STATEMENT OF ORIGINALITY

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university of other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. I give consent to the final version of my thesis being made available worldwide when deposited in the University’s Digital Repository, subject to the provisions of the Copyright Act 1968. I give consent to this copy of my thesis, when deposited in the University Library, being made available for loan and photocopying subject to the provisions of the Copyright Act 1968.
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.

Signed:

Name: Meghan Finch

Date: 13 December, 2016
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To my family for providing me with a secure and loving upbringing, the legacy of which allowed me to believe in myself and this PhD as a possibility. Dad, I began this journey with you, although you aren’t here to see me finish, you have been alongside me the whole way giving me courage to get through the hard times and the will to persevere. I can feel your pride now. Mum, thankyou for being a strong, capable and independent female role-model. You have been steadfast in your encouragement and belief in me through this endeavour. That has meant so very much to me. To my two beautiful girls, Mia and Lucia, you have grown so much in the time I have been working at this. Thankeyou for keeping me grounded, keeping me laughing, and keeping me sane (sort of). A special thankyou for being my little cheer-squad in these last few months and for organising my shoes in celebration of the publication of my 3rd chapter.

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Finally thanks to the many wonderful colleagues at population health who have contributed in so many ways to this achievement. In particular I would like to thank the childcare team. This project could not have taken place without the efforts of such a wonderful, highly committed group of people. I am so very lucky to be able to work with you all. I would also like to thank the amazing group of PhD students and graduates at population health who have been a continual source of support and inspiration over these years.
CONFLICT OF INTEREST STATEMENT

Meghan Finch reports no conflict of interest.
LIST OF PUBLICATIONS FROM THESIS CHAPTERS

This thesis is presented as a series of five papers. All of these papers have been published in peer reviewed journals.

Chapter 2


Chapter 3


Chapter 4A


Chapter 4B


Chapter 5

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I attest that Research Higher Degree candidate Meghan Finch contributed to the paper/publication entitled:

*Child physical activity levels and associations with modifiable characteristics in centre based child care*

in the following ways:

- Contributing to the development of the research question
- Contributing to the research design and study methodology
- Determining the measures to be used
- Developing data collection tools
- Conducting service recruitment
- Overseeing data collection and data entry
- Cleaning the data

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*Effectiveness of centre-based childcare interventions in increasing child physical activity: a systematic review and meta-analysis for policy makers and practitioners*

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- Screening abstracts and titles
- Assessing full text articles for eligibility
- Piloting the data extraction form
- Extracting data regarding study characteristics from all included studies
- Extracting data regarding risk of bias from all included studies
- Combining the extraction forms from the independent reviewers
- Contributing to data analysis and interpretation
- Leading the writing of the manuscript

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A cluster randomised trial to evaluate a physical activity intervention among 3-5 year old children attending long day care services: Study protocol

in the following ways:

- Contributing to the development of the research question
- Contributing to the research design and study methodology
- Determining the measures to be used
- Leading the writing of the manuscript

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CO-AUTHOR STATEMENT – CHAPTER 4B

I attest that Research Higher Degree candidate Meghan Finch contributed to the paper/publication entitled:

*A cluster randomized trial of a multi-level intervention, delivered by service staff, to increase physical activity of children attending center-based childcare*

in the following ways:

- Contributing to the research question and study methodology
- Determining the measures to be used
- Developing data collection tools
- Overseeing the development of intervention resources
- Overseeing the delivery of the intervention
- Conducting service recruitment
- Overseeing data collection and data entry
- Cleaning the data
- Leading the data analysis
- Leading the writing of the manuscript

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*Impact of a population based intervention to increase the adoption of multiple physical activity practices in centre based childcare services: a quasi-experimental, effectiveness study*

in the following ways:

- Contributing to the research, question, design and study methodology
- Overseeing the development of intervention resources
- Overseeing the delivery of the intervention
- Contributing to the development of data collection tools
- Overseeing data collection
- Cleaning the data
- Leading the data analysis
- Leading the writing of the manuscript

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<td>BMI</td>
<td>Body mass index</td>
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<tr>
<td>CATI</td>
<td>Computer assisted telephone interview</td>
</tr>
<tr>
<td>CI</td>
<td>Confidence interval</td>
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<tr>
<td>EPAO</td>
<td>Environment and policy assessment and observation</td>
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<tr>
<td>FMS</td>
<td>Fundamental movement skills</td>
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<td>ICC</td>
<td>intra class correlation</td>
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<td>MVPA</td>
<td>moderate-vigorous physical activity</td>
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<td>NSW</td>
<td>New South Wales</td>
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<td>PA</td>
<td>physical activity</td>
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<td>RCT</td>
<td>randomised controlled trial</td>
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<td>sd</td>
<td>standard deviation</td>
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<td>TDF</td>
<td>Theoretical Domains Framework</td>
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ABSTRACT

THESIS ABSTRACT

BACKGROUND AIMS, AND METHODS
Internationally and in Australia low levels of physical activity are associated with the most prevalent causes of mortality and morbidity. Further, adequate physical activity in early childhood is associated with a number of health benefits. Despite this, many preschool age children are not meeting physical activity guidelines. Evidence from experimental studies and descriptive research suggests that there is considerable potential to improve child physical activity levels through interventions delivered in childcare services. There is however a need for research to confirm this potential. Specifically there is a need to comprehensively examine the policies and practices in the childcare setting that are associated with child physical activity whilst in childcare, and to determine the effectiveness of pragmatic interventions in increasing child physical activity in childcare. To address these research needs, the first broad aim of the thesis was to identify effective interventions that can feasibly be delivered in the context and resources of routine childcare service delivery. This aim was addressed through the conduct of three studies:

1. A study to identify associations between childcare policies and practices and children’s physical activity behaviours in the Australian context.

