2018

Evidence-based web-mediated professional learning program for Early Childhood Education and Care addressing physical activity and healthy eating behaviours of young children

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Evidence-based web-mediated professional learning program for Early Childhood Education and Care addressing physical activity and healthy eating behaviours of young children

This thesis is presented as part of the requirement for the conferral of the degree:

Doctor of Philosophy

from the

University of Wollongong

By

Michele Elizabeth Peden

Bachelor of Teaching (Early Childhood)

Master of Teaching (Early Childhood)

Graduate Diploma in Adult Education and Training

Early Start

Faculty of Social Sciences

November 2018

The research reported in this thesis was funded by Faculty of Social Science SEED grant.

Abstract

The Early Childhood Education and Care (ECEC) environment has been identified as an optimal environment for the promotion of healthy eating and physical activity. A number of factors influence healthy eating and physical activity in the ECEC environment, including the quality of the environment, and ongoing Professional Learning (PL) of ECEC educators. This project investigated the relationship between the quality of ECEC environment and children's physical activity and evaluated the efficacy of a blended PL program focusing on healthy eating and physical activity. A systematic review was conducted to investigate the impact of PL in physical activity interventions on childrens objectively measured physical activity. A cross sectional study investigated the relationship between the quality of the ECEC environment and physical activity and sedentary behaviours of toddlers and preschoolers (n=68). The Environmental and Policy Assessment and Observation (EPAO) was used to assess changes in physical activity (centre-level), plus accelerometry used to assess physical activity at child-level. The results identified that toddlers who attended supportive (high EPAO) services sat more (8.73min [-10.26,27.73]) and stood less (-13.64min [-29.27,2.00]) than those in less supportive (low EPAO) services. A stepped-wedge clustered randomised control trial involving 15 ECEC centres (314 children aged between 2-5 years) was implemented to evaluate the efficacy of a blended PL program. The intervention comprised of a day-long face-to-face PL session and 12-weeks of synchronous and asynchronous online PL. Assessments were conducted at baseline, 3-, 6- and 12-months. Changes in healthy eating behaviours and physical activity (centre-level) were assessed using the Environmental and Policy Assessment and Observation

(EPAO) and changes in child physical activity was assessed using accelerometry (child-level). Results of the blended PL program showed a significant difference in the total physical activity EPAO score, between the intervention and controls groups at the end of the intervention period (adjusted difference=5.33units, 95% CI [-0.30,10.37], p=0.04) and at the end of the maintenance period (adjusted difference=8.54units, 95% CI [1.61,15.48], p=0.02). A significant difference in percent of time spent in light-intensity physical activity was reported between the control and intervention groups at the end of the intervention period (adjusted difference=0.01, 95% CI [0.00,0.01], p=0.02] as well at the end of the maintenance period (adjusted difference= 0.01, 95% CI [0.00,0.02], p=0.04). A significant difference between the intervention group and the control group in the total EPAO score was reported at the end of the maintenance period (adjusted difference =14.63, 95% CI [1.33, 27.92], p=0.03). High retention rates were also reported (80% educators and 90% children). The blended PL program aligned with all three elements of Community of Practice (Domain, Community and Practice) however, one area that was noticeably missing related to individual educator participation.

This thesis addresses a number of significant gaps in current ECEC-related research and highlights the importance of the quality of the ECEC environment and the feasibility and efficacy of blended PL programs.

Statement of thesis style

This thesis has been prepared in journal article compilation style format, under the approval, guidance and support of my supervisors. Given the mixed methodology used in completing this thesis, this style was deemed to be an appropriate format. The outcomes of this work provide researchers with insightful information about ECEC factors that influence physical activity in ECEC environments and the efficacy of a blended PL program targeting early childhood educators, in the promotion of physical activity and healthy eating.

Publications constituting this thesis

Published

Chapter 2

Peden, M. E., Okely, A. D., Eady, M. J., & Jones, R. A. (2018). What is the impact of professional learning on physical activity interventions among preschool children? A systematic review. *Clinical Obesity*, *8*(4), 285-299. https://doi.org/10.1111/cob.12253

Appendix B

Chapter 4

Peden, M. E., Jones, R., Costa, S., Ellis, Y., & Okely, A. D. (2017). Relationship between children's physical activity, sedentary behavior, and childcare environments: A cross sectional study. *Preventive Medicine Reports*, *6*, 171-176. doi.org/10.1016/j.pmedr.2017.02.017

Appendix C

Submitted for publication

Chapter 5

Peden, ME., Okely, AD., Eady, MJ., Jones, RA Healthy online professional program for early learners (HOPPEL): Creating an online community of practice for early childhood educators. *Professional Development in Education* (under review).

Chapter 6

Peden, ME., Eady, MJ., Okely, AD., Patterson, K., Batterham, M., Jones, RA A web-mediated intervention for educators in early childhood education and care settings targeting physical activity and healthy eating behaviours in young children: A cluster randomised stepped-wedge design. *American Journal of Preventive Medicine* (under review).

Conference presentations in support of this thesis

Peden, M. E., Jones, R., Costa, S., Ellis, Y., & Okely, A. D. (2015). The relationship between physical activity levels, childcare environments and children's sedentary behaviours: A cross sectional study. *Early Start Conference,* University of Wollongong, Australia (Oral presentation).

Peden, M. E., Jones, R., Costa, S., Ellis, Y., & Okely, A. D. (2016). The relationship between physical activity levels, childcare environments and children's sedentary behaviours: A cross sectional study. *International Society of Behavioural Nutrition and Physical Activity (ISBNPA)*- South Africa, Cape Town (Oral presentation).

Peden, M. (2016). Evaluation of an evidence-based interactive technology-based professional learning package for the early childhood sector, The NSW IER student Research conference, Macquarie University, Sydney (Oral presentation).

Peden, M. E., Okely, A.D., Eady, M., & Jones, R. A (2017). Healthy Online Professional Program for Early Learners (HOPPEL): Creating an online community of practice for early childhood educators. *International Society for the Scholarship of Teaching and Learning (ISSOTL)*, Calgary, Alberta, Canada (Oral presentation).

Peden, M. E., Okely, A.D., Eady, M., & Jones, R. A. (2017). HOPPEL: Creating an online community of practice for early childhood educators. *Early Start Conference,* University of Wollongong, Australia (Oral presentation).

Peden, M., Eady, M., Okely, A.D, Patterson, K., Batterham, M. & Jones, R. A. (2018). A web-mediated intervention targeting physical activity and healthy eating behaviours for educators in early childhood education and care settings: Using a cluster randomised stepped wedge design. *International Society of Behavioral Nutrition and Physical Activity (ISBNPA)*- Hong Kong (Oral presentation).

Acknowledgements

"You have brains in your head, you have feet in your shoes, you can steer yourself any direction you choose".

Dr. Seuss

As I complete this dissertation, I begin to reflect about how incredibly fortunate I am too have had so much support and encouragement from those around me during the past few years. I am unbelievably grateful to a number of people who have given me the courage needed to tackle such a journey, as I worked towards my dream of attaining my doctoral degree.

First and foremost, I would like to thank my husband, Craig Peden, for his unwavering support, encouragement and unconditional love as we collectively made the decision to pursue my dream of further study. Your patience and willingness to sacrifice our time together when I needed to place study first, was never unnoticed and very much appreciated. I thank you from the bottom of my heart for inspiring me to take a risk in this stage of my professional life, as I leapt into uncharted waters and worked through the ups and the downs of a PhD. I could have not sustained and completed this difficult journey without your emotional support, tireless love and most of all your ability to believe in my abilities. To Thomas and Daniel, my beautiful sons, who have over the past few years, patiently watched their mother dedicate every spare hour and evening towards the pursuit of a goal. As you both grow into kind, caring, young men, I want you to know that you were both instrumental in motivating me to overcome the

numerous obstacles I faced during the course of this journey, to seek solutions in order to move forward and to 'just keep swimming' when times were tough. I understand at times you questioned why I began this journey, but hopefully now you both understand my motivation. To my parents, Phil and Cheryl for your continual encouragement and support (personally and for the family) and raising me to be a resilient learner and to believe in my abilities. To my mother-in law and father-in law, Liz and Barry, I am very grateful for your constant support and help. You all supported the family, looked after my boys, and nurtured them in times of need. I am also grateful to my brother, Peter, sister-in law Lauren and nephews, Jaxon and Pheonix, for your support.

Others, who have been instrumental in assisting me complete my goal are my friends and colleagues at Early Start, University of Wollongong (Penny, Tamara, Limin, Julie, Sanne, Yvonne, Jade, Amy, Rebecca, Fay, Karen, Rachel, Lyndal, Sara, and Erin). Your wisdom, support and advise on how to survive this rollercoaster ride was an essential reminder of why I started this journey and wanted to finish it. I would like to particularly thank Megan for your friendship, assistance, encouragement and continual support (especially aiding in data collection in Tasmania at short notice). Also, Jenny for your wisdom, kindness, support and friendship and sharing many laughs during our African adventure. I also want to express my appreciation to all my dearest friends who have shown me support and a great amount of patience during the past few years. In particular, to my dearest friend Tracy S (and your beautiful family), your honesty, positivity, encouragement and patience throughout the entire journey has been instrumental in emotionally supporting me over the finish line (and the many cups of hot chocolate and cake we shared).

I would like to express my sincere thanks to my supervisors, for whom I'm deeply indebted to for making my dream become a reality. To Senior Professor Tony Okely, your wisdom, experience, and advice during this time guided me through the many stages of completing a dissertation. You provided invaluable assistance in the form of written and verbal feedback on my drafts and provided insightful perspectives during our meetings. The support of a senior researcher cannot be overstated, and I am very grateful for your time and support. To Dr. Rachel Jones, you're the inspiration behind my journey, as you initially encouraged and reassured me that I had what was necessary to undertake this journey after being my main lecturer throughout my Masters. Your continual encouragement as an advisor, cheerleader, constructive feedback and the person who gently and kindly pushed me more than any others to forge ahead and finish this journey. Furthermore, your humour, wit, friendship, endless emotional support and patience in dealing with the complexities of completing this journey would not have been possible without your genuine caring assistance. To Dr. Michelle Eady, your dedication, drive and sense of determination were inspirational to me as you acted as my mentor, colleague and friend. Your personal insights into your experiences and perspective was always valuable, helpful and kept me on track when completing my tasks (especially around qualitative research). Your continual emotional support, IT support and your written and advice for improvement was instrumental in assisting and guiding me through this journey. I would also like to thank Associate Professor Marijka Batterham for her statistical support and Dr. Kira Patterson for assisting in data collection in Tasmania.

Finally, a special thanks to Lady Gowrie Tasmania. I am very grateful for the opportunity of working with such a passionate, inspiring and motivational group of educators who were supportive of this research. Furthermore, I would like to thank and acknowledge all the families and children who agreed to participate in this project.

