatively, wrist-worn accelerometers may promote compliance.⁷⁴ Nonetheless, analysis of outcomes that adjusted for variables associated with loss to follow-up and analysis using multiple imputation for missing data indicated similar findings to the primary analyses, suggesting consistency in direction of the effect. Secondary outcomes for percentage of wear time spent in MVPA and VPA were also consistent with the main trial outcomes over time. MPA shows a positive trend, although statistically not significant, perhaps owing to limited power to detect an effect on this scale. The subgroup analyses indicated no intervention effect by baseline levels of BMI or physical activity despite such variables being shown to be moderators of energy balance.⁶⁵ This finding may be attributable to the study not being adequately powered to detect such differences, or to other factors. Future adequately powered studies are required to better understand the impact of such moderators on intervention effectiveness.

Conclusions

The PA4E1 intervention was effective in increasing daily minutes of MVPA in the intervention group compared with a decrease in the control group for all students and for female and male students. Findings suggest that implementation of the intervention by disadvantaged schools has the potential to reverse the decline in physical activity in this population group. Further research is warranted to determine the potential to benefit adolescents from a range of schools, regardless of SES of the school community, and its impact if implemented on a routine basis throughout secondary schooling. Additionally, although review evidence indicates that physical activity benefits achieved from multicomponent school-based interventions are sustainable,⁷⁵ few long-term follow-up studies have been published. Further follow-up assessing school practices and student physical activity would determine if implementation has been maintained and impact sustained beyond the intervention. Assessment of the intervention impact on school day physical activity should also be explored in addition to cost and cost effectiveness.

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The research team acknowledges the importance of making research data publically available. Access to the accelerometer data from this study may be made available to external collaborators following the development of data transfer agreements. Further results arising from the study can be found at www.goodforkids.nsw.gov.au/high-schools/.

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Appendix

Supplementary data

Supplementary data associated with this article can be found at <http://dx.doi.org/10.1016/j.amepre.2016.02.020>.

ORIGINAL ARTICLE

Effects of a ‘school-based’ physical activity intervention on adiposity in adolescents from economically disadvantaged communities: secondary outcomes of the ‘Physical Activity 4 Everyone’ RCT

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BACKGROUND/OBJECTIVES: Obesity prevention during adolescence is a health priority. The ‘Physical Activity 4 Everyone’ (PA4E1) study tested a multi-component physical activity intervention in 10 secondary schools from socio-economically disadvantaged communities. This paper aimed to report the secondary outcomes of the study; to determine whether the intervention impacted on adiposity outcomes (weight, body mass index (BMI), BMI z-score), and whether any effect was moderated by sex, baseline BMI and baseline physical activity level, at 12 and 24 months.

SUBJECTS/METHODS: A cluster randomised controlled trial was conducted in New South Wales, Australia. The school-based intervention included seven physical activity strategies targeting the following: curriculum (strategies to maximise physical activity in physical education, student physical activity plans, an enhanced school sport programme); school environment (physical activity during school breaks, modification of school policy); and parents and the community (parent engagement, links with community physical activity providers). Students’ weight (kg), BMI and BMI z-score, were collected at baseline (Grade 7), 12 and 24 months. Linear Mixed Models were used to assess between-group mean difference from baseline to 12 and 24 months. Exploratory sub-analyses were undertaken according to three moderators of energy balance.

RESULTS: A total of 1150 students (mean age = 12 years) provided outcome data at baseline, 1051 (91%) at 12 months and 985 (86%) at 24 months. At 12 months, there were group-by-time effects for weight (mean difference = -0.90 kg (95% confidence interval (CI) = -1.50, -0.30), $P < 0.01$) and BMI (-0.28 kg m⁻² (-0.50, -0.06), $P = 0.01$) in favour of the intervention group, but not for BMI z-score (-0.05 (-0.11; 0.01), $P = 0.13$). These findings were consistent for weight (-0.62 kg (-1.21, 0.03), $P = 0.01$) and BMI (-0.28 kg m⁻² (-0.49, -0.06), $P = 0.01$) at 24 months, with group-by-time effects also found for BMI z-score (-0.08 (-0.14; -0.02), $P = 0.02$) favouring the intervention group.

CONCLUSION: The PA4E1 school-based intervention achieved moderate reductions in adiposity among adolescents from socio-economically disadvantaged communities. Multi-component interventions that increase adolescents’ engagement in moderate-to-vigorous physical activity (MVPA) may assist in preventing unhealthy weight gain.

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INTRODUCTION

Preventing obesity during adolescence is a public health priority.¹ Internationally, among adolescent populations (10–19 years), the prevalence of overweight and obesity is estimated to be between 20–30%,² and is increasing.³ During puberty, adolescents experience changes in body composition and physical fitness, and decreased insulin sensitivity.¹ Changes in eating behaviours, physical activity, sedentary behaviours and psychological wellbeing may also occur during this critical period of growth and development.¹ These behavioural and physiological changes increase the risk of overweight and obesity during adolescence.¹ Global self-reported data from 105 countries estimate that just 20% of adolescents participate in ≥ 60 min of moderate-to-vigorous physical activity

(MVPA) each day.⁴ Longitudinal studies have also shown a decline in physical activity during adolescence of ~7% of MVPA per year.⁵ Research across 32 countries in Europe, Israel and North America indicates a positive association between physical inactivity and socio-economic disadvantage in adolescents.⁶

The school environment is a recommended setting for the promotion of physical activity among adolescents;⁷ however, school-based physical activity interventions have resulted in only a small increase in objectively measured MVPA (~4 min per day) of children, and limited reductions in the adiposity of adolescents.⁸ A systematic review and meta-analysis of 18 studies (including 18 141 students) that aimed to determine the effect of school-based physical activity interventions (>6 months duration) on

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body mass index (BMI) in children and adolescents found that neither BMI (mean difference = -0.05 kg m^{-2} , 95% CI (confidence interval): $-0.19; 0.10$) nor any other body composition measures improved.⁹ The review primarily included elementary-aged students in Grades 3–6, and 15 of the 18 studies included a nutrition co-intervention. The lack of an overall effect on BMI was explained by insufficient intervention dose, either due to the amount of physical activity or low intervention compliance by the students.⁹ In a more recent meta-analysis of 43 studies (involving 36 579 children) that aimed to evaluate the impact of nutrition and physical activity school-based interventions on BMI in children and adolescents (< 18 years old), studies that assessed physical activity-only interventions reduced BMI by -0.13 kg m^{-2} ($-0.22; -0.04$).¹⁰ Intervention duration ranged from 1 month to 6 years.¹⁰ Neither of the reviews reported the physical activity intervention findings separately for adolescents,^{9,10} precluding the drawing of conclusions regarding the effect of physical activity interventions on adiposity in adolescent populations.

To increase the likelihood of an effect, school-based interventions that are multi-component and socio-ecologically framed are recommended.^{11,12} Systematic reviews of school-based physical activity interventions have also recommended that interventions address educational, curricular and environmental changes in the school.^{13,14} The 'Physical Activity 4 Everyone' (PA4E1) cluster randomised controlled trial (RCT) was designed based on these recommendations and aimed to reduce the decline in physical activity typically observed during adolescence.¹⁵ The multi-component intervention resulted in a significant differential change in the primary outcome (daily minutes MVPA) from baseline to 24 months of seven minutes/day ($P < 0.01$).¹⁶ The secondary aims of PA4E1 reported in this paper, were to determine whether the intervention impacted on adiposity outcomes (weight, BMI and BMI z-score), and whether any effect on such measures was moderated by (i) sex (male, female), (ii) baseline BMI (underweight/healthy weight; overweight/obese) and (iii) baseline physical activity level (active/inactive), at 12 and 24 months.

MATERIALS AND METHODS

Study design and setting

A cluster RCT was conducted in secondary schools in socio-economically disadvantaged communities in New South Wales (NSW), Australia. Communities were considered socio-economically disadvantaged if they had a socio-economic status score of five or less (lower 50% of NSW) based on the postal code. Outcome assessments were undertaken at baseline, 12 and 24 months. The study was approved by the University of Newcastle Human Research Ethics Committee (H-201-0210), the Hunter New England Ethics Committee (11/03/16/4.05) and the Department of Education and Catholic Schools Diocese. The trial adhered to the Consolidated Standards of Reporting Trials (CONSORT) guidelines¹⁷ and was registered with the Australian New Zealand Clinical Trials Registry (ACTRN 12612000382875). Detailed methods of the PA4E1 study have been reported elsewhere.¹⁵

Participants and recruitment

Secondary schools. Randomly selected secondary schools within the study region were invited to participate between October and December 2011. Schools were eligible to participate in the study if they were (i) Government or Catholic schools, (ii) had a socio-economic status score of five or less (lower 50% of NSW) based on the postal code,¹⁸ (iii) had at least 120 Grade-7 students and (iv) were not participating in any other physical activity or health intervention study. School Principals were provided with a study information package and asked to provide written informed consent. The consenting schools were randomly allocated to intervention or control groups following the collection of baseline data, using a computer generated block randomisation procedure (1:1 ratio) by an independent statistician.

Students. A cohort of first-year high-school students (Grade 7, aged 12–13 years) at the consenting secondary schools were invited to participate. Parents were provided with an information package and asked to provide written informed consent for their child. Two weeks following

the distribution of the information package, the non-responding parents were telephoned and asked to provide verbal consent. Children also provided assent for participating in the study.

'Physical Activity 4 Everyone' intervention

The design of the PA4E1 intervention was guided by social cognitive theory¹⁹ and socio-ecological theory,²⁰ and based on evidence of effective intervention features including multiple intervention components, delivery for a period of at least 12 months,^{13,14,21} and the inclusion of strategies to enhance implementation of intervention components.^{13,21–24} The intervention strategies have been outlined in detail elsewhere.^{15,16} Briefly, the intervention components targeted the school curriculum, school environment, and broader community and parental support^{7,21,25–27} in accordance with the WHO's Health Promoting Schools framework.⁷ The intervention was delivered over seven to eight school terms (19–24 months), and included the following seven physical activity intervention strategies:

School curriculum

1. 'Teaching strategies to maximise student physical activity in health and physical education (PE) lessons'. PE teachers received two professional learning workshops (conducted at 6-month intervals) that focused on (i) increasing motivation and MVPA in PE lessons to meet the target of 50% of PE lesson time in MVPA recommended by the US Centers for Disease Control and Prevention,²⁸ (ii) an implementation guide for delivering the 10-week enhanced school sport programme (that is, Program X) and (iii) recommended procedures for fitness testing and 'personal best' days. A final booster session provided a summary of all concepts and strategies included in the PA4E1 intervention.
2. 'Development and monitoring of student physical activity plans within PE lessons'. The student physical activity plans focused on (i) short- and long-term physical activity, (ii) actions and timelines, (iii) fitness assessments, (iv) recording actions and goal achievements, and (v) rewards for goal attainment (for example, balls, wrist bands and drink bottles).²⁹
3. 'Implementation of an enhanced school sports programme'. All students participated in a 10-week enhanced school sport programme during school sport. The programme was based on Program X, which was originally designed for less-active students.^{25,30–32}

School environment

4. 'Development and modification of school policies'. School policies were established or modified with the aim of enhancing students' physical activity.^{33,34} For example; incorporating pedometer-based lessons with PE, offering the enhanced school sport programme as a standard school sport option, routinely providing physical activity information to parents.
5. 'Physical activity programmes during school breaks'. Schools were provided with physical activity equipment (for example, balls, skipping equipment) and encouraged to offer supervised physical activity on at least 2 days per week during recess and lunch breaks.³⁵

Partnership and services

6. 'Promotion of community physical activity providers (community links)'.^{33,36} Schools were supported to host a physical activity expo that promoted local physical activity providers to students in Grade 8. Community physical activity providers were also promoted in school newsletters.
7. 'Parent engagement'. Information was regularly sent to the parents via existing school newsletters, the school website and PA4E1 newsletters on physical activity recommendations, school-based physical activity strategies, promotion of community physical activity providers and strategies to support their child's physical activity.^{31,37}

Four of the seven intervention strategies were implemented during the first 12 months (strategies 1, 2, 5 and 7 above). The remaining strategies were implemented over the next 12 months, with delivery of the initial strategies being maintained. The intervention strategies, particularly those under the curriculum domain, included a range of behaviour-change techniques with students^{15,38} such as the provision of information

about the behaviour and the consequences, general encouragement, prompting specific goal setting and a review of behavioural goals, prompting self-monitoring, prompting practice, modelling and demonstrating the behaviour, and the provision of feedback on performance.³⁸ The intervention further used six strategies to support the implementation of the seven physical activity intervention strategies listed above. The intervention implementation strategies included (i) an in-school physical activity consultant 1 day per week (change agent position),³⁶ (ii) establishing leadership and support, (iii) teacher training,^{39,40} (iv) resources, (v) teacher prompts⁴¹ and (vi) intervention implementation performance feedback to schools.⁴²

Control schools

Schools allocated to the control group participated in the measurement components of the study. Control schools were requested to follow their usual PE and sport programmes during the study period and were offered all intervention materials, equipment packs and the findings at the conclusion of the study.

Measures

Study outcome assessments were conducted at baseline and on the same cohort of students after 12 and 24 months post baseline. Data were collected at the schools by trained research assistants using standardised protocols.

Student characteristics. Students completed an online survey to collect data regarding their socio-demographic characteristics including age, sex, Aboriginal and Torres Strait Islander status, language spoken at home and residential postal code. Baseline accelerometer data were collected to derive minutes of MVPA per day. Students wore an accelerometer (Actigraph GT3X+ and GT3X models, Pensacola, FL, USA⁴³) for 7 days during waking hours. Physical activity data were included in the physical activity analyses if the accelerometer was worn for ≥ 600 min on ≥ 3 days per week.^{44–46} The Evenson cutpoints were used to categorise the intensity of physical activity.⁴⁷

Outcome measures: indicators of adiposity. At each measurement point, trained research assistants used the International Society for Advanced Kinanthropometry (ISAK) procedures to assess height and weight.⁴⁸ Participants were required to complete the assessments in light clothing and wearing no shoes. Weight was measured to the nearest 0.1 kg on a portable digital scale (Model no. UC-321PC, A&D Company Ltd, Tokyo, Japan). Height was measured to the nearest 0.1 cm using a portable stadiometer (Model no. PE087, Mentone Educational Centre, Springvale, VIC, Australia). Two recordings of height (cm) and weight (kg) measures were taken to calculate baseline BMI (weight (kg)/height (m)²). BMI z-scores were calculated using the WHO 2007 growth reference ranges for 5–19 years of age.⁴⁹

Statistical analysis

Data were analysed using SAS Version 9.2 (SAS Institute Inc., Cary, NC, USA). Summary statistics were used to describe student characteristics and accelerometer wear time. Participants were categorised as 'active' at baseline if they participated in ≥ 60 min of MVPA per day for a least 3 days and 'inactive' if they participated in < 60 min of MVPA per day. Weight status (underweight/healthy weight; overweight/obese) was categorised according to International Obesity Task Force cutpoints.⁵⁰ Participants with a baseline BMI ≥ 60 kg m⁻² and weight ≥ 150 kg were excluded from the analysis. The characteristics of those that provided follow-up data were compared with those that did not, using *t*-tests for continuous variables and χ^2 -tests for categorical variables.

The study was powered on the primary trial outcome (daily minutes of MVPA), based on ten schools providing 120 students per school (assuming 50% of the Grade consented and provided valid accelerometer data).^{51,52} If 65% of the cohort provided usable data at 24 months,⁵³ and after adjustment for a design effect of 1.38, the effective sample size was estimated to be 141 students per group. Previous studies were used to estimate the standard deviation of mean daily minutes of MVPA per group (17.1)⁵⁴ and intra-class correlation coefficient (0.01).⁵⁵ With 80% power and an α -level of 0.05, the study was able to detect a difference in daily mean minutes of MVPA between intervention and control students of ± 5.73 min at 24 months. On the basis of this, the detectable difference for weight with a standard deviation of 12.1 kg was 4 kg.

Analyses followed intention-to-treat principles. Significance levels were set at $P < 0.05$. Linear mixed models (LMM) were used to examine

the outcome measures of weight, BMI and BMI z-score. A three-level hierarchical model was used to capture correlations in the data with random intercepts for repeat measures (level 1), on individuals (level 2) and clustering within schools (level 3). The LMM analyses aimed to determine if there was a significant difference in mean change from baseline to 12 months and baseline to 24 months between intervention and control groups for each outcome measure, both assessed using an interaction term between treatment group (intervention vs. control) and time (baseline vs. 12 months and baseline vs. 24 months). Two sensitivity analyses were conducted, first using only those that provided complete adiposity outcomes at all three time points (complete cases), and second using multiple imputation to fill in the missing data. The multiple imputation model used the method of chained regression equations, including variables that were prognostic of missing data and additional demographic and outcome data to create five imputed data sets. The results from fitting the LMM were pooled over the five data sets using Rubin's method.⁵⁶

Sub-analyses. Exploratory sub-analyses (defined *a priori*) were undertaken to determine whether the intervention impacted on the outcome measures for students according to three moderators of energy balance (i) sex (male; female), (ii) baseline BMI (underweight/healthy weight; overweight/obese) and (iii) baseline physical activity level (active; inactive). The moderator interaction terms were included in individual LMM analyses for each outcome, and the *P*-value for the three-way interaction term (group \times time \times moderator) was used to assess the level of evidence against the null hypothesis of no effect modification. Treatment effects are presented within each subgroup regardless of this *P*-value.

RESULTS

Sample

Of the 22 eligible schools, 13 were approached to participate in the study. Ten schools consented to participate (77%) and parental consent was obtained for 1233 of the 1468 Grade-7 students in the 10 schools (84%). A total of 1150 students provided adiposity outcome data at baseline, 1051 (91%) at mid-point (12 months) and 985 (86%) at 24 months. Demographic characteristics of the sample at baseline, 12 and 24 months are outlined in Table 1. At baseline, the mean age of participants was 12 years, 51% were female, 17% were overweight and 5% were obese, and 64% did not meet the physical activity recommendation of ≥ 60 min of MVPA per day. Participants who were lost to follow-up were more likely to be older in age ($P = 0.03$) and did not speak English as a primary language ($P = 0.02$) compared with those who provided outcome data at all time points.

At 24 months, all 5 intervention schools had implemented 6 of the 7 physical activity strategies. The exception was strategy 5 (school policy); 4 of the 5 schools had developed a school policy. All intervention implementation strategies were delivered as planned. The majority of intervention group PE teachers ($n = 35$) reported using pedometers to increase activity levels in PE (88.9%), and 58.8% reported including student physical activity plans each term. All schools were represented by at least one PE teacher (range 1–5) at each professional learning workshop. More information on intervention delivery can be found in the 24-month physical activity outcome paper.¹⁶

Indicators of adiposity

The results for the 12- and 24-month adiposity outcomes are presented in Table 2. At 12 months, there were group-by-time effects for weight (mean difference (95% CI) = -0.90 kg (-1.50 ; -0.30), $P < 0.01$) and BMI (-0.28 kg m⁻² (-0.50 ; -0.06), $P = 0.01$) in favour of the intervention group, but not for BMI z-score (-0.05 (-0.11 ; 0.01), $P = 0.13$). These findings were consistent for weight (-0.62 kg (-1.21 ; -0.03), $P = 0.01$) and BMI (-0.28 kg m⁻² (-0.49 ; -0.06), $P = 0.01$) at 24 months, with group-by-time effects also found for BMI z-score (-0.08 (-0.14 ; -0.02), $P = 0.02$) favouring the intervention group.

Table 1. Sample characteristics at baseline, 12 and 24 months for students who provided adiposity outcome measures

Variable	Subgroup	Baseline		Mid-point (12 months)		Follow-up (24 months)	
		Control (n = 505)	Intervention (n = 645)	Control (n = 459)	Intervention (n = 592)	Control (n = 425)	Intervention (n = 560)
Sex ^a	Male	244 (49%)	299 (48%)	219 (48%)	268 (46%)	219 (52%)	266 (48%)
	Female	254 (51%)	329 (52%)	233 (52%)	311 (54%)	204 (48%)	287 (52%)
ATSI ^b	No	456 (91%)	581 (92%)	415 (91%)	540 (92%)	390 (92%)	520 (93%)
	Yes	44 (8.8%)	53 (8.4%)	39 (8.6%)	45 (7.7%)	35 (8.2%)	40 (7.1%)
Language ^c	English	474 (97%)	593 (99%)	425 (97%)	539 (98%)	392 (97%)	506 (98%)
	Other	15 (3.1%)	8 (1.3%)	11 (2.5%)	9 (1.6%)	11 (2.7%)	8 (1.6%)
SEIFA ^d	Low	295 (61%)	349 (59%)	260 (60%)	308 (57%)	236 (59%)	285 (56%)
	High	190 (39%)	246 (41%)	172 (40%)	235 (43%)	163 (41%)	222 (44%)
Rurality	Metropolitan	236 (47%)	340 (53%)	220 (48%)	324 (55%)	207 (49%)	304 (54%)
	Rural	269 (53%)	305 (47%)	239 (52%)	268 (45%)	218 (51%)	256 (46%)
BMI category ^e	Underweight	30 (6.3%)	41 (7.3%)	19 (5.8%)	29 (6.9%)	7 (2.0%)	12 (2.5%)
	Normal weight	321 (67%)	397 (71%)	214 (65%)	291 (69%)	214 (62%)	320 (66%)
	Overweight	100 (21%)	97 (17%)	72 (22%)	75 (18%)	95 (28%)	111 (23%)
	Obese	29 (6.0%)	27 (4.8%)	25 (7.6%)	24 (5.7%)	27 (7.9%)	45 (9.2%)
MVPA ^f	Inactive (< 60 min per day)	324 (67%)	414 (67%)	277 (72%)	340 (68%)	226 (72%)	261 (66%)
	Active (≥60 min per day)	162 (33%)	207 (33%)	108 (28%)	158 (32%)	90 (28%)	137 (34%)
Age ^g	median (min., max.)	12 (11,13)	12 (11,13)	13 (12,14)	13 (12,14)	14 (12,15)	14 (12,15)
Height ^h	Mean (s.d.)	156.81 (7.92)	157.13 (7.47)	162.56 (8.20)	162.39 (8.73)	167.28 (9.40)	167.02 (7.88)
Weight ⁱ	Mean (s.d.)	50.01 (12.05)	49.43 (11.05)	55.96 (12.60)	55.22 (12.51)	61.50 (13.23)	60.52 (12.72)
BMI ^j	Mean (s.d.)	20.19 (3.81)	19.90 (3.59)	21.04 (3.76)	20.77 (3.96)	21.90 (4.33)	21.64 (4.06)
BMI z-score ^k	Mean (s.d.)	0.58 (1.16)	0.54 (1.11)	0.61 (1.13)	0.55 (1.11)	0.72 (1.09)	0.65 (1.12)

Abbreviations: ATSI, Aboriginal and Torres Strait Islander; BMI, body mass index; MVPA, moderate-to-vigorous physical activity; SEIFA, Socio-Economic Indexes for Australia. ^aBaseline (control = 7, intervention = 17), mid-point (control = 7, control = 13), follow-up (control = 2, intervention = 7). ^bBaseline (control = 5, intervention = 11), mid-point (control = 5, control = 7), follow-up (control = 0, intervention = 0). ^cBaseline (control = 16, intervention = 44), mid-point (control = 23, control = 44), follow-up (control = 22, intervention = 46). ^dBaseline (control = 20, intervention = 50), mid-point (control = 27, control = 49), follow-up (control = 26, intervention = 53). ^eBaseline (control = 25, intervention = 83), mid-point (control = 129, control = 173), follow-up (control = 82, intervention = 72). ^fBaseline (control = 19, intervention = 24), mid-point (control = 74, control = 94), follow-up (control = 109, intervention = 162). ^gParticipants (n). ^hBaseline (control = 491, intervention = 593), mid-point (control = 409, control = 516), follow-up (control = 407, intervention = 534). ⁱBaseline (control = 491, intervention = 590), mid-point (control = 442, control = 573), follow-up (control = 415, intervention = 549). ^jBaseline (control = 491, intervention = 587), mid-point (control = 440, control = 562), follow-up (control = 410, intervention = 547). ^kBaseline (control = 491, intervention = 584), mid-point (control = 440, control = 562), follow-up (control = 409, intervention = 547). ^lBaseline (control = 484, intervention = 571), mid-point (control = 406, control = 502), follow-up (control = 343, intervention = 488).

Intervention effects were significant for all adiposity outcomes at 12 and 24 months in both the complete cases and multiple imputation analyses (Supplementary Appendix 1 and 2).

Subgroup analyses

The results of the subgroup analyses are presented in Supplementary Appendix 3.

Sex. There was weak evidence of a differential treatment on effect on weight in males compared with females (three-way interaction $P=0.22$). Among males there was a statistically significant treatment effect at 24 months in favour of the intervention group (-1.26 kg (-2.11 ; -0.41), $P=0.01$). There were no significant effects on weight, BMI and BMI z-score at either 12 or 24 months for females.

Weight status at baseline. We found very little evidence of differential treatment effects depending on baseline weight for weight ($P=0.50$), BMI ($P=0.57$) or BMI z-score ($P=0.64$). Nevertheless, we did observe the following results.

Among underweight and normal weight participants combined, there were significant effects for weight (-0.71 kg (-1.28 ; -0.14), $P=0.04$), BMI (-0.33 kg m^{-2} (-0.55 ; -0.10), $P=0.01$) and BMI z-score (-0.08 (-0.15 ; -0.01), $P=0.01$) in favour of the intervention group at 12-month follow-up. Similar findings for weight (-0.71 kg (-1.28 ; -0.14), $P=0.04$), BMI (-0.33 kg m^{-2} (-0.55 ; -0.10), $P=0.01$) and BMI z-score (-0.08 (-0.15 ; -0.01), $P=0.01$) in

underweight/normal weight participants were found at 24 months in favour of the intervention group.

Among overweight and obese students, no significant effects were found at 12 or 24 months for weight (12 months = -1.29 kg (-3.12 ; 0.53), $P=0.16$; 24 months = -1.16 kg (-2.98 ; 0.67), $P=0.30$), BMI (12 months = -0.39 kg m^{-2} (-1.01 ; 0.22), $P=0.21$; 24 months = -0.18 kg m^{-2} (-0.80 ; 0.44), $P=0.45$) and BMI z-score (12 months = -0.07 (-0.21 ; 0.07), $P=0.31$; 24 months = -0.00 (-0.14 ; 0.14), $P=0.54$).

Physical activity level at baseline. We found no evidence of differential treatment effects depending on activity status at baseline for weight ($P=0.94$), BMI ($P=0.95$) or BMI z-score ($P=0.31$). There was no significant effect on weight, BMI or BMI z-score for either active or inactive students at 12 or 24 months.

DISCUSSION

This study reports the 12- and 24-month effects of PA4E1 on the secondary outcomes of weight, BMI and BMI z-score. The intervention had a favourable impact on adiposity outcomes, having a moderate effect on weight and BMI at 12 months, and weight, BMI and BMI z-score at 24 months. A difference in BMI of -0.28 kg m^{-2} over 24 months between intervention and control groups is twice the effect found in a meta-analysis of 11 school-based physical activity intervention studies (-0.13 kg m^{-2}).¹⁰ However, of the 11 physical activity interventions, only 2 were conducted in secondary schools and only 1 of these during school

Table 2. Changes in adiposity outcomes from baseline to 12- and 24-month follow-up

Outcome	Intervention			Control			Difference in change between groups						
	Baseline (n = 645) mean (95% CI)	12 m (n = 592) mean (95% CI)	24 m (n = 560) mean (95% CI)	P-value (baseline to follow-up)	Baseline mean (95% CI)	12 m (n = 459) mean (95% CI)	24 m (n = 425) mean (95% CI)	P-value (baseline to follow-up)	Baseline to 12 m	P-value	Baseline to 24 m	P-value	Group × time P-value
Weight (kg)	50.08 (48.83, 51.34)	55.91 (54.65, 57.17)	61.08 (59.83, 62.34)	< 0.0001	50.04 (48.69, 51.38)	56.48 (55.13, 57.83)	61.94 (60.59, 63.30)	< 0.001	-0.90 (-1.50, -0.30)	0.0034	-0.62 (-1.21, -0.03)	0.0396	0.0106
BMI (kg m ⁻²)	20.27 (19.76, 20.78)	21.07 (20.56, 21.59)	21.86 (21.34, 22.37)	< 0.0001	20.19 (19.65, 20.72)	21.27 (20.73, 21.81)	22.06 (21.52, 22.60)	< 0.001	-0.28 (-0.50, -0.06)	0.0126	-0.28 (-0.49, -0.06)	0.0116	0.0145
BMI z-score	0.62 (0.47, 0.77)	0.61 (0.46, 0.75)	0.69 (0.54, 0.84)	0.0002	0.59 (0.43, 0.74)	0.66 (0.50, 0.81)	0.71 (0.55, 0.86)	< 0.0001	-0.05 (-0.11, 0.01)	0.1307	-0.08 (-0.14, -0.02)	0.0062	0.0226

Abbreviations: BMI, body mass index; CI, confidence interval. Bold values are statistically significant.

time.¹⁰ In the latter study, the effectiveness of a 12-week school exercise training programme was tested in 24 obese, adolescent males, and found a significant intervention effect of -0.59 kg m^{-2} (95% CI = $-1.4; 0.23$).⁵⁷ The small sample in a high-risk, single-sex obese subgroup and the short intervention duration makes it difficult to equate to PA4E1. In an earlier meta-analysis of 18 studies, the intervention effect on BMI was much lower at -0.05 kg m^{-2} ($-0.19; 0.10$).⁹ However, only two of the 18 studies exclusively investigated the effect of a physical activity intervention in middle- or secondary-school students.⁹

The exploratory subgroup analyses found a significant effect at 24 months, favouring the intervention group on (i) weight among male adolescents, and (ii) weight, BMI and BMI z-score among underweight/healthy weight adolescents. There were no treatment effects on any of the adiposity measures for the other subgroups examined including females, overweight/obese students or active/inactive students. Although the moderator analyses indicate that the PA4E1 intervention was effective in limiting weight and BMI increases in the underweight/healthy weight subgroup, there was no evidence that the intervention had an adverse effect on underweight students as the proportion of underweight students decreased during the study, from 7.3% at baseline to 2.5% at 24 months. Weight, BMI and BMI z-score increased in both intervention and control underweight/healthy weight students, but increased to a lesser extent among students in the intervention group.

In PA4E1, 76% of students were not overweight or obese at baseline meaning a lower propensity to reduce adiposity measures. For this reason the authors of the HEALTHY study⁵⁸ have suggested that although population-based primary prevention interventions should continue to target all children, the study aim and primary outcomes should be evaluated in the highest-risk subgroup (overweight/obese adolescents) instead of the entire cohort. Although there were no significant intervention effects in the PA4E1 overweight/obese subgroup, the adiposity results for the intervention group are trending in the hypothesised direction and the effect was larger than that found in the main analysis and among healthy weight/underweight students. A lack of significant findings in overweight and obese students is likely to be a sample size issue, as the disproportionate number of adolescents in each weight status group may have contributed to the sub-analyses being underpowered.