A cross-sectional study was conducted with 328 children aged three to five years attending childcare services in the Hunter Region of New South Wales (NSW), Australia. The physical activity of children was assessed using pedometers and centre characteristics and staff attitudes and physical activity practices were assessed using surveys, interviews and an observational audit. The associations between children’s activity (step counts) in childcare and
centre characteristics and practices were tested using a linear regression model within a Generalized Estimating Equation (GEE) framework.

2. The conduct of a systematic review and meta-analysis examining the impact of childcare based physical activity interventions according to intervention and trial design characteristics including whether the trials were pragmatic (those most likely to approximate effects in real world settings) or non-pragmatic (those conducted under more tightly controlled research conditions).

The review involved a systematic search of the Cochrane Central Register of Controlled trials (CENTRAL), MEDLINE, EMBASE, PsycINFO, ERIC, CINAHL SCOPUS and SPORTDISCUS. Studies selected included randomized controlled trials conducted in centre-based childcare including an intervention to increase objectively measured physical activity in children aged less than six years. Data were converted into standardized mean difference and analysed using a random effects mode. A total of 17 trials were included in the review with 16 included in the meta-analysis.

3. A study to determine the impact on children’s physical activity levels of a pragmatic staff delivered physical activity intervention delivered in childcare.

This randomised controlled trial sought to assess the impact of a four-month intervention delivered by service staff on children’s physical activity. Participants in the trial were 459 children aged three to five years recruited through 20 childcare services in the Hunter region of NSW, Australia. Child physical activity was measured using pedometers at baseline and six months after baseline. Intervention implementation was assessed via observation of staff physical activity practices and audits of the service environment and policies.
ABSTRACT

In the context of limited or no knowledge regarding the effectiveness of interventions aiming to support routine implementation of evidence-based physical activity promoting policies and practices by childcare settings (reach), the second aim of the thesis was to assess the effectiveness of a population-based intervention in increasing the implementation of physical activity promoting policies and practices by childcare.

This aim was addressed through the conduct of a quasi-experimental trial evaluating the effectiveness of an intervention in increasing the implementation of physical activity promoting policies and practices in a population of childcare services. A three-month intervention was offered to all childcare services (n=338) located within the Hunter New England region of NSW, Australia. A random sample of childcare services in the remainder of the state of NSW served as the comparison group (n=164). The primary outcomes were childcare service manager reported implementation of targeted physical activity promoting policies and assessed by a telephone survey at baseline and follow-up occurring between six and 12 months after the initiation of the intervention.

RESULTS

In regard to the first aim, findings from the cross-sectional study assessing childcare physical activity practices and service environmental and organisational characteristics showed a number of significant associations between children’s activity and childcare policies and practices. The systematic review, found that childcare physical activity intervention effectiveness varied according to intervention and trial design characteristics and that there was evidence suggesting pragmatic trials may be ineffective. Further, in a pragmatic a cluster
ABSTRACT

randomised controlled trial, the thesis found no improvement in child physical activity following receipt of a pragmatic staff delivered physical activity intervention.

In regard to the second aim, the large quasi-experimental study conducted with 392 childcare services in New South Wales (NSW), Australia found significantly greater increases in the proportion of services implementing two of eight targeted physical activity practices relative to the comparison region. Specifically the services in the experimental group were more likely to implement a physical activity policy (including the policy referring to placing limits on small screen recreation) and have staff trained in physical activity.

CONCLUSION

This thesis provides new evidence to inform the both the future effectiveness of pragmatic physical activity interventions delivered in childcare and the routine implementation of evidence-based physical activity promoting policies and practices. Firstly, the findings indicate that there is a need for additional pragmatic trials evaluating interventions that may be effective in increasing children’s physical activity. Secondly, the findings suggest that additional evidence is required to improve the effectiveness of strategies aiming to improve implementation of evidence-based physical activity promoting policies and practices by childcare services.
PERSONAL CONTRIBUTION STATEMENT

I was the sole PhD student and project manager of these studies and was intricately involved in all aspects of the study conceptualisation, design, development, implementation, and evaluation. I was the contact person for childcare services and parents 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
- Program design and development
- Ethics approval and clinical trial registry
- Study measures
- Service and child recruitment
- Data management
- Program implementation
- Data cleaning and analysis
- Presentation of study results