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List of Abbreviations

CoP	Community of Practice
ECEC	Early childhood education and care
ECE	Early childhood educator
EPAO	Environment and Policy Assessment and Observation
EYLF	Early Years Learning Framework
HE	Healthy eating
HOPPEL	Healthy Online Professional Program for Early Learners
IOM	Institute of Medicine
LPA	Light-intensity physical activity
MPA	Moderate-intensity physical activity
MVPA	Moderate- to vigorous-intensity physical activity
NQS	National Quality Framework
OSRAC-P	Observational System for Recording Physical Activity in Children-Preschool
PA	Physical activity
PL	Professional learning

SD	Standard deviation
TMPL	Technology-mediated professional learning
TPA	Total physical activity
VCop	Virtual Community of Practice
VPA	Vigorous-intensity physical activity

Chapter 1

General Introduction

1.1 Background to the study

The Early Childhood Education and Care (ECEC) environment has been identified as an important setting for the promotion of healthy eating and physical activity. Within an Australian context, an ECEC service includes a range of formal care and education services that caters for the educational and care needs of children under school age (birth-5 years). ECEC services are important settings as they provide early education to children, by maximising their learning and development with an emphasis on play-based learning (ACECQA) (2017). In Australia, service times vary, however, long day care services (catering for Birth-5 years) operate generally from 6.00am to 6.00pm, and preschools (catering for 2-5years) generally operate from 8.00am-4.00pm. Daily routines are service specific and educators generally have a mix of qualifications, which are depe on the size of the service. Educational curriculums are underpinned by a play-based philiolosphy, allowing children to freely tranistion between indoor and outdoor environments throughout the day. A number of factors influence the healthy eating behaviours and physical activity patterns of children in these settings. While some of these potential factors have been extensively studied, others have been given less attention and require further investigation. Two areas that fall into this category are the quality of the ECEC environment, and the ongoing learning of ECEC educators through professional learning (PL) opportunities.

High-quality ECEC environments have shown short- and long-term health and behavioural benefits for children. However, to date, minimal studies have investigated the relationship between the quality of the ECEC environment and physical activity of

children. Furthermore, few studies have investigated this relationship in both toddlers and preschool-aged children (Peden, Jones, Costa, Ellis, & Okely, 2017). Thus, there is a gap in the literature where further research is needed.

The PL of educators significantly influences the learning experiences of children in ECEC settings. Educators typically perceive children to be relatively healthy eaters and adequately active (Pate, McIver, Dowda, Brown, & Addy, 2008), however, recent data suggests that children whilst attending ECECs do not particate in adequate levels of physical activity and excessive amounts of sedentary behavior (Pereira, Clifff, Sousa-Sa, Zhang, Santos, 2019). Furthermore, the role of the educator in relation to healthy eating and physical activity are typically as a supervisory capacity rather than a facilitator (Dyment & Coleman, 2012). An educator's role is vital within an ECEC environment and their main role is to facilitate childrens learning through 'scaffolding', whereby educators can promote increased levels of competence in children if learning occurs in collaboration with others (Hewett, 2001). High-quality PL programs are needed to re-educate and update educators about the importance of healthy eating and active living and teach them how to implement meaningful high-quality learning experiences in their centres. In recent years, there has been an increase in the number of ECEC-based interventions in this area (Finch, Jones, Yoong, Wiggers, & Wolfenden, 2016; Mehtala, Saakslahti, Inkinen, & Poskiparta, 2014; Temple & Robinson, 2014; Ward, Bélanger, Donovan, & Carrier, 2015). Many of these interventions have included a PL component for educators (Adams, Zask, & Dietrich, 2009; Hodges, Smith, Tidwell, & Berry, 2013), however, there is a lack of empirical evidence around what constitutes effective ongoing PL programs for educators in the area of healthy eating

and physical activity. There is a need for ongoing PL that meets the needs of educators and underpinned by sound theoretical frameworks. A gap remains in the current literature to what is the most effective mode of PL with no studies to date investigating the efficacy of blended (i.e., a combination of face-to-face and online) PL models that target physical activity and healthy eating behaviours of children in ECEC settings.

1.2 Aim

The aim of this study was first to investigate the quality of ECEC environments in relation to children's physical activity and second to evaluate the efficacy of a blended PL program focusing on healthy eating and physical activity. This study aimed to address gaps in the literature regarding the promotion of healthy eating and physical activity in ECEC settings.

This thesis is divided into seven chapters (**Figure 1.1**). In **Chapter 1,** an introduction to this doctoral thesis is provided. **Chapter 2** provides a comprehensive review of literature, outlining the benefits of healthy eating behaviours and physical activity in early childhood, and the role of ECEC in promoting such behaviours. The critical role of the educator is highlighted, and impact of high-quality innovative PL is discussed. **Chapter 3** describes the overall methodology of this doctoral study. The research design, research instruments, process evaluation methods, PL design and content, data collection and analysis procedures are detailed. **Chapter 4** reports a cross-sectional study, which investigated the relationship between children's physical activity/sedentary behaviour and quality of the ECEC environment. This chapter highlights that the quality of the ECEC environment results in different physical activity levels for toddlers and

preschoolers. The results emphasise the importance of high quality ECEC environments in relation to physical activity and that these high quality ECEC environments can be fostered by educators participating in PL opportunities. **Chapter 5** describes the results of a blended PL intervention for ECEC educators targeting healthy eating behaviours and physical activity. Significant changes in centre- and child-level outcomes are reported. **Chapter 6** discusses how the blended PL program, assessed in **Chapter 5**, aligns with the Community of Practice (CoP) framework (Christ & Wang 2015; Lave &Wenger 1991). This study contributes to addressing the gap in literature around the promotion of healthy eating and physical activity within ECEC settings and the need for alternative successful PL models. In the final chapter, **Chapter 7**, a detailed discussion of the overall doctoral thesis findings is outlined, inclusive of limitations, conclusions and recommendations.

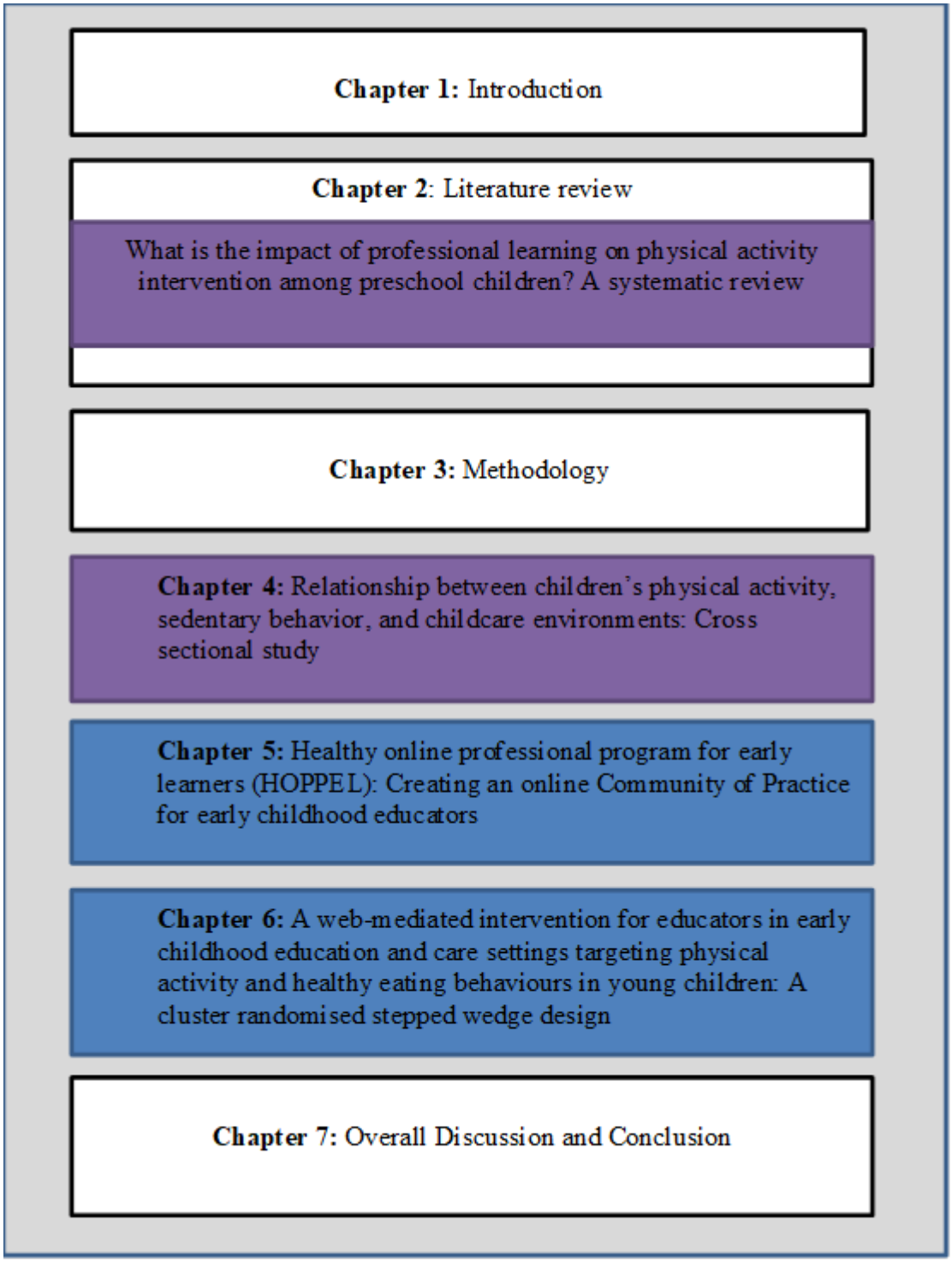

Figure 1.1: An overview of the thesis Purple indicating a peer-reviewed published article, blue indicating manuscripts that have been submitted to peer review journals and are currently under review

1.3 Research questions

The research questions for this thesis were:

1. What is the relationship between quality of the ECEC setting and physical activity?

2. How effective is a healthy eating and physical activity blended PL intervention, on child and centre outcomes?

3. Can the Community of Practice (CoP) framework successfully underpin a blended PL intervention?

1.4 The significance of the study

Promoting healthy eating and physical activity is critical from a young age, as healthy eating and adequate physical activity are important for optimal physical, cognitive, social and emotional development (Daniel, 2016; Liu & Raine, 2017; McNeill, Howard, Vella, Santos, & Cliff, 2018; Vazou, Mantis, Luze, & Krogh, 2017; Veldman, et al., 2018). The ECEC environment has a critical part to play in the promotion of these behaviours (Bower et al., 2008; Ward et al., 2008; Vanderloo et al., 2014). This research highlights the importance of the ECEC environment, specifically the quality of the environment and the role of educators. PL is key in up-skilling educators in strategies for promoting healthy eating and physical activity within ECEC settings, however to-date there are limited opportunities for educators to participate in state-of-the-art PL in this area (Peden, Okely, Eady, & Jones, 2018). Furthermore, innovative and unique methods of PL delivery that align with educators demands for flexible learning

opportunities are desirable (Sheridan, Edwards, Marvin, & Knoche, 2009). The first study in this thesis investigated the relationship between the quality of the ECEC environment and the physical activity of toddlers and preschool children. There is little research that has investigated this relationship in both toddlers and preschool children. This thesis also presents the first investigation of the efficacy of a blended PL program focusing on healthy eating and physical activity in the ECEC environment. Significant changes were reported at the end of the 12-week intervention period and were maintained at the end of the maintenance period. The research in this thesis addressed a number of the gaps in the literature and further strengthens the evidence that suggests that the ECEC sector is critical in the promotion of healthy eating and physical activity.