At 24 months, the mean difference in BMI change between groups was -0.28 kg m^{-2} , with the intervention group's students increasing BMI by 1.59 kg m^{-2} and control by 1.87 kg m^{-2} over 2 years. This BMI trajectory is higher (intervention = $\sim 0.80 \text{ kg m}^{-2}$ per year; control = $\sim 0.94 \text{ kg m}^{-2}$ per year) than that found in a longitudinal study in Britain that aimed to examine the developmental trajectory of obesity throughout adolescence in relation to sex, ethnicity and socio-economic status in a cohort of 5836 adolescents.⁵⁹ Over 5 years from Grade 7 to Grade 11, BMI increased by 0.73 kg m^{-2} per year.⁵⁹ The rate of BMI increase did not differ by sex; however, socio-economically disadvantaged and black female adolescents had higher rates of overweight and obesity.⁵⁹ The higher BMI trajectory in participants of the PA4E1 study may also explain why PA4E1 was effective in limiting the adiposity increases in underweight/healthy weight adolescents, but had a limited, non-significant effect on overweight and obese adolescents.

The majority of school-based physical activity interventions targeting adolescents from socio-economically disadvantaged communities have not reported the effect on adiposity outcomes, and few have found an intervention effect.^{60,61} However, the results of PA4E1 are similar to findings from the 'Intervention Centred on Adolescent Physical Activity and Sedentary Behaviour' (ICAPS) study, which found intervention effects on BMI z-score.⁶² Similar to PA4E1, ICAPS was a socio-ecologically framed, multi-component intervention, implemented over a longer 4-year

period.⁶² The intervention involved changing attitudes towards physical activity (that is, educational component), promoting social support from teachers and parents (that is, regular meetings), and providing environmental and institutional conditions to promote physical activity (for example, break-time and after-school physical activity, sporting events and cycle to school days).⁶² The impact of ICAPS on adiposity (BMI z-score = -0.11; $P=0.02$) was comparable to PA4E1 (BMI z-score = -0.08; $P < 0.01$), and were maintained for 2 years 6 months after the intervention had finished, indicating that the results could be sustained. Similar proportions of overweight and obese adolescents were reported in ICAPS (23%) and PA4E1 (22%), and neither of the studies found significant adiposity effects on adolescents who were initially overweight or obese. The findings provide evidence for long-term multi-component interventions that target determinants at all socio-ecological levels (that is, intra-personal, inter-personal, organisation, community and policy).

PA4E1 is one of few school-based physical activity interventions to reduce the risk of overweight and obesity in adolescents living in socio-economically disadvantaged areas.^{9,63,64} A recent systematic review of childhood-obesity-prevention programmes incorporating diet and physical activity strategies, found that the strength of evidence was high for physical activity-only interventions in schools with home involvement, and for combined diet-physical activity interventions delivered with both home and community components. The PA4E1 findings indicate that school-based physical activity-only interventions (with home and community components) show promise, particularly adolescent populations. The impact of the intervention on adiposity outcomes could also be enhanced by incorporating a dietary school-based component with home and community involvement.

Although the adiposity results are unlikely to be clinically significant at an individual level, the reduced adiposity trajectory may produce health benefits at a population level and over an individual's lifetime. A 1% reduction in the prevalence of overweight and obesity in 16–17-year-old adolescents today has been projected to reduce the number of obese adults by 52 821 in the future, decrease total lifetime medical costs by \$586.3 million dollars and increase the quality-adjusted life years by 47 138 years.⁶⁵ The positive effect of PA4E1 on adiposity may have occurred due to the increase in objectively measured MVPA of 7 more minutes of MVPA per day than the control students at 24 months.¹⁶ The PA4E1 intervention was a multi-component and socio-ecologically framed school-based intervention, key elements of which have been recommended to increase physical activity and reduce the prevalence of obesity during adolescence.^{11,12} The intervention addressed educational, curricular and environmental changes in the school, supported by evidence from recent systematic reviews of school-based interventions.^{13,14} A 'change agent', who was a trained PE teacher, visited each of the intervention schools 1 day per week for the duration of the intervention to support the school and PE teachers in implementing the strategies (the change agent did not deliver any classes). The use of strategies within a sustainable framework of PA4E1 makes it a potentially scalable intervention. The intervention could be disseminated more broadly in secondary schools by education departments, and therefore, warrants dissemination evaluation.

This PA4E1 study had several strengths including the RCT design, the long intervention duration and a large sample size. The study included a suite of intervention implementation strategies based on the theoretical frameworks and evidence from past school-based physical activity reviews. Analyses were repeated using complete cases only and multiple imputation which reported similar results to the main analysis with regard to weight, BMI and BMI z-score, suggesting that the findings are robust. A number of limitations of the study need to be acknowledged. Although BMI is an acceptable measure of change in adiposity, direct measures, such as dual-energy radiography

absorptiometry, give a more accurate measure of adiposity.⁶⁶ Although the study was implemented over a 24-month period, the study did not assess whether the adiposity differences were sustained in the longer term once the 'change agent' ceased visiting the intervention schools. The students were recruited from moderate-to-large sized, socio-economically disadvantaged schools from one area in Australia, which may reduce the generalisability of the findings. The study did not collect maturation data from students. The study is likely to be underpowered for the subgroup analyses so these findings should be interpreted with caution, as the lack of a treatment effect may have been due to type II error (failing to detect an effect that is present). Assessment of the cost and cost effectiveness of the PA4E1 intervention will be reported in a separate paper.

There is a need for innovative physical activity interventions to target adolescents most at risk of overweight and obesity. The results from the PA4E1 intervention provide evidence for a multi-component physical activity intervention implemented in secondary schools to have a moderate effect on adiposity outcomes at the population level among adolescents from socio-economically disadvantaged communities. Multi-component interventions that increase adolescents' engagement in MVPA may assist in preventing overweight and obesity.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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AUTHOR CONTRIBUTIONS

JW, PJM, DRL, LC, LW and KG obtained funding for the research. All authors contributed to developing the intervention and data collection protocols and materials. JLH drafted the manuscript, and all authors reviewed, edited and approved the final version of the paper. All authors accept full responsibility for, and have read and approved, the final manuscript.

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RESEARCH

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Cost effectiveness of a multi-component school-based physical activity intervention targeting adolescents: the 'Physical Activity 4 Everyone' cluster randomized trial

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Abstract

Background: Few school-based interventions have been successful in reducing physical activity decline and preventing overweight and obesity in adolescent populations. As a result, few cost effectiveness analyses have been reported. The aim of this paper is to report the cost and cost effectiveness of the Physical Activity 4 Everyone (PA4E1) intervention which was a multi-component intervention implemented in secondary schools located in low-income communities. Cost effectiveness was assessed using both the physical activity and weight status trial outcomes.

Methods: *Intervention and Study Design:* The PA4E1 cluster randomised controlled trial was implemented in 10 Australian secondary schools (5 intervention: 5 control) and consisted of intervention schools receiving seven physical activity promotion strategies and six additional strategies that supported school implementation of the intervention components. Costs associated with physical activity strategies, and intervention implementation strategies within the five intervention schools were estimated and compared to the costs of usual physical activity practices of schools in the control group. The total cost of implementing the intervention was estimated from a societal perspective, based on the number of enrolled students in the target grade at the start of the intervention (Grade 7, $n = 837$).

Economic Outcomes: The economic analysis outcomes were cost and incremental cost effectiveness ratios for the following: minutes of moderate-to-vigorous physical activity (MVPA) per day gained, MET hours gained per person/day; Body Mass Index (BMI) unit avoided; and 10 % reduction in BMI z-score.

Results: The intervention cost AUD \$329,952 over 24 months, or AUD\$394 per student in the intervention group. This resulted in a cost effectiveness ratio of AUD\$56 (\$35–\$147) per additional minute of MVPA, AUD\$1 (\$0.6–\$2.7) per MET hour gained per person per day, AUD\$1408 (\$788–\$6,570) per BMI unit avoided, and AUD\$563 (\$282–\$3,942) per 10 % reduction in BMI z-score.

Conclusion: PA4E1 is a cost effective intervention for increasing the physical activity levels and reducing unhealthy weight gain in adolescence, a period in which physical activity typically declines. Additional modelling could explore the potential economic impact of the intervention on morbidity and mortality.

(Continued on next page)

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Trial registration: Australian New Zealand Clinical Trials Registry ACTRN12612000382875.

Keywords: Physical activity, Adolescents, School, Randomized controlled trial, Low income, Disadvantaged, Cost effectiveness, Economic

Abbreviations: BMI, Body mass index; ICER, Incremental cost effectiveness ratios; ISS, Implementation support strategy; MVPA, Moderate-to-vigorous physical activity; NSW, New South Wales; PA4E1, Physical activity 4 everyone; PAS, Physical activity strategy; PE, Physical education

Background

Regular physical activity has well established positive benefits for both physical and mental health [1], yet physical activity levels are known to decline throughout adolescence [2] with only 20 % of youth currently undertake sufficient daily physical activity to obtain these health benefits [3]. Physical inactivity is considered to directly contribute to 1.5 %–3.0 % of global health care costs [4], including direct and indirect health care costs [5]. The large proportion of low-active adolescents, coupled with the global concern regarding overweight and obesity, make population-based interventions focused on physical activity promotion and obesity prevention in this population sub-group a public health priority [6–8]. As both physical inactivity and overweight and obesity are more prevalent in adolescents from disadvantaged backgrounds, strategies targeting this population are particularly warranted [9, 10].

School-based physical activity and lifestyle interventions show promise in addressing both physical inactivity and overweight and obesity [6–8, 11–13]. Schools provide almost universal access to children and adolescents, including those from disadvantaged backgrounds [14]. In addition, schools have the policies, resources, and teaching staff to adopt programs into usual school practice that are likely to impact on both physical activity and weight status [15]. Despite this, successful interventions targeting adolescents are limited in number, particularly interventions that target adolescents from disadvantaged backgrounds [7, 12, 16–20]. A recent systematic review reported only 14 of the 44 included school-based physical activity intervention trials targeted adolescents, of which only four resulted in significant physical activity intervention effects [7]. Only two of the adolescent trials focused on disadvantaged adolescents, with one reporting significant intervention effects on physical activity [7]. Additionally, a recent review of childhood and adolescent obesity prevention reported multi-component school physical activity interventions have resulted in only modest reductions in BMI (–0.13 kg/m [2], 95 % CI –0.22 to –0.04) [21]. However, the review reported results for both children and adolescents combined, with the impact

specifically on adolescents unknown. Systematic reviews of interventions that aim to prevent obesity have demonstrated smaller effects in adolescent populations in comparison to younger children [22].

In order for policy makers to allocate scarce health resources, economic evaluations of effective programs, ideally based on outcomes of randomised controlled trials, are needed [23]. Cost-effectiveness analysis (CEA) aims to evaluate questions around the benefits of interventions relative to their cost in order to inform funding decisions and health care policy [24]. CEA is used to determine technical efficiency. That is, the production of health benefit for the least cost. No single threshold exists for determining the acceptability of a CE ratio. Rather, a variety of considerations, including the prosperity of a nation or health system, as well as the incremental value delivered by an intervention, influence funding decisions. Despite the valuable contribution of CEA, very few studies have evaluated school-based physical activity interventions from a cost effectiveness perspective [25–31]. Even fewer studies have targeted adolescents and none have focussed on disadvantaged adolescents. Two recent systematic reviews of physical activity interventions reporting cost-effectiveness included school-based interventions, but neither separated the effects for elementary and secondary school-focussed interventions [27, 31]. The reported cost effectiveness of interventions included in the review by Wu and colleagues (16 school-based trials, four in adolescents) was based on costs obtained either directly from published cost analyses or imputed by the review authors [31]. The second review by Laine and colleagues included school-based interventions from the Wu review [31], as well as modelled cost-effectiveness studies [27] (total of six school based trials, three in adolescents). While these reviews have limitations such as few of the studies assessing physical activity using objective measures [32], use of imputed cost estimates rather than actual costs and variability in study design (with rigorous well designed RCT's tending to show smaller physical activity effectiveness and higher cost-effectiveness ratios) [27] [31], both reviews conclude that school-based physical activity interventions are cost effective

compared to other population based interventions in terms of physical activity outcomes [27, 31].

From an obesity prevention perspective, the Australian ACE Obesity prevention study conducted in 2003 used modelling techniques to review a portfolio of interventions targeting the prevention of childhood obesity [33]. Five of the thirteen population level interventions were school-based. The review concluded that multi-strategic school-based interventions were cost effective (modelled to cost less than \$50,000 AUD per DALY) and estimated at \$211–\$473 per student [33]. However the strength of the evidence was often limited, weak or inconclusive with only seven of the 13 interventions included in the study being based on evidence of effect gained from randomized controlled trials [33]. A further systematic review of eight childhood obesity primary prevention trials (including three school-based trials all targeting elementary aged children) reported school-based interventions were cost effective using a variety of cost effectiveness measures [34]. The authors concluded that limited comparison between studies could be made due to the heterogeneity of outcome measures across the studies, low quality of included studies and the use of model-based studies to obtain an outcome rather than trial outcome measures. Given the limitations of existing data there is an increasing demand for additional data on cost and cost effectiveness of school based intervention for both physical activity and adiposity outcomes.

The Physical Activity 4 Everyone (PA4E1) trial involved a 24-month multicomponent school-based intervention implemented in secondary schools located in disadvantaged communities [35]. The trial aimed to determine the effectiveness of the intervention in reducing the decline in physical activity among adolescents. The trial was one of a very limited number of school-based physical activity interventions that has demonstrated an increase in objectively measured physical activity coupled with a reduction in weight gain [36–38], and the first study in adolescents [39, 40]. At both 12 [35] and 24-months [39], the study reported improvements in daily moderate-to-vigorous physical activity (MVPA) together with a positive effect for weight and body mass index (BMI) in favour of the intervention group [35, 39, 40]. In addition, a significant intervention effect was also observed for BMI Z-score at 24 months [40]. Due to the limited literature outlining the cost effectiveness of school-based interventions that can impact on both physical activity and weight status in adolescents, the aim of this study was to assess the costs of the PA4E1 intervention, and the cost effectiveness of the intervention considering both physical activity and weight status trial outcomes.

Methods

Intervention trial design, setting and sample

A cluster randomized trial was conducted involving randomly selected secondary schools (five intervention and five control schools) in socio-economically disadvantaged communities in New South Wales (NSW), Australia. Outcome assessments were conducted with a cohort of students at baseline (when students were in Grade 7), 12-month (mid-intervention) and 24-month post-randomisation follow-up. Details of the study methods have been reported elsewhere [16], along with the intervention effects at 12-months [35] and 24-months [39, 40].

The trial was registered with the Australian New Zealand Clinical Trials Registry (ACTRN1261200038287) and approved by the Hunter New England Area Human Research Ethics Committee (11/03/16/4.0) and the University of Newcastle Human Research Ethics Committee (H-2011-0210). The study adhered to the Consolidated Standards of Reporting Trials (CONSORT) guidelines (<http://www.consort-statement.org>), and the Consolidated Health Economic Evaluation Reporting Standards (CHEERS) Statement (<http://www.equator-network.org/reporting-guidelines/cheers/>) [41].

Economic study and setting

A trial-based retrospective economic evaluation of a multi-component school-based physical activity outcome (PA4E1) versus usual school physical activity practice was conducted from a societal perspective. The outcomes for the economic analysis were the cost and incremental cost effectiveness ratios per: minute of MVPA per day gained; MET hour gained per person/ day; BMI unit avoided; and 10 % reduction in BMI z-score.

PA4E1 intervention

The intervention implemented in secondary schools based in disadvantaged communities located in NSW, Australia, was delivered to all students who commenced Grade 7 in 2012, through incorporating the intervention as part of usual school business. The intervention was implemented over 7–8 school terms (average 24 months) and consisted of embedding seven physical activity strategies across the domains of the Health Promoting Schools Framework [42] into the school community. The seven physical activity strategies included: more active physical education (PE) lessons; development of personal physical activity plans; delivery of a 10 week enhanced school sport program (Program X [43, 44]); conducting supervised recess and/or lunch physical activity opportunities; supportive school physical activity policy; and linking with the community and linking with parents (Fig. 1. Intervention overview – physical activity and intervention implementation strategies [39]). In addition to the physical activity strategies, six evidenced-

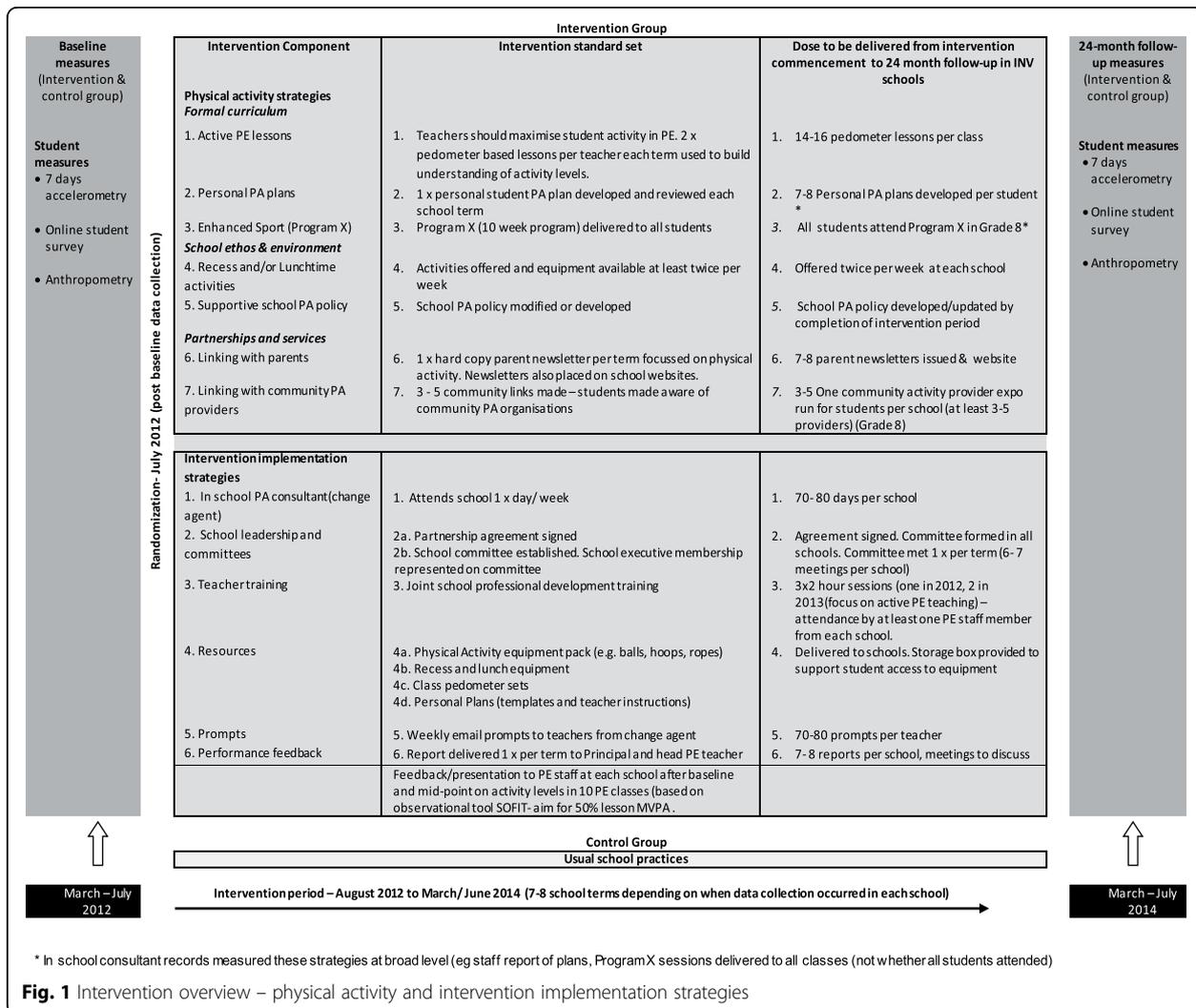


Fig. 1 Intervention overview – physical activity and intervention implementation strategies

based implementation support strategies were delivered [45–49]: an in-school physical activity consultant, executive support, teacher training, resources, prompts and monitoring reports (Fig. 1). Schools allocated to the control group participated in the measurement components of the trial only and delivered physical activity teaching and promotion practices according to the PE curriculum and school-based initiatives. Intervention materials were provided to control schools following the 24-month assessments.

Measurement of trial outcomes

Physical activity

Accelerometer data were used to derive the physical activity outcome measure, duration (minutes) of MVPA per day. Accelerometer non-wear time was defined as 30 min of consecutive zeros [50]. Counts were collected in 15 s epochs and counts per minute calculated by dividing the total accelerometer counts by the minutes of wear time. The Evenson cut-points were used to

categorise the intensity of physical activity (moderate or vigorous) [51]. Mins per day of MVPA were calculated for students who wore accelerometers for ≥ 600 min on ≥ 3 days [52].

The conversion of minutes of MVPA per day to MET hours gained per person/ day was undertaken to aid the comparison with other cost effectiveness studies of physical activity interventions. A MET represents energy expended divided by resting energy expenditure [31, 53]. Determining MET hours gained accounts for the variety of physical activity measures in use and takes into account a range of parameters including intensity, duration and frequency of physical activity [31].

To determine MET hour gained per person/day, the difference in daily minutes of MVPA between the intervention and the control groups was converted to MET hours gained, following the steps outlined by Wu et al., and replicated in a subsequent systematic review by Laine et al [27]. Using validated measures, moderate physical activity is assigned 3.0 to 6.0 METS, vigorous

activity >6.0 METS and MVPA is assigned 4.5 METS [27]. This process of converting minutes of MVPA per day to MET hours gained involves multiplying mean minutes MVPA/ day by MET assigned, divided by 60 min.

Weight status

Anthropometric data were collected in duplicate by trained research assistants using the International Society for Advanced Kinanthropometry (ISAK) procedures to measure student height and weight. [54] Students completed the measurements in light clothing without shoes. Weight was measured to the nearest 0.1 kg on a portable digital scale (Model no. UC-321PC, A&D Company Ltd, Tokyo Japan). Height was measured to the nearest 0.1 cm using a portable stadiometer (Model no. PE087, Mentone Educational Centre, Australia). Body mass index (BMI) was calculated (weight (kg) / height (m) [2]) and weight status determined using the International Obesity Taskforce definitions [55, 56].

Measurement of costs

The cost and incremental costs associated with the implementation of the physical activity intervention and intervention implementation strategies were calculated as those costs additional to the costs of usual physical activity practices of schools. The total cost of implementing the intervention was estimated from a societal perspective. Costs incurred for research and development were excluded in order to only capture the costs of replicating the intervention. Resource use categories included personnel costs, materials and printing. Personnel costs included opportunity costs for the delivery of strategies by school staff and community sport and fitness providers. All costs are reported in 2014 Australian dollars. All other resource use categories were valued using market rates. Potential effects on healthcare costs were not included.

Direct costs of the intervention

Project records relating to intervention delivery, including costs, were kept throughout the trial. For the physical activity strategies (Fig. 1), personnel costs included opportunity costs for delivery of strategies by school staff and community sport and fitness providers. Personnel costs for the implementation of strategies that occurred outside of PE and sport time were valued using the opportunity cost of forgone time. No opportunity costs were assumed for physical activity strategies 1–3 (Active PE, personal physical activity plans, enhanced sport) as such strategies were implemented by staff within school PE and sport time as part of usual school business. Opportunity costs were included for physical activity strategies 4, 5 and 7 (organised recess and/or lunch activities,

policy, community links) as strategy 4 (organised recess and/or lunch activities) involved the provision of additional staffing of playground areas, strategy 5 (policy) required time for policy development/modification and sign off, and strategy 7 (community links) required time for school and community member involvement.

Costs incurred for the intervention implementation strategies (Fig. 1) included personnel costs, equipment and travel/venue/meal expenses. Personnel costs included in-school consultant salary, payment of consultants to deliver PE teacher training, teacher relief to allow PE teachers to attend training, and opportunity costs (forgone time) associated with implementation strategy 2 (school leadership and committee) as staff attended additional committee meetings about intervention implementation.

With respect to control schools, it was assumed that no additional costs were incurred in implementing their usual physical education practices.

Australian Bureau of Statistics average earnings data (May 2014) were used to impute labour costs for community sport and fitness personnel [57]. The Industrial Relations Commission of NSW 2014 Award data were used to impute labour costs for teaching personnel [58].

Statistical analysis

Cost effectiveness analysis was undertaken from a societal perspective and all analyses were carried out using Microsoft Excel software 2013. The analysis was conducted on an intention to treat basis, with the total program cost being calculated for all enrolled students in the target Grade across the five intervention schools at baseline given these students would have been exposed to the intervention ($n = 837$). Incremental cost effectiveness ratios (ICER) were calculated for each outcome measure and represent the additional expenditure required to deliver each additional unit of benefit.

For the physical activity outcome measures, the ICERs calculated were the cost per student per mean minute of MVPA gained and cost per student per MET minute gained. To present the intervention cost per minute of MVPA gain, the total cost per student was divided by the mean difference in change in MVPA minutes between intervention and control groups over 24 months, to provide a cost per student per minute of additional MVPA. The cost per person/day is then divided by the MET hours gained per day, resulting in a cost effectiveness ratio per MET hour gained [27, 31].

For the weight status outcomes, the ICERs were calculated to represent the expenditure per student per BMI unit avoided and cost per student per 0.1 unit (10 %) BMI z-score reduction. The total intervention cost per student was divided by mean difference in change in BMI and BMI z-score between groups over 24 months

to provide a cost per BMI unit avoided and cost per 0.1 (10 %) reduction in BMI z-score [59].

The multicomponent intervention was delivered in its entirety to a cohort of students in Grade 7 at the beginning of the intervention, followed through to Grade 9. Whilst the evaluation of the intervention occurred within the cohort of students and the cost effectiveness analysis has been conservatively calculated on the basis of the intervention benefiting only the cohort of students measured in the evaluation. Due to the nature of the intervention strategies (teacher training, school environment and broader school community links), it was likely the intervention had an impact on all students attending the school more broadly, not just on those students within the evaluation cohort. Univariate sensitivity analyses were undertaken to test plausible variation in the evaluation components as well as the impact of changing key design features of the intervention, including broader exposure and an associated estimate of benefit. Table 1 details the sensitivity tests that were modelled and provides justification for the assumptions made based on evaluations and empirical data from the PA4E1 trial: (i and ii) variation in the costs of specific intervention components (iii) variation in the magnitude of effect size using the upper and lower confidence interval limits; (iv) test assuming physical activity strategy 4 (recess and lunchtime activities) is extended to 10 % of students beyond the target grade, with a reduced effect on daily minutes of MVPA compared to students in the target grade; and (v) test assuming the benefits of physical activity strategy 1 (active PE), strategy 5 (physical activity policy) and implementation strategy 1 (change agent), 2 (executive support) and 3 (resources) are extended to all students (100 %) outside the target year (in Grades 7–10), with a reduced effect on daily minutes of MVPA compared to students in the target grade. Aggregated costs across schools meant it was not possible to capture the cost profiles of individual student participants, prohibiting uncertainty analysis.

In addition, two scenario analyses, detailed in Table 1 were undertaken to explore the potential cost effectiveness of state-wide implementation of the intervention across NSW. There are 487 secondary schools catering for students in Grades 7 to 10 in NSW, with 254,923 students enrolled in these Grades. The first scenario used the current intervention implementation model within the target year across all applicable secondary schools in NSW. That is, those schools with Grades 7–10. Due to the logistical challenges of implementing interventions across large groups of schools and based on questions posed to principals of participating schools, the second scenario analysis used a real world solution whereby the implementation of school based physical activity

practices is supported by an existing in-school teacher as an alternative to the school physical activity consultant employed in the efficacy trial. The potential model utilising an existing in-school teacher for providing guidance for schools was assumed for the intervention across Government and Catholic schools catering for students in Grades 7 to 10 across NSW ($n = 487$ secondary schools, catering for 254,923 students). The dissemination model included the costs of each school receiving relief funding for three periods per week for two years to support the implementation of the intervention within the school. This relief funding would allow an existing teacher within each secondary school to be released from classroom teaching to support the implementation within their school. This existing school teacher would be provided with teacher professional learning to enable them to embed the seven PA4E1 strategies within the school, using the same intervention implementation strategies used in PA4E1. Such a model was supported by principals of participating schools, who expressed a willingness to commit school resources for an in-school consultant for a period of 24 months. It was assumed that expansion of the intervention and changes to the support model would result in a reduced effectiveness compared to the primary trial outcome reported in the efficacy trial [60], and a reduced impact as outlined in the sensitivity analysis for students outside the target year.

Results

Schools

Five intervention schools (including 4 government and 1 catholic school of which 3 schools were located within the inner city and 2 were rural schools, with a mean of 129 Year 7 students) and five control schools ((including 4 government and 1 catholic school of which 3 schools were inner city schools and 2 were rural schools with a mean of 101 year 7 students).

Trial participants

The study included 1150 students in Grade 7 (645 intervention, 505 control) at baseline. At 24-month follow-up, 985 students wore an accelerometer with 441 students providing valid physical activity outcome data (three or more days of accelerometer data) and 985 students provided weight status outcome data. Table 2 outlines the characteristics of students in the sample.

Trial outcomes

At 24-month follow-up, the adjusted mean difference in change in daily MVPA between groups was 7.0 min (95 % CI: 2.7, 11.4, $p < 0.002$). Sensitivity analyses based on multiple imputation were consistent with the main analysis

Table 1 Sensitivity and scenario description: strategies and benefit

Test to be modelled	Detailed assumptions	Justification
Sensitivity analyses		
(i) Variation in the intervention cost	Higher estimate of the assumed opportunity cost of school staff participation in PA strategy (PAS) 4 & 5 and implementation support strategy (ISS) 1	Plausible variation in the cost
(ii) Variation in the intervention cost	Lower estimate of the assumed opportunity cost of school staff participation in PAS 4 & 5 and ISS 1	Plausible variation in the cost
(iii) Varying the magnitude of the effect size	Assumes benefit of the overall intervention varies between the calculated confidence interval of the effect size in daily minutes of MVPA	Plausible variation in the effect size
(iv) Extending the benefit of physical activity recess and lunchtime activities to students beyond the target year.	Assumes benefit of PAIS 4 is extended to 10 % of students beyond the target year, with a reduced effect on daily minutes of MVPA compared to students in the target year. Reduced effect estimate was based on the accelerometer data within the recess and lunchtime segment from the efficacy trial (unpublished). The number of additional students that may benefit from whole of school recess and lunchtime activities was conservatively estimated based on 10 % of a multiple of 3X the mean number of students in the target year ($n = 132$).	It was likely these specific components of the intervention would impact students more broadly and not be isolated to those students within the evaluation cohort.
(v) Extending the benefit of multiple strategies to all students	Assumes benefit of PAS 1, PAS 5 and ISS 1, 2 and 3 are extended to all students (100 %) outside the target year (in Grades 7–10), with a reduced effect on daily minutes of MVPA compared to students in the target year. The assumed effect size for the extension cohort was based on the results of the sensitivity analysis conducted within the efficacy trial (undertaken using imputation of missing data).	As above, due to the nature of the intervention strategies (teacher training, school environment and broader school community links) the intervention impact would likely not be isolated to the evaluation cohort. For example, once PE teachers are trained on how to maximise MVPA in PE, these strategies would likely be applied to all classes at no additional cost. The same assumption applies for other strategies such as a school Physical activity policy, executive support, change agent, and use of resources. As such the cost of these strategies would not increase, however we have assumed there is potential for more students to benefit from a school implementing such strategies.
Scenario analysis		
State wide roll out (current model)	Total cost of the intervention is based on the current implementation support model. Assumes benefit to 100 % of students, with an effect size based on the results of the sensitivity analysis conducted within the efficacy trial (undertaken using imputation of missing data). The number of students ($n = 254,923$) is based on a calculation from 487 NSW schools with Grades 7–10.	
State wide roll out- Alternate (real world) model	The total cost of the intervention is modified to reflect (a) an alternate model of school support - existing in-school teacher to support role out (1/2 day per week (0.5 FTE/ ½ day per week) and (b) a reduction in the equipment cost per school. Whilst the offer of an equipment pack was an attractive selling point for schools to consent to the intervention, evaluation of this specific strategy highlighted that schools within the intervention group were well stocked with equipment. As such, the provision equipment was not deemed an essential component of the trial. Based on this observation, the assumption that reducing the intervention costs by removing the provision of equipment, would not substantively alter the impact of the intervention. Assumes benefit to 100 % of students, with an effect size based on the results of the sensitivity analysis conducted within the efficacy trial (undertaken using imputation of missing data). The number of students ($n = 254,923$) is based on a calculation from 487 NSW schools with Grades 7–10.	

