



PHYSICAL ACTIVITY FOR EVERYONE

**A MULTICOMPONENT SCHOOL-BASED
INTERVENTION IN DISADVANTAGED SECONDARY
SCHOOLS TO REDUCE THE DECLINE IN PHYSICAL
ACTIVITY ASSOCIATED WITH ADOLESCENCE:
THE PHYSICAL ACTIVITY 4 EVERYONE
RANDOMIZED CONTROLLED TRIAL.**

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**Submitted for the Degree of
Doctor of Philosophy**
School of Medicine and Public Health
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28 October 2016

STATEMENT OF ORIGINALITY

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THESIS BY PUBLICATION

I hereby certify that this thesis is submitted in the form of a series of published papers of which I am a joint author. I have included as part of the thesis a written statement from each co-author; endorsed by the Faculty Assistant Dean (Research Training), attesting to my contribution to the joint publications. The University of Newcastle Thesis by Publication Guidelines, are included in Appendix I1.

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CONFLICT OF INTEREST STATEMENT

Rachel Sutherland reports no conflict of interest.

LIST OF PUBLICATIONS FROM THESIS CHAPTERS

This thesis is presented as a series of five papers. At the time of submission, all five of these papers were published in peer reviewed journals.

PUBLISHED IN PEER-REVIEWED JOURNALS

Chapter 3

Sutherland R, Campbell E, Lubans DR, Morgan PJ, Okely AD, Nathan N, Wolfenden L, Jones J, Davies L, Gillham K, Wiggers J (2013) A cluster randomised trial of a school-based intervention to prevent decline in adolescent physical activity levels: study protocol for the 'Physical Activity 4 Everyone' trial. *BMC Public Health* 2013, 13:57.

Chapter 4

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Chapter 5

Sutherland RL, Campbell EM, Lubans DR, Morgan PJ, Nathan NK, Wolfenden L, Okely AD, Gillham KE, Hollis JL, Oldmeadow CJ, Williams AJ, Davies LJ, Wiese JS, Bisquera A, Wiggers JH. (2016) The Physical Activity 4 Everyone Cluster Randomized Trial. 2-Year Outcomes of a School Physical Activity Intervention Among Adolescents. *American Journal of Preventive Medicine*. 2016 Apr 7. pii: S0749-3797(16)00100-8. doi: 10.1016/j.amepre.2016.02.020.

Chapter 6

Hollis JL, **Sutherland R**, Campbell L, Morgan PJ, Lubans DR, Nathan N, Wolfenden L, Okely AD, Davies L, Williams A, Cohen KE, Oldmeadow C, Gillham K, Wiggers J. (2016) Effects of a school-based physical activity intervention on adiposity in adolescents from economically

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disadvantaged communities: The 'Physical Activity 4 Everyone' RCT. *International Journal of Obesity*. 2016 Oct;40(10):1486-1493. doi: 10.1038/ijo.2016.107.

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CO-AUTHOR STATEMENT – CHAPTER 3

I attest that Research Higher Degree candidate Rachel Sutherland contributed to the paper/publication entitled:

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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- 1** Hollis J, Williams AJ, **Sutherland R**, Campbell E, Nathan N, Wolfenden L, Morgan PJ, Lubans DR, Wiggers JA. A systematic review and meta-analysis of moderate-to-vigorous physical activity levels in elementary school physical education lessons. *Preventive Medicine* (2016) 86 34-54.
- 2** Nathan N, Wolfenden L, Williams CM, Yoong SL, Lecathelinais C, Bell AC, Wyse R, **Sutherland R**, Wiggers J Adoption of obesity prevention policies and practices by Australian primary schools: 2006 to 2013 *Health Education Research* (2015) 30 2 262-271
- 3** Williams CM, Nathan NK, Wyse RJ, Yoong SL, Delaney T, Wiggers J, **Sutherland R**, Freund M, Hodder RK, Wolfenden L. Strategies for enhancing the implementation of school-based policies or practices targeting risk factors for chronic disease. *Cochrane Database of Systematic Reviews* (2015) 5
- 4** Nathan N, Wolfenden L, William CM, Yoong S, Lecathelinais C, Bell AC, Wyse **R**, **Sutherland K**, Gillham K, Wiggers J. Physical Activity Policies and Practices in Australian Primary Schools 2006-2013: How Far Have We Really Come? *Journal of Physical Activity and Health* (2014) 11 Supp 1 S126 – S198