1.5 Importance of high quality ECEC

A growing body of evidence exists around the importance of high quality ECEC experiences and the associated developmental benefits for children in these settings (Melhuish et al., 2016; Sylva et al., 2014). The longitudinal study, "The Effective Pre-school, Primary and Secondary Education (EPPSE) project" completed by Sylva et al in 2014, reported strong correlations between the quality of ECEC centres and children's socio-behavioural and cognitive outcomes. The Longitudinal Study of Australian Children (LSAC, 2013) reported that children who experienced quality relationships with peers and educators within a high quality ECEC centres, had higher levels of self-regulation and concentration levels within the first few years of primary school (Gialamas et al., 2014 as cited in Siraj et al., 2017). The Fostering Effective Early Learning (FEEL) study (2018) recently published findings that suggest there are

positive relationships between the quality of ECEC environments and children's language development and numerical understanding (Siraj et al., 2017). However, the quality of the ECEC environment in relation to healthy eating behaviours and physical activity is an area that remains understudied.

1.6 Healthy eating and physical activity in ECEC settings

The proportion of children attending ECEC settings has increased in recent years (OECD, 2013). In Australia, 71% of toddlers (18 months-3 years of age) and 83% of pre-schoolers (3-5 years of age) now attend formal childcare each week (Australian Bureau of Statistics, 2014). Given the high attendance rates of children in formal childcare contexts, these settings are ideal environments to promote healthy eating and physical activity (Story, Kaphingst, & French, 2006). Furthermore, within the National Quality Standards, Australia, the inclusion of healthy eating and physical activity in an ECEC services pedagogical practice is a mandatory requirement (ACECQA, 2018). The National Academies of Medicine (2015) suggest that ECECs should provide opportunities for light, moderate and vigorous physical activity for at least 15 minutes per hour while children are in care, and limit sitting to no more than 30 minutes at a time (Burns, Parker, & Birch, 2011). Similarly, they recommend that ECEC settings provide a variety of healthy foods and 'age-appropriate-sized' portions that encourage the consumption of safe drinking water and a healthy diet for children (Burns et al., 2011). Despite these recommendations, a significant proportion of young children currently do not adhere to these guidelines (Ball, Benjamin, & Ward, 2008; Sambell, Devine, & Lo, 2014; Pate et al., 2015). In Australia, children attending an ECEC setting

spend more than 50% of their time sedentary (Ellis et al., 2017). Additionally, children's intake of discretionary foods and drinks contribute to 30% of the energy intake of 2-3-year olds, exceeding Australian guidelines for this age group of less than 20% of energy from discretionary foods (AGNHMRC, 2013). Preschool lunch box audits revealed that 60% of lunches contained more than one serving of high fat, salt or sugar foods or drinks (Kelly, Hardy, Howlett, King, & Farrell, 2010). Given the importance of healthy eating and physical activity, these findings demonstrate the need to investigate methods that promote healthy eating behaviours and physical activity within ECEC environments.

1.7 Healthy eating and physical activity interventions in ECEC settings

There has been an increase in ECEC-based interventions to address the poor healthy eating and suboptimal levels of physical activity levels in ECECs (Hesketh & Campbell, 2010; Ling, Robbins, Wen, & Peng, 2015; Mikkelsen, Husby, Skov, & Perez-Cueto, 2014; Tucker, 2008). A 2014 systematic review reported the outcomes of 26 healthy eating interventions among 3-6-year olds (Mikkelsen et al., 2014). These interventions were applied to a variety of settings with 13 interventions being conducted in preschools and 10 intervention studies in kindergartens. The majority of studies targeted excess nutrient intake, children's willingness to try new foods and food preferences. In this review, six of the multi-component interventions reported a significant increase in fruit and vegetable intake (Mikkelsen et al., 2014). There were six studies that included a PL component for ECEC educators. A 2010 systematic

review reported interventions that promote physical activity and healthy eating in 0- to 5-year-olds (Hesketh & Campbell, 2010). Of the 23 interventions included, nine were based in ECEC settings. Six of the nine ECEC-based studies showed positive changes in some or all of the outcomes measured. Interventions that targeted educators and parents as agents of change were more likely to elicit positive and lasting changes in childhood behaviours (Hesketh & Campbell, 2010). These findings are consistent with a more recent systematic review that examined 20 physical activity interventions in children aged 2-5 years (Ling et al., 2015). In this review, 18 studies were based in ECEC settings, of which eight showed positive outcomes. Structured physical activity sessions and targeting parents and educators were highlighted as components that maybe important for intervention success (Ling et al., 2015). Furthermore, educators acting as 'interventionists' was suggested to be an important contributor in delivering centre-based healthy eating and physical activity programs. All systematic reviews support the need for high methodological and effective ECEC-based interventions. The specific intervention components that may contribute to the success of ECEC-based interventions remains largely unknown. Several components, inclusive of PL opportunities for educators, have been suggested to be important (De Marco, Zeisel, & Odom, 2015).

1.8 Professional learning in ECEC settings

Professional Learning (PL) is highly encouraged in the ECEC sector as a precursor for change (Campbell & McNamara, 2010; Melhuish, 2016; Siraj et al., 2017). It has been a key part of ECEC educator development for a number of years and has been shown to

result in higher quality educational programs (Burchinal, Cryer, Clifford, & Howes, 2002; Weber-Mayrer, Piasta, & Pelatti, 2015).

Within the Australian ECEC context, the importance of continual PL is highlighted in Quality 7 of the National Quality Standards within the National Quality Framework (ACECQA, 2018). Quality Area 7 suggests that educators must update and maintain their knowledge in a range of PL areas (ACECQA, 2018). Quality Area 7 outlines the responsibilities of effective leadership in promoting and building a positive culture within a learning community to bring about change in practices (ACECQA, 2018). However, educators' 'just' participating in PL is not enough to bring about change in practices: ongoing support is required to scaffold educators learning as they increase self-confidence and implement changes into their everyday practices (Carter & Fewster, 2013). A PL model that supports a 'whole team' approach, and one that has a strong emphasis on centre-based leadership and collaboration with academic experts would be beneficial. ECEC educators need to be challenged through PL to avoid complacency and need to seek PL opportunities that adhere to their individual needs, interests and abilities (Desimone, 2009; Hadley, Waniganayake, & Shepard, 2015; McCormack, Gore, & Thomas, 2004).

Traditionally, ECEC PL has comprised one-off face-to-face workshops, which are usually facilitated off-site and involve one, or perhaps two, educators from a centre attending and participating e.g., *Munch and Move* (Hardy, King, Kelly, Farrell, Howlett, & 2010) and 'Tooty Fruity Vegie' (Adams, 2009; Androutsos et al., 2014; Zask, Adams, Brooks, & Hughes, 2012) Although, this model of PL has been widely used in

ECEC, it is associated with a number of significant pitfalls. First, this type of PL model utilizes a top down approach and on completion of the workshop, the attending educator/s are expected to transfer the 'new' information to other educators in their service, which generally results in limited transfer of knowledge (Yoong et al., 2015). Second, this type of PL typically provides generalised knowledge to groups of educators (i.e., one size fits all) rather than contextualised specific knowledge (Olofsson, 2010; Marklund, 2015; Nitecki, 2014). Third, the one-off workshops generally incorporate minimal or no follow-up thereby transference of educator's knowledge into their ECEC service is largely unknown (Karagiorgi, Kalogirou, Valentina, Theophanous, & Kendeou, 2008; Brown & Inglis, 2013). Costs associated with attending one-day workshops are generally high and ECEC services are required to replace the educators who attend the PL to ensure that educators to children ratios align with national specifications. Finally, the reach of these face-to-face workshops is generally limited with few PL workshops facilitated in rural and remote settings (where perhaps the need for PL is the greatest) (Broadley, 2012).

In more recent years, face-to-face PL has been challenged within the ECEC sector. Early childhood educators are now seeking PL that:

1. is conducted by qualified highly effective facilitators (Byington & Tannoock, 2011);

2. is contextually relevant and content specific (Buysse, Winton, & Roth, 2009);

3. offers an opportunity to reflect on practices (i.e., reflective learning) (Moon, 1999);

4. offers ongoing support, guidance and mentoring (from other educators or professionals) (Nuttall, 2013; Pianta, 2006);

5. incorporates active learning strategies for all educators (Snyder et al., 2012);

6. provides a place for ongoing professional conversation and discussion of new ideas (Fukkink & Lont, 2007; Patton & Parker, 2015); and

7. provides an opportunity to be part of a professional community (Wood & Bennett, 2000).

To address the current limitations associated with traditional ECEC PL models and to address the 'wants' of educators, an alternate PL is needed.

1.9 Blended PL

It is feasible to suggest that a blended PL might be a positive alternative. A blended PL model incorporates a face-to-face component and an online component within a flexible platform (Boelens, De Wever, & Voet, 2017). Blended PL has the potential to overcome many of the limitations associated with current models. The face-to-face component allows educators to build rapport with other educators, as well as with the facilitator, and the online component provides an opportunity for ongoing learning and support. Ongoing learning and support have been shown to be far superior to one off PL and has much more of an impact on increasing educator's knowledge and skills in pedagogical practices, and thus impacting on changes in everyday practice and child outcomes

(Weigel, Weiser, Bales, & Moyses, 2012; Fishman et al., 2013; Downer, Kraft-Sayre, & Pianta, 2009).

While only one blended PL program within the ECEC sector has been evaluated (Kyzar et al., 2014), a number of studies from the primary-school sector have reported the feasibility and acceptability of such a PL model. A 2015 meta-analysis involving 20 studies, suggested that teachers consistently felt empowered and engaged in individual and peer reflective practices as a result of the online professional discussions (Surrette & Johnson, 2015). In these studies, 95% of participating teachers' online contributions were of high quality and related closely to specific content (Surrette & Johnson, 2015). Another study from Australia indicated that teachers participating in blended PL were able to effectively collaborate with other teachers from various communities across different social and cultural contexts (including mentoring, coaching) in order to build new skills and identify practical teaching strategies that could be contextualised to their students' needs (Broadley, 2012). Furthermore, teachers felt less isolated as they connected with other professionals via an online professional community that promoted social and professional cohesiveness using videos, images, sharing current pedagogical content, and critical resources to support everyday practice (Herrington & Herrington, 2001; Sisco, Woodcock, & Eady, 2015). Blended PL has been reported as a sustainable, achievable model, as it overcomes demands on time, effort, cost and staff related issues (Broadley et al., 2010; Brown & Green, 2003; Dede, Ketelhut, Whitehouse, Bet, & McCloskey, 2009). Therefore, given the success of blended PL in the primary-school sector, it is feasible to suggest that this would be an appropriate method for the ECEC

sector as well. Thus, this thesis evaluated the first blended PL program for the ECEC sector, targeting healthy eating and physical activity in young children.