(6.0 min, 95 % CI: 0.6, 11.3, $p < 0.031$) [39]. The difference in change for BMI and BMI z-score was -0.28 (95 % CI = -0.49 ; -0.06 , $p = 0.01$) and -0.08 (95 % CI = -0.14 ; -0.02 , $p = 0.02$) respectively, favouring the intervention group.

Intervention costs

A total of 837 students were enrolled in Grade 7 at schools allocated to the intervention group of the study and were therefore included in the economic analysis. Table 3 shows the breakdown of the intervention costs

Table 2 Student characteristics at baseline – students wearing an accelerometer ($n = 1150$)

Characteristic	Intervention group	Control group
Number/ Total Participants	645	505
Boys ^a	312	246
Girls ^a	333	258
3 vld days	530	435
Mean age (years)	12.0	12.0
Aboriginal and/ or Torres Strait Islander (%)	5.3 %	7.8 %
Height, (mean m)	157.1	156.8
Weight, (mean kg)	49.3	50.0
Student BMI Category, (%)	78.3 %	73.3 %
Underweight/ Healthy Weight		
Overweight/ Obese	21.7 %	24.7 %
Student activity level	33 %	33 %
Active (≥ 60 min MVPA/ day)		
Low active (< 60 min MVPA/ day)	67 %	67 %
Accelerometer wear time	793.6	804.6
Mean minutes per day		

^aNote - One (1) gender missing

against the various physical activity and implementation strategies. The total cost of the intervention was calculated to be \$329,952 over 24 months. Unit costs of intervention components are displayed in Table 4. On the basis that schools allocated to either intervention or control would likely have the same baseline costs of implementing PE and sport, a zero cost was assumed for usual physical activity practices of schools randomised to the control arm, resulting in an intervention cost of \$394 per student.

Incremental cost effectiveness ratios

Cost per additional minute of MVPA per day gained:

Based on the finding of a difference in change of 7.0 (95 % CI 2.68–11.36) minutes per student per day of MVPA for students in the intervention versus control groups [39], the intervention cost of \$394 per student divided by 7.0 resulted in an incremental cost effectiveness ratio of \$56 [95 % CI \$35–\$147] per additional minute of MVPA per day (Tables 3 and 5).

Cost per MET hour gained per person per day:

When mean minutes MVPA per day were converted to MET hours gained, the PA4E1 intervention resulted in 0.5 [95 % CI 0.2–0.9] MET hours gained per person/day, and a cost of effectiveness ratio of \$1 (\$0.6–\$2.7 per MET hour gained (Table 3).

Cost per BMI unit avoided:

Based on a finding of a difference in change of -0.28 BMI units per student in the intervention group versus the control group [40], the intervention cost of \$394 per

student divided by -0.28 resulted in an incremental cost effectiveness ratio of \$1,408 [95 % CI \$788–\$6,570] per BMI unit avoided (Table 3).

Cost per reduction in BMI z-score:

Similarly, the intervention cost of \$394 per student divided by the difference in BMI z-score of -0.07 [40], resulted in an incremental cost effectiveness ratio of \$5,632 per 1.0 unit BMI z-score reduction or \$563 per 10 % reduction in BMI z-score [95 % CI \$282–\$3,942] (Table 3).

Students included all students enrolled in Grade 7 at intervention commencement.

Sensitivity analysis

Figure 2 outlines the outcomes from sensitivity testing. Tests (i) and (ii) plausible variation in the cost of the intervention by varying the assumed opportunity cost of school staff participation in PAS 4 & 5 and ISS 2 resulted in ICERs of \$57 (\$35, \$149) and \$54 (\$33, \$142) respectively. Test (iii) variation in the magnitude of the estimated effect size between the lower and upper confidence interval in minutes of MVPA per day resulted in point estimate ICERs of \$35 and \$147 respectively. Tests (iv) and (v) extending the intervention benefit outside the target grade resulted in ICERs of \$60 (\$37, \$150) and \$28 (\$15, \$154) respectively.

Scenario analysis

The costs to disseminate the intervention across secondary schools in NSW using the existing model were \$66 (\$35–\$656) per additional minute of MVPA. The cost of disseminating the intervention across NSW, through a real world model provision of teacher relief funding for half a day per week over 24 months to allow an existing in teacher to lead the implementation of the program at school (estimated to cost \$10,100 per school over 24 months) resulted in a cost per minute of MVPA of \$27 (\$14–\$267) (Fig. 2).

Discussion

This study assessed the cost and cost effectiveness of a multi-component school-based intervention (*Physical Activity 4 Every1*) that aimed to reduce the decline in physical activity among secondary school students. The cost of the intervention was \$329,952 over a 24-month period, resulting in the intervention being delivered at a cost of \$394 per student. In terms of physical activity, the ICER was \$56 per minute of MVPA gained and \$1 per MET hour gained per person. From a weight perspective, the ICER's were \$1,408 per BMI unit avoided and \$563 per 10 % reduction in BMI z-score. These findings suggest that implementation of the intervention by schools in disadvantaged areas has the potential to make a cost-effective contribution to reducing the

Table 3 Breakdown of costs across physical activity intervention and implementation strategies over two years

Physical activity intervention strategies (PAS)	Description & cost components	Total cost (24 m)	Total cost (24 m) per student	
1	Active PE lesson ^a	Teachers should maximise student activity in PE. 2 × pedometer based lessons per teacher each term used to build understanding of activity levels	\$0	\$0
2	Personal physical activity plans ^a	1 × personal student PA plan developed and reviewed each school term	\$0	\$0
3	Enhanced sports program ^a	Program X (10 week program) delivered to all students	\$0	\$0
4	Recess and lunchtime activities	Activities offered and equipment available at least twice per week	\$10,526	\$13
5	Supportive school physical activity policy ^a	School PA policy modified or developed	\$301	\$0.36
6	Linking with parents	1 × hard copy parent newsletter per term focussed on physical activity. Newsletters also placed on school websites. Cost includes printing and materials	\$4,933	\$6
7	Linking with the community	3–5 community links made – students made aware of community PA organisations Cost relates to community provider expos and includes showbag materials plus the opportunity cost of the preparation and face-face time of community sports representatives and school staff	\$8,285	\$10
Implementation support strategies (ISS)				
1	In school consultant (change agent)	Attends school 1 day per week. Cost is salary for two years	\$216,544	\$259
2	School leadership & committee	Partnership agreement signed, School committee established. School executive membership represented on committee Cost includes the opportunity cost of school staff time associated with committee meeting attendance	\$1,263	\$1.51
3	Staff development & training	Joint school professional development training Cost includes the opportunity cost of school staff time (teacher relief), external consultant services, travel and meal expenses and venue hire	\$28,340	\$34
4	Resources	Physical Activity equipment pack (e.g. balls, hoops, ropes), recess and lunch equipment, class pedometer sets (5 per school), personal plans (templates and teacher instructions)	\$59,370	\$71
5	Prompts	Weekly email prompts to teachers from change agent Costs include printing and materials	\$389	\$0.46
6	Performance feedback	Report delivered 1 × per term to Principal and head PE teacher	\$0	\$0
Total cost	\$329,952	\$394		

^aCosts are accounted for in various implementation strategies

decline in physical activity during adolescence and the health-related burden associated with physical inactivity and overweight and obesity.

This is one of the few cost effectiveness studies of school-based physical activity interventions targeting adolescents, and to the authors' knowledge, the first based on an objective measure of physical activity, and the first cost effectiveness study of a school-based physical activity intervention targeting disadvantaged adolescents. While, the PA4E1 intervention demonstrated a consistent effect in terms of MET hours gained per person/day

compared to a meta-analysis of the cost effectiveness of school-based physical activity interventions (0.50 compared to 0.48 MET hours gained) [31], the cost effectiveness profiles of the studies are not as easily compared. The cost-effectiveness result from the PA4E1 intervention of \$1 per MET hour gained is at the upper end of the spectrum of reported cost-effectiveness ratios of the studies included in the reviews (\$0.06–\$0.8/MET hr). However, as discussed above, the reported costs and therefore cost-effectiveness of the studies included in the meta-analyses were derived from either published cost

Table 4 Physical activity 4 Everyone intervention unit costs

Cost variable	Unit	Value
PE staff labour time	Rate/h	\$60.15 ^a
Volunteer personnel, labour time	Rate per hour	\$33.18 ^b
Printing	Cents per sheet	
Showbag contents	Cost per bag	\$0.62 ^c
Venue hire (including catering)	Cost per session	\$482.133 ^c
Conference fees	Cost per conference	\$1805.00 ^c
Travel expenses	Cost per person	\$441.23 ^c
Equipment packs (including incentives)	Per pack	\$11,874.00 ^c

Sources for cost prices

^aCommission IR: Crown employees (Teachers in schools and related employees) salaries and conditions award 2014. In., vol. May; 2014^bAverage weekly total cash earnings May 2014, ABS 6302.1^cReal cost price

analyses or imputed by the review authors and therefore may not accurately reflect the profiles of the interventions. Since the current analysis did not extend to including any potential cost-offsets associated with increased physical activity, the cost-effectiveness of the intervention should still be considered favourable.

From a weight perspective, the intervention costs per child calculated in PA4E1 are similar to a school- and community-based childhood obesity intervention (implementing both nutrition and physical activity strategies) known as *Be Active Eat Well*, which was also implemented in Australia targeting children aged 5–12 years [29]. This study reported a cost per child of \$344AUD, and resulted in a similar effect on BMI (0.28 BMI Units), but a greater impact on BMI Z-score [29], potentially due to the younger age of the students targeted by the intervention [22]. Similarly, the APPLES childhood obesity prevention study conducted in New Zealand targeted children aged 5–12 years and reported higher intervention cost per child of NZD \$1,281 (equivalent to \$1202.7AUD), and an incremental cost-effectiveness

ratio (ICER) of NZD \$664–\$1708 per kg of weight-gain prevented [35].

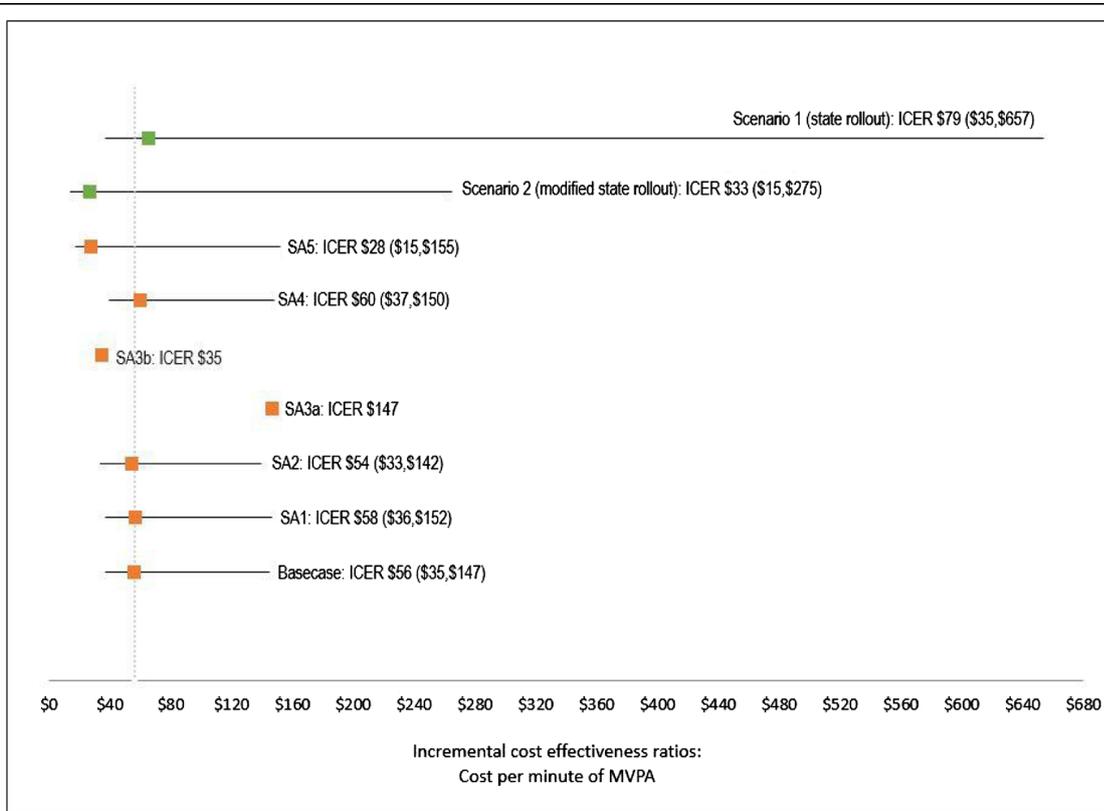
The cost per student in the PA4E1 study were comparable to other school-based physical activity interventions and multi-component school-based obesity prevention interventions with a physical education component that have reported to be cost effective [29, 33, 61]. This is in spite of PA4E1 targeting adolescents, in which systematic reviews show smaller effects in adolescents compared to elementary aged children. As a result, the PA4E1 study seems a cost effective option for improving the physical activity and weight status of adolescents within a higher risk population group [29, 33]. In most cases, the cost effectiveness ratios are conservative in nature due to the intervention effect being limited to the target group only. Sensitivity analyses revealed lower costs per students when the benefits were extended beyond the target group to others students in the school, or if equipment provided was reduced.

Based on conservative estimates of benefit (applied to the target year only), this study demonstrates that PA4E1 is a cost effective intervention for maintaining adolescent physical activity levels and impacting favourably on weight status. The sensitivity analyses provide insight into impact of the intervention if the health benefits were applied to students across the school more broadly, with the majority of these analyse demonstrating a greater cost effectiveness and a reduced intervention cost per student. When the assumptions of the intervention are manipulated as demonstrated in the scenario analyses, by reducing the cost of equipment and extending the benefit of the MVPA outcome (at a reduced level) beyond the target year, the intervention remains cost effective. The provision of an in-school physical activity consultant for one day per week was the largest cost relating to the efficacy trial (66 % of the total intervention cost). Whilst the provision of an in-school physical activity consultant was necessary under efficacy trial conditions in order to evaluate the effect of the combination of intervention strategies, the feasibility

Table 5 Mean costs per participant, mean difference in change and ICER's presented for physical activity (MVPA and MET minutes) and weight status (BMI unit avoided and per 0.1 unit (10 %) reduction in BMI z-score)

	Cost per enrolled student in five intervention schools over 24 months	Mean difference in change between Intervention and Control groups at 24 month follow-up (95 % CI)	ICER (95 % CI)
Mean minutes MVPA/ Day	\$394	7.0 (2.7–11.3)	\$56 (\$35–\$147) ^a
MET hours gained per person/ day		0.5 (0.2–0.9)	\$749 (\$463–\$1,961) ^b
BMI		0.3 (0.1–0.5)	\$1408 (\$788–\$6,570) ^c
BMI z-score		0.1 (0.0–0.1)	\$563 (282–3,942) ^d

^a cost per minutes of MVPA gained^bcost per MET hour gained^ccost to avoid a gain in 1 BMI unit^dcost per 0.1 (10 %) unit reduction in BMI z-score



Scenario Assumptions

Roll out of program across public schools in NSW over 24 months
 Change agent costed at ½ day (3 period) teacher per week for 24 months for 400 schools

Physical activity strategies

1. no cost
2. no cost
3. no cost
4. Costs accounted for include: Recess/lunch (10 mins opportunity cost for staff time for 2.5 days/week for 84 weeks for all schools)
5. Extrapolation assumed same cost per school
6. Online strategy to link with parents- extrapolation assumed same cost per school
7. Link with community - extrapolation assumed same cost per school

Implementation Support Strategies

1. Change agent - Existing in-school teacher to support roll out, 1/2 day/week/school
2. Cost includes the opportunity cost of school staff time associated with committee meeting attendance – assumed same uptake proportion (3/5)
3. Teacher training - Cost includes the opportunity cost of school staff time (teacher relief), external consultant services, travel and meal expenses and venue hire – extrapolation assumed same cost per school
4. Assume same as SA3 – schools will have own equipment
5. Prompts - Weekly email prompts to teachers from change agent, Costs include printing and materials - extrapolation assumed same cost per school
6. Feedback – no cost assumed

Fig. 2 Sensitivity and scenario analyses for PA4E1 intervention

of providing a part-time consultant within schools across large geographic regions and the cost of such a model of support presents challenges in upscaling the intervention. The dissemination of an effective intervention across the community requires the use of implementation strategies which better mirror real world practice. A dissemination model that utilises an existing in-school teacher to embed desired practices has been shown to successfully impact on student physical activity levels, and our results indicate

such a model is more cost effective at scale [45, 62]. However, to the authors’ knowledge, the cost effectiveness of these studies has not been reported. Whilst PA4E1 appears to be a cost effective intervention, dissemination is needed if its health benefits are to be realised. Based on a model to a disseminate an effective intervention under real world conditions, a scenario analysis indicated the potential of a state-wide roll-out of the PA4E1 program, resulting in a cost per student which was substantially

reduced compared to the costs of the randomised controlled trial. As the intervention is effective, prioritising higher risk schools such as those located in socio-economically disadvantaged areas may provide a rationale for prioritisation.

Strengths and limitations

This study has a number of strengths and limitations that should be considered within the broader context of the economic evaluations and disease prevention. The strengths include: firstly the data informing the analysis is based on results from a randomized controlled trial using [16, 35, 39, 63] objectively measured physical activity using accelerometry. Secondly, the costs associated with the intervention were collected prospectively thus improving accuracy by eliminating recall bias [64]. Thirdly, this study reported the ICER from a number of perspectives, both physical activity and weight status. This enables comparison across studies, particularly physical activity studies in which a broad range of outcomes have been used in the past and therefore limit the usefulness of such studies. In our case, the conversion of the physical activity outcome to METS, and cost per MET minute gained enable useful comparison with the limited number of published physical activity cost effectiveness studies [31].

The study also has limitations that should be noted. The translation of the intermediate outcomes captured by the study into final outcomes, such as DALYs, expedient for economic evaluations was beyond the scope of this analysis. This type of modelling has previously been conducted on interventions that aimed to prevent overweight and obesity in children and adolescents, and as a result may provide policy makers with additional useful data to make informed policy decisions [29]. These studies model the broad societal level cost effectiveness, and should potentially be considered for this intervention in the future.

The sensitivity and scenario analysis are both hypothetical. Whilst based on empirical data from the evaluation of the intervention they may overestimate (or underestimate) the impact of changing the intervention component on the intervention costs. The scenario analysis tests only one set of possible assumptions, and whilst based on empirical data collected via a sensitivity analysis conducted within the efficacy trial and formative research of schools participating in the intervention, the scenario is hypothetical. Additionally, this analysis is constrained by the time horizon of the intervention. Whilst the intervention appears to be cost effective and able to obtain health benefits for both physical activity and weight status for a relatively low cost, the sustainability of these behaviours remains unknown. Lai and colleagues [65] have indicated the physical activity of similar school-based intervention can be

sustained, however, the likelihood that the positive change achieved through the PA4E1 intervention can be maintained is currently unknown. Future research on the sustainability of PA4E1 is warranted in addition to research evaluating the impact of using an alternative model to support large scale implementation. This would in turn inform the extrapolation of these cost effectiveness results.

Conclusion

The PA4E1 intervention had a statistically significant intervention effect on physical activity and weight gain which can be achieved for a relatively low monetary cost of \$394AUD per student over a 24-month period. This investment is promising for public health policy, particularly as the intervention was delivered in school communities located in disadvantaged communities where both physical inactivity and overweight and obesity are likely to be more prevalent, therefore likely to result in a greater future burden of disease. Further research is required to determine the impact of the intervention if implemented on a routine basis throughout the period of secondary schooling.

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Availability of data and materials

The research team acknowledges the importance of making research data publicly available. Access to the accelerometer data from this study may be made available to external collaborators following the development of data transfer agreements.

Authors' contributions

JW, PJM, DRL, LC, LW, KG obtained funding for the research. All authors contributed to developing the intervention and data collection protocols and materials, and reviewing, editing, and approving the final version of the paper. All authors accept full responsibility for, and have read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

Declaration

The trial was approved by the Hunter New England Area Human Research Ethics Committee (11/03/16/4.0) and the University of Newcastle Human Research Ethics Committee (H-2011-0210). Parental consent, including consent for publication was obtained from prior to baseline data collection as a requirement of Hunter New England Area Human Research Ethics Committee and the University of Newcastle Human Research Ethics Committee. All data is aggregated and no individual data is presented.

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Appendix 1

Accelerometer cut points (Evenson 2008)

Classification of physical activity intensity collected via accelerometer was based on the cut points published by Evenson et al, 2008.

Physical activity intensity	Accelerometer cut points
Sedentary	0-100 CPM
Light	101-2295 CPM
Moderate	2296-4011 CPM
Vigorous	4012-∞ CPM

CPM: counts per minute.

Reference: Evenson KR, Cattellier D, Gill K, Ondrak K, McMurray RG. Calibration of two objective measures of physical activity for children. J Sports Sci 2008; 26: 1557-65.

Appendix 2

PA4E1 School Manual

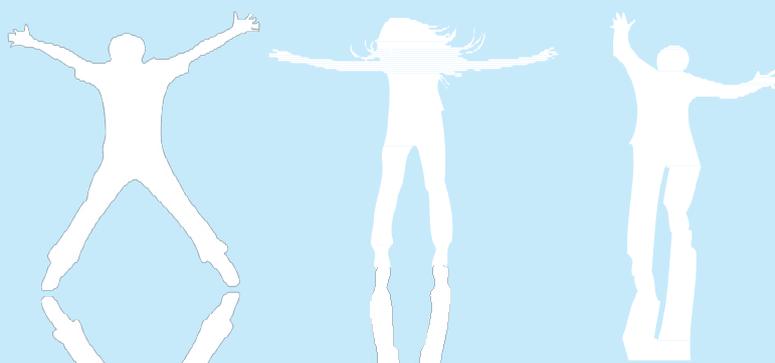


Health
Hunter New England
Local Health District



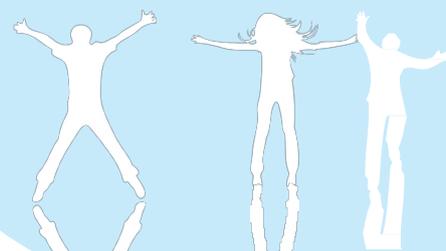
PHYSICAL ACTIVITY FOR EVERYONE

SCHOOL & TEACHER MANUAL



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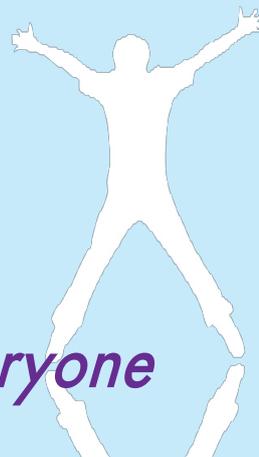


PHYSICAL ACTIVITY FOR EVERYONE

Section 1:

Background to

Physical Activity For Everyone



PHYSICAL ACTIVITY FOR EVERYONE



What is Physical Activity for Everyone (PA4E1)?

PA4E1 is an innovative physical activity program for secondary school students that aims to support students to maintain their physical activity levels. PA4E1 is a research trial involving 5 intervention schools and 5 control schools. The main focus of the program will be on students in Year 7 in 2012; these students will continue to be the focus as they progress in to Year 8 (2013) and Year 9 (2014). Measures will be taken in 2012 (before the program starts) and in 2013 and 2014. This will tell us if the program has been effective. This manual provides information about the rationale for the PA4E1 program and detail around the different program components.

The major aim of PA4E1 is to support students to maintain their physical activity levels as they become older adolescents.

7 key strategies:

PA4E1 is a program consisting of 7 strategies that are implemented through the school. Separately, each strategy has been shown to support physical activity.

Commitment:

The 7 key evidence-based strategies will be rolled out during 2012 - 2014. Some strategies may take longer to be put in place than others.

Health Promoting Schools Framework:

The strategies follow the Health Promoting Schools Framework¹ and use a combination of curriculum, school environment and broader community strategies.





Well supported:

Schools will be well supported to roll out the program. A PA4E1 School Support Manager will be located in your school for 1 day per week to support the roll out of the 7 strategies. Additional PE Teacher support, resources equipment and training will be provided.

An Australian first:

PA4E1 is the first Australian program to combine these 7 strategies in secondary schools. The strategies have been trialed individually either overseas or in Australia, but this is the first Australian program to trial this combination of strategies within secondary schools.

We believe that if a student learns within a school environment that embraces these strategies, they are more likely to maintain their physical activity levels.





Why is a program like this needed?

Students are not active enough!

Research suggests that adolescents are not sufficiently active and become progressively less active during their time at secondary school.²⁻⁴ Considering the importance of physical activity for social, physical and psychological health, strategies to reduce the decline in physical activity during the teenage years have the potential to deliver both short and long term health benefits including:

- Psychosocial benefits (decreased anxiety and depression)⁵
- Digestive benefits (lower risk of colon cancer)⁵
- Musculoskeletal benefits (improved muscular strength and endurance)⁵
- Cognitive benefits (improved concentration and academic achievement)⁶
- Cardiovascular benefits (lower blood pressure, cholesterol and insulin)⁵
- Metabolic benefits (reduced risk of overweight and obesity and Type 2 diabetes)⁵

Secondary schools have been suggested to be an appropriate setting for programs to increase the physical activity of adolescents.

What is the aim of Physical Activity for Everyone?

To keep students active!

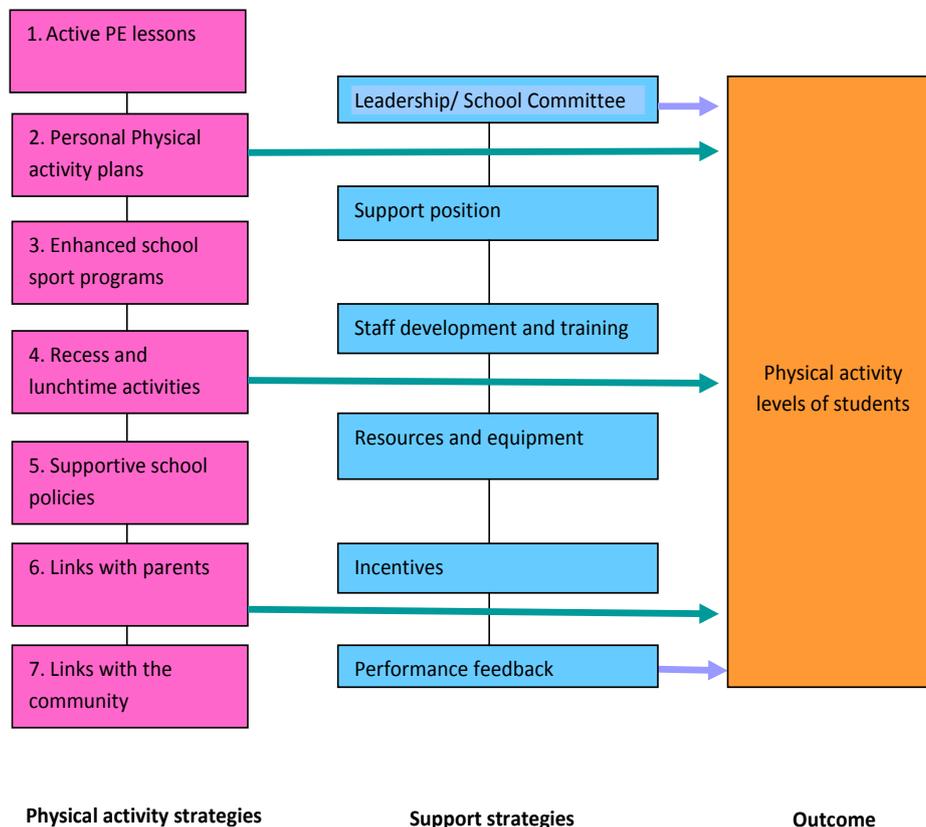
The aim of the PA4E1 program is to reduce the decline in physical activity levels of adolescents. Given that the latest research suggests that adolescents are not sufficiently active, and become progressively less active during their time at secondary school,²⁻⁴ PA4E1 aims to reduce the decline and maintain students' physical activity levels throughout adolescence.

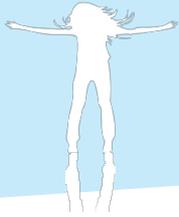




What strategies form part of Physical Activity for Everyone?

The program includes 7 physical activity strategies that align with the Health Promoting Schools Framework.





Who will be responsible for implementing the Physical Activity for Everyone program?

The School PA4E1 Committee, the school PA4E1 contact (member of school staff) and the PA4E1 School Support Manager.

PA4E1 is designed to be a whole of school program. The curriculum based strategies will initially focus on students in Year 7 2012. The curriculum based strategies will commence with students in Year 7 2012 and then follow into Year 8 and then Year 9. The school environment and broader community strategies will impact on all school students, including those in Year 7, Year 8 and Year 9.

To help implement the program, a PA4E1 School Support Manager (from the PA4E1 team) will be located in the school for 1 day per week for a 2 year period (until final data is collected in 2014). Their role will be to support schools to implement the 7 strategies. The school should also nominate a school PA4E1 contact person. This person will be the 'go to' person at the school, and work closely with the PA4E1 School Support Manager to guide the roll out.