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- 1** **Sutherland R**, Campbell L, Lubans D.R, Morgan P.J, Okely A.D⁵, Nathan N, Wolfenden L, Gillham K, Wiggers J. Objectively measured sedentary behavior in secondary school physical education lessons. *Global Summit on Children’s Physical Activity*. Toronto,

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- 1 Sutherland R**, Campbell L, Lubans D.R, Morgan P.J, Okely A.D, Nathan N, Wolfenden L, Gillham K, Wiggers J. Objectively measured physical activity levels in secondary school physical education lessons: meeting the mark or a missed opportunity? International Society Behavioural Nutrition Physical Activity, San Diego USA. 21-24 May, 2014. Poster presentation.
- 2 Sutherland R**, Campbell L, Lubans D.R, Morgan P.J, Okely A.D, Nathan N, Wolfenden L, Gillham K, Wiggers J. Enhancing the implementation and adoption of a multi-component physical activity intervention in disadvantaged secondary schools. Global Implementation Conference, Dublin, Ireland. 26-28 May, 2015. Poster presentation.
- 3 Sutherland R**, Campbell L, Lubans D.R, Morgan P.J, Okely A.D, Nathan N, Wolfenden L, Gillham K, Wiggers J. A Multi-component Intervention In Disadvantaged Secondary Schools To Reduce The Decline In Adolescent Physical Activity: The PA4E1 Cluster RCT. International Society Behavioural Nutrition Physical Activity, Edinburgh, Scotland. 3-6 June, 2015. Oral presentation.
- 4 Sutherland R**, **Hollis J**, Williams A, Campbell E, Lubans D, Morgan P, Okely A, Nathan N, Wolfenden L, Gilham K, and Wiggers J. *Moderate-to-vigorous physical activity in secondary school physical education lessons*. International Society of Behavioural Nutrition and Physical Activity, Edinburgh, United Kingdom, 3-6 June, 2015. Poster presentation.
- 5 Sutherland R**, Campbell L, Lubans D.R, Morgan P.J, Okely A.D, Nathan N, Wolfenden L, Gillham K, Wiggers J. A Multi-component Intervention In Disadvantaged Secondary Schools To Reduce The Decline In Adolescent Physical Activity: The PA4E1 Cluster RCT. 3rd

ADDITIONAL PUBLICATIONS, PRESENTATIONS AND AWARDS ASSOCIATED WITH THE
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- Population Health Congress, 6-9 September, 2015. Hobart, Australia. Oral presentation.
Presented by **Crooks K.**
- 6** NSW Government Healthy Eating Active Living Forum 2016 - NSW Health, Sydney (Invited Presentation) (24 month results -lessons learnt)
- 7** NSW Health Promotion Forum 2016, Sydney (invited presentation) (Physical Activity 4 Everyone 24 month results)
- 8** Sutherland R, Campbell L, Lubans D.R, Morgan P.J, Okely A.D, Nathan N, Wolfenden L, Gillham K, **Wiggers J.** 'Physical Activity 4 Everyone' cluster RCT: 24-month physical activity outcomes of a school-based physical activity intervention targeting adolescents. International Society Behavioural Nutrition Physical Activity, Capetown, South Africa. 8-11 June, 2016. Oral presentation.
- 9** Sutherland R, Campbell L, Lubans D.R, Morgan P.J, Okely A.D, Nathan N, Wolfenden L, Gillham K, **Wiggers J.** Effects of a school-based physical activity intervention on adiposity in adolescents: The 'Physical Activity 4 Everyone' cluster RCT. International Society Behavioural Nutrition Physical Activity, Capetown, South Africa. 8-11 June, 2016. Oral presentation.
- 10** Sutherland R, Campbell L, Lubans D.R, Morgan P.J, Okely A.D, Nathan N, Wolfenden L, Gillham K, **Wiggers J.** Cost effectiveness of the 'Physical activity 4 Everyone' cluster randomised trial: a school-based physical activity intervention targeting secondary school students. International Society Behavioural Nutrition Physical Activity, Capetown, South Africa. 8-11 June, 2016. Oral presentation.
- 11** Sutherland R, Campbell L, Lubans D.R, Morgan P.J, Okely A.D, Nathan N, Wolfenden L, Gillham K, **Wiggers J.** 'Physical Activity 4 Everyone' cluster RCT: 24-month physical activity outcomes of a school-based physical activity intervention targeting