1.10 Blended PL in the area of healthy eating and physical activity

PL for educators in the area of healthy eating and physical activity is urgently needed because few opportunities are available for educators to participate in PL in this area. In the Australian context, an audit of more than 200 ECEC centres across New South Wales, Australia, showed that 30% of educators had not received any PL in the area of healthy eating in the past year. Another study indicated that 40% (11/27) of educators surveyed had either never participated in PL related to physical activity or had not done so in the past year (data unpublished). Given the direct relationship between healthy eating and physical activity and holistic child development (inclusive of cognitive, social, emotional and physical development) regular PL in this area is needed.

1.11 Summary

This chapter provided background information and a rationale for the research. The overall objectives, research questions and its significance were outlined. A brief overview of the current literature highlighting the importance of promoting healthy eating and physical activity in ECEC settings and the role of the educator was discussed. The current status of PL within the sector was discussed and the need for an alternate delivery model was highlighted. An evaluation of a blended PL program

focusing on healthy eating and physical activity was justified. The next chapter will present the systematic review and supplementary literature review that guided the current thesis.

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Chapter 2

Literature Review

Part of this chapter has been published:

Peden, M. E., Okely, A. D., Eady, M. J., & Jones, R. A. (2018). What is the impact of professional learning on physical activity interventions among preschool children? A systematic review. *Clinical Obesity*. 8(4), 285-299, https://doi.org/10.1111/cob.12253

2.1 Preface

This chapter highlights the importance of establishing healthy eating behaviours and physical activity patterns in early childhood and the role that early childhood education and care (ECEC) settings have in the promotion of these behaviours. The factors associated with healthy eating behaviours and physical activity in ECEC environments will be discussed as well as the role of educators as agents of change, pertaining to the promotion of healthy eating behaviours and physical activity. Educators can be effective agents of change when they are provided with appropriate and adequate professional learning (PL) opportunities. The chapter identifies ECEC-based healthy eating and/or physical activity interventions which have included a PL component. Limitations with these studies are examined. The final section of this chapter reviews the literature on current PL models for the ECEC sector and highlights the need for more innovative models of PL within the sector specifically for healthy eating and physical activity ECEC-based interventions. The chapter concludes with the identification of three key gaps in the current literature, all of which will be addressed in the thesis.

2.2 The early years and ECEC settings are important in developing healthy eating and physical activity behaviours

The development of healthy eating habits and positive physical activity patterns within the early years (0-5 years) is critical in establishing a healthy lifelong lifestyle (Goldfield, Harvey, Grattan, & Adamo, 2012; Matwiejczyk, Mehta, Scott, Tonkin, & Coveney, 2018; Story, Kaphingst, Robinson-O'Brien, & Glanz, 2008; Ward, Vaughn,

McWilliams, & Hales, 2010). Healthy eating habits and positive physical activity patterns established in the early years results in more favourable weight status, better cardiorespiratory and metabolic health, increased self-esteem, cognitive and developmental functions, and the prevention of chronic diseases (Timmons et al., 2012). These associations have been clearly highlighted in systematic reviews (Bell, & Golley, 2015; Mikkelsen, Husby, Skov, & Perez-Cueto, 2014). A 2012 systematic review (n=22) examined the relationships between physical activity and positive health indicators (adiposity, bone and skeletal health, motor skill development, and psychosocial, cognitive and cardiometabolic health) of young children (0-4 years) (Timmons et al., 2012). The results showed positive relationships between higher levels of physical activity and a range of health indicators in infants (adiposity, motor and cognitive development), toddlers (bone and skeletal health) and preschoolers (adiposity, motor skill development, and psychosocial and cardiometabolic health) (Timmons et al., 2012). A recent 2017 systematic review (n=96) examined associations between objectively and subjectively measured physical activity and health indicators within the early years (0-4 years), inclusive of all study designs. In this review more than half (>60%) of the studies reported positive correlations with higher intensity physical activity (moderate- to vigorous-intensity and vigorous-intensity) and improved psychosocial and cardiometabolic health and improved motor and cognitive development (Carson et al., 2017).

The formation of positive physical activity and healthy eating behaviours can track from early childhood to childhood and then to adolescence and adulthood, thus establishing optimal behaviours at a young age is critical (EDEN Mother et al., 2015; Jones,

Hinkley, Okely, & Salmon, 2013; Lipksy et al., 2015; Wall, Thompson, & Robinson, 2013). Despite the benefits of establishing optimal physical activity and healthy eating behaviours, current research indicates that young children have suboptimal dietary patterns (Spence, Campbell, Lioret, & McNaughton, 2018) and spend a large proportion of their time in sedentary behaviours (particularly during ECEC hours) (Berg, 2015; De Craemer et al., 2016; Ellis et al., 2017; Truelove et al., 2018; Tucker, Vanderloo, Burke, Irwin, & Johnson, 2015; Vanderloo & Tucker 2018).

Given the global increase in children attending ECEC settings in recent years (Corcoran & Steinley 2017; OECD, 2014) and the increase of hours children spend in ECEC settings, ECEC settings are an ideal environment to promote positive healthy eating and physical activity behaviours (Bower et al., 2008). In Australia, children spend between 20 and 45 hours per week in such settings (average 28.4 hours per week) (ABS, 2012; DET, 2016). Furthermore, preschool children consume nearly 70% of their dietary intake in these settings (Mikkelsen, 2011) and the ECEC environment is often a child's first exposure to different eating behavioural norms outside their family home environment (De Bock, Breitenstein, & Fischer, 2012). The ECEC setting also has the capacity to offer meaningful physical activity learning experiences (Jones, Gowers, Stanley, & Okely, 2017). ECEC environments and associated programs directly influence children's development (Ward et al., 2009), therefore, high quality educational experiences, inclusive of physical activity and healthy eating are critical (Ward et al., 2010).

In support of promoting such behaviours in ECEC settings, The National Academies of Medicine (*www.nationalacademies.org/HMD*) recommend ECEC settings provide opportunities for children to extend their food preferences, promote the importance of water consumption and promote relaxed, social and positive meal occasions (Burns, Parker, & Birch, 2011). The recommendations also encourage educators to consume the same food as the children and engage with children during meal occasions. Furthermore, the HMD suggest that children aged 0-5 years should be active for at least 15 minutes for every hour that they attend an ECEC setting and children should not be sedentary for any more than 30 minutes at a time whilst attending ECEC settings. The importance of promoting healthy eating and physical activity within ECEC settings is further supported by national and international ECEC curriculums (DEEWR, 2009; Department of Education, 2012; National Council for Curriculum and Assessment (NCCA), 2009). In Australia, the revised National Quality Standards (NQS) (ACECQA, 2017) outlines requirements for a healthy lifestyle, inclusive of healthy eating and physical activity. For example, Quality Area 2: "Children's health and safety", element 2.1.3 "Healthy Lifestyle- healthy eating and physical activity are promoted and appropriate for each child" requires educators to provide evidence (either through assessor observations, discussions or sighting documentation) pertaining to healthy eating and physical activity (ACECQA, 2017). When specifically examining the requirements around healthy eating behaviours, educators are required to engage children in experiences that promote relaxed and sociable meal times that aim to enhance children's understanding of healthy food and nutrition. In addition, educators need to consult children about their meal times and food preferences and monitor their

cues of children being ‘full’. Children’s special dietary requirements and individual requirements for food (culturally appropriate preferences) need to be accounted for. Centres are assessed against the quality of their nutritional policies (inclusive of food, beverages and dietary requirements) and program planning that promotes healthy eating and knowledge of healthy eating behaviours (inclusive of cooking experiences) (ACECQA, 2017). The physical activity component of Element 2.1.3 as stated above acknowledges educators need to enthusiastically implement, role model, and frequently engage in physical activity experiences with children. Educators need to encourage and support children to further develop their gross motor skills, balance and spatial awareness through intentionally planned learning experiences or within indoor and outdoor learning spaces (ACECQA, 2017).

2.3 Factors associated with modifying eating behaviours and physical activity in ECEC settings

Within the ECEC setting, healthy eating and physical activity behaviours are influenced by a number of factors, which is not surprising given the complexity of ECEC environments. A 2018 systematic review (n=41) highlighted a number of factors related to improvements in healthy eating (2-19 years) (Murimi et al., 2018). In this review, 41 studies reported on interventions specifically in ECEC settings. Of these, a number of overarching factors were identified as being influential in modifying healthy eating behaviours within ECEC settings. These included: (1) the use of a multicomponent approach to interventions and targeting specific behavioural outcomes (e.g., increasing fruit and vegetable intake); (2) the length of the intervention (longer programs were

more effective, i.e., >6 months); (3) parental engagement (e.g., parent and children preparing healthy snacks); (4) practical hands-on experiences that were age appropriate (e.g., structured healthy eating based learning experiences); (5) PL for educators to ensure intervention fidelity; and (6) ECEC environmental changes (modifications in serving meals, design and implementation of age-appropriate activities) (Murimi et al., 2018). This study concluded that healthy eating interventions were more likely to be successful if extensive PL opportunities were provided to educators to enhance fidelity, and the duration of healthy eating interventions extended beyond 6 months (Murimi et al., 2018).

A 2017 systematic review (n= 27) identified correlates of sedentary behaviour and physical activity in young children attending ECEC centres (Tonge, Jones, & Okely, 2016). The main findings, framed around the Social Ecological Model, showed multidimensional factors that influenced physical activity. With regard to child variables, nine were identified; however, only two had strong positive associations: boys were more active than girls and older children were more active than younger children. All the educator variables, inclusive of educators' qualifications, training, attitudes and practices were inconclusive. The review highlighted the need for more research on educators as 'agents of change' and the need for PL opportunities for educators to ensure the provision of high-quality educational experiences, inclusive of physical activity (Tonge et al., 2016). In relation to the physical environmental variables, two (out of eight) strong positive associations were reported for the presence of an outdoor learning environment and the size outdoor space. In the organisational domain, associations between physical activity opportunities, presence of a physical

activity policy, centre quality, centre location and program type were investigated, however the only positive association reported was the provision of active opportunities within the ECEC environment. These reviews highlighted the complexities associated with modifying healthy eating behaviours and physical activity in ECEC environments (Murimi et al., 2018; Tonge et al., 2016). A number of potential correlates have been identified; however, few strong associations have been acknowledged. Thus, further research is needed to confirm these relationships and to explore other ECEC environmental factors that influence healthy eating and physical activity behaviours.

To address this gap in the research, **Chapter 4** discusses additional ECEC factors, for example ECEC quality, that may be important in the promotion of physical activity in ECEC environments. Investigating additional factors associated with modifying healthy eating behaviours in ECEC settings was beyond the scope of this thesis. It is feasible to suggest that a range of pedagogical practices are important in modifying these behaviours in ECEC settings and that PL for educators (as eluded to in both of the above-mentioned systematic reviews) has a critical role to play in modifying these behaviours.

2.4 ECEC educators are important in promoting healthy eating behaviours and physical activity

The role of ECEC educators is complex and varied (Siraj-Blatchford et al., 2017) as they have the responsibility of actively planning and implementing meaningful educational experiences for diverse groups of children. Although a complex role,

educators have the unique opportunity to significantly change the trajectory of a child's learning in all key developmental domains (social, emotional, physical, language and cognitive) and in turn child health and developmental outcomes. Through intentional teaching, positive role modelling, meaningful and purposeful interactions (Siraj-Blatchford, 2009) and collaborations with parents and families, ECEC educators can be key players in influencing all areas of child development, including physical activity and healthy eating.