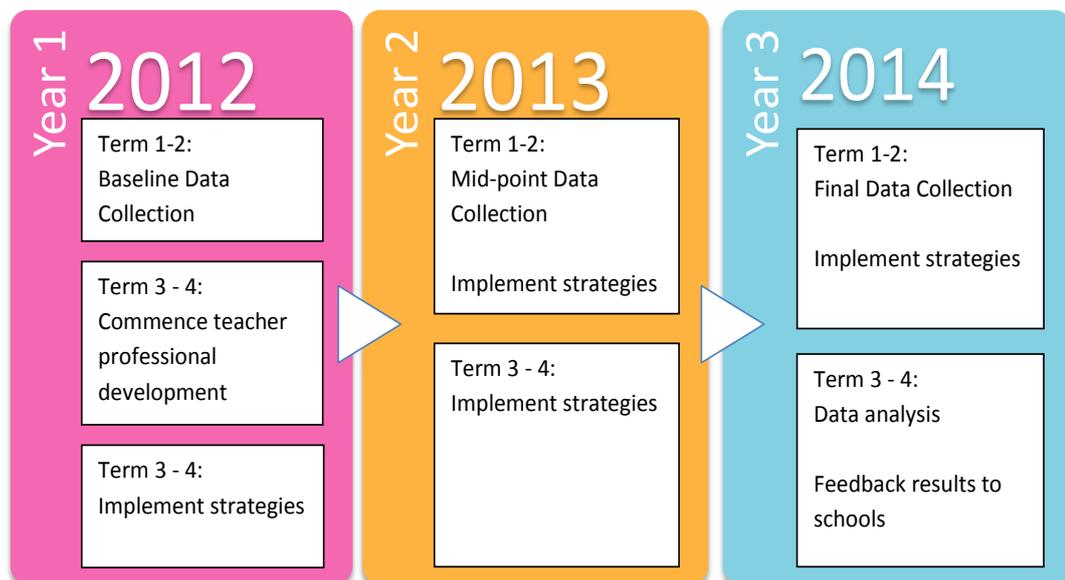
To implement the 7 strategies, schools could form a PA4E1 Committee, or include PA4E1 within the scope of an existing committee. The committee would ideally include schools executives, the PA4E1 School Support Manager, the school PA4E1 key contact person, staff from the HPE department, a teacher representative from another department, a parent representative and also some students. This committee will guide the roll out of the strategies.

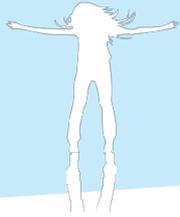




When will the program occur in our school?

The PA4E1 program will be implemented between Term 3 2012 and Term 2 2014.





How will Physical Activity for Everyone be rolled out?

The 7 strategies will be phased in over the first few terms of the program. Schools should aim to have all strategies in place by the end of Term 1, 2013.

The School PA4E1 Committee will develop an action plan to guide the roll out the strategies. The PA4E1 School Support Manager will offer guidance and additional training and resources to assist schools to roll out the strategies. There will also be opportunities to share experiences and challenges with implementing the strategies with other schools that are involved in the program.

Key milestones will be provided to assist schools in prioritising when to roll out each strategy.

Who is this manual for?

This manual is designed for schools and teachers implementing the Physical Activity for Everyone program. It is also designed to have new information added as resources and tips are developed over the life of the program.





What will be asked of schools?

To implement the 7 physical activity strategies.

Formal Curriculum

- Active PE lessons - Implementation of regular pedometer-based PE lessons and curriculum material to assist students meet the recommended 50% of PE class time in moderate-to-vigorous physical activity (MVPA)
- Personal Physical Activity Plans - Implementation of individual physical activity plans in HPE that include: fitness assessments; long- and short-term personal goals for improving or maintaining regular physical activity; specific actions and timelines to achieve those goals; methods to be used to record actions and assess progress; and rewards for achieving goals.
- *Program X*, enhanced sports program for all students. All students will participate in *Program X*, a 10 week program during sport in Years 7, 8 and 9. *Program X* includes; health-related fitness activities, pedometers for self-monitoring, lunch activities, information for parents, follow up support and interactive seminars. School staff will be provided with resources and training to deliver *Program X*.

School ethos and environment

- Modification of school policies to align with practices that research shows encourage low-active students to be more physically active e.g. single sex PE and sports classes.
- Implementation of daily, accessible, evidence based physical activity programs for boys and girls during recess and lunch, including increasing the availability of facilities and equipment.

Partnerships and Services

- Parent information with strategies that parents can use to; improve their children's physical activity, be active with their children at home and in the community.
- Implementation of weekly, accessible after-school physical activity programs through linkages with community sporting groups or fitness industry.





How will schools be supported to make these changes?

Support is provided.

- **PA4E1 School Support Manager:** A position has been created for this program to assist schools to implement the strategies. The PA4E1 School Support Manager will be located in the school 1 day per week for the period of the program (approximately 2 years). The PA4E1 School Support Manager and the school PA4E1 contact (member of school staff) will work in partnership to lead the planning, implementation and evaluation of the program within the school.
- **Leadership/ School PA4E1 Committee:** will be established with representatives from school executive, students, parents and community to lead the implementation of the program within the school.
- **Staff Development and Training:** additional support in strategies to enhance physical activity and to deliver the *Program X* program will be provided to HPE staff and other staff. HPE staff will also specifically be supported to deliver PE lessons that increase students' MVPA.
- **Resources:** Physical activity equipment e.g. gym sticks, pedometers and curriculum material will be provided to each school to facilitate implementation of the enhanced sports, HPE programs and physical activity programs during recess, lunch and out of school hours.





- **Incentives:** will also be provided to schools, to be used to encourage students to participate in the program. These may include items such as small pieces of equipment and vouchers.
- **Partnerships:** Building on the existing relationships already formed by schools, the program will aim to enhance existing and create new community partnerships. Partnerships will be formed with other participating schools and relevant local community sporting organisations/associations.
- **Performance feedback:** Annual student surveys will be conducted. Results from these and other information on how the program is going will be fed back to the school regarding intervention progress.

How will schools benefit from Physical Activity for Everyone?

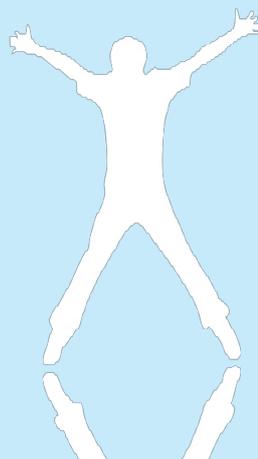
Schools will receive professional development and support to engage students in physical activity. To support the intervention delivery, all schools will be provided with an equipment pack valued at ~\$4,000. Students will be provided with access to motivating and health-enhancing physical activity.

1. Australian Government Department of Health and Family Services and the Australian Health Promoting Schools Association, National framework for health promoting schools (2000 - 2003)
2. Commonwealth Scientific Industrial Research Organisation (CSIRO), Preventative Health National Research Flagship and the University of South Australia (2007). Australian National Children's Nutrition and Physical Activity Survey- Main Findings 2007. CSIRO 2008.
3. Cancer Councils, Cancer Council Australia & National Heart Foundation of Australia. The National Secondary Students' Diet and Activity (NaSSDA) survey 2009-10.
4. Hardy, L. (2010). NSW schools physical activity and nutrition survey SPANS 2010: executive summary. University of Sydney. 2010. http://www.health.nsw.gov.au/pubs/2011/spans_2010_summary.html
5. World Health Organisation 2009 Global health risks: mortality and burden of disease attributable to selected major risks. http://www.who.int/healthinfo/global_burden_disease/GlobalHealthRisks_report_full.pdf
6. Trost S. Active Education: Physical Education, Physical Activity and Academic Performance. A Research Brief. Princeton, NJ: Active Living Research, a National Program of the Robert Wood Johnson Foundation. Summer 2009. Available from www.activelivingresearch.org.



Section 2:

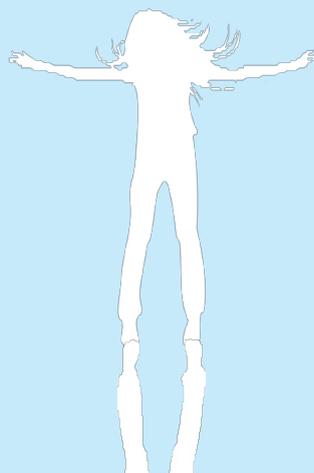
7 Key Strategies



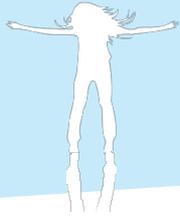
PHYSICAL ACTIVITY FOR EVERYONE

Strategy 1:

Active PE Lessons



PHYSICAL ACTIVITY FOR EVERYONE



Objective:

Students are engaged in Moderate to Vigorous Physical Activity (MVPA) for at least 50% of class time.

What is moderate to vigorous physical activity (MVPA)?

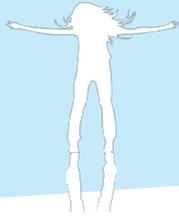
Moderate physical activity refers to activities that require a reasonable amount of effort to noticeably increase the heart rate such as brisk walking, dancing or cycling.¹ Vigorous physical activity refers to activities that require a significant amount of effort to produce large increases in breathing and heart rate, such as jogging, aerobics, competitive sports or fast swimming.¹

Why have MVPA in PE?

Current Australian guidelines recommend that young people participate in at least 60 minutes of MVPA daily.² However, recent data shows that only 15% of adolescents meet this recommendation.³ PE is an effective strategy to increase physical activity among young people. There are a number of benefits for students who engage in MVPA during PE lessons, as it:

- generates more energy expenditure⁴
- contributes to obesity prevention and muscular and bone development⁴
- reduces anxiety and stress⁴
- improves self-esteem, mood and concentration⁴
- reduces the risk of chronic disease⁴
- improves academic performance, attendance and positive classroom behaviour⁴
- provides opportunities for positive social interactions⁴





How much PE time should be spent in MVPA?

To gain the health and academic benefits the United States' Centers for Disease Control and Prevention (CDC) recommends that students engage in MVPA for at least 50% of the time they spend in a PE class.⁵

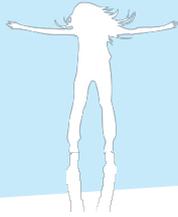
The Current State of Physical Education

International studies have reported that, in typical PE classes, students engage in MVPA less than 50% of class time.⁶ Studies have found that PE teachers spend a considerable amount of class time, up to 30%, for activities related to administrative and management tasks (e.g. taking attendance, making announcements etc).⁶⁻⁷

How to increase MVPA in PE?

There are a number of small changes PE teachers can make to their teaching practices that will make a difference. See the "EAASE" Principles and Tip Sheets for strategies you can use in your PE lessons.





How do I know if students are meeting the 50% of MVPA in PE?

One of the best strategies to determine if your lessons are sufficiently active is to have students wear a pedometer during the class. A pedometer will measure the number of steps that the students take. As an indicator, students should be aiming to take 75-85 steps/minute to meet the 50% MVPA in PE guideline.⁸ For more information see the Tip Sheets.

How to calculate the step count aim for your lesson

You can calculate the step count aim for your lesson by completing the following equation:

$$\begin{array}{ccccc} 75 - 85 & \times & \underline{\hspace{2cm}} & = & \underline{\hspace{2cm}} \\ \text{(steps/minute)} & & \text{(number of minutes} & & \text{(range of steps per lesson} \\ & & \text{in the lesson/2)} & & \text{to aim for)} \end{array}$$

EXAMPLE:

$$\begin{array}{ccccc} 75 - 85 & \times & \underline{25} & = & \underline{1,875 - 2,125} \\ \text{(steps/minute)} & & \text{(number of minutes} & & \text{(range of steps per lesson} \\ & & \text{in 50 minute lesson/2)} & & \text{to aim for)} \end{array}$$

1. World Health Organisation. Global Strategy on Diet, Physical Activity and Health: What is Moderate-intensity and Vigorous-intensity Physical Activity? http://www.who.int/dietphysicalactivity/physical_activity_intensity/en/index.html
2. Department of Health and Ageing (2004). Australia's Physical Activity Recommendations for 12-18 year olds, Canberra
3. Australian Institute of Health and Welfare. A picture of Australia's children 2009. Cat. no. PHE 112. Canberra: AIHW; 2009.
4. California School Boards Association. California Project LEAN (Leaders Encouraging Activity and Nutrition). Moderate to Vigorous Physical Activity in Physical Education to Improve Health and Academic Outcomes. Fact sheet November 2009.
5. Centers for Disease Control and Prevention. School Health Index: A Self-Assessment and Planning Guide. Middle school/ High school version. 2005. Atlanta, Georgia. <http://www.cdc.gov/HealthyYouth/shi/pdf/MiddleHigh.pdf>
6. McKenzie TL, Catellier DJ, Conway TL, et al. Girls' activity levels and lesson contexts in middle school PE: TAAG Baseline. *Med Sci Sports Exerc.* 2006;38:1229-1235
7. Dudley DA, Okely AD, Cotton WG, Pearson P, Caputi P. Physical activity levels and movement skill instruction in secondary school physical education. *J Sci Med Sport.* 2012 May;15(3):231-7. Epub 2011 Dec 14
8. Scraggs PW Middle School Physical Education Physical Activity Quantification: A Pedometer Steps/min Guideline. *Research Quarterly for Exercise and Sport;* 2007; 78(4); 284-292





5 “EAASE” Principles for Active PE Lessons

Efficient

Class management tasks are efficient and limit time students spend being inactive.

1. Use active warm-ups during attendance checks.
2. Use games to form students into groups quickly.
3. Keep instructions and "talk time" to a minimum. Give small bits of instruction, get the students moving and then change the activity to include other aspects of the skill/concept.
4. Use students to participate in routines associated with management tasks e.g., roll taking, distributing equipment, and selecting partners, forming groups

Active

Lessons involve a high level of movement and active learning time (ALT).

1. Use small-side games to maximise participation.
2. Ensure equipment is plentiful and developmentally appropriate.
3. Monitor in-class physical activity using pedometers (i.e. approx. 85 steps/min of PE time is equal to 50% ALT).
4. Use student leaders to set-up games and activities.
5. Use circuits and tabloids to maximise participation.

Autonomous

Lessons involve elements of choice and opportunities for graded tasks.

1. Ensure that tasks incorporate multiple challenge levels, and give students the freedom to select level of difficulty.
2. Provide students with “guided” choices in PE e.g. opportunities to create and modify rules and activities
3. Provide students with opportunities for leadership roles.
4. Encourage students to assess their own skill performances (e.g. detect and correct their own errors).

Success

Lessons provide all students with an opportunity to experience success.

1. Ensure tasks are not dominated by the most competent students.
2. Modify the tasks to increase the opportunity for success (i.e. make the goals bigger, reduce the number of defensive players, alter the equipment used, revise the task rules).
3. Ensure students are evenly matched in competitive activities.
4. Acknowledge and reward participation and good sportsmanship.

Enjoyable

Lessons include enjoyable experiences.

1. Include a wide variety of games and activities.
2. Provide engaging and age appropriate tasks.
3. Avoid boring and repetitive activity (e.g. running around the field for a warm-up).
4. Don't use exercise or physical activity as punishment.





Ideas for incorporating “guided choice”

Yearly

Department creates Yearly Plan that incorporates choices for students at each grade level (possibly stratifying with more choices in higher grades). Could even ask students what they would like to be offered.

Monthly/ By the Unit

What	How
Choice of activity units themes	2-3 teachers team up to offer choices to students for a 6 week unit. Each teacher teaches one e.g. dance, team sport, group fitness
Choice of activity units within the same theme	Individual Sports, Badminton, Frisbee, Golf, Track and Field
Choice based on gender, e.g. in a 4-week unit of the same activity	Co-ed soccer class, all-girls soccer class, all-boys soccer class
Choice based on a mix of gender and activity	A team sport unit for girls, individual sports unit for co-ed group, aerobic games unit for boys
Choice based on students' skill level within an activity unit	Beginning, recreational, advanced

Daily / Lesson

What	How
Individuals choose skill level within a single lesson	Beginning, recreational, advanced
Individuals choose a level within a single lesson based on their fitness	Level 1, level 2, level 3
Individuals choose a competition level within a single lesson	Fun, team, competitive
Students choose an activity each class period within a specific unit, which is led by a different instructor	Aerobics class, yoga class, strength training

Task / Activity

Modifying tasks to reflect students' skill levels makes a lesson challenging/successful for all. By offering more than one choice at the beginning of a specific task assignment, you are “teaching by invitation.” Then students may choose the level that they feel comfortable with and is appropriate for them.





Tips for making PE management tasks “efficient”

Roll taking

- Walk/Jog Rollcall- Students begin walking/ jogging a pre-established route. As they pass the teacher or roll-taker they report their name.
- Fun and Fitness Circuit - Students in pre-assigned cooperative groups begin a “Fun and Fitness Circuit.” Each group begins at a different station, and moves clockwise to the next station on cue (you will need as many stations as there are groups). Stations could include fitness challenges (e.g., sit-ups, push-ups, pull-ups) alternating with fun/skill challenges (e.g. dribble the length of a basketball court and shoot a lay-up, throw a softball with partner, dribble a soccer ball around the perimeter, etc.). Group leaders report attendance to the teacher when they pass him/her.
- Cooperative Groups - Incorporate roll-call into the instructional unit or instant activity. For example, in basketball, students are pre-assigned to cooperative groups each with a roll-taker, and a backup if she/he is absent. Students arrive at class and dribble on their groups’ half-court until the STOP cue. The teacher circulates from court to court, checking with the roll-taker and recording absences.
- Perimeter Move - Students with a basketball (or soccer ball, or in pairs with football, Frisbee, etc.) dribble slowly around the perimeter of the court in the same direction. Students are to stop at each basket (or goal, if applicable) for one shot only. Students call their roll call number or name as they pass the teacher (or roll-taker).
- Paddle pop sticks - Write names of all students on paddle pop sticks. Spread out sticks on ground. Students find the stick with their name and bring it to a specified collection box. Those sticks not collected indicate absentees. Bunching sticks with coloured rubber bands helps differentiate between classes.
- Pedometer Check - Students have assigned pedometer check-out numbers. Students put on pedometers as they arrive. Remaining pedometers identify absentees.





Forming groups

- Whistle groups - students walk/ jog around and every few seconds blow your whistle the number of times you want a group of students to be e.g. 3 blasts, groups of three. After a few rounds of this make the groups bigger or you could "add" groups together to get the desired number of students together.
- Kneelers and Standers - students quickly find a partner. Teacher asks one student to kneel while other partner stands. Kneelers and standers become two different groups.
- Pick a Card - each student takes a card from a deck of playing cards while moving around the perimeter. Groupings are then made based on card (same colour, same suit, even numbers, odd numbers, groups whose cards add up to more than 20, etc.).
- Perimeter Pick- give students group numbers as they travel the perimeter. When all have received their number, call out group numbers and point to where you want them to meet.

Distributing equipment

- 4 Corners - Equipment is placed in corners of the activity area, and students pick up an implement as they move around the perimeter.
- Monitors - Assign equipment monitors to help.
- Same Out, Same In - Collect equipment the same way it was distributed.
- Squatters and Standers - If students are in pairs, have one squat, the other stand. Standers collect equipment while squatters move to designated activity space. When done, the squatters return it.





Active transitions

- Perimeter move - Walk/jog or variety of locomotor movements around the perimeter.
- First to finish start new - Start a new activity for some while others finish the first.
- Waiting game - Complete specific task while waiting for others. (e.g., dribble throughout the area or work on ball handling skills from a choice of a few drills.)

Class closure

- Stretch and talk - While stretching, encourage students to participate in physical activity outside of PE class.
- Perimeter move - While walking perimeter, give reward students for positive social skills seen/heard throughout the lesson.
- Pick up - While collecting equipment, review the teaching cues for the skills worked on.
- Toes on the line - Solicit feedback from students on the lesson objectives while they stretch standing on a line of the court or field. "Thumbs up if you were able to...?"



Strategy 2:
*Personal
Physical Activity Plans*



PHYSICAL ACTIVITY FOR EVERYONE



Why personal physical activity plans?

Objective:

Students develop individual physical activity plans at the beginning of each school year and review the plan each term.

Guiding students to develop personal physical activity plans, including a goal setting component, can improve students' motivation to be physically active. Students' behavioural skills related to physical activity i.e. problem solving, decision making, goal setting and negotiation skills are increased as well as their intrapersonal skills i.e. confidence, self-esteem.

There is evidence to support that physical education should focus on helping students assess their own physical activity behaviours and set goals for improvement, emphasising personal responsibility.¹ Teachers should also provide ongoing feedback to students on the progress of their plan.



PHYSICAL ACTIVITY FOR EVERYONE

MY PHYSICAL ACTIVITY PLANNER

Student Name: _____

HPE Class: _____

Term: _____



Strategy 2: Personal Physical Activity Plans 26



When should students develop their personal physical activity plans?

At the beginning of the school year, students can be guided in developing their individual physical activity plan (using the PA4E1 template provided). This could be incorporated into routine fitness testing or alternatively, students could develop their plan at the start of a unit of work.

Alternatively, the development of personal physical activity plans could become an assessment task for students, with feedback given by teachers through this process.

When do I review personal physical activity plans?

Personal physical activity plans should be reviewed at the start of each term. Students should have the opportunity to review their progress and choose whether to set new goals or keep existing goals.

Acknowledgement: San Diego State University Research Foundation 2010 SPARK program Middle School Physical Education Resource





How do I help students develop personal physical activity plans?

- In your HPE class, identify 2-3 components of fitness that students want to improve. This could be something related to PE or other activities at home. Remember you can also encourage students to link their plan to Personal Best Day.
- Provide the personal physical activity planner to students and show them the Health & Fitness Plan where they will write where they are now in terms of how well they are currently performing.
- Help students identify where they want to be with this component of fitness by the end of the Term, i.e. their goal, which is recorded in the column “Where I want to be”. For example they may want to improve their score by 10%.

PERSONAL PHYSICAL ACTIVITY PLANNER



Finding 60 minutes of physical activity every day is one of the best things you can do for your social, mental and physical health. Using a personal physical activity planner can help you get started and stay motivated to achieve your goals. This planner helps you develop a health and fitness plan and a personal best day plan.

HEALTH & FITNESS PLAN



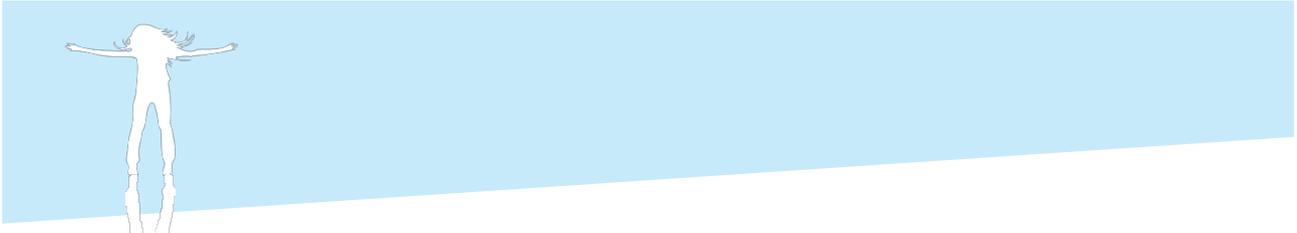
How to use the health & fitness plan

Step 1: List the components of fitness from your PE health and fitness challenge

Component of fitness	Where I am now	Where I want to be	Things I can do to get there	Where I am at end of Term.
MVPA in PE (Pedometer steps in PE)	800 steps	880 steps	Walk or cycle to school three times a week	900 steps
Muscular Endurance (1 minute sit up test)	14 sit ups	18 sit ups	Do sit ups 3 nights a week for 1 minute before bed	18 sit ups
Cardio-respiratory Endurance	Run 1 km	Run 2 km	Go for a 30 minute run 2 afternoons a week after school	Ran in 2 km fun run

Also list any other component of fitness that you want to improve and strategies to help you improve, for example improve cardio-respiratory endurance by running after school to go in a fun run by the end of Term.





- Identify some strategies they can use to help them achieve their goals, for example:
 - 2 afternoons after school kick a ball at your local park, go for a ride, or go bush walking with your family
 - 2 mornings before school put on your favourite music and dance
 - Walk or cycle to school 3 times a week

Step 2: Using the results from your PE health and fitness challenge, write where you are now in terms of how well you performed in the challenge.

Component of Fitness	Where I am now	Where I want to be	Things I can do to get there	Where I'm at end of Term 1
MVPA in PE (Pedometer Steps)	800 steps	880 steps	Go for a 30 min run 2 afternoons after school	900 steps
Muscular Endurance (1 min sit-up test)	14 sit ups	18 sit ups	Do sit ups 3 nights a week for 1 minute before bed.	18 sit ups
Cardio-respiratory Endurance	Run 1 km	Run 2 km	Go for a 30 minute run 2 afternoons a week after school	Ran in 2 km fun run

Step 3: Identify where you want to be with each component of fitness by the end of the term. For example, you may want to improve your result by 10%

Step 4: Identify some strategies you can use to help you get there. For example:

- 2 afternoons after school, go for a run, ride or go bushwalking with your family.
- Walk or cycle to school 3 times a week.

- Be sure to set up students for success and not failure. You could encourage them to use the SMART (specific, measureable, achievable, relevant and time-framed) principles when developing their strategies.
- At the end of each week, students should check that they have been doing what they planned and if not, try and do better the next week. Physical activity plans should then be reviewed and new goals set at the start of each school term.

Helpful tip: You could include information about personal physical activity plans in student report cards and at parent-teacher interview time. Personal physical activity plans can also be developed into an assessment task for students, assisting with ability to feedback achievements to parents. There is strong evidence linking physical activity levels with academic performance² and parents aren't always aware of this.

1. Centers for Disease Control and Prevention. School Health Index: A Self-Assessment and Planning Guide. Middle school/ High school version. 2005. Atlanta, Georgia. <http://www.cdc.gov/HealthyYouth/shi/pdf/MiddleHigh.pdf>

2. Trost S. Active Education: Physical Education, Physical Activity and Academic Performance. A Research Brief. Princeton, NJ: Active Living Research, a National Program of the Robert Wood Johnson Foundation. Summer 2009. Available from www.activelivingresearch.org.





What is a Personal Best Day?

Personal Best Day (PBD) is designed so students may track their fitness progress over time. PBD are designed to teach students how to monitor their MVPA in PE lessons as well as other components of fitness such as aerobic capacity, muscular strength and endurance, and to help set goals for individual improvement.

When do you use PBD?

You may wish to use the PBD to evaluate improvements in student fitness. If so, you may like to conduct the PBD before starting a new unit of work and ideally every month after.

How do I run a PBD?

PBD can be easily implemented at the start of any PE lesson. Simply inform the class that today is a “PBD” and what challenge you are going to be doing today. For example, it may be a pedometer lesson for MVPA in PE or a sit-up test for abdominal endurance. Depending upon the challenge that you choose it can take anywhere between 1 minute and 10 minutes to do.





How do I record students' PBD scores?

Students will record their PBD score on their PBD plan, which is in their PA4E1 Personal Physical Activity Planner.

Component of fitness		PBD #1	PBD #2	PBD #3
MVPA in PE (Pedometer steps in PE)	My score today			
	My goal for next PBD			
	My score today			
	My goal for next PBD			
	My score today			
	My goal for next PBD			
	My score today			
	My goal for next PBD			





Which challenges to do?

You may like to focus on a few different components of fitness each term so that students have variety in the challenges they are undertaking and the components of fitness they are addressing each term. You may find it useful to choose the challenges based upon the practical sports or games you are focusing on that term in PE. For example, if in Term 1 you are teaching a unit on soccer, you may like to choose PBD challenges related to aerobic capacity and muscular endurance. Whilst in Term 2 you may be teaching a unit on Gymnastics, so you may like to choose PBD challenges that are related to muscular strength and flexibility. Asking students which challenge the class should focus on for the term may be a way of providing them guided choices in PE.

How does this relate to students' personal physical activity plans?

Encourage students to use the PBDs as opportunities to set their individual health and fitness goals in their Health & Fitness Plan (part of the PA4E1 Personal Physical Activity Planner) each term and to check progress against their goals. Once you have decided which challenges you may do each term, encourage students to set their health and fitness goals based on these components of fitness. Students may also wish to include other health or fitness goals which they may be able to monitor at school or at home.

Which fitness tests to use?

Your school may already have fitness tests that you use each year, which are fine to use for PBD. If not, please see the following pages for 2 examples of fitness tests that can be easily implemented in your school. For other examples, see *The Australian Fitness Education Award Teacher's Handbook* by the Australian Council for Health, Physical Education and Recreation, or the *Jump Start* textbook available at <http://www.cambridge.edu.au/go/series/?pid=42> .





1 minute sit-up test

Purpose: To evaluate strength and endurance of the abdominal muscle groups.

Student objective: To complete as many sit-ups as possible, working at a cadence of 20 per minute.

Preparation: Provide instruction, demonstration and time to practise prior to testing day.

Equipment:

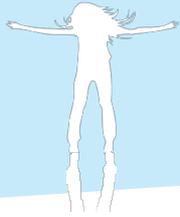
- Gym mats with pencils (to form a fist around)
- Pencil and score sheet with rulers (to place on knees)
- CD player and cadence CD

Procedures:

1. Student A lies on back with head resting on the mat, knees bent at approximately 90° with feet flat on the floor.
2. Keeping arms straight, curl hands into fists around the pencils and rest on thighs. A pencil is held firmly in both fists throughout the test to assist student to maintain correct body position.
3. Student B kneels at right angles to student A's knees placing a ruler across the top of student A's knees forming a 'wall'. No pressure to be placed on student A's knees/feet.
4. In time with the beat, student A curls up rounding back, sliding the fists along thighs until they touch the ruler, then uncurls back down until the head touches the mat.
5. The test stops when, for two consecutive sit-ups, either one or more of the following occurs:
 - not staying in time with the beat on the cadence CD (this would include poorly controlled rhythm or bouncing);
 - releasing the grip of the pencil;
 - one or both soles of feet leaving the floor;
 - one or both fists not touching the ruler;
 - the head not making contact with the mat;
 - arms/elbows bend.

Scoring: The number of correctly performed sit-ups are counted each time the head returns to the mat.





Note:

- Ensure correct technique at all times.
- Ensure strict adherence to point 5 of procedures.
- Remind students to exhale during the 'up' phase.

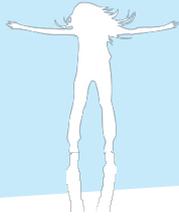
Interpretation of results:

- Scores should be compared with the appropriate sex and age related standards.
- Students scoring at or above the set standard are considered to have the level of muscular strength and endurance needed to gain health benefits. These students should be encouraged to maintain or increase their strength and endurance.
- Students scoring below the standard need to increase their strength and endurance towards the criterion based standard.

Criterion based standards – number										
Age	9	10	11	12	13	14	15	16	17	18
Male	16	18	23	26	30	30	30	30	30	35
Female	14	18	20	22	25	25	25	25	25	30

Acknowledgement: Jump Start Years 7 & 8, 1st edition 2010. Cambridge University Press





1.6km run

Purpose: To measure cardiorespiratory endurance

Student objective: To run/walk 1.6km at the fastest pace possible without stopping

Preparation:

- Provide instruction and allow time to practise pacing prior to testing day.
- Student should maintain a constant pace during most of the test.
- Walking is permitted, but instruct students to walk at a fast pace.

Facility: Determine an appropriate 1.6km route. A flat course with a minimum lap distance of 100m is required.

Equipment:

- Stopwatch
- Pencil and score sheet
- Marker cones - use cones to mark out the course
- Trundle wheel/measuring tape
- Marker pen

Procedures:

- Provide a warm-up
- Explain procedures to students
- Students begin on the signal "Ready, start."
- To count laps use a pen to mark each student's hand after each completed lap.
- For larger groups use a partner to count the laps.
- Call out the finish time as each student crosses the line.
- Record each student's finishing time.
- A prescribed warm down procedure should commence immediately after the completion of the run.
- Use this test wisely and consider those who may not be suited to distance running.

Scoring: The test is scored in minutes and seconds.