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- adolescents. World Cancer Congress, Paris, France. 31 Oct-3 Nov, 2016. Poster presentation.
- 12** Sutherland R, Campbell L, Lubans D.R, Morgan P.J, Okely A.D, Nathan N, Wolfenden L, Gillham K, **Wiggers J**. Effects of a school-based physical activity intervention on adiposity in adolescents: The 'Physical Activity 4 Everyone' cluster RCT. World Cancer Congress, Paris, France. 31 Oct-3 Nov, 2016. Poster presentation.
- 13** Sutherland R, Campbell L, Lubans D.R, Morgan P.J, Okely A.D, Nathan N, Wolfenden L, Gillham K, **Wiggers J**. Cost effectiveness of the 'Physical activity 4 Everyone' cluster randomised trial: a school-based physical activity intervention targeting secondary school students. World Cancer Congress, Paris, France. 31 Oct-3 Nov, 2016. Poster presentation.
- 14** **Sutherland R**, Campbell L, Lubans D.R, Morgan P.J, Okely A.D, Nathan N, Wolfenden L, Gillham K, Wiggers J. Enhancing implementation of an adolescent physical activity intervention: 2 year outcomes. 3rd Biennial Australasian Implementation Conference, Melbourne, Australia. 5-6 Oct, 2016. Oral Presentation.
- 15** **Sutherland R**, Campbell L, Lubans D.R, Morgan P.J, Okely A.D, Nathan N, Wolfenden L, Gillham K, Wiggers J. 'Physical Activity 4 Everyone' cluster RCT: 24-month physical activity outcomes of a school-based physical activity intervention targeting adolescents. Overall and school day physical activity outcomes. Sport Medicine Australia conference. Melbourne, Australia. 12-15 Oct, 2016. Oral presentation.
- 16** Sutherland R, Campbell E, Lubans D, Morgan P, Nathan N, Wolfenden L, Gillham K, Okely A, **Hollis J**, Oldmeadow C, Williams A, Davies L, Bisquera A, and Wiggers J. 'Physical Activity 4 Everyone' cluster RCT: 24-month outcomes of a school-based physical activity intervention targeting adolescents. International Society for Physical Activity and Public Health, Bangkok, Thailand. 16-19 Nov, 2016. Oral presentation.

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- 17 Sutherland R**, Reeves. P, Campbell L, Lubans D.R, Morgan P.J, Okely A.D, Nathan N, Wolfenden L, Gillham K, Wiggers J. Is a school-based physical activity intervention targeting secondary school students cost effective? International Society for Physical Activity and Public Health, Bangkok, Thailand. 16-19 Nov, 2016. Oral presentation.
- 18 Sutherland R**, Campbell L, Lubans D.R, Morgan P.J, Okely A.D, Nathan N, Wolfenden L, Gillham K, Wiggers J. 'Physical Activity 4 Everyone' cluster RCT: 24-month physical activity outcomes of a school-based physical activity intervention targeting adolescents. International Congress of Behavioural Medicine, Melbourne, Australia. 7-10 Dec, 2016. Oral presentation.
- 19 Sutherland R**, Reeves, P, Campbell L, Lubans D.R, Morgan P.J, Okely A.D, Nathan N, Wolfenden L, Gillham K, Wiggers J. Is a school-based physical activity intervention targeting secondary school students cost effective? International Congress of Behavioural Medicine, Melbourne, Australia. 7-10 Dec, 2016. Oral presentation.
- 20 Sutherland R**, Campbell L, Lubans D.R, Morgan P.J, Okely A.D, Nathan N, Wolfenden L, Gillham K, Wiggers J. Effects of a school-based physical activity intervention on adiposity in adolescents from economically disadvantaged communities: 'physical activity 4 everyone' RCT. International Congress of Behavioural Medicine, Melbourne, Australia. 7-10 Dec, 2016. Poster presentation.
- 21 Hollis J, Sutherland R**, Campbell E, Lubans D, Morgan P, Okely A, Nathan N, Gilham K, and Wiggers J. Physical Education in secondary schools located in low-income communities: A cross sectional study of physical activity levels, lesson context and teacher interaction. International Society of Behavioural Nutrition and Physical Activity, Edinburgh, United Kingdom, 3-6 June, 2015.