Previous studies have shown that educators have a positive influence in modifying feeding practices (De Bock et al., 2012), and centre policies (Bravo, Cas, & Tranter, 2008; Hollar et al., 2018). Educators' participation in mealtimes can elicit positive feeding practices as children's willingness to try new and unfamiliar foods is heightened, and educators can increase children's knowledge about healthy dietary behaviours during a shared meal (Hendy & Raudenbush, 2000). The behaviours of educators during meal time can have a positive social influence on children's eating preferences, especially if educators eat or sit with children during meal times and engage children in educational based conversations around food and (healthy) eating habits (Benjamin Neelon, Vaughn, Ball, McWilliams, & Ward 2012; Neelon, Burgoine, Hesketh, & Monsivais, 2015; Sigman-Grant, Christiansen, Branen, Fletcher, & Johnson, 2008; Sisson et al., 2012). In contrast, studies have shown fewer positive practices in relation to the promotion of healthy eating within ECEC centres, for example, the use of directive feeding practices and controlling behaviours. In some studies, educators placed high importance on children finishing a meal before being offered other food (such as dessert), thereby inhibiting children's self-regulation around the volume of

food they consumed (Freedman & Alvarez, 2010) and encouraging overeating (Baker, & Dennison, 2005; Sellers, Russo). Additionally, healthy eating behaviours are influenced by educators' own perceptions. For example, educators have suggested that it is more important for children to eat something rather than nothing, irrespective of the nutritional value of the food (e.g., offering discretionary based foods over healthy food options) (Wallace, 2016). Some educators suggest that it is the responsibility of parents to provide a child with healthy food options, despite spending long hours in an ECEC centre (Stage et al., 2018).

A number of studies have shown educators' influence in promoting physical activity behaviours of children. Positive associations between educators' and children's physical activity have been reported (Bower et al., 2008; Ward et al., 2008; Vanderloo et al., 2014). For example, higher levels of physical activity in children were associated with the inclusion of structured, staff-led physical activity experiences in ECEC centres (Bell et al., 2015; Bower et al., 2008). Additionally, other studies have shown that educators have a positive impact on children's physical activity by modifying children's access to outdoor learning environments (Copeland, Kendeigh, Saelens, Kalkwarf, & Sherman, 2011; Tucker et al., 2017; Vanderloo, Tucker, Johnson, & Holmes, 2013). Modifications that are made to the outdoor environment, such as the addition of portable play equipment (Hannon & Brown, 2008), or larger outdoor spaces have been found to be conducive to higher physical activity levels (Cardon, Van Cauwenberghe, Labarque, Haerens, & De Bourdeaudhuij, 2008; Dowda et al., 2009). In contrast, other studies have shown that physical activity learning experiences in ECEC settings are limited by educators prioritising unstructured play opportunities over intentional-based

physical activity activities and educators suggesting that their main priority in the outdoor learning environment was supervising the children to ensure that they were safe (Dyment & Coleman, 2012). Furthermore, the common misconception among educators that children are sufficiently active during ECEC hours and that children naturally develop their gross motor skills has been shown to be influential in children's physical activity levels (Ellis et al., 2017; Stauss, 1999). The priority (or lack thereof) of physical activity with ECEC settings is further highlighted by the low proportion of ECEC centres that have a written policy relating to physical activity (Wolfenden et al., 2011).

Whilst educators have a critical role in influencing healthy eating behaviours and physical activity patterns of young children (Copeland et al., 2011; Lindsay, Salkeld, Greaney, & Sands, 2015), meaningful change is somewhat hindered by educators' current (and long standing) practices and perceptions. Regular participation in PL that focuses specifically on healthy eating behaviours and physical activity is needed to change practices and perceptions of educators (Fees, Trost, Bopp, & Dzewaltowski, 2009; Copeland et al., 2011; Lyn, Evers, Davis, Maalouf, & Griffin, 2014) to promote healthier child behaviours and health outcome (Sisson, Krampe, Anundson, & Castle, 2016). Furthermore, PL, inclusive of the development and implementation of physical activity and healthy eating policies and practices, may assist in increasing educator's knowledge in developing programs that promote healthy behaviours.

Within the Australian context, PL opportunities in the areas of healthy eating and physical activity are limited (Peden, Okely, Eady, & Jones 2018). An Australian study showed that educators (n=28) in the last five years have received limited training on the

promotion of physical activity (n=8) and fewer educators (n=6) have participated in PL related to healthy eating (Hardy, King, Kelly, Farrell, & Howlett, 2010). In Australia, only one state, New South Wales, (out of seven states and territories) has an ongoing PL program that focuses on promoting healthy eating and physical activity for preschool-aged children in ECEC settings (other states and territories have had similar programs; however, none are ongoing). '*Much and Move*' is a PL program designed to support educators in the promotion of healthy eating, active play and gross motor skills in ECEC settings (Hardy et al., 2010). It has been evaluated over the past eight years (http://www.preventivehealth.net.au/), initially through a randomised controlled trial involving 15 intervention and 14 control centres, with outcome measures including lunch box audits and gross motor skill proficiency (Hardy et al., 2010). Positive changes were reported for gross motor skill mastery and the consumption of sweetened drinks in the intervention group decreased by 0.13 serves. Educators also reported that '*Munch and Move*' was an acceptable and suitable program for ECEC settings (Hardy et al., 2010). In this study the PL program involved one or two educators from each intervention centre attending a one-day face-to-face workshop. In more recent years, online PL modules rather than face-to-face PL sessions (https://www.healthykids.nsw.gov.au/campaigns-programs/munch-move-long-day-care-and-preschool-training/munch-and-move-online-training-and-resources.aspx) have been developed. The program has extensive reach across New South Wales, with more than 90% of ECEC centres having been involved in the training (http://www.preventivehealth.net.au/) (i.e., at least one educator has been involved in the training). The program is currently monitored through the adoption of 15 program

indicators or practices. In 2016, 70% of ECEC centres had adopted 80% of the indicators, however, the ongoing effectiveness of the program on child outcomes remains unknown.

ECEC educators have a critical role in the promotion of healthy eating behaviours and physical activity, however they need to be continually informed of best practice in this area. **Chapters 5** and **6** describe a PL program for educators that focused on increasing skills and knowledge in the areas of healthy eating and physical activity and increasing the confidence of educators in these areas. In this study, educators had the opportunity to participate in ongoing PL over a 12-month period.

2.5 ECEC based healthy eating interventions inclusive of a PL component

Previous literature indicates a positive association between an educator's education level and quality of the ECEC program offered (Zaslow & Martinez-Beck, 2006) and the impact of the ECEC program on child outcomes (Saracho & Spodek, 2007; Whitebrook & Sakai, 2003). Educators who are well-educated and continually update their knowledge and skills through PL opportunities create higher quality pedagogical environments that are more favourable in increasing positive developmental outcomes for children, than those educators who don't have the same PL opportunities (Siraj et al., 2018; Taguma, Litjens, & Makowiecki, 2012).

Numerous ECEC-based healthy eating interventions have been evaluated, with the number of such interventions increasing in recent years (Mikkelsen et al., 2014). The

increase has been informed by the discourse between children's food intake while in ECEC centres and current dietary recommendations (Ball, Benjamin, & Ward, 2007) as well as the need for high quality ECEC programs which are inclusive of a lifestyle component (including the promotion healthy eating) (Campbell et al., 2014). A 2014 systematic review (n=26) reported on the effectiveness of healthy eating ECEC-based interventions on children's (3-6 years) food preferences (Mikkelsen et al., 2014). Positive increases in fruit and vegetable consumption and children's knowledge relating to fruits and vegetables were reported and multi-component interventions (i.e., those that used more than one strategy to modify behaviours) were more effective than single component interventions. More than half of the single interventions (62%) showed significant increases in fruit and vegetable consumption and nutritional knowledge, whereby the majority (85%) of multi-component interventions reported significant results within these two areas. Six out of the seven multi-component studies reported a significant increase in fruit and vegetable intake, which included significant results for the two studies that included a PL component targeting educators (Bayer et al., 2009; Vereecken et al., 2009). Of the 26 studies, only three studies included a PL component (one study from those studies classified as educational (Parcel, Bruhn, & Murray, 1983) and two studies from those that were classified as being multi-component (Bayer et al., 2009; Vereecken et al., 2009). In these three studies (Bayer et al., 2009; Parcel et al., 1983; Vereecken et al., 2009) PL was delivered via face-to-face workshops ranging from two sessions (three hours each) to two days of training. No other information was provided regarding the PL sessions and the specific impact of the PL on the study outcomes was not investigated. This review highlighted that ECEC settings are

promising environments for increasing fruit and vegetable intake, and that children's knowledge about healthy eating choices are directly influenced by the pedagogical practices of ECEC settings (Mikkelsen et al., 2014).

Another review examined the effect of healthy eating ECEC-based interventions in children aged 0 to 5 years (n=26) (Bell & Golley, 2015). The review included changes in biological, anthropometric and attitudinal outcomes. Similar, to the previous review (Mikkelsen et al., 2014), most interventions (88%) reported positive outcomes. Of the 26 studies, 13 studies (50%) included a PL component (Bravo et al., 2008; Cason, 2001; Clark, Anderson, Adams, Baker, & Barrett, 2009; Colmer, & McWhinnie, 2007; Drummond, Staten, & Sanford, 2009; Gorelick & Clark 1985; Gosliner et al., 2010; Hardy et al., 2010; Herman, Nelson, Teutsch, & Chung, 2012; Herman, Nelson, Teutsch, & Chung, 2012; Matwiejczyk,; Sangster, Eccleston, & Stickney, 2003; Sharma, Chuang, Hedberg, 2011; Sweitzer et al., 2010; Williams et al., 2002). Within these 13 studies, five studies offered PL face-to-face workshops (Bravo et al., 2008; Drummond et al., 2009; Gosliner et al., 2010; Hardy et al., 2010; Matwiejczyk et al., 2007), one was a webinar (Herman et al., 2012), one was delivered via study website (Clark et al., 2009) and the remaining studies mentioned training but did not mention the form of delivery (Cason et al., 2001; Gorelick et al., 1985; Sangster et al., 2003; Sharma et al., 2011; Sweitzer et al., 2010; Williams et al., 2002). Only five of the 13 studies that included PL reported the duration or frequency of PL (Cason et al., 2001; Gosliner et al., 2010; Hardy et al., 2010; Matwiejczyk et al., 2007; Williams et al., 2002), ranging from a single nine-hour workshop to a series of three-1xhour workshops. No further information pertaining to the PL sessions was documented in the review. The

analysis of the secondary outcomes (staff knowledge/attitudes/behaviours) indicated that educator knowledge significantly improved in two studies (Clark et al., 2009; Herman et al., 2012). In these studies, the PL component was delivered via technology (webinar and website). This review highlighted that environmental and behavioural influences targeting dietary intake, inclusive of centre food provision, staff knowledge, attitudes and behaviours and service policies and practices were able to be modified and were important in ECEC-based healthy eating interventions (Bell & Golley, 2015). Furthermore, it highlighted that alternate PL delivery modes can be successfully integrated into interventions (e.g., webinars and websites) (Bell & Golley, 2015).

