



**Scheduling frequent opportunities for outdoor free-play –
a simple approach to increasing physical activity in childcare**

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Keywords

Child, childcare environment, play, preschool, scheduling

Abstract

To address the commonly reported barriers of reliance on educators' resources and skills, this thesis sought to investigate the potential of simple environmental interventions in increasing moderate to vigorous physical activity (MVPA) in childcare. Specifically, it aimed to:

Describe the implementation of current recommended practices and policies encouraging physical activity in Australian childcare services;

Assess the efficacy of modifying the scheduling of outdoor free-play periods on the MVPA of attending children aged 3 to 6 years;

Systematically review the factors affecting the implementation of environmental recommendations to increase children's activity in childcare; and

Provide recommendations for future research and practice arising from this thesis.

The initial cross-sectional study of 309 childcare services reported variable implementation of evidence based physical activity policies and practices but no implementation differences when examined by operational characteristics (service type, size, geographical locality and socioeconomic status). A cluster randomised controlled trial (cRCT) with 10 services (n= 316) found that a simple scheduling intervention, dividing one continuous outdoor free-play period into three periods, without a change in total duration from baseline, increased the child average daily MVPA in the intervention services compared to controls with an adjusted difference between groups of 5.21 minutes (95% CI 0.59-9.83, p=0.03). A second cRCT involving 6 services (n= 231) studied the effect of providing unrestricted access to outdoor areas when no structured programs were

taking place, did not significantly improve child MVPA. Analysis of trial outcomes in both RCTs utilised Generalised Linear Mixed Models; accounting for clustering and repeated measures. A systematic review via a theoretical framework identified that factors influencing the implementation of environmental physical activity recommendations largely belonged to environmental, resource and social domains. This thesis provides further support for the significant potential of ecological interventions in childcare settings for increasing attending children's MVPA. While broadly supportive, further research is required prior to significant government investment in the implementation of greater outdoor free-play opportunities in childcare. These opportunities are described in the thesis and include larger RCTs, with longer term follow-up to confirm the effectiveness of these interventions; formative evaluation to better understand barriers to facilitate the development of implementation strategies, and the conduct of trials of large-scale implementation approaches.

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List of Abbreviations

BMI	Body mass index
CATI	Computer assisted telephone interview
CI	Confidence interval
ECEC	Early childcare and education centres
EPAO	Environment and policy assessment and observation
FMS	Fundamental movement skills
HNELHD	Hunter New England Local Health District
ICC	intra class correlation
IOM	Institute of Medicine
MVPA	moderate-to-vigorous physical activity
NAP SACC	Nutrition and physical activity self-assessment of childcare
NASPE	National Association for Sport and Physical Education
NSW	New South Wales
PA	physical activity
RCT	randomised controlled trial
SED	sedentary
SEM	Social ecological model
Sd.	standard deviation
TDF	Theoretical Domains Framework
TPA	Total Physical Activity
US	United States
WHO	World Health Organization

Definitions

Term	Definition
Best practice	A method or technique that has generally been accepted as superior to any alternatives because it produces results that are superior to those achieved any other means or because it has become a standard way of doing things
Centre-based ECEC	Long day care and preschools
Early years	Typically, children aged 3 to 6 years old
Guidelines	An overall rule, principle or form of advice that offers guidance to proper actions and behaviour. Guidelines are not binding and are not enforced
Physical activity	Any bodily movement produced by skeletal muscle that results in energy expenditure above resting
Policy	A document or system that justifies a regulatory measure and/or action by a government or legislative body also known as a law, generally a mandatory principle
Recommendation	A suggestion for the most appropriate plan of action especially when promoted by an authority
Regulation	A rule or condition that guides behaviour or instruction that is legally binding

Statement of Originality

I hereby certify that the work embodied in the thesis is my own work, conducted under normal supervision. The thesis contains no material which has been accepted, or is being examined, for the award of any other degree or diploma in any university or 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. 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 and any approved embargo.

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Disclosure of Editing Services

This thesis was professionally edited by Dr Guenter Plum from Functionaledit.com. Specifically, he assisted in the formatting of this thesis, checking references, and fixing typographical errors. His services were completed in accordance with the ‘Guidelines for editing research theses’.

Thesis by Publication

I hereby certify that this thesis is in the form of a series of papers. I have included as part of the thesis a written declaration from each co-author, endorsed in writing by the Faculty Assistant Dean (Research Training), attesting to my contribution to any jointly authored papers.

By signing below, I confirm that **Lubna Abdul Razak** contributed

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This thesis includes three published, one accepted and one journal articles under review (Chapters 2 through 6). All authors and the journals where in each chapter is published are attributed in this thesis under the statement ‘Thesis by publication’ and at commencement of each related chapter. Such chapters were published under the following Creative Commons Licenses:

Chapter 2:

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Chapter 3:

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Chapter 4:

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Chapter 5:

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Chapter 6:

Revision to address minor comments; resubmitted to *Journal of Physical Activity and Health* on 18 June 2019.

Conflict of Interest Statement

Lubna Abdul Razak reports no conflict of interest.