Limitations:

- Allowing walking in the test may encourage some to choose that easier option.
- Inability to self-pace.
- Requires a level of self-motivation.
- Counting laps and accurately recording times for the students.
- Some students may be discouraged because they finish later than others.

Interpretation of results:

- Scores should be compared with the appropriate sex and age-related standards.
- Students scoring at or above the set standard are considered to have the level of cardiorespiratory endurance needed to gain health benefits. These students should be encouraged to maintain or increase their cardiorespiratory endurance.
- Students scoring below the standard need to increase their cardiorespiratory endurance towards the criterion based standard.
- A low score may be determined by numerous factors. These include: aerobic capacity, growth, inability to pace, running/walking efficiency, motivation and environmental conditions.

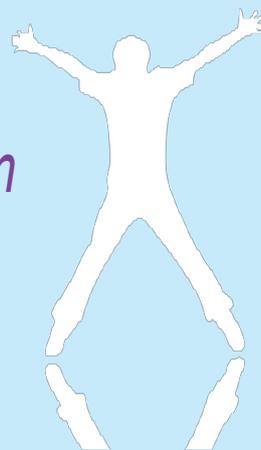
Criterion based standards – minutes and seconds										
Age	9	10	11	12	13	14	15	16	17	18
Male	11:00	10:30	9:30	9:00	9:00	9:00	8:00	7:30	7:30	7:30
Female	13:00	12:00	11:30	11:00	11:30	11:00	11:00	11:00	10:00	10:00

Acknowledgement: Jump Start Years 7 & 8, 1st edition 2010. Cambridge University Press

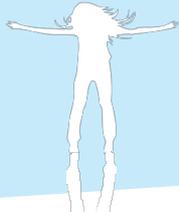


Strategy 3:

*Enhanced School Sport Program
- Program X*



PHYSICAL ACTIVITY FOR EVERYONE



What is *Program X*?

Objective:
**All students
complete
Program X by
the end of
2013.**

Program X is an enhanced school sport program that aims to provide students with additional skills and resources to remain physically active. ***Program X*** has been developed in an attempt to appeal to and cater for the interests and needs that may vary between male and female students. The program has also been designed to meet the needs of low-active students, and is known to be acceptable and appropriate for such students.

Program X is backed by the latest evidence and has been shown to be effective with secondary school students in:¹⁻³

- increasing physical activity levels
- reducing energy- dense/low-nutrient (less healthy) snack consumption and increasing fruit intake among girls
- decreasing sweetened drink consumption

The duration of the program is 10 weeks and each week the session is made up of an information session that presents a key nutrition and physical activity message, a practical health-related fitness activity which is chosen by the students and the provision of information home to parents.

The practical health-related fitness activities combine aerobic workouts with resistance training using novel methods, and include a combination of the following activities:

- Circuit Training
- Cross Fit
- Zumba
- Skipping for Fitness
- Boxing for Fitness
- Gymstick Resistance Training
- Gymstick Pilates
- Fit Ball Training





The PA4E1 team will provide schools with everything needed for teachers to deliver the program to students including: structured sessions and lesson plans, student and parent resources and any equipment needed for the sessions. The sessions can be delivered during your school's scheduled sports afternoon or alternative. The aim is for each student to complete the enhanced school sport program once throughout the next 2 years.

Keep your eye out for the resources and equipment for the enhanced sport program.

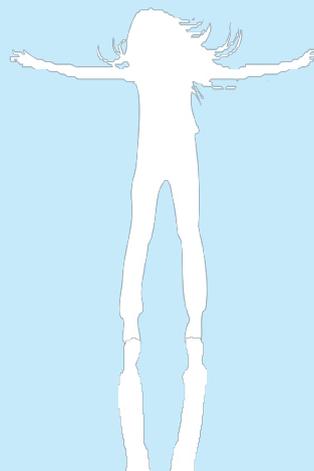
1. Lubans DR, Morgan PJ, McMormack A. Adolescents and school sport: The relationship between beliefs, social support and physical self-perception. *Physical Education & Sport Pedagogy*. in press Accepted February 2010
2. Lubans DR, Morgan PJ, Callister R, Collins CE. Effects of integrating pedometers, parental materials, and E-mail support within an extracurricular school sport intervention. *Journal of Adolescent Health* 44(2):176-83, 2009 Feb.
3. Lubans DR, Morgan PJ, Aguiar EJ, Callister R. [Randomized controlled trial of the Physical Activity Leaders \(PALs\) program for adolescent boys from disadvantaged secondary schools](#). *Prev Med*. 2011 Mar-Apr;52(3-4):239-46.



Strategy 3: Enhanced school sport program – Program X 40

Strategy 4:

Recess and Lunch Activities



PHYSICAL ACTIVITY FOR EVERYONE



Objective:

Students can access activities at recess or lunch at least 3 days per week.

Students can access equipment at recess and lunch at least 4 days per week.

Why make activities available to students at recess and lunch?

Recess and lunch time present great opportunities for students to be physically active during the school day. Physical activity during breaks has been shown to:¹

- Enhance cognitive performance
- Develop social skills
- Increase the likelihood of focus on academic subjects in the classroom
- Improve physical health

Will students participate?

Research suggests that when students are provided the chance to be active during recess and lunch, they will be active.¹ However, some students may be more likely to want to participate in different activities. For example, some students may be more interested in less competitive, more social activities; whilst others may enjoy more competitive sports. Therefore, it is important to consider a variety of competitive and non-competitive activities that all students may enjoy.





How much time will it take?

There are many effective strategies for increasing students' levels of physical activity during recess and lunch which don't require a lot of effort and are relatively cost-effective. Strategies such as providing equipment, utilising activity zones, painting the playgrounds, and teaching recess activities during physical education can all be easily implemented and most importantly sustainable.¹

How to get recess and lunch activities going?

Whilst PE teachers or other enthusiastic staff members are generally always happy to facilitate such activities within the school it can be tiresome for these staff. If attempting to implement organised activities you could utilise coaches or activity leaders from the community who may want to run programs in the school. Another strategy may be to use University student teachers (from all departments not just PE) to organise school games or activities. It is also a great opportunity to provide senior students with leadership opportunities to plan and deliver these activities. These leaders may eventually come from *Program X* or be house captains or even student representative leaders.

1. Aaron Beighle, Associate Professor, Department of Kinesiology and Health Promotion, University of Kentucky
Maximizing recess physical activity <http://www.pelinks4u.org/articles/Beighle0610.htm>



Ideas for recess and lunchtime activities

What	Strategy	Cost	Ideas to help establish strategy.
Providing equipment	Providing students with equipment such as balls, Frisbees and jump ropes.	No cost if you use PE or PA4E1 equipment pack	<ul style="list-style-type: none"> Students leave bus pass/ student card to borrow equipment. Program X leaders, House captains or student leaders hand out equipment.
Markings and paintings	Painting playground markings for games such as handball, wall targets, soccer and basketball.	Cost of paint	<ul style="list-style-type: none"> Approach local businesses to donate the paint. Use school newsletter to encourage parents to donate funds for paint or time to help paint markings.
Activity Zones	Zoning areas for specific activities. For example, one area may be for Frisbees, one area for basketball, one area a walking track, and one area for ball sports.	No cost	<ul style="list-style-type: none"> Playground supervisors monitor the zones assisting students and encouraging students to be active. Program X leaders, House captains or student leaders organise games in these activity zones. Teachers participate and encourage student participation.
Teaching playground games during physical education	Integrating games that students can play at recess or lunch into the curriculum e.g. using games that use the painted wall targets in PE.	No cost	<ul style="list-style-type: none"> The activities/games should be relatively simple so students can play with little supervision or explanation. The games should also be enjoyable to a majority of students.
Organised games/ sports	Competitive sports i.e. Yr 7/8 competition and Yr9/10 competition.	No cost	<ul style="list-style-type: none"> May initially need a teacher to help get the "competition" started. Ultimately the Program X leaders, House captains or student leaders run the competition and are in charge of equipment, officiating, and/or tracking records. All arguments are solved with rock paper scissors to avoid confrontation and keep students active. To keep student interest, non-traditional games such as ultimate Frisbee can be taught in physical education and then offered as an organised competition.
Recreational games or activities.	Non-competitive games or activities are provided to students as "come and try days"		<ul style="list-style-type: none"> Invite community members with non-traditional activities e.g. hip hop, Zumba etc to come into the school for a number of weeks to run their activity. Use technology e.g. Wii FIT games for students to participate in en-masse at recess and lunch.

Strategy 4: Recess & lunch activities 45



Checklist for recess and lunch activities

Two weeks prior to starting

Task	Completed
1. Meet with student leaders e.g. Program X , house captains, student representatives and identify students who could co-ordinate recess/ lunch activity.	
2. Promote recess/ lunch time activity to students by; <ul style="list-style-type: none"> <input type="checkbox"/> Adding to student notices <input type="checkbox"/> Placing posters around school <input type="checkbox"/> Including in year/ school assemblies etc 	
3. Establish any "rules" e.g. students can wear PE uniform on day of recess or lunch activities, games are to start, finish and equipment packed away during the break to avoid students turning up late to class	
4. Organise for fields etc to be marked out if needed	
5. Book equipment/ fields/ rooms etc	
6. Establish system for students to register themselves or teams for lunchtime activity	
7. Organise referees (student leaders?)	
8. Organise the draw and post draw for students	

On the day

Task	Completed
1. Remind students of recess/ lunch activity - Daily notice, assembly etc.	
2. Organise equipment and set up accordingly	
3. Organise a time keeper/referees/scorers (student leaders?)	
4. Organise a system for recording scores i.e. captains/ referees provide you with the scores.	
5. Inform students of procedure at end of game i.e. pack up equipment, where to return to, changing and being on time to class.	

Afterwards

Task	Completed
1. Inform students of future events/games at recess/ lunch or post the draw on a noticeboard for students to see.	
2. Ensure results have been recorded and posted on a noticeboard for students to see.	
3. Encourage students and others to attend future recess/ lunch activities	



Strategy 5:

School Policies



PHYSICAL ACTIVITY FOR EVERYONE



Why target school policies?

Objective:

The school has policies that support students to increase their participation in physical activity.

A written policy:

- provides guiding statements approved by council and/or the P&C
- addresses the needs of students and expectations of parents
- allows you to evaluate your performance against a pre-determined goal and identify where improvement may be needed
- ensures that practices are in line with current, evidence based, national recommendations, are of high quality and consistent.
- enables both staff and families to be aware of the school's policies and practices.

Informing new staff and families of your policies will help them to be aware of the expectations of your school

Adopting a policy to increase physical activity during the school day (including immediately before and after school) has a positive effect on daily participation in physical activity during school breaks.¹ The strength of the policy has been shown to influence the impact it has on physical activity, a strong policy statement is one that includes a concept followed by specific plans or strategies for implementation and action oriented wording e.g. shall or will.²





What is in a strong Physical Activity Policy?

A strong physical activity policy:

- States the rationale of the school in relation to physical activity
- Outlines the goals that support the philosophy of the policy
- Provides a set of strategies which enable the goals to be met.
- Uses action oriented wording e.g. shall or will.





Sample Physical Activity Policy

Rationale

In recognition of the importance of physical activity for young people aged 12-18 years, (insert school name) is participating in the Physical Activity for Everyone (PA4E1) program for 3 years, 2012-2014. The PA4E1 program employs seven strategies shown to increase students' physical activity time and intensity; they are covered under the five goals of this policy.

Physical inactivity significantly increases the risk of cardiovascular disease, cancer and obesity.³ It is estimated to be responsible for 3.2 million deaths worldwide each year,³ and 16,000 deaths per year in Australia.⁴ Also, physical activity has also been shown to enhance cognitive performance, assist in developing social skills and increase the likelihood of focus on academic subjects in the classroom.⁴ Recent surveys suggest that Australian adolescents are not sufficiently active and become progressively less active during their time at secondary school.⁶⁻⁸ Given that low levels of physical activity during adolescence are associated with low levels of physical activity in adulthood^{9, 10}, implementation of appropriate physical activity practices in secondary schools has the potential to deliver both short and long term health and educational benefits.

This policy is complementary to and not in lieu of any NSW Department of Education or Curriculum requirements.





Aim

The purpose of this policy is to ensure that through the school's participation in the PA4E1 program, secondary school students are supported and encouraged to be physically active in line with current guidelines. Australia's Physical Activity Guidelines for 12 to 18 Year olds are to achieve at least 60 minutes of moderate-to-vigorous intensity physical activity each day.¹¹

Goals and Strategies

Goal 1. Provide adequate opportunities for physical activity

The school will:

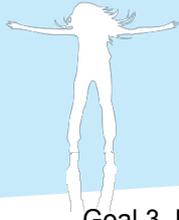
- Implement PA4E1 Strategy 4 – provide daily, accessible, evidence based physical activities appropriate for male and female students during recess and lunch (including access to adequate space and equipment)
- Implement PA4E1 Strategy 7 - enable regularly, accessible, after-school PA programs through linkages with community sporting groups or fitness industry.
- Implement PA4E1 Strategy 6 - provide families with information and strategies that they can use to improve their children's physical activity and be active with their children at home and in the community, e.g. via school newsletter, website, P&C meetings and parent events.

Goal 2. Enable appropriate intensity of physical activity

The school will:

- Implement PA4E1 Strategy 1 – employ weekly pedometer-based PE lessons as well as curriculum material and teaching strategies that aim to increase moderate to vigorous activity to at least 50% of lesson time in PE.





Goal 3. Encourage and support all students (including low-active and high active students) to increase and maintain physical activity levels

The school will:

- Implement PA4E1 Strategy 3 - in Term 1, 2013 and annually after that, review and where necessary modify other school policies to align with practices that research shows encourage low-active students to be more physically active e.g. single sex PE and sports classes, ensuring spaces for physical activity are available during school breaks and outside school hours, allow wearing of PE/sports uniform all day on PE and sports days, including students in PE practical class regardless if wearing PE uniform, ensuring school uniforms are physical activity friendly (e.g. option of shorts and long pants for girls, rather than restricting to skirts)
- Implement PA4E1 Strategy 2 – support students to complete individual physical activity plans in HPE that include: fitness assessments; long and short term personal goals for improving or maintaining regular physical activity; specific actions and timelines to achieve those goals; methods to be used to record actions and assess progress; and rewards for achieving goals.
- Implement PA4E1 Strategy 5 - run an age appropriate 10 week enhanced sports program (Program X) for all students who started Year 7 in 2012, year wide, during the PA4E1 program (Term 1, 2013 to Term 2, 2014).

Goal 4. Monitor and review the implementation and currency of physical activity policy

The school will:

- Summarise and review data from student fitness assessments, student participation in physical activity opportunities (recess, lunch and out of school activities) and pedometer lessons to assess progress toward policy goals
- Review the physical activity policy and relevant sections of other policies (e.g. school uniform, access to spaces and equipment) against current, evidence based, national recommendations and relevant DEC requirements every 12 months





Goal 5. Allocate resources (professional development time, leadership/committee time, equipment) to support implementation of the above strategies in order to achieve the above goals

The school will:

- Ensure HPE teachers receive adequate training and resources to support physical education classes to be at least 50% moderate to vigorous activity
- Ensure all teachers receive adequate training and resources to deliver the enhanced sports program (Program X)
- Enable the school PA4E1 contact (e.g. Head HPE Teacher) to work in partnership with the PA4E1 School Support Manager to lead the planning, implementation and evaluation of the program within the school
- Establish a PA4E1 Committee with representatives from school executive, students (e.g. SRC representatives), parents and community to lead the implementation of the program within the school and enable it to meet regularly OR or include PA4E1 within the scope of an existing committee
- Ensure resources are accessible to implement the above strategies, e.g. physical activity equipment and spaces for students during recess and lunch and for community groups for after school physical activity programs, timetabling of 10 weeks sports time for the enhanced sports program (Program X), use of communications and events with families for dissemination of physical activity and PA4E1 information

1. Haug E, Torsheim T, Samdal O. Local school policies increase physical activity in Norwegian secondary schools. *Health Promotion International*, 2009, 25(1):63-72
2. Evenson KR, Ballard K, Lee G, Ammerman A. Implementation of a school based state policy to increase physical activity. *J Sch Health*. 2009; 79: 231-238.
3. World Health Organisation 2009. Global health risks: mortality and burden of disease attributable to selected major risks. http://www.who.int/healthinfo/global_burden_disease/GlobalHealthRisks_report_full.pdf
4. Medibank Private (October 2008) The cost of physical inactivity http://www.medibank.com.au/Client/Documents/Pdfs/The_Cost_Of_Physical_Inactivity_08.pdf
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7. Cancer Councils, Cancer Council Australia & National Heart Foundation of Australia. The National Secondary Students' Diet and Activity (NaSSDA) survey 2009-10.
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9. Telama R, Yang X, Viikari J, et al. Physical activity from childhood to adulthood: a 21 year tracking study. *Am J Med* 2005; 28 (3): 267-73
10. Matton L, Thomis M, Wijndaele K, Duvigneaud N, Beunen G, Claessens AL, Vanreusel B, Philippaerts R, Lefevre J. Tracking of physical fitness and physical activity from youth to adulthood in females. *Med Sci Sports Exerc*. 2006 Jun;38(6):1114-20.
11. Department of Health and Ageing (2004), Australia's Physical Activity Recommendations for 12-18 year olds, Canberra





Physical Activity Policy Checklist

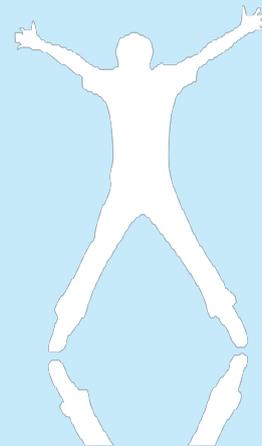
Use this checklist to review your physical activity policy.

Does the policy include:		
Overall	<input type="checkbox"/>	an overall aim of the school in terms of physical activity?
	<input type="checkbox"/>	specific goals that support the aim of the policy?
	<input type="checkbox"/>	a list of strategies which enable each goal to be met?
Opportunities for physical activity	<input type="checkbox"/>	statements on how the school will provide and encourage adequate opportunities for physical activity during and outside school hours, respectively?
Intensity of physical activity	<input type="checkbox"/>	how the school will enable students to attain moderate to vigorous levels of physical activity during at least 50% of PE class time?
Low-active students	<input type="checkbox"/>	how low-active students will be encouraged and supported to increase and then maintain adequate physical activity levels, in particular run an evidence based, enhanced sports program (Program X)?
Monitoring and review	<input type="checkbox"/>	information on how and when the school will evaluate their physical activity policies and practices?
	<input type="checkbox"/>	time frames for review?
Resource allocation	<input type="checkbox"/>	commitment to adequate training and resources for HPE and other staff to deliver PE lessons with at least 50% MVPA and/or the enhanced sports program?
	<input type="checkbox"/>	commitment to staff time to work with the PA4E1 lead the planning, implementation and evaluation of the PA4E1 program within the school?
	<input type="checkbox"/>	commitment to staff and student time to participate in a committee to lead the implementation of the PA4E1 program within the school?
	<input type="checkbox"/>	commitment to ensuring the accessibility of relevant resources to implement the PA4E1 program within the school?



Strategy 6:

Partnering with Parents



PHYSICAL ACTIVITY FOR EVERYONE



Objective:

Increase the provision of information to parents about the amount and type of activity needed by children and the importance of parental role modelling.

Why partner with parents?

There is evidence that parent and family involvement is important to improve the effectiveness of school-based physical activity programs.¹⁻³ While the school is recognised as an important setting for physical activity promotion, parents are of major importance and should be actively involved in school-based physical activity promotion efforts.

The PA4E1 program wants to support your school to partner with parents to improve children's physical activity and help parents be active with their children at home and in the community.

There are numerous benefits to partnering with parents. Parents are important role models and need to support and encourage healthy, active lifestyles. Involving families may help gain parental, community, and student support for PE as well as other physical activity inside and outside of school. Creating a home environment that is supportive of physical activity also complements the physical activity messages that students receive at school and in PE.

We know that partnering with parents can be challenging as parents may not be able to participate as they may not be interested and have little spare time. The PA4E1 program aims to work with you to engage with parents in a number of innovative ways that best suit you and your school's parent community.

1. Wilson DK, Lawman HG, Segal M, Chappell S. Neighborhood and Parental Supports for Physical Activity in Minority Adolescents. *Am J Prev Med* 2011;41(4):399-406

2. Wright MS, Wilson DK, Griffin S, Evans A. A qualitative study of parental modeling and social support for physical activity in underserved adolescents. *Health Educ Res* 2010;25(2):224-32.

3. Sallis JF, Prochaska JJ, Taylor WC. A review of correlates of physical activity of children and adolescents. *Med Sci Sports Exerc* 2000;32(5):963-75





Ten ways to partner with parents

Include the PA4E1 newsletter snippets in each of your school newsletters

Provide parents with the one page PA4E1 fact sheet in Term 3 2012

Include the PA4E1 information on your school website

Promote the PA4E1 Twitter and Facebook page

Provide parents with a PA4E1 newsletter once per term

Invite the PA4E1 consultant to present at existing parent information sessions

Place PA4E1 posters in the school foyer and on noticeboards

Invite a parent representative to join the PA4E1 school committee

Aim to organise 2 special physical activity focused days each year

Use the PA4E1 physical activity message for your school on-hold music





PA4E1 Newsletter Snippets

Regular PA4E1 newsletter snippets (like the one below) will be provided to your school in electronic format to be inserted into each school newsletter.



with Jarrod Wiese

Dear Parents and Families,

Physical Activity for Everyone has started this term at **XXXX** High School! The Physical Activity for Everyone (PA4E1) program aim is to increase the physical activity levels of the students at your school.

Research shows that students that participate in regular physical activity not only have better health outcomes, but may also achieve better academic outcomes.

My name is Jarrod Wiese and over the next 18 months I will be working with your school to get a number of strategies up and going to help students stay healthy, active and reduce the decline in physical activity associated with adolescence. Some of these strategies include recess and lunchtime activities, an enhanced school sport program, personal physical activity plans for students, family engagement strategies and links with the community physical activity organisations.

I completed a Bachelor of Education at La Trobe University Bendigo, Victoria. Since finishing university I have taught in mainstream primary and secondary schools, special education and Indigenous education in both Melbourne and Darwin. I love Physical Education and sport and believe the school community will benefit greatly from the PA4E1 program.

Keep an eye out for me at school on **XXXXday** each week and come and say hi! I am looking forward to getting to know you all this term. I will also have a column in every newsletter so look out for this too. It will include ideas for keeping you and your family healthy.

Jarrod Wiese



Strategy 6 : Partnering with parents

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PHYSICAL ACTIVITY FOR EVERYONE

Parent Fact Sheet

What is Physical Activity for Everyone?

Physical Activity for Everyone (PA4E1) is an Australian-first program that aims to keep adolescents healthy and active.

Recent surveys show that Australian adolescents are not active enough, and become progressively less active during their time at secondary school. We know that low levels of physical activity during adolescence often continue through to adulthood, so encouraging and supporting students to be active during the teenage years has the potential for numerous health benefits.

There are 7 key strategies that the PA4E1 program will be putting into place over the next 2 years – see the table below for some further information on each of these.

Jarrold Wiese from PA4E1 will be working with HPE staff to get the program up and running at XX High School.

Australia's Physical Activity Guidelines for 12-18 Year Olds

- At least **60 minutes** of moderate-to-vigorous intensity (*activity that makes you huff and puff*) each day.
- Maximum 2 hours per day watching television, DVDs, electronic games and using the computer for fun (not school related).

Did you know?

- The biggest decline in physical activity occurs between the ages of 13 - 18.
- Almost 80% of NSW high school students spend more than 2 hours a day watching TV, using the computer and playing electronic games.
- Only 20% of NSW high school students walk to school.

Strategy 1	Active PE classes – We will be working with HPE staff to meet the current recommendation of 50% of PE class time in moderate-to-vigorous intensity physical activity and to check progress towards this through weekly pedometer lessons
Strategy 2	Personal physical activity plans – Students will develop long and short term personal goals for improving or maintaining regular physical activity
Strategy 3	Enhanced school policies – We will be reviewing relevant school policies and modifying to encourage students to be more active
Strategy 4	Recess and lunch activities – We will be working with HPE staff to run daily activities at recess and lunchtime
Strategy 5	Enhanced school sport programs – Students will receive training in an enhanced sport programs, Program X, during sport for one school term
Strategy 6	Partnering with parents – We will be keeping parents informed about how the PA4E1 program is going and also ways students can be active outside of school
Strategy 7	Linking with the local community – We will be working with various groups in the community to improve student access to after school physical activity programs

for more information...



@PA4E1

www.facebook.com/PA4E1

Or see Jarrold at school on XXXday's



Strategy 6 : Partnering with parents

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PA4E1 Information for Your School Website



PHYSICAL ACTIVITY FOR EVERYONE

Our school is excited to be participating in an Australian first project called Physical Activity for Everyone. The project aims to keep adolescents healthy and active using a number of strategies.

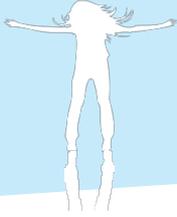
Recent surveys show that Australian adolescents are not active enough, and become progressively less active during their time at secondary school. It is well-known that low levels of physical activity during adolescence often continue through to adulthood, so encouraging and supporting students to be active during the teenage years has the potential for numerous health benefits.

There are 7 key strategies that the PA4E1 program will be putting into place over the next 2 years as shown below.

Strategy 1	Active PE classes – We will be working with HPE staff to meet the current recommendation of 50% of PE class time in moderate-to-vigorous intensity physical activity and to check progress towards this through weekly pedometer lessons
Strategy 2	Personal physical activity plans – Students will develop long and short term personal goals for improving or maintaining regular physical activity
Strategy 3	Enhanced school policies – We will be reviewing relevant school policies and modifying to encourage students to be more active
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Strategy 5	Enhanced school sport programs – Students will receive training in an enhanced sport programs, Program X, during sport for one school term
Strategy 6	Partnering with parents – We will be keeping parents informed about how the PA4E1 program is going and also ways students can be active outside of school
Strategy 7	Linking with the local community – We will be working with various groups in the community to improve student access to after school physical activity programs

Jarrold Wiese will be working with the HPE staff to get the program up and running at our school. for further information, see Mr/s XXXX or Jarrold who will be at the school on XXXday's each week. Make sure you also 'like' the PA4E1 Facebook page by going to www.facebook.com/PA4E1 or follow PA4E1 on Twitter @PA4E1





PA4E1 Twitter and Facebook

To follow and/or promote the PA4E1 Twitter account, search @PA4E1

To like and/or promote the PA4E1 Facebook page, go to www.facebook.com/PA4E1

PA4E1 Parent Newsletter

A one page newsletter from the PA4E1 team will be distributed to parents at your school once per term.

PA4E1 Posters

A series of posters designed by the PA4E1 team will be provided to be placed in the school foyer and on school noticeboards.





Physical Activity Focused Days

Aim to organise 2 special physical activity focused days each year. The PA4E1 School Support Manager will work with you to decide what you can do on these days and when they will occur.

Ideas include:

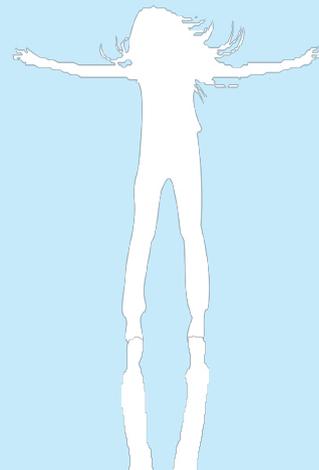
- Walk, cycle or skateboard to school day
- Walk-a-thon / Run-a-thon / Dance-a-thon / Fun-run
- Jump Rope for Heart
- Inter-school sports competition
- Staff and student health and wellbeing day

Using the PA4E1 physical activity messages for your school on-hold music

Ask the PA4E1 School Support Manager to provide you with a copy of the PA4E1 physical activity messages to use as your school on-hold music.



Strategy 7: *Community Links*



PHYSICAL ACTIVITY FOR EVERYONE



Why link in with the community?

Objective:

Improve the availability of community based physical activity options available to students.

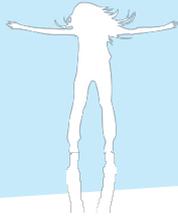
Children are most likely to enjoy, benefit from and continue physical activity when they gain consistent messages and support – from everyone across the community. Together, school and community organisations can offer a wide range of opportunities for physical activity after school hours in supportive physical and social environments.

The potential benefits from linking in with the community are wide ranging and received by all involved. For example, through trying the variety of activities offered after school a student is not only more physically active but may go onto to become an active member of one of the community organisations, making new friends and developing leadership skills as a volunteer. The community organisation has experienced increased profile, membership and volunteer numbers, whilst the school has also experienced an increased profile as well as a healthier and more skilled student.

Ways to link in with the community

Community organisations include sport clubs, recreation organisations (e.g. scouts, Duke of Edinburgh award), government owned sport and recreation centres (e.g. council owned recreation centres and pools, Sport and Recreation NSW centres), commercial providers of sport and recreation (e.g. indoor sports centres), support organisations (e.g. Rotary, Lions), sponsors of sport and recreation (e.g. registered Clubs like local Workers or RSL Club, Sport and Recreation NSW), and parents.





A successful whole school community approach sees **all** key partners collaborating to promote **consistent** messages and actions. A whole school community approach will:

- Build physical activity into the school communities
- Create consistent policies and procedures for groups and organisations working with schools to deliver physical activity
- Create opportunities and structures to involve the whole school community in physical activity.

Whilst there are benefits for the school and the community organisations, the focus of the collaboration needs to be on student learning and undertaken with a shared attitude of service towards young people. For example, community organisations aren't just a resource for schools to access, a mutually beneficial relationship sees the school seeking to support and grow the organisation they are collaborating with. Similarly, working with schools isn't just an opportunity for a sport or recreation organisation to increase membership it is about supporting the school's goals of enhanced learning for students.

As a first step to building community links you could arrange a meeting with the relevant community organisations available to your school to gauge their willingness to collaborate. At the initial meeting you could:

- Share your goals in relation to student learning
- Share the advantages you see in collaborating together
- Find out what motivates the organisation to work with the schools
- Consider ways you could work together

At subsequent meetings you could:

- Identify some long term goals/targets for the collaboration
- Develop a partnership agreement
- Work through a realistic action plan (towards the goal) for 1 year and review at the end of the 1 year

Acknowledgements:

SPARC (Sport and Recreation) New Zealand 2007 *Activating Communities through Active Schools* <http://www.srknowledge.org.nz/research-completed/activating-communities-through-active-schools-an-introduction-and-guide-for-organisations-clubs-parents-and-volunteers-supporting-active-schools/>

SPARC (Sport and Recreation) New Zealand 2008 Sport Fit Secondary School Sport and Recreation Co-ordinators Manual Section 7 - School-Community Collaboration http://www.sportnz.org.nz/en-nz/young-people/Ages_13-18_Years/Sport--Recreation-Co-ordinators-/



Appendix 3

Sample teacher training/workshop slides

PA4E1
PHYSICAL ACTIVITY FOR EVERYONE

PROGRAM X

[[Presenter Name]
[School Name]
[Date]

OVERVIEW OF SESSION

- ❖ Background information
- ❖ What is Program X?
- ❖ Program X student handbook
- ❖ Program X lesson plans and activity units
- ❖ Example – Circuit
- ❖ Where to from here
- ❖ Questions and evaluation

BACKGROUND INFORMATION

BACKGROUND

- ❖ In 2007-08 only 13.3% of Australian school children aged 12 to 17 years participated in at least 60 minutes of moderate-to-vigorous PA every day
- ❖ PA4E1 aims to reduce the decline in physical activity levels of adolescents



WHAT IS PROGRAM X

PROGRAM X

- ❖ Program X is an enhanced school sport program that aims to provide students with additional skills and resources to increase PA levels
- ❖ Evidence-based
- ❖ Developed to cater for low-active adolescents from disadvantaged backgrounds
- ❖ Girls and boys ideally attend separate sessions
- ❖ Goal setting and self-monitoring
- ❖ Choice-based physical activity units



PROGRAM X: HOW DOES IT RUN?