The *Good for Kids Good for Life* program is one of few studies that has been inclusive of a PL component and has described in detail the components of the PL (Bell et al., 2015). The program involved 287 intervention and 296 comparison ECECs and focused on designing and implementing policies and practices that promoted healthy eating (Bell et al., 2015). Educators participated in a six-hour face-to-face PL workshop on nutrition and received electronic and paper-based module content. Specific details about the content of the workshops were not reported. In addition to this workshop, ECEC centres that provided meals invited cooks and authorised supervisors to participate in a six-hour healthy menu planning workshop. All services received a resource kit (program guidelines, games, activities, materials for families) and a 20-minute telephone support follow-up call (Bell et al., 2015). In this study the intervention services that provided meals were significantly more likely to comply with healthy eating guidelines, particularly in the areas of sugary beverages, vegetables and fruit intake and supplying water and plain milk. In the comparison group, a signifincace

increase in vegtavble intake was observed, however there were differences in menus between the intervention and comparions group.

Despite the many ECEC-based interventions which have focused on healthy eating behaviours, very few have included a PL component and if a PL component was included it was inadequately described (Mikkelsen et al., 2014). Limited information has been provided on the number of educators involved in the PL and the type and frequency of the PL sessions. To date, there have been no reviews which have investigated the impact of PL on healthy eating behaviours of children attending ECEC centres. The optimal length, mode and content of PL which promotes healthy eating behaviours remains unknown. The lack of PL opportunities in the areas of healthy eating behaviours is evident. Given educators are key in developing and implementing high quality pedagogical programs for young children, the inclusion of innovative and effective PL seems to be an important gap in the literature.

Similarly, there are relatively few ECEC-based physical activity interventions that have included a PL component. Like the studies mentioned above, for those studies that have included a PL component the key features of the PL component remain unknown. To further investigate this, a systematic review was conducted. The following section of this chapter presents the published systematic review, inclusive of the abstract, introduction, methods, results, discussion and conclusion.

2.6 Published systematic review

ECEC-based physical activity interventions which are inclusive of PL components are summarised in the following systematic review. This review was published in 2018 in the peer-reviewed journal *Clinical Obesity*. The full references of this paper are as follows:

This section has been published as: Peden, M. E., Okely, A. D., Eady, M. J., & Jones, R. A. (2018). What is the impact of professional learning on physical activity interventions among preschool children? A systematic review. *Clinical Obesity*, 8(4), 285-299. https://doi.org/10.1111/cob.12253

2.6.1 Introduction

Childhood obesity is an international public health problem (World Health Organisation, 2016), with low levels of physical activity potentially being a contributory factor to excess weight gain in young children (Goran, & Sell, 1998; Weinsier, Hunter, Heini,). The early years (ages 0-5) is a significant developmental period, during which healthy behaviours, such as physical activity, are established (Hinkley et al., 2014). Regular physical activity is associated with more favourable health outcomes, such as improved cardiovascular health, bone density, concentration, obesity prevention and psychological well-being (Blake-Lamb et al., 2016; Timmons et al., 2012). Current physical activity guidelines recommend that toddlers and preschoolers' (ages 2-5) should accumulate at least three hours of physical activity per day (Department of Health, 2011, UK; DoHA, 2010; Tremblay et al., 2012) for optimal health. Furthermore, the Institute of Medicine (USA) (now known as the National Academies of Medicine) recommends that obesity prevention interventions should

begin targeting children under the age of five and suggests that children should be active for 15 minutes per hour whilst in formal care (Institute of Medicine, 2011). Unfortunately, a suboptimal percent of young children participates in sufficient physical activity (Crawford, & Hesketh, 2012; Tucker, 2008; Hinkley, Salmon, Okely, Crawford, Hesketh, 2012; National Academies of Sciences, Engineering & Medicine, 2016).

With a high proportion of children attending formal child care, these settings have been highlighted as an ideal environment to promote physical activity (and in turn prevent overweight and obesity) (Botey, Bayrampour, Carson, Vinturache, & Tough, 2016; Kaphingst & Story, 2009; Ling, Robbins, & Wen, 2015; Ling, Robbins, & Wen, 2016). Physical activity interventions facilitated within ECEC settings, that didn't specifically target overweight or non-overweight children, have generally been well received by educators and children (Goldfield et al., 2012), however, changes in physical activity outcomes have been varied (Hesketh & Campbell, 2010; Mehtälä, Sääkslahti, Inkinen, & Poskiparta, 2014; Morris, Skouteris, Edwards, & Rutherford, 2015; Puder et al., 2011; Temple & Robinson, 2014; Ward et al., 2010; Zask, Adams, Brooks, &Hughes, 2012).

The key components of success for physical activity interventions in ECEC settings remain largely unresolved with many interventions comprising of multiple components. Past reviews have reported that intervention designs that support both educators and parents in increasing physical activity engagement levels and health outcomes for young children were key components in positively influencing changes in children's physical

activity behaviours in child care settings (Adams, Zask, & Dietrich, 2009; Hesketh et al., 2010). Other key factors include availability of play equipment (Bower et al., 2008; Broekhuizen, Scholten, & de Vries, 2014), educator-led physical activity interventions (i.e., educators acting as an interventionist) or educator-led structured physical activity lessons (Jones, Okely, Hinkley, Batterham, & Burke, 2015; Alhassan, Nwaokelemeh, Lyden, Goldsby, & Mendoza, 2013), the role of the educators (Copeland et al., 2011), and professional learning (PL) for the educators (Androutsos et al., 2014; Puder et al., 2011, Zask et al., 2012). Other external factors may include age of children, socio economic status and parental influences (such as maternal physical activity levels) (Oliver, Schofield, & Schluter, 2010; Sallis, Patterson, McKenzie, & Nader, 1988; Schoeppe & Trost, 2015).

A number of physical activity interventions facilitated in ECEC settings have included a PL component (Alhassan et al., 2016; Goldfield et al., 2016; Pate et al., 2016), however the delivery length, length and intensity of PL varies greatly between studies. For example, some provide PL for educators in one-off sessions (Trost, Fees, & Dzewaltowski, 2008), while others offer PL over multiple sessions (Puder et al., 2011; Stanley et al., 2016). To date, it remains unknown if there are any potential patterns between the length, mode and content of PL provided to educators as part of a physical activity intervention and physical activity outcomes. Therefore, the following review aims to investigate the presence of potential patterns between PL and childrens' objectively measured physical activity in ECEC settings.

2.6.2 Methods

2.6.2.1 Protocol and registration

The protocol for this systematic review was registered with PROSPERO international prospective register of systematic reviews (registering number CRD42016032941) and adheres to guidelines outlined in the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) statement (Moher, Liberati, Tetzlaff, & Altman, 2009).

2.6.2.2 Inclusion and exclusion criteria

The search was limited to original, full-text, peer-reviewed journal articles that were published in English. Whilst this article adheres to the PRISMA statement, it has been presented as PICO (Schardt, Adams, Owens, Keitz, & Fontel, 2007). Using the PICO (population, intervention, intervention/exposure, comparator/control, and outcome) format (Schardt et al., 2007) the inclusion criteria are described below.

Population: The two population groups included children aged 0-5 years enrolled in licenced public or commercial ECEC settings (preschool, nursery, long day care centres) and educators employed in these settings.

Intervention (exposure): All studies were randomised controlled trials, cluster randomised trials, or pilot studies that incorporated some professional learning (online, face-to-face, on-site visits or blended) which focused on increasing children's physical activity.

Comparator: All studies included a control group.

Outcomes (indicators): All studies reported objectively measured physical activity using a validated measurement tool such as accelerometers or observational tools

including Evaluation Policy Assessment Observation (EPAO), Observational System for Recording Physical Activity in Children- Preschool (OSRAC-P).

Studies were excluded if they involved primary/secondary-aged children (6 years and older); children that attended out of school care programs (5 years and older) or family day care settings; special population groups (children with diagnosed conditions) and interventions that reported proxy reported physical activity.

2.6.2.3 Study identification

A computer-based literature search was conducted from September to June 2017. The search was carried out in eight databases; A+ Education, Education Research Complete, ERIC, ProQuest Central, Scopus, MEDLINE, SportDiscuss, PsycINFO and Web of Science. The following search string was used ("physical activit*" OR "gross motor" OR "movement" or "exercise") AND ("preschool" OR "pre-school" OR "early childhood" OR "child care" OR "childcare") AND intervention AND ("training" OR "professional learning" OR "professional development" OR "staff development"). Additional studies were manually identified from references lists of included studies. The combined search hits from all databases were downloaded and entered in Endnote software reference management software (Endnote x7) and duplicates were removed.

2.6.2.4 Study selection

Studies were initially screened based on titles (MEP and RAJ). Included abstracts were then reviewed (MEP and RAJ). Full text versions were obtained, and two reviewers independently assessed the full text (MEP and RAJ). Any discrepancies were resolved by further discussed until a consensus was reached.

2.6.2.5 Data collection process

Between January and June 2017, all data extraction was conducted by one author (MEP) and checked by another author for accuracy (RAJ). A standardised data extraction spread sheet was used to extract data on methodological variables in alignment with inclusion criteria. Extracted information included: characteristics of participants (age of children, number of children enrolled in setting), study design and duration, description of intervention (length, facilitator, follow-up), theoretical framework, primary and secondary outcomes, physical activity measures and outcomes, PL component (length, content, number of educators, incentives) and behavioural change techniques (goal setting, parental involvement).

2.6.2.6 Quality assessment

The Cochrane Collaboration's assessment tool was used to assess the quality and risk of the included studies. Items assessed included: (a) random sequence generation, (b) allocation of concealment, (c) blinding of participants and personnel, (d) blinding of outcomes assessment, (e) incomplete data, (f) selective reporting and (g) other reporting. Each item was assessed by three assessors (MEP, RAJ, MJE) as low risk, high risk or unclear. Any discrepancies were resolved via discussions and re-examination of individual articles with consensus reached.

2.6.3 Results

2.6.3.1 Study selection

The initial review resulted in the identification of 4247 studies. Thirty-seven full text articles were assessed, and 11 studies were included in this review.

2.6.3.2 Study characteristics

Table 2.1 summarises the study characteristics. Ten studies were randomised controlled trials (Alhassan et al., 2016; Annesi, Smith, & Tennant, 2013; Bonvin et al., 2013; Fitzgibbon et al., 2011; Goldfield et al., 2016; Jones et al., 2011; Jones et al., 2015; O'Dwyer et al., 2013; Pate et al., 2016; Trost et al., 2008). Three studies were informed by Socio-Ecological theories (Bonvin et al., 2013; O'Dwyer et al., 2013; Pate et al., 2016;), whilst one study based their intervention on Self-Efficacy Theory (Annesi et al., 2013) and three interventions were underpinned by Social Cognitive Theory (Annesi et al., 2013; Fitzgibbon et al., 2011; Jones et al., 2015). One study was guided by both Social Cognitive Theory and Self-Determination Theory (Fitzgibbon et al., 2011). All studies were conducted between 2008 and 2016.