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This PhD thesis is dedicated to my family and friends for their wonderful support and continuous prayers, of which I am profoundly indebted. To my husband, you are my rock and always will be. I am eternally grateful that due to immersing myself in the field of physical activity in young children, my own daughter who was five when I started is living proof of the benefits of outdoor free-play.

Presentations arising from this Thesis

The candidate presented results from this thesis at one international and one national conferences (2 oral and 2 posters). A co-author presented results arising from this thesis at one international conference (one oral presentation)

Conference Presentations – Oral Presentations

International

1. Impact of a free-play scheduling intervention on the physical activity of children aged 3-6 years attending childcare: a randomised controlled trial. ISBNPA 2018 Hong Kong 3-6 June 2018 (Presenter)
2. Factors affecting the implementation of environmental recommendations to encourage physical activity in centre-based childcare services: a systematic review. ISBNPA 2019 Prague 4-7 June 2019 (Co-author)

National

3. Factors that influence the implementation of physical activity recommendations in childcare services: systematic review. Global Evidence and Implementation Summit 2018 Melbourne 22-24 Oct 2018 (Presenter)

Conference Presentations – Poster Presentations

International

1. Childcare physical activity policies and practices in Australia. ISBNPA 2018 Hong Kong 3-6 June 2018 (Presenter)

2. Effect of a free-play scheduling intervention to increase physical activity during childcare: a randomised controlled trial. ISBNPA 2018 Hong Kong 3-6 June 2018
(Presenter)

Statement of Personal Contribution

I was involved in all aspects of the research undertaken as part of this thesis including ethical approval, recruitment, intervention development, implementation and evaluation of the primary trials reported in Chapters 3 -5. A summary of my contributions are as follows:

Study planning and preparation

I led the planning and preparation for all the research included in this thesis. This included undertaking literature reviews, developing resources for data collection and consultations with childcare services to assess the acceptability and feasibility of interventions. I also consulted with my Aboriginal and Torres Islander colleague to ensure the data collection tools were culturally appropriate. Under the guidance of an advisory group, I developed project timelines, milestones and key performance indicators and monitored progress against these. Under my primary supervisor's direction, agreement was rendered with Early Childhood Specialists to deliver the intervention with the cooperation of the room leaders and educators in participating childcare services according to study protocols.

Ethics approval and registering the trial

In collaboration with my supervisors, I assisted in drafting applications, variations and submitting ethics applications through the Human Research Ethics Committees of the Hunter New England Local Health District (reference 15/11/18/4.03) and the University of Newcastle (reference H-2016-0088). This involved the completion of all ethics forms, designing recruitment materials, developing information statements, and consent forms and data collection tools. I was also responsible for addressing committee feedback and

updating progress reports at set timeframes. I registered the trial with the Australian New Zealand Clinical Trials Registry (reference 12616000347460).

Study measures

In consultation with the project team, I developed and adapted the measures used for research within the thesis. This included adapting the NAP SACC questionnaires and use of other validated physical activity related questionnaires for the parent computer assisted telephone interviews (CATI), EPAO tool (physical activity environment component), iPad based cognitive function tests and the practices and policies interview questions for the nominated supervisors.

Recruitment and Data collection

Partnering with the project manager, I was responsible for the organisation of recruitment and data collection. I was responsible for developing training materials and data collection protocols. I also oversaw the training of CATI interviewers and took on problem solving responsibility real time. In addition, I developed the CATI scripts to contact parents to conduct the parental survey. I facilitated the data collection training for the research assistants and was physically present for the first days of recruitment and data collection. This involved training team of research assistants at three time points to: fit and remove accelerometers; follow-up missing information from the nominated supervisors' survey; conduct the EPAO; and facilitate the cognitive function assessments.

Data entry, cleaning and management

Entry, cleaning, merging and de-identifying all the data collected from the different sources and the development of a database for analysis in consultation with a

biostatistician was my responsibility. This involved ensuring all data collection devices were in working order and charged prior to deployment to services, and initialising and downloading data from the accelerometers. I was also responsible for the data management, adhering to privacy standards and ensuring all files were backed up accordingly.

Data analysis

I corresponded directly with Dr Kelli Cain from the Meterplus consultancy who were commissioned to clean the accelerometer raw files and the developer of the cognitive function apps to clarify datasets matters. I determined the methods of statistical analysis in consultation with a biostatistician. I ensured data de-identification to allow for blinded outcome assessment of primary and secondary outcomes. I was responsible for the interpretation of the results and presentation of the data with the guidance of my primary supervisor.

Systematic review

I was involved in all stages of the systematic review as described in Chapter 6. I was responsible for drafting and registering the study protocol with the International Prospective Register of Systematic Reviews (PROSPERO). The search strategy was initially developed upon consultation with a librarian who had previously been involved in other systematic reviews. Thereafter, the search strategy was further refined with assistance from my supervisors before the search was performed. Regular meetings were held between reviewers to ensure data screening, extraction and synthesis were reliable and consensus was achieved.

Dissemination of thesis findings

The results of the research within this thesis have been presented at one local and three international conferences. I was the corresponding author for journal submissions and this involved preparing the manuscript for submission, addressing reviewer comments under my supervisors' direction and managing the publication process.