- ❖ 10 weeks of in-sport sessions
- ❖ All students complete Unit 1: Circuits in first 2 weeks
- ❖ Students choose 4 x 2-week units for the remaining 8 weeks of the program
- ❖ 7 different sport options



PROGRAM X AT [School Name]
In [Lesson Name] starting [Term Number
and Calendar Year]



PROGRAM X IN-SPORTS ACTIVITY UNIT OPTIONS

- Cross Fit
- Zumba
- Skipping for Fitness
- Boxing for Fitness
- Gymstick Resistance Training
- Gymstick Pilates
- Fit Ball Training

Uppercut



PROGRAM X STUDENT HANDBOOK



THE STUDENT HANDBOOK

- ❖ Complements the Program X in-sport sessions
- ❖ Designed to be appropriate for secondary school aged students
- ❖ Students provided with a key message each week
- ❖ A weekly challenge is presented for students to complete at home
- ❖ A section for parents or caregivers to complete is provided
- ❖ A weekly physical activity and nutrition diary is provided as a method of self-monitoring and feedback



PROGRAM X: KEY MESSAGES

- Week 1** Keep track of your physical activity and physical fitness
- Week 2** Aim to eat fruit and vegetables every day
- Week 3** Reduce your sitting time during school lunch breaks, after school and on the weekends
- Week 4** Eat a healthy breakfast every day
- Week 5** Be active with friends and family
- Week 6** Monitor your portion sizes during dinner and eat at the dinner table
- Week 7** Be active in anyway you can
- Week 8** Drink more water and swap sugary drinks for sugar-free drinks
- Week 9** Identify excuses for not being active
- Week 10** Reduce your junk food snacks



PROGRAM X

LESSON PLANS AND ACTIVITY UNITS



Week	Key Messages	In-sport Activity	Student Worksheet	Take home activity
1	Keep track of your physical activity and physical fitness	Chosen Activity: Circuit	Keep Track of your Physical Activity & Physical Fitness	Physical Activity And Physical Fitness
2	Aim to eat fruit and vegetables every day		Aim to Eat Fruits and Vegetables Every Day	Fruit And Vege Diary
3	Reduce your sitting time during school lunch breaks, after school and on the weekends	Chosen Activity:	Reduce Your Sitting Time During School Lunch Breaks, After School and on Weekend	Decreasing Recreational Screen Time
4	Eat a healthy breakfast every day		Eat a Healthy Breakfast Everyday	Breakfast At Home
5	Be active with friends and family	Chosen Activity:	Be Active With Friends and Family	Home Fitness Circuit
6	Monitor your portion sizes during dinner and eat at the dinner table	Chosen Activity:	Monitor your portion sizes during dinner and eat at the dinner table	The Healthy Dinner Plate
7	Be active in anyway you can	Chosen Activity:	Be Active Any Way You Can	Active Transport
8	Drink more water and swap sugary drinks for sugar-free drinks	Chosen Activity:	Drink More Water and Swap Sugary Drinks for Sugar Free Drinks	Nutrition Content of Drinks
9	Identify excuses for not being active	Chosen Activity:	Excuses For Not Being Ative	Physical Activity Excuses
10	Reduce your junk food snacks	Chosen Activity:	Reduce your junk food snacks	Junk Food Intake

Lesson Segment	Time
Introduction ◊ Briefly recap the key message from the previous week and have a quick discussion about how the students went with their take home activity ◊ Introduce this weeks key message ◊ Discuss the key message using resource provided in this manual ◊ Whilst discussing the key message have the students complete the key message activity sheet provided in both student and teacher manual	15 minutes
Physical Activity Introduction ◊ Review safety guidelines for this weeks Physical Activity session ◊ Introduce lesson format ◊ Warm-up ◊ Main workout ◊ Cool-down ◊ Student goal setting sheet	5 minutes
Physical Activity Practical Session ◊ Refer to chosen activity unit ◊ Warm-up ◊ Main workout ◊ Cool-down ◊ Student goal setting sheet	65 minutes 10 minutes 45 minutes 5 minutes 5 minutes
Closure ◊ Congratulate students on their effort today ◊ Inform students of next weeks activity ◊ Reinforce key messages from today ◊ Remind the students of their take home challenge activity	5 minutes

WEEKLY IN-SPORT ACTIVITY UNITS

- ◊ Safety Considerations
- ◊ Equipment needed
- ◊ Lesson format
- ◊ Suggestions
- ◊ Overall overview of practical session is provided
 - ◊ Warm-up
 - ◊ Main workout
 - ◊ Cool-down
 - ◊ Goal setting activity sheet



EXAMPLE - CIRCUIT



EXAMPLE LESSON PLAN: CIRCUIT

WEEK 2 - Circuit Training			
Time	Lesson segment	Learning experience and instruction	Resources
5 mins	Recap	<ul style="list-style-type: none"> Briefly recap the key message from the previous week. Quick discussion about how the students went with their take home activity. 	Student manual
10 mins	Theory - introduction	Introduce the key message for this week: Aim to eat fruit and vegetables every day	
	Theory	Key points to be presented refer to key message resources: <ol style="list-style-type: none"> The importance of fruits and vegetables How many serves of fruits and vegetables are recommended per day What a serve of fruit and vegetables is Some examples of fruits and vegetables <ul style="list-style-type: none"> Students to complete key message activity sheet. Key message activity sheet found in the student manual. However a copy has been included with this lesson plan and can be photocopied if needed. 	<ul style="list-style-type: none"> Key message resource (pg 22) Week 2 key message student worksheet (pg 23)
5 mins	Physical activity - introduction	<ul style="list-style-type: none"> Review safety guidelines for this week's physical activity which is circuit training. Introduce lesson format (warm-up, main workout, cool-down and student goal setting sheet) 	<ul style="list-style-type: none"> Circuit Training Activity Unit (pg 65) Student goal setting sheet (pg 70)
65 mins	Physical activity - practical session	<ul style="list-style-type: none"> Refer to circuit training activity unit. Redistribute students goal setting sheet. Student to complete student goal setting sheet for this week and compare to last weeks goals. 	
5 mins	Closure	<ul style="list-style-type: none"> Congratulate students on their effort today. Inform student's what activity they will be doing next week. Reinforce key messages of the day. Remind them of their take home challenge activity. 	Student manual
Total Time: 90 minutes			

WHERE TO FROM HERE...

- ❖ Review the teacher manual
- ❖ Review the student manual
- ❖ Get to know the different in-sport activities
- ❖ Reflect on what your best approach to *Program X* will be
- ❖ Equipment
- ❖ Confirm the plan for the roll-out of the program at your school

QUESTIONS & THANK YOU

- ❖ Any questions?
- ❖ Evaluation form

Appendix 4

Sample student physical activity plan



PHYSICAL ACTIVITY FOR EVERYONE

MY PHYSICAL ACTIVITY PLANNER

Student Name:

HPE Class:

Term: _____



PERSONAL PHYSICAL ACTIVITY PLANNER



Finding 60 minutes of physical activity every day is one of the best things you can do for your social, mental and physical health. Using a personal physical activity planner can help you get started and stay motivated to achieve your goals. This planner helps you develop a health and fitness plan and a personal best day plan.

HEALTH & FITNESS PLAN



How to use the health & fitness plan

Step 1: List the components of fitness from your PE health and fitness challenge

Component of fitness	Where I am now	Where I want to be	Things I can do to get there	Where I am at end of Term.
MVPA in PE (Pedometer steps in PE)	800 steps	880 steps	Walk or cycle to school three times a week	900 steps
Muscular Endurance (1 minute sit up test)	14 sit ups	18 sit ups	Do sit ups 3 nights a week for 1 minute before bed	18 sit ups
Cardio-respiratory Endurance	Run 1 km	Run 2 km	Go for a 30 minute run 2 afternoons a week after school	Ran in 2 km fun run

Also list any other component of fitness that you want to improve and strategies to help you improve, for example improve cardio-respiratory endurance by running after school to go in a fun run by the end of Term.

MY PERSONAL BEST DAY (PBD)



Component of fitness		PBD #1	PBD #2	PBD #3
MVPA in PE (Pedometer steps in PE)	My score today			
	My goal for next PBD			
	My score today			
	My goal for next PBD			
	My score today			
	My goal for next PBD			
	My score today			
	My goal for next PBD			

PERSONAL BEST DAY PLAN



How to use the Personal Best Day Plan

Personal Best Day is designed to help you track your health and fitness progress over time. Your PE teacher will tell you when you have a Personal Best Day and what challenge you are going to be doing. For example, if it is a pedometer lesson for MVPA in PE. At the end of the lesson simply record your score on your card. Based on how well you went, you may like to set yourself a goal for the next lesson. You do not need to show anyone your score, nor will you be “marked” on how well you do. It is simply a way of helping you see how well you are going with the health and fitness challenges that you have set. If you are concerned about how you are going, speak to your PE teacher at the end of the lesson.



Example of a Personal Best Day Plan

Component of fitness		PBD #1	PBD #2	PBD #3
MVPA in PE (pedometer steps)	My score today	400 steps	550 steps	750 steps
	My goal for next PBD	600 steps	700 steps	
1 minute push up test	My score today	12	14	15
	My goal for next PBD	14	16	

HEALTH & FITNESS PLAN



How to use the Personal Best Day Plan

Step 2: Using the results from your PE health and fitness challenge, write where you are now in terms of how well you performed in the challenge.

Component of Fitness	Where I am now	Where I want to be	Things I can do to get there	Where I'm at end of Term 1
MVPA in PE (Pedometer Steps)	800 steps	880 steps	Go for a 30 min run 2 afternoons after school	900 steps
Muscular Endurance (1 min sit-up test)	14 sit ups	18 sit ups	Do sit ups 3 nights a week for 1 minute before bed.	18 sit ups
Cardio-respiratory Endurance	Run 1 km	Run 2 km	Go for a 30 minute run 2 afternoons a week after school	Ran in 2 km fun run

Step 3: Identify where you want to be with each component of fitness by the end of the term. For example, you may want to improve your result by 10%

Step 4: Identify some strategies you can use to help you get there. For example:

- 2 afternoons after school, go for a run, ride or go bushwalking with your family.
- Walk or cycle to school 3 times a week.

HEALTH & FITNESS PLAN



Step 5: Check that your strategies are SMART :

- **Specific** (say exactly what you want to do)
- **Measurable** (will you be able to know that you have achieved the goal?)
- **Achievable** (is your goal possible to accomplish?)
- **Relevant** (will your suggested strategies help you achieve your goal?)
- **Time framed** (what can you achieve by the end of term?)

Step 6: At the end of the week check that you have been doing what you planned and if not, try and do better next week.

Step 7: During your PE class, monitor and record on your plan how you are improving through the personal best day challenge. Use these Personal Best Days to help set small goals.



MY HEALTH & FITNESS PLAN



Component of fitness	Where I am now	Where I want to be	Things I can do to get there	Where I am at end of Term.
MVPA in PE (Pedometer steps in PE)	800 steps	1000 steps	Go for a 30 min run 2 afternoons after school.	1100 steps

Appendix 5

School physical activity policy template

POLICY TEMPLATE

Physical Activity Policy

Rationale

In recognition of the importance of physical activity for young people aged 12-18 years, [School name] is participating in the Physical Activity for Everyone (PA4E1) program for 3 years, 2012-2014. The PA4E1 program employs seven strategies shown to increase students' physical activity time and intensity; they are covered under the five goals of this policy.

Physical inactivity significantly increases the risk of cardiovascular disease, cancer and obesity.¹ It is estimated to be responsible for 3.2 million deaths worldwide each year,¹ and 16,000 deaths per year in Australia.² Also, physical activity has also been shown to enhance cognitive performance, assist in developing social skills and increase the likelihood of focus on academic subjects in the classroom.³ Recent surveys suggest that Australian adolescents are not sufficiently active and become progressively less active during their time at secondary school.⁴⁻⁶ Given that low levels of physical activity during adolescence are associated with low levels of physical activity in adulthood^{7,8}, implementation of appropriate physical activity practices in secondary schools has the potential to deliver both short and long term health and educational benefits.

This policy is complementary to and not in lieu of any NSW Department of Education or Curriculum requirements.

Aim

The purpose of this policy is to ensure that through the school's participation in the PA4E1 program, secondary school students are supported and encouraged to be physically active in line with current guidelines.

Australia's Physical Activity Guidelines for 12 to 18 Year olds are to achieve at least 60 minutes of moderate-to-vigorous intensity physical activity each day.⁹

Goals and Strategies

Goal 1. Provide adequate opportunities for physical activity

The school will:

- Implement PA4E1 Strategy 4 – provide daily, accessible, evidence based physical activities appropriate for male and female students during recess and lunch (including access to adequate space and equipment)
- Implement PA4E1 Strategy 7 - enable regular, accessible, before and after-school PA programs through linkages with community sporting groups or fitness industry.
- Implement PA4E1 Strategy 6 - provide families with information and strategies that they can use to improve their children's physical activity and be active with their children at home and in the community, e.g. via school newsletter, website, Facebook, BVC App, P&C meetings and parent events.

Goal 2. Enable appropriate intensity of physical activity

The school will:

- Implement PA4E1 Strategy 1 – fortnightly pedometer-based PE lessons for year 7 and 8 students as well as curriculum material and teaching strategies that aim to increase moderate to vigorous activity to at least 50% of lesson time in PE.

Goal 3. Encourage and support all students (including low-active and high active students) to increase and maintain physical activity levels

The school will:

- Implement PA4E1 Strategy 3 - in Term 1, 2013 and annually after that, review and where necessary modify other school policies to align with practices that research shows encourage low-active students to be more physically active e.g. single sex PE and sports classes, ensuring spaces for physical activity are available during school breaks and outside school hours, ensuring school uniforms are physical activity friendly (e.g. option of shorts and long pants for girls, rather than restricting to skirts)
- Implement PA4E1 Strategy 2 – support students to complete individual physical activity plans in HPE that include: fitness assessments; long and short term personal goals for improving or maintaining regular physical activity; specific actions and timelines to achieve those goals; methods to be used to record actions and assess progress; and rewards for achieving goals.
- Implement PA4E1 Strategy 5 - run an age appropriate 10 week enhanced sports program (Program X) for all students in year 8

Goal 4. Monitor and review the implementation and currency of physical activity policy

The school will:

- Review the physical activity policy and relevant sections of other policies (e.g. school uniform, access to spaces and equipment) against current, evidence based, national recommendations and relevant DEC requirements every 12 months

Goal 5. Allocate resources (professional development time, leadership/committee time, equipment) to support implementation of the above strategies in order to achieve the above goals

The school will:

- Ensure HPE teachers receive adequate training and resources to support physical education classes to be at least 50% moderate to vigorous activity
- Ensure all teachers receive adequate training and resources to deliver the enhanced sports program (Program X)
- Ensure resources are accessible to implement the above strategies, e.g. physical activity equipment and spaces for students during recess and lunch and for community groups for after school physical activity programs, timetabling of 10 weeks sports time for the enhanced sports program (Program X), use of communications and events with families for dissemination of physical activity and PA4E1 information

Physical Activity Policy Checklist

Use this checklist to review your physical activity policy.

Does the policy include:

Overall	<input type="checkbox"/>	an overall aim of the school in terms of physical activity?
	<input type="checkbox"/>	specific goals that support the aim of the policy?
	<input type="checkbox"/>	a list of strategies which enable each goal to be met?
Opportunities for physical activity	<input type="checkbox"/>	statements on how the school will provide and encourage adequate opportunities for physical activity during and outside school hours, respectively?
Intensity of physical activity	<input type="checkbox"/>	how the school will enable students to attain moderate to vigorous levels of physical activity during at least 50% of PE class time?
Low-active students	<input type="checkbox"/>	how low-active students will be encouraged and supported to increase and then maintain adequate physical activity levels, in particular run an evidence based, enhanced sports program (Program X)?
Monitoring and review	<input type="checkbox"/>	information on how and when the school will evaluate their physical activity policies and practices?
	<input type="checkbox"/>	time frames for review?
Resource allocation	<input type="checkbox"/>	commitment to adequate training and resources for HPE and other staff to deliver PE lessons with at least 50% MVPA and/or the enhanced sports program?
	<input type="checkbox"/>	commitment to staff time to work with the PA4E1 lead the planning, implementation and evaluation of the PA4E1 program within the school?
	<input type="checkbox"/>	commitment to staff and student time to participate in a committee to lead the implementation of the PA4E1 program within the school?
	<input type="checkbox"/>	commitment to ensuring the accessibility of relevant resources to implement the PA4E1 program within the school?

References

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8. Matton L, Thomis M, Wijndaele K, Duvigneaud N, Beunen G, Claessens AL, Vanreusel B, Philippaerts R, Lefevre J. Tracking of physical fitness and physical activity from youth to adulthood in females. *Med Sci Sports Exerc.* 2006 Jun;38(6):1114-20.
9. Department of Health and Ageing (2004), Australia's Physical Activity Recommendations for 12-18 year olds, Canberra

Appendix 6

Sample parent newsletter



PARENT NEWSLETTER FEBRUARY, 2013

PA4E1 returns for 2013

Physical Activity for Everyone or PA4E1 is an Australian first program designed to help keep students physically active and healthy. It started last year at your child's school with all Year 7 students invited to participate in the measurement of the program (survey, accelerometer & height, weight and waist measurements).

PA4E1 then provided some new PE equipment and a support person (Jarrod Wiese, PE teacher) 1 day a week, to help the PE department to:

- offer active games at recess and lunch
- assist each Year 7 student to develop their personal physical activity plan
- develop new ways to make PE times as active as possible

Measuring changes from last year

If you think about it, since this time last year many things have changed for you and your family. Maybe you moved house or started a new job.

Measuring any changes in your child's physical activity levels, their attitudes and beliefs about physical activity, their usual physical activity habits and their height, weight and waist circumference helps us to see how the PA4E1 program is going. So, if your child had one or more of these things measured last year, we will be back at your school this year to measure them again. Thank you for consenting to these measurements and for your child's participation last year. Your child will receive a small gift to thank them for their participation.

Just like last time, you and/or your child will receive reminders by sms to wear the accelerometer each day and to return it.

See the attached flyer for when we be visiting your school to collect this data. We look forward to seeing your child again this year.

Physical activity tip

Create a fun kit - keep a box full of bats, balls, kites, frisbees (both at home and in the car) and you will always be ready for action.

Active boredom fighters

Keep a list of fun activities handy so whenever you hear "I'm bored," you've got a suggestion ready to go. Here are some ideas for your own fun activities list:

- bike rides
- skateboarding
- rock-climbing, abseiling or adventure rope courses
- archery or skirmish
- fun runs and walks
- surfing or body boarding
- kick-boxing or martial arts
- sport in the backyard or local park – lawn bowls, cricket, touch football, Frisbee, handball, shooting hoops (netball or basketball), volleyball or softball - maybe even start a friendly neighbourhood competition
- learning hip-hop or latin dance
- helping around the house — mowing the lawn, or carrying groceries
- starting a business like washing cars or dogs for extra pocket money
- taking the dog or a neighbour's dog for a walk
- planting and looking after a garden
- dancing to some favourite music

Did you know?



The accelerometer worn in PA4E1 to measure physical activity levels does this by detecting changes in acceleration. In a car, an accelerometer detects when the car slows down quickly and sets off the airbags.





PARENT NEWSLETTER FEBRUARY, 2013

Keep an eye out for...

All the new and continuing PA4E1 initiatives happening at your child's school this year.

Ways you can help your child enjoy these activities are listed below.

Personal Physical Activity Planner

Discuss and support *SMART* goals and strategies for their Personal Physical Activity Plan. *SMART* stands for:

Specific (say exactly what you want to do),

Measurable (will you be able to know that you have achieved the goal),

Achievable (is your goal humanly possible to accomplish),

Relevant (will your suggested strategies help you achieve your goal),

Time framed (what can you achieve by the end of Term)

Each health and fitness goal is meant to be something that can be achieved over a school term or 10 weeks, so a 10% improvement is more realistic than a 90% improvement.

Strategies are the activities that your child plans to do each week to help them achieve their goals.

For example to reach a goal of 10% increase in the number of steps taken during PE, the strategy could be to go for a 30 minute run 2

afternoons a week after school or to reach a goal of 10% increase in the number of sit ups done in a minute, the strategy could be to do sit ups for 1 minute 3 nights a week before bed.

At the end of each week you could discuss with your child if they have been doing what they planned and if not, what they could do differently to make it easier to do their activities next week.

Program X

This program runs for 1 term in usual sports time and gives students a chance to try out some great new activities, like:

- Circuit Training
- Cross Fit
- Zumba
- Skipping for Fitness
- Boxing for Fitness
- Gymstick Resistance Training
- Gymstick Pilates
- Fit Ball Training

If your child likes one of these activities you could encourage this interest by hiring a workout DVD from your local library or downloading a workout video from you tube.

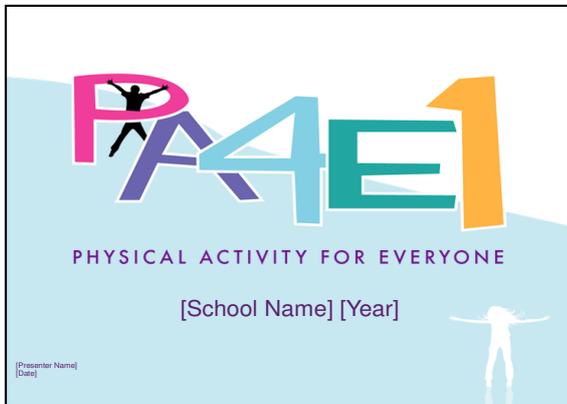
Each week during Program X, there is also a key nutrition or physical activity topic with a challenge related to the topic to do at home. Your participation in these challenges will make them more meaningful and fun for your child. For example, allow the lounge room to become a temporary gym where together you and your child can complete a fitness circuit of exercises such as leg lunges, stomach crunches, and step-ups.

PHYSICAL ACTIVITY FOR EVERYONE



Appendix 7

Sample SOFIT feedback report



SOFIT Overview

- SOFIT (system for observing fitness instruction time) is a tool that assesses PE classes by providing for the simultaneous collection of data on **student activity levels, lesson context and teacher behaviour.**
- Participation in moderate to vigorous physical activity (MVPA) during class is highly dependent upon how PE subject matter is delivered and the instructor delivering it.

- The first ten year 8 PE classes were observed, including any disruptions, eg casual teachers, assemblies, packing away chairs.
- The main objective we are targeting is for PE classes to reach 50% MVPA. Obviously there are a number of factors that affect this outcome.
- It is our aim to limit these inhibiting factors and use the results to see how we can improve MVPA.

Principles of Active PE Lessons

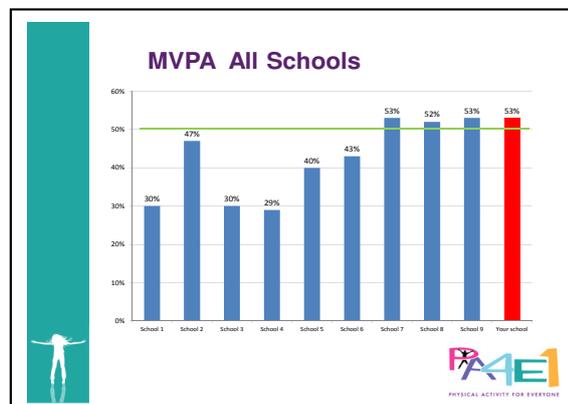
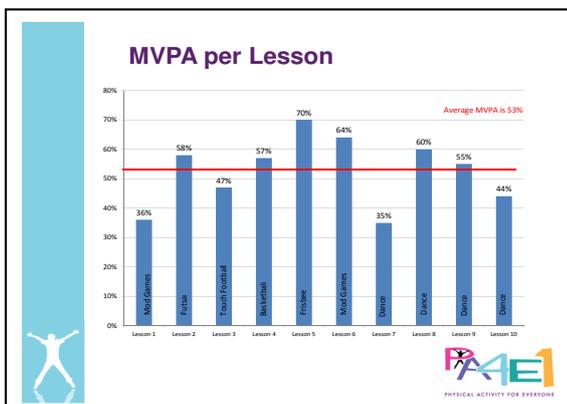
Efficient – Class management tasks are efficient and limit time students spend being inactive.

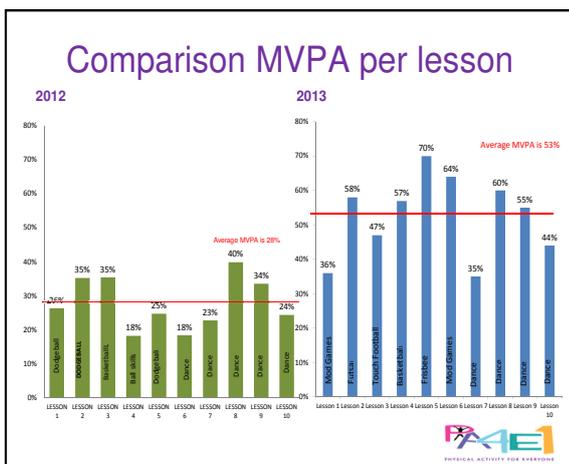
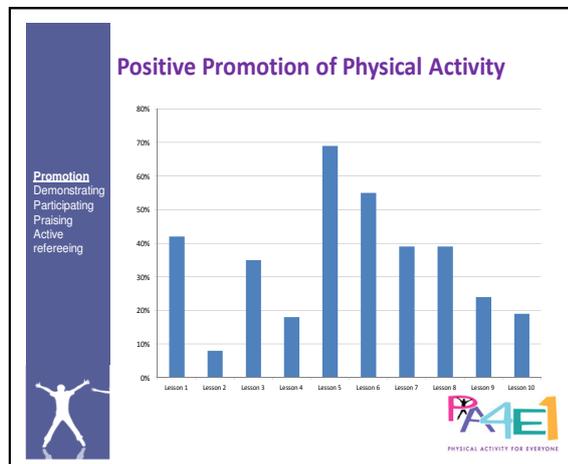
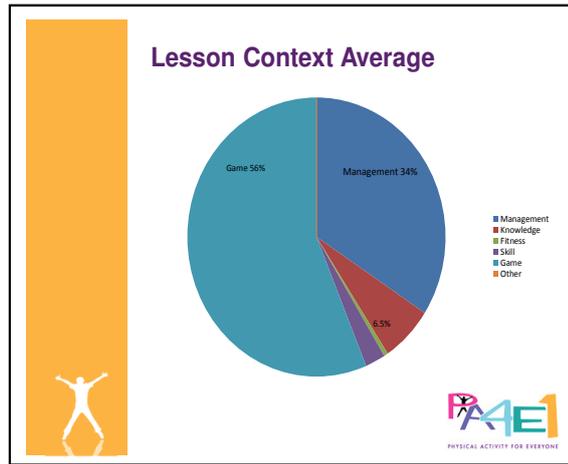
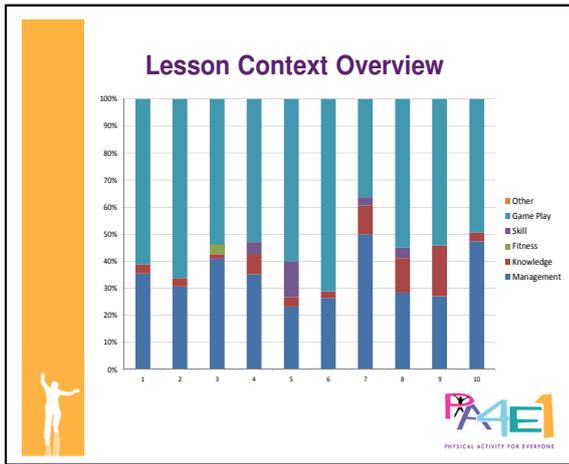
Active – Lessons involve a high level of movement and active learning time (ALT).

Autonomous – Lessons involve elements of choice and opportunities for graded tasks.

Success – Lessons provide all students with an opportunity to experience success.

Enjoyable – Lesson include enjoyable experiences.





What does [School Name] do well?

?
?
?
?
?
?

What can [School Name] improve on?

?
?
?
?
?



Key Points

- Your school has improved its MVPA average from 28% to 53%!
- We thank you for everything you are doing to make this project a success.