More than half of the studies (58%) were conducted in the USA (n=7) (Alhassan et al., 2016; Annesi et al., 2013; De Marco et al., 2015; Fitzgibbon et al., 2011; Goldfield et al., 2016; Pate et al., 2015; Trost et al., 2008) with the remaining studies conducted in Australia (Jones et al., 2011; Jones et al., 2015), United Kingdom (O'Dwyer et al., 2013) and Switzerland (Bonvin et al., 2013). The length of the interventions varied from eight weeks (Annesi et al., 2013) to 2 years (Pate et al., 2016), averaging 26.5 weeks.

2.6.3.3 Professional learning

The length, mode and content of the PL were considered important for this review and were different between studies. Six of the eleven studies described all three of these components (Annesi et al., 2013; Bonvin et al., 2013; De Marco et al., 2015; Goldfield

et al., 2016; Jones et al., 2015; Trost et al., 2008). The length of the PL sessions varied. Three studies provided a single PL session (Annesi et al., 2013; De Marco et al., 2015; Trost et al., 2008) and eight studies provided multiple PL sessions (Alhassan et al., 2016; Bonvin et al., 2013; Fitzgibbon et al., 2011; Goldfield et al., 2016; Jones et al., 2011; Jones et al., 2015; O'Dwyer et al., 2013; Pate et al., 2016). The majority of PL models that offered multiple sessions incorporated alternate modes of PL sessions such as booster sessions (Bonvin et al., 2013; Goldfield et al., 2016), refresher training (Alhassan et al., 2016), group meetings (O'Dwyer et al., 2013), and ongoing on-site support (Fitzgibbon et al., 2011; Goldfield et al., 2016). The face-to-face PL sessions ranged from 2x90 minutes to 6x60 minutes.

One study described the quantity of PL sessions (five workshops), however no length of time for each session was discussed (Bonvin et al., 2013). The number of educators involved in the PL sessions were not described for any study, however one study reported 'all teachers' attended training, yet no figures of attendance were provided (De Marco et al., 2015).

Nine studies reported the mode of the PL (Annesi et al., 2013; Bonvin et al., 2013, Fitzgibbon et al., 2011; Goldfield et al., 2016; Jones et al., 2011; Jones et al., 2015; O'Dwyer et al., 2013; Trost et al., 2008) with face-to-face delivery the most frequently documented mode of delivery. Three studies used this mode exclusively (Fitzgibbon et al., 2011; Jones et al., 2015; Trost et al., 2008), while other studies supplemented the initial face-to-face workshops with onsite visits (Fitzgibbon et al., 2011; Goldfield et al., 2016), supplementary demonstration videos (provided independently from the face-to-

face visits) (Trost et al., 2008), and written materials/manuals (De Marco et al., 2015; Goldfield et al., 2016; Jones et al., 2015). Five studies provided financial based incentives for educators to participate in the intervention ranging from US$5 to complete assigned homework (Fitzgibbon et al., 2011) to CHF1500 (Swiss Franc) for services to rearrange their child care centres indoor and outdoor learning environments (Bonvin et al., 2013).

Only six studies reported aspects of educator training content (i.e., specific lesson content to be implemented in centres by educators, underlying themes of intervention, recommended pedagogy to be used, practical activities) (Annesi et al., 2013; Bonvin et al., 2013; De Marco et al., 2015; Goldfield et al., 2016; Jones et al., 2015; Trost et al., 2008). For example, Bonvin et al. (2013) focused on the relevant theories and practical implications of how to promote motor development and physical activity in ECEC settings and resources showing how educators could implement the program. Similarly, Jones et al. (2011) and Bonvin et al (2013) focused on how to implement structured and unstructured lessons to promote movement skill development, inclusive of both theory and practical components. Only two studies reported specific PL outcomes such as educator's motivational levels (Bonvin et al., 2013) and completion of ongoing tasks (i.e., educator lesson plans) (Fitzgibbon et al., 2011).

2.6.3.4 Physical activity outcomes

Five studies measured physical activity using accelerometers only (Annesi et al., 2013; Fitzgibbon et al., 2011; Goldfield et al., 2016; O'Dwyer et al., 2013; Pate et al., 2016), five studies measured physical activity using accelerometers and direct observation

(Alhassan et al., 2016; Bonvin et al., 2013; Jones et al., 2011; Jones et al., 2015; Trost et al., 2008) and one study measured physical activity using direct observation only (De Marco et al., 2015). Although all studies reported objective physical activity, several studies reported additional outcomes such as changes in child care environments (Goldfield et al., 2016), gross motor skill competence (Bonvin et al., 2013; Jones et al., 2015; O'Dwyer et al., 2013) and body mass index (Fitzgibbon et al., 2011). All studies recorded physical activity within ECEC hours only.

Different accelerometer epochs were used. O'Dwyer et al. (2013) used 5 second epochs (O'Dwyer et al., 2013) while others used 15 second epochs (Alhassan et al., 2016; Annesi et al., 2013; Bonvin et al., 2013; Fitzgibbon et al., 2011; Goldfield et al., 2016; Jones et al., 2011; Pate et al., 2016; Trost et al., 2008). Cut points and wear time also differed. Four studies adopted Pate et al's (2006) cut points (Bonvin et al., 2013; Fitzgibbon et al., 2011; Jones et al., 2015, Pate et al., 2016) and four studies applied Sirard et al's (2005) cut points (Alhassan et al., 2016; Jones et al., 2011; O'Dwyer et al., 2013; Trost et al., 2008). Goldfield et al. (2016) used Adolph et al.'s (2012) and Pfeiffer et al.'s (2012) cut points to allow for different intensities of physical activity with preschool children. Annessi et al. (2013) cited numerous cut points (Pate et al., 2006; Pate, Pfeiffer, Trost, Ziegler, Dowda, 2004; Sirad et al., 2005) to classify physical activity into various levels of intensity and De Marco et al. (2015) reported no cut points. Wear time ranged from 1 day (Bonvin et al., 2013) to 20 days (Trost et al., 2008).

Of the 11 studies included in this review, seven studies reported significant changes in objectively measured physical activity post intervention (Alhassan et al., 2016; Annesi et al., 2013; Fitzgibbon et al., 2011; Goldfield et al., 2016; O'Dwyer et al., 2013; Pate et al., 2016; Trost et al., 2008) (**Table 2.1**). In the Alhassen et al. (2016) study, significant changes in light-intensity physical activity (LPA) ($p<.01$) and moderate- to vigorous-intensity physical activity (MVPA) ($p<.01$) were reported. Annessi et al. (2013) reported a significant change in MVPA and vigorous-intensity physical activity (VPA) ($p<.01$) for both, equating to an 8.7% and 9.3% increase respectively. Fitzgibbon et al, (2011) reported significant changes in MVPA, moderate-intensity physical activity (MPA) and VPA ($p<.02$, $p<.05$, $p<.03$, respectively) for the intervention group compared to the control group. Goldfield et al. (2016) reported significant differences between the intervention group and the control group for total physical activity ($p<.01$). Increases between groups for LPA were also reported, although differences were not significant. Pate et al. (2016) reported significant differences in MVPA during preschool day ($p<.002$) between the intervention group and the control group.

2.6.3.5 Risk of bias

Table 2.2 reports the risk of bias for each study. The majority (83%) of studies reported unclear allocation concealment details (unclear risk of bias). Only two studies (Jones et al., 2011; Jones et al., 2015) included adequate details of concealment of random allocation sequence. Some studies failed to report details pertaining to the blinding of key study participants and personal (41.6%) (Alhassan et al., 2016; De Marco et al., 2015; Fitzgibbon et al., 2011; Goldfield et al., 2016; O'Dwyer et al., 2013). The

majority of studies (75%) provided evidence of attrition bias, reporting withdrawals from studies that may have led to incomplete outcome data, therefore studies accounted for this data being omitted. Irrespective of the study protocol available in each study, all individual studies clearly identified and reported pre-specified (primary and secondary) outcomes that aligned with the interests of this review (low risk of bias).

2.6.4 Discussion

This systematic review aimed to investigate the influence of PL models offered (length, mode and content) in physical activity interventions facilitated in ECEC settings and childrens' objectively measured physical activity outcomes. Based on the quality of the evidence reviewed, the key components of successful physical activity centre-based interventions remain unclear. A number of key components, including PL for educators, have been suggested as potentially being important. However, in the studies included in this review there seemed to be inconsistent evidence on the length, mode and content of PL delivered to educators that is associated with changes in physical activity outcomes. Therefore, based on these included studies in this review, it is not possible to determine the influence that PL had on physical activity outcomes for children in ECEC settings.

Studies included in this review varied considerably in sample size, length of intervention and focus of intervention. For example, some studies involved children from six child ECEC settings while others involved children from 58 ECEC settings and the intervention length ranged from six weeks to 10 months. Some studies focused entirely on modifying physical activity levels (Alhassan et al., 2016) while others had a number of other outcomes. For example, Fitzgibbon et al's (2011) intervention focused

on physical activity, as well as television watching and nutrition and Goldfield et al.'s (2016), Jones et al.'s (2011) and Jones et al.'s (2015) interventions focused on physical activity and gross motor skill proficiency. Bonvin et al.'s (2013) intervention strategy was different from all other studies in that they provided funds for the ECEC settings to modify their indoor and outdoor environment to encourage the children to participate in more physical activity learning experiences. These study characteristics may have been more influential in physical activity changes rather than the knowledge gained through the PL sessions. Furthermore, given that most physical activity interventions are designed under a 'one size fits all" model (i.e., the same PL provided to all centres irrespective of the centre's enrolment needs etc.), the lack of customisation may also lead to further variabilities in the effectiveness of physical activity-based interventions (Howie et al., 2014).

PL within an ECEC setting has traditionally been pivotal in initiating change within the sector based on the transference of knowledge. Thus, investigating the potential patterns between PL and physical activity outcomes was reasonable as one might hypothesise that the more PL received the greater the changes in physical activity. In the studies reviewed, PL may have contributed to the changes in physical activity; however, this is only speculative given very limited information provided in the studies that detailed the PL component of the interventions. On the whole information pertaining to the PL was scarce and/or poorly reported. The length and mode of delivery were briefly reported in most studies, however details regarding the content of the PL were limited for all studies. Studies typically provided general statements about the PL rather than detailing the specifics of the PL component. This is important particularly in studies that had

multiple outcomes, for example Fitzgibbon et al.'s (2011) intervention assessed the feasibility and effectiveness of a teacher delivered weight control intervention covering topics around physical activity, nutrition and screen time. The PL component was mentioned however; specific content covered was not reported (Fitzgibbon et al., 2011). Therefore, it remains unknown, how much of the PL was spent on each component (physical activity, television time and nutrition). If equal amount of time was spent on each component, this would mean that the face-to-face PL that focused on physical activity specifically was one hour in total, which is considerably less than the whole PL provided.