ADDITIONAL PUBLICATIONS, PRESENTATIONS AND AWARDS ASSOCIATED WITH THE THESIS

- 22** Hollis J, **Sutherland R**, Williams A, Campbell E, Lubans D, Morgan P, Okely A, Nathan N, Wolfenden L, Gilham K, and Wiggers J. A meta-analysis of moderate-to-vigorous physical activity in primary school physical education lessons. International Society of Behavioural Nutrition and Physical Activity, Edinburgh, United Kingdom, 3-6 June, 2015.
- 23** Hollis J, **Sutherland R**, Campbell L, Morgan P, Lubans D, Nathan N, Wolfenden L, Okely A, Davies L, Williams A, Gilham K, Cohen K, and Wiggers J. A socio-ecologically framed, school-based physical activity intervention has beneficial effects on obesity outcomes in adolescents from low SES communities: The PA4E1 RCT. European Congress on Obesity, Prague, Czech Republic, 6-9 May, 2015.
- 24** **Davies L**, Sutherland R, Campbell L, Nathan N, Wolfenden L, Gilham K, and Wiggers J. Longitudinal changes in adolescent sedentary behaviour in a school day. 44th Annual Public Health Association of Australia and 20th Chronic Diseases Network Conference. Alice Springs, Australia. 18 - 21 September 2016.
- 25** Davies L, **Sutherland R**, Campbell L, Nathan N, Wolfenden L, Gilham K, and Wiggers J. Longitudinal changes in adolescent sedentary behaviour in a school day. Sports Medicine Australia Conference. Melbourne, Australia, 12 - 15 October 2016. Presented by Clare Desmet.

PUBLISHED RESEARCH REPORTS

- 1** Wiggers J, Wolfenden L, Campbell E, Gillham K, Bell C, **Sutherland R**, Hardy LL, King L, Grunseit A, Milat AJ, Orr N Evaluation Report. Good for Kids, Good for Life, 2006-2010. (2013)

AWARDS RELATED TO THIS THESIS

- 1 Sutherland R.** A Multi-component Intervention In Disadvantaged Secondary Schools To Reduce The Decline In Adolescent Physical Activity: The PA4E1 Cluster RCT. International Society Behavioural Nutrition Physical Activity, Edinburgh, Scotland. 3-6 June, 2015. Finalist. Best oral presentation- student category.
- 2 Wiggers J, Sutherland R, Wolfenden L, Campbell L, Lubans D, Morgan P, Searles A, Oldmeadow C, Nathan N, Morrison R, Kajons N, Tokely R, Williams M.** New South Wales Ministry of Health. Translational Research Grant Scheme. Translation trial PA4E1. July 2016- June 2018. \$990,770.
- 3 Sutherland R, Wiggers J, Wolfenden L, Campbell L, Nathan N.** Hunter New England Local Health District. High Value Health Care Awards. Preventive Health Category. Physical Activity 4 Everyone. Category Winner. 2016.
- 4 Sutherland R, Wiggers J, Wolfenden L, Campbell L, Nathan N, Lubans D, Morgan P.** New South Wales Government Premiers Awards. Tackling Childhood Obesity Category. Physical Activity 4 Everyone. Finalist. 2016.
- 5 Sutherland R, Wiggers J, Wolfenden L, Campbell L, Nathan N.** New South Wales Ministry of Health. Excellence Awards. Preventive Health Category. Physical Activity 4 Everyone. Finalist. 2016.

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GLOSSARY OF COMMON ABBREVIATIONS

BMI	body mass index
BMI-Z	body mass index z- score
CATI	computer assisted telephone interview
CI	Confidence Interval
HPE	health and physical education
HPS	health promoting schools
ICC	intra class correlation
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
sd	standard deviation
SOFIT	System for Observing Fitness Instruction Time
VPA	vigorous physical activity
WHO	World Health Organization
WC	waist circumference
SCT	Social Cognitive Theory

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 thesis 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

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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.

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.

ABSTRACT

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 evidenced 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.