Appendix 8

Equipment provided to intervention schools

As part of the Physical Activity 4 Every1 program, your school will receive over \$3000 worth of physical activity equipment including:

- 5 x Group boxing kits - includes 15 pairs of gloves, 15 pairs of focus pads and 5 kit bags
- 15 x Skipping ropes (2.7m long)
- 27 x Gymsticks and team bags (Gymsticks are a fitness tool designed to simplify and combine cardiovascular, muscular endurance and flexibility training)
- 5 x Swiss balls
- 125 x Pedometers including storage containers
- Zumba DVDs
- Set of digital scales
- Nintendo Wii including Wii Sports and Wii Sports Resort games
- Wii Fit
- Dance Dance Revolution Wii game
- Just Dance Wii game
- iPod docking station



Appendix 9

Sample monitoring and feedback report



Physical Activity for Everyone

IMPLEMENTATION PROGRESS (to be provided at the end of each term)

Progress Report for: [School name]

Physical Activity for Everyone Support Manager: [SM name]

As at: End of Term 4, 2012

Progress:

Completed/ Deliverable met/ on track 😊

At risk of not meeting being behind 😐

Behind/ Deliverable off track 😞

Milestone	Due Date	Progress	Comments
Support Strategies			
PA4E1 Support Manager in place	Mid Term 3	😊	Commenced in Week 4, Term 3, 2012. The PA4E1 Support Manager has been in place for 15 weeks, as of the end of Week 8, 2012.
Partnership agreement signed	End Term 3	😊	Signed in Week 9, Term 3, 2012.
PA4E1 committee formed and functional. The committee should have a representative from the school executive and a range of teachers outside of the PE department.	End Term 3	😊 😐	1 st meeting held in Week 5, Term 4, 2012 2 nd meeting held in Week 6, Term 4, 2012. Action plan developed, to work towards Term 1, 2013
Presentation at whole of staff meeting	Mid Term 3	😊	Held in Week 9, Term 3, 2012
Presentation to PE staff on PA4E1	Mid	😊	Delivered by [SM name] via

and active PE principles	Term 3		face to face meeting in Week 1, Term 4, 2012. Attended by: [teacher names]
Resources manuals provided to school	Mid Term 4	😊	Draft delivered Week 2, Term 3 Final resource manual delivered Week 9, Term 4, 2012.
Physical activity equipment pack provided to school	Early Term 4	😊	Provided to the school in Week 3, Term 4, 2012.
Prompts in place to remind PE staff to undertake pedometer based lessons and personal best days	Early Term 4	😊	Prompts include a sticker sheet to be used in day books, email and verbal reminders.
SOFIT feedback provided to PE staff (including the development of 'active PE strategies' developed by PE department.	Early Term 4	😊	Department participated in a session focused on SOFIT feedback and active PE principles in Week 1, Term 4, 2012. Attended by: [teacher names]
Baseline data report provided to school	End Term 4	😞	To be provided by HNE Population Health in Term 1, 2013. The report will be sent to the School Principal and Head PE teacher. The PA4E1 Team would be happy to organise a meeting to discuss the report if requested.
Physical activity strategies			
1. Active PE			
50% of class time (practical lessons) should be active (MVPA) by end Term 4 (2012). (Mean % of lesson time that is active (MVPA) across a class is 50%).	End Term 4	😊	At baseline (Term 1, 2012) your Year 7 practical PE lessons were identified to be 28% active (measured using the SOFIT observational tool).
Pedometer based lessons (termed 'Personal Best Days') undertaken once a month in PE class, with students recording	Mid Term 3	😐	Pedometers are being used once week by most teachers. Pedometer step counts collated and given

step counts on their Personal Physical activity plans			to [SM name] in Week 5, Term 4, 2012.
2. Personal PA plans			
All Year 7, 2012 students have developed an individual physical activity plan including at least one health related and skill related component of fitness goal by T4, 2012.	End Term 3/ Early Term 4		Personal Physical Activity plans were provided to school in Week 8, Term 3, 2012. Teachers began using the plans with students in early in Term 4, 2012. Revision of plans to occur twice in Term 4, 2012.
All Year 7, 2012 students have had the opportunity to review the goals outlined in their personal physical activity plans by the end of Term 4, 2012	Mid and late Term 4		PA4E1 team to develop a method to monitor use of PA plans
3. Enhanced School Sport			
The school has developed a plan for rolling out the Program X enhanced school sport program by end Term 3, 2012.	End Term 3		A plan for rolling out the Enhanced school sport program (Program X) was provided in Week 4, Term 4, 2012.
Relevant teachers have received training on how to deliver Program X to students.	Mid Term 4		Training of teachers responsible for delivering Program X in 2013 is being provided by the PA4E1 Team in Week 9, Term 4, 2012.
All year 7, 2012 students have been through Program X or PALs at least once by end of Term 1 Yr 9 (2012/2013/2014).	End Program		School is on track to deliver Program X to Year 8, 2013 students.
Recess and lunch activities			
At least 20% (1 day week) of recess/ lunch breaks across a week have at least 1 supervised activity organised and offered/ promoted to students by end 2012.	End Term 3		Commenced Week 4, 2012. Executive support has been gained to have the bottom field open at lunch times

At least 50% (2-3 days a week supervised activity) of breaks by end of 2013/14.	End Term 4, 2013		Equipment is not yet available
50% of days with equipment available for students to access by end of 2012 and throughout 2013/2014.	End Term 4, 2013		Meetings organised to involve student leaders in providing equipment strategy in 2013
Supportive school policy			
Policy ideas considered by end Term 4, 2012.	End Term 4		Policy template developed by PA4E1 Team and provided to the school in Week 5, Term 4, 2012.
Plan developed incorporate strategies to support PA by end Term 1 2013	End Term 4		Literature has provided to the school PA4E1 committee on the link between school policies and student physical activity levels.
School Physical activity policy developed and implemented by end term 2, 2013.	Term 1 2013		School physical activity policy to be developed in Term 1, 2013.
Parent links			
Newsletters provided 2 times per term by end Term 3, 2012 & maintained throughout 2013/2014	End Term 3		Two parent contacts have been made to date since Term 3, 2012. 1. Parent information sheet (Term 3, 2012), 2. Information on the school website. An additional parent newsletter will be distributed to parents in Week 9, Term 4, 2012.
Parent rep invited to be part of school committee by end Term 3 2012. Parent rep maintained on the committee through 2012/2013/2014.	End Term 4		[SM name] presented PA4E1 program at P&F committee meeting Week 1, Term 4, 2012

<p>Community links</p> <p>Links made with agencies that offer and promote to students/families after school activities</p> <p><i>Initially proposed</i></p> <ul style="list-style-type: none"> • 3 links by end Term 4, 2012 • 5 activities sustained throughout 2013/2014 	<p>End Term 3</p>		<p>[SM name] is following up on 3 links discussed at the school PA4E1 committee</p>
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Appendix 10

Student survey

Office use only

Date: _____

ID: _____

Physical Activity 4 Every1 Student Survey

Q1	What is your date of birth?	____ / ____ / ____ Day / Month / Year
Q2	What year are you currently in?	1. Year 7 2. Year 8 3. Year 9 4. Year 10
Q3	Are you male or female?	1. Male 2. Female
Q4	What language do you speak most at home?	1. English 2. Another language (please write it below) _____
Q5	Are you of Aboriginal and/or Torres Strait Islander origin?	1. Yes, Aboriginal 2. Yes, Torres Strait Islander 3. Yes, both Aboriginal and Torres Strait Islander 4. No
Q6	What suburb do you live in?	_____
Q7	What is the postcode where you live?	_____

The following questions are about **ORGANISED** physical activities that you do at school, before and after school and on weekends.

Please think about a normal week and write in the table below:

- **Activities that you usually do,**
- **How many times each week you usually do them, and**
- **The usual amount of time you spend doing them.**

Organised sports and games are ones in which you compete, have training or coaching sessions, and which adults may organise. They include activities like playing on a cricket or netball team, gymnastics or dance classes, swimming squads, or classes at a gym or fitness centre.

If you do not do any organised activities, please write "zero" in the first row of the table.

Q8 Enter the organised sports or games you participate in during a usual week (not including school holidays). Please include School Sport and PE classes.

	Sport or game	How many days per week do you do this sport or game?	On average how long do you play this sport or game? (in minutes)
P.E.			
School Sport			
Sport or game 1			
Sport or game 2			
Sport or game 3			
Sport or game 4			
Sport or game 5			

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Date: _____

ID: _____

The following questions are about **NON-ORGANISED** physical activities that you do at school, before and after school and on weekends.

Please think about a normal week and write in the table below:

- **Activities that you usually do,**
- **How many times each week you usually do them, and**
- **The usual amount of time you spend doing them.**

Non-organised physical activities are ones that are not usually supervised by adults and do not usually involve training or competition. It includes things like skateboarding, surfing, riding a bike, walking or cycling to and from school, walking the dog, active chores or jobs you do at home or work, or casually getting together with some friends to play a game or sport after school or during recess/lunchtime.

If you do not do any non-organised activities, please write “zero” in the first row of the table.

Q9 Enter the non-organised sport you participate in during a usual week (not including school holidays).

	Sport or game	How many days per week do you do this sport or game?	On average how long do you play this sport or game? (in minutes)
Sport or game 1			
Sport or game 2			
Sport or game 3			
Sport or game 4			
Sport or game 5			
Sport or game 6			
Sport or game 7			

Physical Activity Confidence

INSTRUCTIONS:

Select **ONE** option to indicate how much you agree or disagree with each statement

		Strongly Disagree	Disagree	Disagree Slightly	Agree Slightly	Agree	Strongly Agree
Q10	When I'm physically active (eg. during PE or school sport) I get embarrassed about my fitness or skill level.	SD	D	DS	AS	A	SA
Q11	I can still find the time to be physically active even when I've had a busy day.	SD	D	DS	AS	A	SA
Q12	I find it difficult to be physically active when the weather is poor, (eg. too hot, too cold or raining).	SD	D	DS	AS	A	SA
Q13	I find it difficult to be physically active when I have no one to be active with.	SD	D	DS	AS	A	SA
Q14	I do not feel comfortable using local facilities to be physically active (eg. the gym, beach, skate parks, bike paths).	SD	D	DS	AS	A	SA

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ID: _____

In the next THREE MONTHS do you...		Not at all true of me	Not very true of me	Somewhat true of me	Very true of me
Q15	... INTEND to be physically active on all or most days of the week?	○	○	○	○

My Physical Activity Environment

INSTRUCTIONS: Select ONE option to indicate how much you agree or disagree with each statement							
		Strongly disagree	Disagree	Disagree slightly	Agree slightly	Agree	Strongly agree
Q16	At home I have access to equipment that helps me to be to be physically active (eg. joggers, bikes, balls, skateboards, weights).	SD	D	DS	AS	A	SA
Q17	It is difficult to be physically active in my neighbourhood because of lots of traffic.	SD	D	DS	AS	A	SA
Q18	I have a place at home where I can be physically active (eg. gym, backyard, garage).	SD	D	DS	AS	A	SA
Q19	My school has good facilities for physical activity (eg. gyms, ovals, dance studio, courts).	SD	D	DS	AS	A	SA
Q20	At school there are facilities available during recess/lunch for me to be physically active (e.g. the gym, dance studio, courts or oval).	SD	D	DS	AS	A	SA
Q21	At school there are facilities available after school hours for me to be physically active (e.g. the gym, dance studio, courts or oval).	SD	D	DS	AS	A	SA

Physical Activity Support from Your Friends & Family

INSTRUCTIONS: Select ONE option for each question.						
FRIEND SUPPORT - In the past THREE MONTHS how often...						
		Never	Rarely	Sometimes	Often	Always
Q22	...did your friends participate in physical activities or sports with you during lunch, recess or after school?	N	R	S	O	A
Q23	...did your friends watch you participate in physical activity or sport (eg. watch you surf or play netball)?	N	R	S	O	A
Q24	...did your friends participate in physical activities/sports with you ?	N	R	S	O	A
Q25	...did you make plans with your friends to be physically active together (eg. to go skateboarding, walking or kick the football around together)?	N	R	S	O	A

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ID: _____

FAMILY SUPPORT - In the past THREE MONTHS how often...						
		Never	Rarely	Sometimes	Often	Always
Q26	...did members of your family participate in physical activities/sport with you?	N	R	S	O	A
Q27	...did members of your family take you to places where you could be physically active (eg. to the beach, training, weekend sport, ice-skating rink)?	N	R	S	O	A
Q28	...did members of your family watch you participate in physical activity/sport?	N	R	S	O	A
Q29	...did your parents buy you equipment that encouraged you to be physically active (eg. sports clothes, joggers, bike, an i-pod for listening to music while being active)?	N	R	S	O	A

Strategies for Being Physically Active

INSTRUCTIONS: Select ONE option for each question.						
In the past THREE MONTHS how often...						
		Never	Rarely	Sometimes	Often	Always
Q30	...did you do things to make physical activity more enjoyable (eg. be physically active with friends or while listening to an i-Pod)?	N	R	S	O	A
Q31	...did you participate in a variety of physical activities/sports to avoid boredom?	N	R	S	O	A
Q32	...did you set yourself physical activity goals (eg. trying a more difficult mountain bike trail or gradually increasing how far you jog)?	N	R	S	O	A
Q33	...did you organise to be physically active with a friend or family member?	N	R	S	O	A
Q34	...did you make an effort to look for nearby settings where you could be physically active (eg. the beach or bush trails)?	N	R	S	O	A
Q35	...did you keep track of how much physical activity you did (eg. by using a timer, pedometer, or by keeping a logbook)?	N	R	S	O	A

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The Benefits of Physical Activity

The following are statements describing some benefits of **REGULAR PHYSICAL ACTIVITY** you might experience in the **NEXT 3 MONTHS**.

Remember, **regular** physical activity = **60 minutes** of at least **moderate intensity** activity on **all or most** days of the week. Examples include brisk walking, bike riding, skateboarding, swimming laps, playing football or netball.

THIS IS AN EXAMPLE:

Participation in regular physical activity can help me to manage stress better.

<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Disagree	Disagree	Partly Disagree	Partly Agree	Agree	Strongly Agree

Q36 Participation in regular physical activity can help to improve my fitness.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Disagree	Disagree	Partly Disagree	Partly Agree	Agree	Strongly Agree

Q37 How important is improving your fitness **to you**?

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Not at all important	Only slightly important	Important	Extremely Important

Q38 Participation in regular physical activity can help me to control my weight better.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Disagree	Disagree	Partly Disagree	Partly Agree	Agree	Strongly Agree

Q39 How important is controlling your weight **to you**?

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Not at all important	Only slightly important	Important	Extremely Important

Q40 Participation in regular physical activity can help me to feel better physically.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Disagree	Disagree	Partly Disagree	Partly Agree	Agree	Strongly Agree

Q41 How important is feeling better physically **to you**?

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Not at all important	Only slightly important	Important	Extremely Important

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Date: _____

ID: _____

Q42 Participation in regular physical activity can help me to manage stress better.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Disagree	Disagree	Partly Disagree	Partly Agree	Agree	Strongly Agree

Q43 How important is managing stress **to you**?

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Not at all important	Only slightly important	Important	Extremely Important

Q44 Participation in regular physical activity with friends can be fun.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Disagree	Disagree	Partly Disagree	Partly Agree	Agree	Strongly Agree

Q45 How important is physical activity with friends being fun **for you**?

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Not at all important	Only slightly important	Important	Extremely Important

Think about a normal **school week**, and write down how long you spend doing the following activities before and after school each day (in hours and minutes).

		Monday	Tuesday	Wednesday	Thursday	Friday
Q46	Watching TV?					
Q47	Watching videos/DVDs?					
Q48	Using the computer for fun?					
Q49	Playing video games other than on the computer?					
Q50	Using the computer for doing homework?					
Q51	Doing homework not on the computer?					

Think about a normal **weekend**, and write down how long you spend doing the following activities on the weekend (in hours and minutes).

		Saturday	Sunday
Q52	Watching TV?		
Q53	Watching videos/DVDs?		
Q54	Using the computer for fun?		
Q55	Playing video games other than on the computer?		
Q56	Using the computer for doing homework?		
Q57	Doing homework not on the computer?		

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Date: _____
ID: _____

For each of the statements below, please select one option.

		Strongly Disagree				Strongly Agree		
Q58	When I make plans, I follow through with them.	1	2	3	4	5	6	7
Q59	I usually manage one way or another.	1	2	3	4	5	6	7
Q60	I am able to depend on myself more than anyone else.	1	2	3	4	5	6	7
Q61	Keeping interested in things is important to me.	1	2	3	4	5	6	7
Q62	I can be on my own if I have to.	1	2	3	4	5	6	7
Q63	I feel proud that I have accomplished things in life.	1	2	3	4	5	6	7
Q64	I usually take things in stride.	1	2	3	4	5	6	7
Q65	I am friends with myself.	1	2	3	4	5	6	7
Q66	I feel that I can handle many things at a time.	1	2	3	4	5	6	7
Q67	I am determined.	1	2	3	4	5	6	7
Q68	I seldom wonder what the point of it all is.	1	2	3	4	5	6	7
Q69	I take things one day at a time.	1	2	3	4	5	6	7
Q70	I can get through difficult times because I've experienced difficulty before.	1	2	3	4	5	6	7
Q71	I have self-discipline.	1	2	3	4	5	6	7
Q72	I keep interested in things.	1	2	3	4	5	6	7
Q73	I can usually find something to laugh about.	1	2	3	4	5	6	7
Q74	My belief in myself gets me through hard times.	1	2	3	4	5	6	7
Q75	In an emergency, I'm someone people can generally rely on.	1	2	3	4	5	6	7
Q76	I can usually look at a situation in a number of ways.	1	2	3	4	5	6	7
Q77	Sometimes I make myself do things whether I want to or not.	1	2	3	4	5	6	7
Q78	My life has meaning.	1	2	3	4	5	6	7
Q79	I do not dwell on things that I can't do anything about.	1	2	3	4	5	6	7
Q80	When I'm in a difficult situation, I can usually find my way out of it.	1	2	3	4	5	6	7
Q81	I have enough energy to do what I have to do.	1	2	3	4	5	6	7
Q82	It's okay if there are people who don't like me.	1	2	3	4	5	6	7
Q83	I am resilient.	1	2	3	4	5	6	7

Thank you for completing this survey!

This information will allow us to make programs to help students stay active and healthy .

Appendix 11

Teacher survey

ID: _____

Physical Activity 4 Every1 Physical Education Teacher Survey

Q1. Date	
Q2. Name of School	
Q3. Gender	1. Male 2. Female
Q4. Years of teaching experience	_____

School Support / School Ethos

<i>For each of the following statements, please circle the number to indicate the answer that best applies.</i>		Poor, needs much improvement	Fair, in needs some improvement	Good, needs little improvement	Excellent
Q5	How strong is support for PE within your school generally?	1	2	3	4
Q6	How strong is support for SPORT within your school generally?	1	2	3	4
Q7	How strong is the general school ethos supporting physical activity?	1	2	3	4
Q8	How strong is support for physical activity at your school by school executive ?	1	2	3	4
Q9	How strong is support for physical activity at your school by teaching staff ?	1	2	3	4
Q10	How strong is support for physical activity at your school by parents ?	1	2	3	4
Q11	How strong is support for physical activity at your school by students ?	1	2	3	4
Q12	Physical education and physical activity programs are regularly evaluated for participation and engagement of students, use of equipment and meeting physical activity targets as well as skill development.	1	2	3	4
Q13	The school promotes participation in physical activity equally to all students regardless of gender, race or ability.	1	2	3	4
Q14	The school provides a safe and supportive environment for physical activity.	1	2	3	4

1

ID: _____

Does your school reward and recognise (through celebrations, certificates and/or rewards) students for participating in the following physical activities?		Yes	No
Q15	School sports teams	1	2
Q16	Participation in physical activity within the school (ie such as recess and lunch, in class etc)	1	2
Q17	Academic excellence in Health and Physical Education	1	2
Q18	Other (please describe) _____		

For the following statements, please circle the number to indicate your response	Strongly agree	Agree	Unsure	Disagree	Strongly disagree
Q19 The school operates a range of physical activity clubs for students at the school.	1	2	3	4	5
Q20. The school has strategies to actively recruit students to physical activity during recess and lunch times.	1	2	3	4	5
Q21. Teachers are encouraged to prompt and engage students in physical activities while undertaking playground duty.	1	2	3	4	5
Q22. The school promotes opportunities for students to be active at recess and lunch breaks by providing equipment/facilities (e.g. box of equipment for students to access, tarmac painting).	1	2	3	4	5
Q23. The school promotes opportunities for students to be active at recess and lunch breaks by providing Peer leaders and training (e.g. student led fitness breaks, recess games).	1	2	3	4	5
Q24. The school promotes opportunities for students to be active at recess and lunch breaks by providing adult (staff or volunteer) assistance to develop and maintain programs.	1	2	3	4	5

For the following statements, please circle the number to indicate your response	Strongly agree	Agree	Unsure	Disagree	Strongly disagree
Q25. The school promotes opportunities for students to be active at recess and lunch breaks by providing active clubs and school intramural activities that are available to all students (e.g. sport and non-team sport intramurals like tai chi and yoga, running club, hiking club).	1	2	3	4	5
Q.26 The school promotes opportunities for students to be active at recess and lunch breaks by providing School teams that operate on a "no cut" basis to encourage everyone to play.	1	2	3	4	5

2

For the following statements, please circle the number to indicate your response	A lot	Some	Very little	Not at all	Don't know
To the best of your knowledge, how well do each of the following statements characterise your school?					
Q.27e administer physical activity, such as laps or push-ups, as a disciplinary measure	1	2	3	4	5
Q28. We use physical activity as a reward	1	2	3	4	5
Q29. We promote physical activity during or as part of special events	1	2	3	4	5
Q30. We integrate physical activity into PDH lessons	1	2	3	4	5
Q31. All teachers (not only PE teachers) act as role models for physical activity	1	2	3	4	5
Q32. All teachers (not only PE teachers) are actively involved in physical activity programs	1	2	3	4	5
Q33. We encourage adults in our school community (e.g., staff, parents) to be visibly physically active and act as role models and mentors to students.	1	2	3	4	5

For the following statement, please circle the number to indicate your response	Yes	No
Q34. Is sport time used for any other activities (e.g. drama, extra curriculum extensions activities such as 4U maths, music rehearsal)?	1	2
Q35. If yes, please list the activities	1. _____ 2. _____ 3. _____ 4. _____ 5. _____ 6. _____	
Q36. Does your school offer non-active sports (e.g. movie appreciation / makeup classes)?	1	2
Q37. If yes, please list the non-active sports	1. _____ 2. _____ 3. _____ 4. _____ 5. _____ 6. _____	

For the following statement, please circle the number that best applies	Yes, all years	Yes, some years	No
Q38. Do your students develop personal physical activity plans?	1	2	3

ID: _____

If yes,

Q39. How often do students in each year level develop personal physical activity plans?			
Year	Each term	Each semester	Each year
a. 7	1	2	3
b. 8	1	2	3
c. 9	1	2	3
d. 10	1	2	3

For each of the following statements, please circle the number that best applies	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Q40. Assisting students to develop personal physical activity plans is a useful way to increase physical activity	1	2	3	4	5

For each of the following statements, please circle the response the best applies	Rarely/ never	1 day/ week	2 days/ week	3 days/ week	4 days/ week	5 days/ week
Q41. On how many days does your school offer organised physical activity at:						
a. Before school	1	2	3	4	5	6
b. Recess	1	2	3	4	5	6
c. Lunchtimes	1	2	3	4	5	6
d. After school	1	2	3	4	5	6

For each of the following statements, please circle the number that best applies	Yes	No	Unsure
Q42. Has the school included information about physical activity in school newsletters?	1	2	3

For each of the following statements, please circle the number that best applies	Yes	No	Unsure
Q43. Has the school made links with any community groups to encourage students to be more active?	1	2	3

ID: _____

For the following statement, please circle the number to indicate your response Below are some school-based barriers to enhancing skill development, fitness and physical activity in adolescents. Please indicate how strongly you think each one applies to your school.	A lot	Some	Very little	Not at all	Don't know
Q44. Competing demands on curriculum time	1	2	3	4	5
Q45. Amount of equipment available	1	2	3	4	5
Q46. Expertise of teachers	1	2	3	4	5
Q47. Amount and standard of facilities	1	2	3	4	5
Q48. Lack of wet weather facilities	1	2	3	4	5
Q49. Level of school / home / community interaction	1	2	3	4	5
Q50. Motivation / attitude of members of staff	1	2	3	4	5
Q51. Absence of a quality PE or sport program	1	2	3	4	5
Q52. Cultural background of students	1	2	3	4	5

<i>For each of the following statements, please circle the number to indicate your response.</i>	Poor, needs much improvement	Fair, needs improvement	Good, needs little improvement	Excellent
Q53 In your view, how adequate are the sports/PE facilities in your school?	1	2	3	4
Q54 In your view, how adequate is the sports/PE equipment in your school?	1	2	3	4

Q55 In a typical Health and Physical Education class, approximately how long are students engaged in <i>moderate to vigorous</i> physical activity (vs. waiting for their turn, listening to instructions or getting changed)?	_____ Minutes				
Q56 On a typical day, approximately what percentage of students are exempt (i.e. present but not participating) from any given Health and Physical Education class (e.g. due to injury, illness, etc.)?	<table style="width: 100%; border: none;"> <tr> <td style="width: 60%;">Females</td> <td style="width: 40%; text-align: center;">_____ %</td> </tr> <tr> <td>Males</td> <td style="text-align: center;">_____ %</td> </tr> </table>	Females	_____ %	Males	_____ %
Females	_____ %				
Males	_____ %				

<i>For each of the following statements, please circle the number to indicate if you strongly agree, agree, are unsure, disagree or strongly disagree.</i>		Strongly agree	Agree	Unsure	Disagree	Strongly disagree
Q57	The school requires every student to develop a Personal Health Plan at the commencement of each school year?	1	2	3	4	5
Q58	Physical activity is reinforced across the curriculum outside of physical education (e.g. Science; Maths; English).	1	2	3	4	5
<i>For each of the following statements, please circle the number to indicate if you strongly agree, agree, are unsure, disagree or strongly disagree.</i>		Strongly agree	Agree	Unsure	Disagree	Strongly disagree
Q59	Teachers have quality resources to provide physical activity (e.g. variety of equipment meeting minimum curriculum standards, equipment in good repair, enough materials for all the class to participate, activities for limited space, outdoor winter games, warm weather outdoor games).	1	2	3	4	5
Q60	Activity is appropriately modified for age and ability/disability.	1	2	3	4	5
Q61	Girls are encouraged to be as involved as boys in physical activity	1	2	3	4	5

ID: _____

<p>Q To the best of your knowledge, what percentage of students at your school engage in moderate to vigorous* physical activity <i>during non-instructional time</i> (e.g., lunch or spare periods) in a typical school day?</p> <p><i>*Moderate physical activity causes some increase in breathing and/or heart rate but not enough to prevent comfortable conversation (e.g. brisk walking, skating, bike riding). Vigorous physical activity is aerobic activity which increases breathing and heart rates enough that talking is possible but the ability to carry on a conversation is limited (e.g. running, basketball, aerobic dancing).</i></p>	Q62	Before School	_____ %
	Q63	Recess	_____ %
	Q64	Lunch	_____ %

Role Modeling

<p><i>For each of the following statements, please circle the number that best applies.</i></p> <p>To the best of your knowledge, how well do each of the following statements characterize your school?</p>		A lot	Some	Very little	Not at all	Don't know
Q65	Teachers act as role models for physical activity	1	2	3	4	5
Q66	Staff are actively involved in physical activity programs	1	2	3	4	5
Q67	We encourage adults in our school community (e.g., staff, parents) to be visibly physically active and act as role models and mentors to students.	1	2	3	4	5

ID: _____

<i>For each of the following statements, please circle the number that best applies.</i>					
How well are the following initiatives in place at your school?		Poor, needs much improvement	Fair, in needs some improvement	Good, in needs little improvement	Excellent
Q68	The use of pedometers in PE classes to maximize students activity	1	2	3	4
Q69	The development of personal PE plans for all students to encourage students to maintain activity levels	1	2	3	4
Q70	Daily supervised activities at recess and lunch	1	2	3	4
Q71	Enhanced school sport programs for all year 8 students to access (Program X and PALS)	1	2	3	4
Q72	School physical activity policies to support students to participate in physical activity	1	2	3	4
Q73	Strategies to communicate school physical activity policies program and partnerships with parents	1	2	3	4
Q74	Partnerships with external community agencies to promote physical activity to students.	1	2	3	4

Supportive school structures

<i>For each of the following statements, please circle the number that best applies.</i>		Yes	No
Q75	Does your school have a dedicated committee formed to promote policies, programs and support for physical activity in your schools?	1	2
Q76	Does this committee have school executive representation?	1	2
Q77	Does this committee involve a variety of members such as teachers, students and parents?	1	2

Thank you for taking the time to complete this survey.

Please return via the reply-paid envelope provided or return to the Physical Activity 4 Every1 research team.

8

Appendix 12

School environment survey

Physical Activity 4 Every1 School Environment Survey

Please circle the number that matches your answer or use the space provided to write your answer.

SECTION 1: BACKGROUND INFORMATION AND GENERAL QUESTIONS

Q1	Today's date	___ / ___ / 2014
Q2	How many FTE classroom teachers are employed at your school?	___
Q3	How many of those are PE teachers?	___
Q4	What is your current position at this school?	<ol style="list-style-type: none">1. Principal2. Assistant Principal3. Head PE Teacher4. PE teacher5. Other (please specify)
Q5	How long have you worked in THIS position at this school?	___ years
Q6	What grade levels are taught at this school?	<ol style="list-style-type: none">1. Year 72. Year 83. Year 94. Year 105. Year 116. Year 12
Q7	What grade levels receive physical education at this school?	<ol style="list-style-type: none">1. Year 72. Year 83. Year 94. Year 105. Year 116. Year 12
Q8	How many students are enrolled in your school?	___ students

SECTION 2: SCHOOL POLICIES

<i>For each of the following statements, please circle the response that best applies.</i>		Yes	No
Q9	A school document exists that provides clear guidelines on how physical activity programs (including recreation to HPE and sport should operate within next 12 months in our school	1	2
Q10	Does the school have a physical activity policy?	1	2
If yes to Q10, go to Q11 If no to Q10, go to Q19			
Q11	Does the school physical activity policy: <ul style="list-style-type: none"> encourage the development of yearly personal physical activity plans for each student? 	1	2
Q12	<ul style="list-style-type: none"> encourage the use of pedometer based lessons in PE class to maximize students moderate to vigorous activity 	1	2
Q13	<ul style="list-style-type: none"> include reference to daily supervised activities at recess and lunch 	1	2
Q14	<ul style="list-style-type: none"> Include reference to the school running enhanced sports programs focusing on building students physical activity skills and mediating factors. 	1	2
Q15	<ul style="list-style-type: none"> Include reference to informing parents about physical activity policy programs and partnership occurring within the school 	1	2
Q16	<ul style="list-style-type: none"> Include reference to developing links with community organisations to enhance students physical activity opportunities 	1	2
Q17	<ul style="list-style-type: none"> Make reference to developing supportive policies and practices within the school to enhance students' physical activity. 	1	2
Q18	<ul style="list-style-type: none"> Make reference to prohibiting the use of physical activity as a punishment 	1	2
Q19	The school upholds equity principles by ensuring that girls and boys have equitable access to school resources	1	2
Q20	The school has a policy that encourages students using active transport to school.	1	2
Q21	Have any school policies, programs or availability of facilities or equipment relating to physical activity (e.g. school uniform, gender mix in PE and sports classes, after school physical activity programs, availability of spaces for physical activity during school breaks and outside school hours) changed from start of Term 2, 2012 to now?	1	2
If yes to Q20, go to Q21 If no to Q20, go to Q23			
Q22	If yes, please briefly describe what has changed.		

SECTION 3: PHYSICAL EDUCATION

GENERAL PROFILE OF SCHOOL PHYSICAL EDUCATION

Q23	How many physical education classes per week do students receive? (Provide the average)	_____ classes per week
Q24	How many total minutes per week of physical education do students receive? (Provide the average)	_____ minutes per week
Q25	What is the typical number of students in a physical education class at your school? (Provide the average class size)	_____ students
Q26	Who generally teaches physical education in your school? (you can tick more than 1)	<ol style="list-style-type: none"> 1. PDHPE Teacher 2. PDHPE staff plus a few teachers from other KLAs 3. Teachers from a range of faculties 4. Parents 5. Outside sporting groups or external contractors 6. Other (specify)
Q27	What percentage of the physical education program is taught by: (Must add up to 100%)	_____% Qualified PE Teachers _____% Classroom Teachers _____% Other (Please specify)

PROFESSIONAL STAFF DEVELOPMENT

Q28	Are physical education teachers required to attend staff development sessions at least once per year?	<ol style="list-style-type: none"> 1. Yes 2. No 3. Don't know
Q29	The school has a policy that ensures staff are released for professional development to enhance their ability to deliver physical activity programs	<ol style="list-style-type: none"> 1. No ethos or policy 2. School ethos, no written policy 3. Written policy in development 4. Written policy in place 5. Policy in place and regularly reviewed
Q30	How many hours of staff development do physical education teachers participate in yearly that are specifically dedicated for physical education? (Provide the average)	_____ hours per year
Q31	Of those staff development sessions specifically allocated to physical education, what proportion of the time focuses SPECIFICALLY on the promotion	<ol style="list-style-type: none"> 1. 0%-25% 2. 25%-50% 3. 50%-75%

	of physical activity for students?	4. 75%-100%
Q32	Does your school or school district provide financial support for physical education teacher's professional development?	1. Yes 2. No 3. Don't know

If yes to Q32, go to Q33

If no or don't know to Q32, go to Q34

Q33	Which of the following expenses are covered? (Check all that apply)	1. Registration for conferences 2. Travel to conferences 3. Other
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PHYSICAL EDUCATION CONTENT, CURRICULUM, AND DELIVERY

Are those who teach physical education provided with:

Q34	Goals, objectives, and expected outcomes for their classes?	1. Yes 2. No 3. Partially
Q35	A physical education curriculum?	1. Yes 2. No 3. Partially
Q36	A chart describing the scope and sequence of instruction?	1. Yes 2. No 3. Partially
Q37	Specific lesson plans or learning activities?	1. Yes 2. No 3. Partially
Q38	Plans on how to assess or evaluate students?	1. Yes 2. No 3. Partially
Q39	Are those who teach physical education required to use a specific curriculum? (e.g., SPARK, CATCH)	1. Yes 2. No 3. Don't know

In general, how frequently does physical education address each of the following categories?

Q40	Physical/motor skill development	1. Rarely 2. Sometimes 3. Often
Q41	Understanding movement concepts, principles, strategies, and tactics	1. Rarely 2. Sometimes 3. Often
Q42	Expressive movement patterns (e.g., dance, creativity)	1. Rarely 2. Sometimes 3. Often
Q43	Promoting active participation in physical activity	1. Rarely 2. Sometimes 3. Often

Q44	Physical fitness development	1. Rarely 2. Sometimes 3. Often
Q45	Responsible personal and social behaviour development	1. Rarely 2. Sometimes 3. Often
Q46	Valuing physical activity for health benefits beyond physical education	1. Rarely 2. Sometimes 3. Often
Q47	During physical education, how often are students required to do extra physical activity for disciplinary reasons (e.g., run laps for being late; do push-ups for off task or bad behaviour)?	1. Rarely 2. Sometimes 3. Often
Q48	How often do classroom teachers/counsellors withhold individual students from physical education to fulfil other academic requirements?	1. Rarely 2. Sometimes 3. Often
Q49	How often do classroom teachers withhold individual students from physical education for disciplinary reasons?	1. Rarely 2. Sometimes 3. Often
Q50	How often is the delivery of physical education compromised because of competing demands for physical education space (e.g., for pictures, assemblies)?	1. Rarely 2. Sometimes 3. Often
Q51	How many days during a semester are physical education classes cancelled (e.g., for inclement weather, gym not available, assemblies, etc.)? <i>(Provide the average.)</i>	_____ days/semester
Q52	During inclement weather, is there a space for students to be physically active during physical education class time?	1. Yes 2. No 3. Don't know
Q53	Relative to other subject matter areas, the number of students in physical education class is typically	1. Similar 2. Smaller 3. Larger
Q54	What is the student-to-PE teacher ratio in physical education class (not including teacher aides)?	___ Students : 1 PE Teacher
Q55	Provision is made for separate physical activity sessions for boys and girls where appropriate/desirable	1. Rarely 2. Sometimes 3. Mostly 4. Always

PHYSICAL EDUCATION TIME RELATIVE TO PHYSICAL ACTIVITY

Q56	Considering that scheduled time may be lost due to students' late arrival, how many actual minutes are students in the physical education setting? <i>(Provide the average.)</i>	_____ actual minutes
Q57	During a typical physical education class, think about how long most students are physically inactive such as while receiving	_____ minutes per

	instructions or waiting for a turn. Estimate the number of total minutes students are typically lying down, sitting, or standing . (Provide the average)	class
Q58	During a typical physical education class, think about how long most students are physically active at least to the level of a moderately paced walk. Estimate the number of total minutes students are engaged in moderate to vigorous physical activity. (Provide the average)	_____ minutes per class

EXEMPTIONS

Q59	Does your school permit students to be exempt from physical education for one grading period or longer for the following reasons? (Circle all that apply.)	<ol style="list-style-type: none"> 1. No exemptions are permitted 2. Religious reasons 3. Long-term physical or medical disability 4. Cognitive disability 5. Behavioral disorder 6. Participation in community sports activities
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PHYSICAL EDUCATION TEACHER DUTIES

Q60	In addition to teaching classes, what additional duties are unique to the physical education teacher? (These are duties required of the physical education teacher that other teachers do not do.) (Circle all that apply.)	<ol style="list-style-type: none"> 1. None 2. Bus duty 3. Recess duty 4. Lunch duty 5. Playground duty before & after school 6. Maintain facilities 7. Other
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BUDGET

Q61	Does your school have a budget allocation for physical education equipment and supplies?	<ol style="list-style-type: none"> 1. Yes 2. No 3. Don't know
<i>If yes to Q61, go to Q62</i>		
<i>If no or don't know to Q61, go to Q63</i>		
Q62	On average how much does the school spend on physical education equipment per year?	\$ _____
Q63	How involved is the physical education teacher with budget decisions related to physical education?	<ol style="list-style-type: none"> 1. Not Involved 2. Somewhat Involved 3. Great Deal Involved

SECTION 4: RECESS AND LUNCH

RECESS AND LUNCH PRACTICES

Q64	School facilities such as ovals, running/ walking tracks, and bike riding areas are used extensively by students at recess and lunchtime.	<ol style="list-style-type: none"> 1. Irrelevant for this school 2. Not present 3. Present but could be improved 4. Improvements planned 5. High standard attained
Q65	School facilities such as playgrounds, ovals, running/ walking tracks, sporting courts and nets are used extensively by students before and after school.	<ol style="list-style-type: none"> 1. Irrelevant for this school 2. Not present 3. Present but could be improved 4. Improvements planned 5. High standard attained
Q66	There is enough school equipment for physical activity for all students who want it.	<ol style="list-style-type: none"> 1. Irrelevant for this school 2. Not present 3. Present but could be improved 4. Improvements planned 5. High standard attained
Q67	School equipment such as balls, ropes, bats are available to students at recess and lunchtime	<ol style="list-style-type: none"> 1. Irrelevant for this school 2. Not present 3. Present but could be improved 4. Improvements planned 5. High standard attained
Q68	School equipment such as balls, ropes, bats are available to students before and after school	<ol style="list-style-type: none"> 1. Irrelevant for this school 2. Not present 3. Present but could be improved 4. Improvements planned 5. High standard attained
Q69	There are regular checks and maintenance of playground facilities and equipment.	<ol style="list-style-type: none"> 1. Irrelevant for this school 2. Not present 3. Present but could be improved 4. Improvements

		planned
		5. High standard attained
Q70	Playground facilities are attractive and in good condition	<ol style="list-style-type: none"> 1. Irrelevant for this school 2. Not present 3. Present but could be improved 4. Improvements planned 5. High standard attained
Q71	Recess, lunch and after school: There are physical activity clubs for students at the school.	<ol style="list-style-type: none"> 1. Irrelevant to this school 2. Rarely 3. Sometimes 4. Mostly 5. Always
Q72	Recess and lunchtimes: The school has strategies to actively recruit students to physical activity during recess and lunchtimes.	<ol style="list-style-type: none"> 1. Irrelevant to this school 2. Rarely 3. Sometimes 4. Mostly 5. Always
Q73	Recess and lunchtimes: Teachers are encouraged to prompt and engage students in physical activities while undertaking yard duties.	<ol style="list-style-type: none"> 1. Irrelevant to this school 2. Rarely 3. Sometimes 4. Mostly 5. Always

GENERAL SCHOOL PROFILE OF RECESS AND LUNCH

Q74	Does your school provide all students with scheduled recess/lunch daily?	<ol style="list-style-type: none"> 1. Yes 2. No 3. Don't know
Q75	On average how many recess/lunch sessions per day do individual students receive?	_____ sessions
Q76	On average, how many total minutes per day does a student receive recess/lunch?	<ol style="list-style-type: none"> 1. Less than 15 minutes per day 2. 15 to 20 minutes per day 3. Over 21 minutes per day
Q77	How often do classroom teachers/counsellors keep individual students from recess/lunch to fulfil academic requirements?	<ol style="list-style-type: none"> 1. Rarely 2. Sometimes 3. Very often

RECESS AND LUNCH SUPERVISION

Q78	What is the student-to-supervisor ratio during recess/lunch?	_____ Students : 1 Supervisor
Q79	Do recess/lunch supervisors regularly provide organized activities during recess/lunch? (e.g., walking or running programs)	1. Yes 2. No 3. Don't know
Q80	Are recess or lunch supervisors asked to encourage students to be physically active during recess/lunch?	1. Yes 2. No 3. Don't know
Q81	Are rules for how to behave at recess/lunch posted for students and adults to see?	1. Yes 2. No 3. Don't know

SUPERVISOR TRAINING/CREDENTIALING

Q82	Who supervises recess/lunch at your school? (Check all that apply.)	1. Classroom Teachers 2. Physical Education Teacher(s) 3. Administrators 4. Paraprofessionals 5. Hourly Wage Employees 6. Volunteers
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RECESS AND LUNCH ACCESS

Q83	During favourable weather conditions, are students allowed to stay indoors during recess/lunch?	1. Yes 2. No 3. Don't know
Q84	During inclement weather, can students be physically active during recess/lunch?	1. Yes 2. No 3. Don't know
Q85	Are teachers permitted to withhold scheduled recess/lunch from students for academic reasons?	1. Yes 2. No 3. Don't know
Q86	Are teachers permitted to withhold recess/lunch from students for disciplinary reasons?	1. Yes 2. No 3. Don't know

RECESS AND LUNCH EQUIPMENT

Q87	Is there a separate annual equipment budget for recess/lunch equipment and supplies?	1. Yes 2. No 3. Don't know
<i>If yes to Q87, go to Q88</i>		
<i>If no or don't know to Q87, go to Q89</i>		
Q88	How much?	\$_____ per year
Q89	Is loose equipment (e.g., balls, jump ropes) available for children to play with during recess/lunch?	1. Yes 2. No 3. Don't know
<i>If yes to Q89, go to Q90</i>		
<i>If no or don't know to Q89, go to Q91</i>		

Q90 Who provides it? (Check all that apply)

1. Individual Classroom Teachers
2. Physical Education Teacher
3. Central Office
4. Recess Supervisors
5. Individual Students
6. Other

SECTION 5: BEFORE, DURING, AND AFTER SCHOOL PHYSICAL ACTIVITY PROGRAMS

PROFILE OF BEFORE, DURING, AND AFTER SCHOOL PROGRAMS

NOTES: **Intramurals** refer to organized sport competitions that are offered only to students who are enrolled in your school. **Interscholastic** sports refer to organized sport competitions in which your school competes against another school.

		Offered	Fee required	Transportation Provided
	Please identify whether or not: (a) your school provides specific physical activity programs, (b) if a separate fee is required of students to participate in them, and (c) whether your school provides special transportation for these programs. In making your decisions, include school sponsored programs only. Do not include programs that are provided by outside agencies.			
Q91	Intramural Sports	Y / N	Y / N	Y / N
Q92	Interscholastic Sports	Y / N	Y / N	Y / N
Q93	Physical Activity Clubs (e.g., running, dance)	Y / N	Y / N	Y / N
Q94	Special Activity Events (e.g., field days, Jump Rope for Heart)	Y / N	Y / N	Y / N

INTEGRATION OF PHYSICAL ACTIVITY INTO ACADEMIC CURRICULUM

Q95	Does your school encourage classroom teachers to promote physical activity with their students?	1. Yes 2. No 3. Don't know
Q96	Are the opportunities for students to participate in your school's physical activity programs communicated to parents/guardians?	1. Yes 2. No 3. Don't know
<i>If yes to Q96, go to Q97</i>		
<i>If no or don't know to Q96, go to Q98</i>		
Q97	Please check all communication methods used.	1. Materials distributed to families 2. Available on school/district website 3. Student handbook 4. Student orientation 5. Open House 6. Newsletters 7. Automated phone calls 8. Electronic means (e.g., e-mail)

9. Other

SECTION 6: SCHOOL FACILITIES AND ACCESS TO EQUIPMENT**Q98** Does the school have the following facilities:

	Yes	No
Please circle ONE option for EACH facility		
a. Useable outdoor basketball/netball courts	1	2
b. Playing fields as part of the school grounds	1	2
c. Playing fields in reasonable walking distance	1	2
d. Swimming facilities in the school grounds	1	2
e. Swimming facilities in reasonable walking distance	1	2
f. Tennis courts	1	2
g. Cricket nets	1	2
h. A weights room	1	2
i. An indoor playing space (eg school hall)	1	2
j. A bike or path near or around the school	1	2
k. A playground/quadrangle	1	2
l. A gymnasium	1	2
m. A fitness lab	1	2
n. Other (please specify below)	1	2
o. Please specify other		

Q99 Are the facilities at your school available for physical activity during <u>lunchtimes</u> ? Please circle ONE option for EACH facility. If the facility is not available at your school <u>at all</u>, please circle N/A	Yes	No	N/A
a. Useable outdoor basketball/netball courts	1	2	3
b. Playing fields	1	2	3
c. Tennis courts	1	2	3
d. Cricket nets	1	2	3
e. A weights room	1	2	3
f. Swimming facilities	1	2	3
g. Indoor playing area (eg school hall)	1	2	3
h. A playground/quadrangle	1	2	3
i. Gymnasium	1	2	3
j. A fitness lab	1	2	3
k. Other (please specify below)	1	2	3
l. Please specify other _____			

Q10 Of the facilities that are available at your school during lunchtimes, how often are they USED by students for physical activity during lunchtimes?

Please circle the appropriate response for EACH facility. If the facility is not available at your school <u>at all</u> , please circle N/A	Rarely/never	Less than once/week	1 day a week	2 days per week	3 days per week	4 days a week	5 days a week	N/A
a. Useable outdoor basketball/netball courts	1	2	3	4	5	6	7	8
b. Playing fields	1	2	3	4	5	6	7	8
c. Tennis courts	1	2	3	4	5	6	7	8
d. Cricket nets	1	2	3	4	5	6	7	8
e. A weights room	1	2	3	4	5	6	7	8
f. Swimming facilities	1	2	3	4	5	6	7	8
g. Indoor playing space (e.g. school hall)	1	2	3	4	5	6	7	8
h. Playground/quadrangle	1	2	3	4	5	6	7	8
i. Gymnasium	1	2	3	4	5	6	7	8
j. A fitness lab	1	2	3	4	5	6	7	8
k. Other	1	2	3	4	5	6	7	8
l. Please specify other								

Q101 Are the facilities at your school available for students to use without supervision BEFORE school? Please circle ONE option for EACH facility. If the facility is not available at your school at all, please circle N/A	Yes	No	N/A
a. Useable outdoor basketball/netball courts	1	2	3
b. Playing fields	1	2	3
c. Tennis courts	1	2	3
d. Cricket nets	1	2	3
e. A weights room	1	2	3
f. Swimming facilities	1	2	3
g. Indoor playing space (eg school hall)	1	2	3
h. School playground/quadrangle	1	2	3
i. Gymnasium	1	2	3
j. A fitness lab	1	2	3
k. Other	1	2	3
l. Please specify other			

Q10 Of the facilities that are available at your school BEFORE school, how often are they used by students for physical activity BEFORE school?

Please circle the appropriate response for EACH facility. If the facility is not available at your school <u>at all</u> , please circle N/A	Rarely/never	Less than once/week	Once a week	2 days a week	3 days a week	4 days a week	5 days a week	N/A
a. Useable outdoor basketball/netball courts	1	2	3	4	5	6	7	8
b. Playing fields	1	2	3	4	5	6	7	8
c. Tennis courts	1	2	3	4	5	6	7	8
d. Cricket nets	1	2	3	4	5	6	7	8
e. A weights room	1	2	3	4	5	6	7	8
f. Swimming facilities	1	2	3	4	5	6	7	8
g. Indoor playing space (eg school hall)	1	2	3	4	5	6	7	8
h. Playground/quadrangle	1	2	3	4	5	6	7	8
i. Gymnasium	1	2	3	4	5	6	7	8
j. A fitness lab	1	2	3	4	5	6	7	8
k. Other	1	2	3	4	5	6	7	8
l. Please specify other								

Q10 3 Are the facilities at your school available for students to use without supervision AFTER school? Please circle ONE option for EACH facility. If the facility is not available at your school at all, please circle N/A	Yes	No	N/A
a. Useable outdoor basketball/netball courts	1	2	3
b. Playing fields	1	2	3
c. Tennis courts	1	2	3
d. Cricket nets	1	2	3
e. A weights room	1	2	3
f. Swimming facilities	1	2	3
g. Indoor playing space (eg school hall)	1	2	3
h. School playground/quadrangle	1	2	3
i. Gymnasium	1	2	3
j. Other	1	2	3
k. Please specify other _____			

Q10 Of the facilities that are available at your school AFTER school, how often are they used by students for physical activity AFTER school?

Please circle the appropriate response for EACH facility. If the facility is not available at your school <u>at all</u> , please circle N/A	Rarely/never	Less than once/week	Once a week	2 days a week	3 days a week	4 days a week	5 days a week	N/A
a. Useable outdoor basketball/netball courts	1	2	3	4	5	6	7	8
b. Playing fields	1	2	3	4	5	6	7	8
c. Tennis courts	1	2	3	4	5	6	7	8
d. Cricket nets	1	2	3	4	5	6	7	8
e. A weights room	1	2	3	4	5	6	7	8
f. Swimming facilities	1	2	3	4	5	6	7	8
g. Indoor playing space (eg school hall)	1	2	3	4	5	6	7	8
h. Playground/quadrangle	1	2	3	4	5	6	7	8
i. Gymnasium	1	2	3	4	5	6	7	8
j. A fitness lab	1	2	3	4	5	6	7	8
k. Other	1	2	3	4	5	6	7	8
l. Please specify other _____ _____								

For each of the following statements, please circle the number that best applies	Poor, in need of much improvement	Fair, in need of some improvement	Good, in need of little improvement	Excellent
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Q105	In your view, how adequate are the sports/PE facilities in your school?	1	2	3	4
Q106	In your view, how adequate is the sports/PE equipment in your school?	1	2	3	4

Q107 Which of the following activities are offered in your school for PE?	Yes	No
(Please circle Yes or No for EACH activity)		
1. Aerobics	1	2
2. Athletics	1	2
3. Aussie Sports	1	2
4. Australian Rules	1	2
5. Baseball	1	2
6. Basketball	1	2
7. Bush walking	1	2
8. Cricket	1	2
9. Cross country	1	2
10. Cycling (competitive)	1	2
11. Cycling (recreational)	1	2
12. Dance	1	2
13. Golf	1	2
14. Fundamental Movement Skills/Gross Motor Programs	1	2
15. Gymnastics	1	2
16. Hockey	1	2
17. Ice-skating Indoor cricket	1	2
18. In line Hockey	1	2
19. Martial arts	1	2
20. Netball	1	2
21. Rockclimbing	1	2
22. Roller blading (skating)	1	2
23. Rowing	1	2
24. Rugby League	1	2
25. Rugby Union	1	2
26. Running	1	2
27. Sailing	1	2
28. Soccer	1	2
29. Softball	1	2
30. Squash	1	2
31. Surfing	1	2
32. Swimming	1	2
33. Tennis	1	2
34. Touch football	1	2
35. Volleyball	1	2
36. Walking	1	2
37. Water polo	1	2
38. Other	1	2
39. Please specify other		

Q108 Which of the following activities are offered in your school for SPORT?		Yes	No
(Please circle Yes or No for EACH activity)			
1.	Aerobics	1	2
2.	Athletics	1	2
3.	Aussie Sports	1	2
4.	Australian Rules	1	2
5.	Baseball	1	2
6.	Basketball	1	2
7.	Bush walking	1	2
8.	Cricket	1	2
9.	Cross country	1	2
10.	Cycling (competitive)	1	2
11.	Cycling (recreational)	1	2
12.	Dance	1	2
13.	Golf	1	2
14.	Fundamental Movement Skills/Gross Motor Programs	1	2
15.	Gymnastics	1	2
16.	Hockey	1	2
17.	Ice-skating Indoor cricket	1	2
18.	In line Hockey	1	2
19.	Martial arts	1	2
20.	Netball	1	2
21.	Rockclimbing	1	2
22.	Roller blading (skating)	1	2
23.	Rowing	1	2
24.	Rugby League	1	2
25.	Rugby Union	1	2
26.	Running	1	2
27.	Sailing	1	2
28.	Soccer	1	2
29.	Softball	1	2
30.	Squash	1	2
31.	Surfing	1	2
32.	Swimming	1	2
33.	Tennis	1	2
34.	Touch football	1	2
35.	Volleyball	1	2
36.	Walking	1	2
37.	Water polo	1	2
38.	Other	1	2
39.	Please specify other		

SECTION 7: SCHOOL ETHOS

	For each of the following statements, please circle the number that best applies	Irrelevant for this school	Rarely	Sometimes	Mostly	Always
Q109	The school ethos supporting physical activity is explicit	1	2	3	4	5
Q110	The school follows a written policy for minimum instruction time in physical education and sport	1	2	3	4	5
Q111	Physical education and physical activity programs are regularly evaluated for participation and engagement of students, use of equipment and meeting physical activity targets as well as skill development	1	2	3	4	5
Q112	It is a requirement that physical education classes keep the students moving and active for at least 50% of the time	1	2	3	4	5
Q113	It is required that students receive instruction in and opportunities to practice fundamental movement skills such as throwing, catching, jumping and striking in the context of active games	1	2	3	4	5
Q114	Students are given the opportunity to participate in games, sports and activities that utilise student centred teaching approaches.	1	2	3	4	5
Q115	The school promotes participation in physical	1	2	3	4	5

	activity equally to all students regardless of gender, race or ability					
Q116	The school encourages staff to be physically active role models by offering staff physical activities such as a walking challenge, or staff use of school swimming pools or gymnasiums. Staff are encouraged to walk or ride to school, walk on excursions, showcase physical activity achievements	1	2	3	4	5
Q117	Physical activity is reinforced across the curriculum outside of physical education (e.g. science – nature walks; maths – distances walked; using throwing and catching to investigate measurement; and school camps)	1	2	3	4	5
Q118	Physical activity programs for students are available at the school after school hours	1	2	3	4	5
Q119	The school applies for additional funding to support physical activity within the school	1	2	3	4	5
	For each of the following statements, please circle the number that best applies	Poor, in need of much improvement	Fair, in need of some improvement	Good, in need of little improvement	Excellent	
Q120	How strong is support for SPORT within your school generally?	1	2	3	4	

Q121	How strong is support for PE within your school generally?	1	2	3	4
Q122	How well are PE and sport generally supported by PARENTS at your school?	1	2	3	4

Q123 Below are some barriers to enhancing skill development, fitness, and physical activity in children and adolescents. Please indicate how strongly you think each one applies to your school.

Please circle the response that best applies for EACH barrier	Does not apply at all	Applies a little	Applies a fair amount	Applies strongly	Applies very strongly
a. Competing demands on curriculum time	1	2	3	4	5
b. Amount of equipment available	1	2	3	4	5
c. Expertise of teachers	1	2	3	4	5
d. Amount and standard of facilities	1	2	3	4	5
e. Lack of wet weather facilities	1	2	3	4	5
f. Level of school/home/community interaction	1	2	3	4	5
g. Motivation/attitude of members of staff	1	2	3	4	5
h. Absence of a quality/PE or sport program	1	2	3	4	5
i. Lack of interest from students	1	2	3	4	5
j. The gender of students	1	2	3	4	5
k. Cultural background of students	1	2	3	4	5
l. Other	1	2	3	4	5

m. Please specify other

Q12 Below is a list of approaches that schools can use to promote physical activity amongst their students. Please indicate what level they are present at in your school.

Please circle the response that best applies for EACH approach	I don't know	Never / rarely	A little of the time	A fair amount	Most of the time	Always
a. Encouraging walking or bicycling to school	1	2	3	4	5	6
b. Encouraging parents to use facilities	1	2	3	4	5	6
c. Encouraging students to be more active outside school	1	2	3	4	5	6
d. Encouraging the use of equipment and facilities during school hours	1	2	3	4	5	6
e. Encouraging the use of equipment and facilities before school	1	2	3	4	5	6
f. Encouraging the use of equipment and facilities after school	1	2	3	4	5	6
g. Encouraging staff members to be involved in lunchtime activity programs	1	2	3	4	5	6
h. Remedial motor skills programs for students	1	2	3	4	5	6
i. Peer support programs in physical activity	1	2	3	4	5	6
j. Permitting community organisations to use facilities for physical activity outside school hours	1	2	3	4	5	6
k. Involving students in decision making regarding the sports and physical activities they participate in and the use and maintenance of	1	2	3	4	5	6

facilities and equipment						
l. Encouragement/merit awards	1	2	3	4	5	6
m. Other	1	2	3	4	5	6

n. Please specify other

SECTION 8: PARENT AND COMMUNITY INTERACTION

	For each of the following statements, please circle the number that best applies	Irrelevant for this school	Rarely	Sometimes	Mostly	Always
Q125	Parents are regularly informed about school programs and initiatives in PE, sport and other physical activity.	1	2	3	4	5
Q126	Parents are made to feel welcome at the school and are given opportunities to be involved in their child's PE, sport and physical activity programs.	1	2	3	4	5
Q127	Parents are provided with progress reports of their child's achievements and participation in physical activity.	1	2	3	4	5
Q128	Parents: A variety of strategies and approaches encourage parents to become involved in their child's skill development and physical activity at home.	1	2	3	4	5
Q129	The school promotes community physical	1	2	3	4	5

	activity and clubs for students and staff in newsletters and at assembly.					
Q130	Community: The school grounds are recognized as key community asset and remain open out of school hours for public recreation, clubs and community groups.	1	2	3	4	5
Q131	Community: Equipment, facilities and resources for physical activity are shared between school and community.	1	2	3	4	5
Q132	The schools rationale for PE, sport and physical activity is widely stated and shared with community.	1	2	3	4	5
Q133	Community: The school makes connection with the community by using halls, oval and sporting facilities outside the school.	1	2	3	4	5
Q134	Community: Community recreation facilities outside the school are of good quality.	1	2	3	4	5
Q135	The school has links with other local schools for physical activity and sport.	1	2	3	4	5

SECTION 9: PROCESS EVALUATION (PA4E1)

IN YOUR SCHOOL - SUPPORTIVE SCHOOL STRUCTURES

Committee

For each of the following statements, please circle the number that best applies		Yes	No
Q136	Does your school have a dedicated committee formed to promote policies, programs and support for physical activity in your schools?	1	2
<i>If yes to Q136, go to Q137</i>			
<i>If no to Q136, go to Q140</i>			
Q137	Does this committee have school executive representation?	1	2
Q138	Does this committee involve a variety of members such as teachers, students and parents?	1	2

For each of the following statements, please circle the number that best applies		Once a month	Once a term	Biannually	Yearly
Q139	How often does your committee meet?	1	2	3	4

Resources

For the following statement, please circle the number that best applies		Yes	No	Unsure
Q140	Have you received a copy of the PA4E1 program manual?	1	2	3

*If yes to Q140, go to Q141a**If no or unsure to Q140, go to Q142a*

For the following statement, please circle the number that best applies		Yes	No	Haven't read
Q141 a	Does this manual contain enough information to enable you to implement the PA4E1 strategies with students?	1	2	3

Q141 b Please explain why you answered as you did to Q141a

For the following statement, please circle the number that best applies		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Q142a	The school has enough resources (such as pedometers, equipment, booklets etc) to implement the PA4E1 strategies	1	2	3	4	5
Q142b	If you would like to make a comment about the PA4E1 resources, please do so here.					

Training

For each of the following statements, please circle the number that best applies		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Q143	Teachers at my school have been given enough information and training to implement the PA4E1 strategies asked of them.	1	2	3	4	5

Q144 Please note any actions or ideas you have to improve PA4E1 project at your school

Monitoring and feedback

For the following statement, please circle the number that best applies		Yes	No	Don't recall getting this report
Q145a	Did the PA4E1 School feedback report assist your school in implementing the PA4E1 strategies?	1	2	3

Q145b Please explain why you answered as you did to Q143a

IN YOUR SCHOOL- PHYSICAL ACTIVITY STRATEGIES

PEDOMETER LESSONS / 50% OF TIME IN MVPA

Q146 What percentage of weekly PE classes in each year level would use pedometers?

	% of practical classes that use pedometers
Year 7	
Year 8	
Year 9	
Year 10	

For each of the following statements, please circle the number that best applies	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
	Q147 Pedometer based lessons are an acceptable learning based tool	1	2	3	4

DAILY PHYSICAL ACTIVITY (RECESS AND LUNCH)

Q148 For each of the following statements, please circle the response the best applies	Rarely/ never	1	2	3	4	5
		day/ week	days/ week	days/ week	days/ week	days/ week
On how many days does your school offer organised physical activity at:						
a. Before school	1	2	3	4	5	6
b. Recess	1	2	3	4	5	6
c. Lunchtimes	1	2	3	4	5	6

d. After school	1	2	3	4	5	6
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ENHANCED SCHOOL SPORT (PROGRAM X AND PALS)

For each of the following statements, please circle the number that best applies		Yes, all years	Yes, some years	No
Q149	Has your school offered an enhanced sport program called Program X to Year 9 students?	1	2	3

If yes to Q149, go to Q150

If no to Q149, go to Q151a

Q150 When did the program (Program X) commence for Year 9 students?

COMMUNITY LINKS

For each of the following statements, please circle the number that best applies		Yes	No	Unsure
Q151a	Has the school made links with any community groups since the commencement of PA4E1 to encourage students to be more active? (i.e. throughout Term 3 and 4, 2012, all of 2013 and since the commencement of 2014)	1	2	3

If yes to Q149a, go to Q149b

If no or unsure to Q149a, go to Q150

Q151b Please outline the links your school currently has with community groups

PARENT LINKS

For each of the following statements, please circle the number that best applies		Yes	No	Unsure
Q152	Has the school included information about physical activity in existing school newsletters since the commencement of PA4E1? (i.e. throughout Term 3 and 4, 2012, all of 2013 and since the commencement of 2014)	1	2	3

Q153	Has the school disseminated the PA4E1 program newsletters or fliers to students since the commencement of PA4E1? (i.e. throughout Term 3 and 4, 2012, all of 2013 and since the commencement of 2014)	1	2	3
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For each of the following statements, please circle the number that best applies		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Q154	Disseminating physical activity information to parents through the school is a useful way to engage parents in supporting their child's physical activity	1	2	3	4	5

For each of the following statements, please circle the number that best applies.					
How well are the following initiatives in place at your school?		Poor, needs much improvement	Fair, needs some improvement	Good, needs little improvement	Excellent
Q155	The use of pedometers in PE classes to maximize students activity	1	2	3	4
Q156	The development of personal PE plans for all students to encourage students to maintain activity levels	1	2	3	4
Q157	Daily supervised activities at recess and lunch	1	2	3	4
Q158	Enhanced school sport programs for all year 9 students to access (Program X and PALS)	1	2	3	4
Q159	School physical activity policies to support students to participate in physical activity	1	2	3	4
Q160	Strategies to communicate	1	2	3	4

	school physical activity policies program and partnerships with parents				
Q161	Partnerships with external community agencies to promote physical activity to students.	1	2	3	4

Q162 Please note any additional support or resources you need to ensure you can implement the PA4E1 strategies with your students

*Thank you for taking the time to complete this survey.
Please return via the reply-paid envelope provided or return to the Physical Activity 4
Every1 research team.*