CONTRIBUTION STATEMENT

I was the sole PhD student and project manager of this study and was intricately involved in all aspects of the study conceptualisation, design, development, implementation, and evaluation. I was the contact person for schools, parents and students throughout the study and was responsible for managing all enquiries. A summary of the various contributions I made to the studies reported in this thesis is provided below.

ACQUISITION OF FUNDING

I was involved in the development of the grant application for the *Physical Activity 4 Everyone* trial. The grant that funded this study was a NSW Ministry of Health, Health Promotion Demonstration Grant 2011: \$587,000

PROGRAM DESIGN AND DEVELOPMENT

I took a lead role in program design and development and was responsible for a team of staff involved in the implementation of the *PA4E1* trial. With guidance from my supervisors, and a group of study investigators, I led the development of the *PA4E1* trial. This required the creation of a range of program components and resources. The trial included: school presentations to staff and school executive, school program manuals, curriculum resources (e.g., student personal physical activity plans, pedometer lesson templates), school physical activity policy templates, amending existing enhanced student physical activity program outline and resources, development of train the trainer manuals for teachers, *PA4E1* parent newsletters, and a suite of resources designed to monitor the implementation of the trial.

ETHICS APPROVAL AND CLINICAL TRIAL REGISTRY

I was responsible for correspondence with the Hunter New England Local Health District Human Research Ethics Committee (11/03/16/4.05), University of Newcastle's Human Research Ethics Committee (H-2011-0210), NSW Department of Education SERAP (2011111) and the Catholic School Office Maitland and Newcastle Diocese Ethics Committee, including drafting applications and addressing feedback from committees. I was also responsible for registering the trial with the Australian New Zealand Clinical Trials Registry (ACTRN12612000382875). This involved developing a study proposal and justification,

CONTRIBUTION STATEMENT

completing all ethics forms, designing the program recruitment material and developing the information statements, consent forms and participant screening procedures.

STUDY MEASURES

In consultation with my supervisors and the investigator team, I selected all of the anthropometric and questionnaire-based assessments for this study. I developed the school environment and Health and Physical Education (PE) teachers' survey items.

SCHOOL AND STUDENT RECRUITMENT

As the project manager, I was responsible for contacting and recruiting schools to the study. This involved phone calls and face to face meetings. Schools were also requested to sign a Memorandum of Understanding. I was also responsible for presenting the program details at school staff and executive meetings to facilitate consent. I was responsible for the delivery and collection of student consent forms. In addition, I developed scripts and trialled Computer Assisted Telephone Interviewers (CATI) to contact parents to gain parental consent.

DATA COLLECTION, ENTRY, AND MANAGEMENT

I was responsible for planning and coordinating the comprehensive trial assessments for the 1200 students who were eligible and agreed to participate. This involved developing the training protocols and training a team of Research Assistants at three time points to: fit accelerometers and instruct students in their use; undertake anthropometric measures; assist students to complete online surveys and follow-up absent students. I was also responsible for developing data collection timetables and liaising with schools regarding timeframes for data collection. I managed a project officer assisting with aspects of the data management.

Data collection was undertaken over a two year period on three separate occasions. I attended and was involved in all data collection processes. This included responsibility for ensuring all equipment was in working order and charging, initialising and downloading accelerometers. I was also responsible for ensuring all the necessary data was collected and was responsible for managing the data once collected and ensuring all files were backed up.

PROGRAM IMPLEMENTATION

CONTRIBUTION STATEMENT

With support from my supervisors and the investigator team, I oversaw the implementation of the *PA4E1* intervention. I was responsible for managing the in-school physical activity consultant.

DATA CLEANING AND ANALYSIS

In correspondence with my supervisors, the methods of statistical analysis were decided upon and I led data cleaning and analysis process. I was also responsible for interpreting the results and presenting the data in either text, table or figure formats. Data were cleaned and analysed externally.

PRESENTATION OF STUDY RESULTS

During my candidature, the results of the research have been presented at eight international and five national conferences. In 2015, I was awarded a travel grant by the University of Newcastle Priority Research Centre for Health Behaviour for conference registration. I was also one of three students nominated for an international student award for best presentation at the International Society Behavioural Nutrition and Physical Activity conference in Edinburgh in 2015, where I presented the 12-month mid-intervention effects of the *PA4E1* trial on student physical activity levels.