The seven studies that reported significant changes in physical activity outcomes all facilitated PL using traditional face-to-face sessions. Face-to-face PL usually involves one or two educators participating and then 'transferring' the information to other educators in their centre. In this review, only one study mentioned that 'all educators' received the PL (Annesi et al., 2013), suggesting that in the other studies not all educators participated in the PL. Although this mode of PL remains popular within the ECEC sector, it does have limitations. For example, on completion of the workshop, the attending educator/s are expected to transfer the 'new' information to other educators in their centre, which generally results in limited transfer of knowledge. Other modes of PL, such as an online environment using synchronous and asynchronous platforms may be a viable option for PL within the ECEC sector. Furthermore, given that such physical activity intervention requires educators to attain new knowledge and to make ongoing changes to aspects of their everyday practices sustained PL over a longer period may be necessary (Hadley, Waniganayake, & Shepherd, 2015; Patton & Parker 2015).

Four of the eleven studies that reported significant changes in physical activity used a multi-component approach to PL (Bonvin et al., 2013; Fitzgibbon et al., 2011; Goldfield et al., 2016; Jones et al., 2015). It is plausible to suggest that PL models that implement face-to-face workshops in conjunction with other forms of PL (on site visits, additional meetings, refresher training opportunities) may promote positive changes in educators' practices and in turn lead to improvements in child physical activity outcomes. However additional evaluations of physical activity interventions are needed to confirm this.

For most of the studies an external professional facilitated the PL. This type of PL facilitation generally employs a 'top down' training model. In this model educators often feel that they are told what, when and how to make changes, with these suggestions being provided without consideration of the broader complex ECEC environment. The 'top down' approach often results in limited ownership of the new knowledge (Marklund, 2015; Olofsson, 2010). Two studies did not use this approach: Goldfield et al used a 'train the trainer' model and in Jones et al's study the PL was delivered by an educator who had been seconded as the program champion for the intervention (Goldfield et al., 2016; Jones et al., 2011). However, Goldfield et al reported significant differences between the intervention group and the control group in total physical activity and LPA, whilst Jones et al did not report any significant differences in physical activity outcomes (Goldfield et al., 2016; Jones et al., 2011). Although mixed results were reported in this review, facilitation of PL as part of physical activity in ECEC interventions should be considered in future intervention. A recent study suggested that educators respond to PL that is facilitated by other educators

who have been working in the sector for a number of years compared with PL facilitated by other professionals (Jones et al., 2017).

Although this review did not show identifiable influence of patterns between the amount, type and duration of PL received and physical activity outcomes, it is clear the role of the educator in promoting physical activity experiences is essential (Tonge et al., 2016). Educators determine children's daily routines, schedules and exposure to different learning experiences (Bell et al., 2015). Educators perceived benefits and barriers for different curricula areas could directly influence children's exposure to such learning experiences. For example, educators generally perceive children in ECEC settings to be 'sufficiently active' and that their main role in relation to these learning experiences is a supervisory role (Dyment & Coleman, 2012). It's feasible to suggest that perhaps PL related to physical activity should not be specifically intervention focused but rather more general to re-shape the perceptions of educators regarding physical activity. Internationally, there is a dearth of such PL for educators. A recent study from Australia showed that 40% of educators across 200 child care settings had either never participated in PL for physical activity or had not done so in the past year. This illustrates that effective documentation of the role of educators is important in gaining a greater understanding of educators as agents of change in physical activity intervention outcomes (Lander, Eather, Morgan, Salmon, & Barnett, 2017).

It should also be noted that other external factors, including age, socio economic status, parental influences may affect physical activity of young children. Tonge et al. (2016) highlighted the older children (i.e., children aged 5 years were less active than young

children (i.e. children aged 3 years) whilst attending ECEC settings. Children from higher socio-economic backgrounds have been shown to be more active than children from lower socio-economic backgrounds in some studies (Drenowatz et al., 2010; Duncan, Birch, Al-Nakeeb, & Nevill, 2012), however, in other studies the opposite has been reported. Also, maternal physical activity has shown to influence young children's physical activity levels (Oliver et al., 2010; Sallis et al., 1998; Schoeppe & Trost, 2015). Ideally, these factors should be accounted for in analysis.

Approximately half of the studies reported descriptive data relating to either ethnicity, socio economic status and parental education levels (Annesi et al., 2013; Bonvin et al., 2013; De Marco et al., 2015; Goldfield et al., 2016 O'Dwyer et al., 2013; Pate et al., 2016; Trost et al., 2008). However, in this review no studies appeared to adjust for age, socio economic status, parental influences and thus may have influenced the outcomes of these studies.

2.6.5 Strengths and limitations

This study followed the PRISMA statement (Moher et al., 2009), summarising the included studies in a reliable and accurate manner. Studies were assessed against the Cochrane Collaboration's assessment tool thereby assessing the quality and risk of bias of the primary studies. All studies reported objectively measured physical activity outcomes.

However, it is important to note the limitations of this review. All included studies in the review were limited to English. Second, whilst a comprehensive search across

numerous databases with no date restrictions was used, it is possible that potential articles were overlooked due to the inclusion criteria used. Third, it was challenging when making comparisons between the studies given the inconsistent measures of physical activity and the variety of PL designs used. Furthermore, due to the small number of studies that met the inclusion criteria for this review, it was difficult to draw conclusions based on any potential patterns between PL in physical activity interventions facilitated in ECEC settings and changes in children's objectively measured learning outcomes. Finally, given the included studies presented statistical evidence differently, a meta-analysis could not be performed, thus the lack of potential patterns was determined anecdotally.

2.6.6 Conclusions

In this review, potential patterns between the type, duration and frequency of PL for educators and physical activity outcomes was difficult to identify. The dearth of PL in the area of physical activity suggests that there is a need for such PL. Furthermore, PL is the key knowledge transfer mechanism in the ECEC sector. However, the specific length, mode and content of PL offered as part of a physical activity intervention that potentially impacts on physical activity outcomes remain unresolved. Given the critical role of the educators in the ECEC sectors the potential benefit of PL for educators, future studies could focus on more 'alternate' or 'multi-mode' PL designs (e.g., using a combination of face-to-face, on-site or online delivery) that are more content specific and contextually relevant to the needs of the educators. Future physical activity interventions for the early years, incorporating PL could also potentially consider

learning that offers: opportunity for educators to reflect on their practices (i.e., reflective learning), support, guidance and mentoring from other educators or professionals which would provide a place for ongoing professional conversations the opportunity to be part of a professional community where educators could feel a sense of a belonging in a professional community. Such aspects have been suggested as key components of PL for early years educators' (Cherrington & Thornton 2013). Furthermore, given the very poor reporting of PL content and PL related outcomes (e.g., educator's self-efficacy, engagement and satisfaction) in this review there is ample scope for future studies to report on these components in a more comprehensive manner. Modifying young children's physical activity and in turn shaping children's health in the future is crucial and is influenced by a number of factors of which, if delivered correctly, could be PL.

Table 2.1: Summary of included studies (ordered alphabetically)

Reference (author, year, country)	Design, duration	Theory	Sample Characteristics (number, age)	Study Outcomes	Intervention (Description, facilitator, follow-up)	Professional learning (length, mode, content, no. educators/or ECEC providers, incentives)	Physical activity outcomes (instrument/ cutpoints)	Results (Physical activity and professional learning)
Alhassen et al 2016, USA	Design: RCT Duration : 6mths	NP	Sample: N=10 centres (INT N=5, CON N=5) N=291 chn (INT N=141, CON N=150) Age: NP	PA	Description: SBS-PA adapted from Instant Recess program. 10min PA routine, focusing on time in MVPA. Routines available on DVD, set to music educator-led. 16x 10min PA routines rotated /wk during intervention Follow-up: NP Facilitator: NP	Length: NP Mode: NP Content: NP No. of educators: NP Incentives: NP	Instruments: Actigraph GT1M, OSRAC-P Cutpoints: Actigraph- 15s epoch, min 7hrs/day wear time for minimum 3 days	PA- Significant diff LPA ($p<.001$) and MVPA ($p<.001$). PL- NP

Annessi, et al 2013, USA	Design: RCT Duration : 8 weeks	Behavior change theory	Sample: N=19 centres, (INT N=11, CON N=8) N=438 (INT N=202, CON N=136 Age: 3-5yrs	PA, weight and height status	Description: 30mins structured PA for children with behavioral/self regularly training (goal setting, self-monitoring, productive self-talk). Child based reward system used 'PA achievement chart', 'Daily activity log' implemented by educator & ' certificate of accomplishment' Follow-up- NP Facilitator: NP	**Length:** Initial PL length NP. 4 hrs additional training provided **Mode:** Face-to-face **Content:** Initial training Active life methods explained & rehearsed, build perception of mastery & ability, use of self-management/self-regulatory skills	Instruments: Actigraph GT3X Cutpoints: Pate et al 2006; Pate et al 2004; Sirard et al 2005 Actigraph- 15s epoch, 4.75hr wear time	PA: Sig diff VPA (p=0.001) and MVPA (p=0.001) PL: NP
Bonvin, et al 2013, Switzerland	Design: single-blinded RCT Duration	Socio-ecological theory	Sample: N=58 centres, N= 648 (N=313 INT, N=335 CON)	PA, motor skills, height and weight.	Description: Youp'l'a Bouge. Training/support educators- PA program,	**Length**: 5 workshops (INT) 1 educator/service **Mode:** Face-to-Face, group meetings	Instruments: Actigraph GT1M	PA- VPA and MVPA- NS PL - Educators strongly

	: 10 months		Age: 3.3 yrs (average)		transform built environment (indoor & outdoor) Parental involvement- info & discussion session & information flyers Follow-up: Satisfaction survey Facilitator: Project coordinator/sport scientists specialised in PA and health, physicians	every 2mths during intervention **Content:** PL themes- 1. Movement & motor skills 2. Moving- a pleasure, a need 3. Practical aspects of PA 4. Health promotion- in ECEC 5. Implementation of project **No. of educators**: NP **Incentives:** $1500/service to rearrange environment	Cutpoints: Pate et al 2006 Actigraph- 15s epoch, 1 day, min wear time 3hrs	motivated (50%) or moderately motivated (50%) & 70% management strongly involved or 30% moderately involved.
De Marco et al 2015, USA	Design: Single case study (SCD) with multiple baseline	NP	Sample: N= 6 centres Age: 1-5yrs	PA	Description: Be Active Kids PA program. PA activities designed increase PA. 40 activities created each age group + adaptions	**Length**: 1x 2hr **Mode**: Face-to-Face **Content**: Promoting PA in ECEC, what influence of PA, links between PA	Instruments: Playcheck adapted from OSRAC-P Cutpoints: NA	PA- NS- MVOA, LPA and SB Increased MVPA (16.6%) & LPA (64.3%), SB

	Be active Kids Evaluation Duration: Unknown				for chn additional needs, or ways to simplify or increase challenge of each activity. Surveys: Director completed demographic survey about centre Lead teacher completed demographic survey about classroom Follow-up: NP Facilitator: Researchers	and other developmental areas, importance motor dev. and milestones in first 5yrs. Strategies how incorporate PA into daily ECEC routine, how prepare lessons, tips make activities more active, how modify PA for chn with disabilities teachers. Written materials/resources provided **No. of educators**: All teachers attended (N=unknown) **Incentives:** Classrooms received $100.		decreased (18.9%) PL- NP
Fitzgibbon et al 2011, USA	Design: RCT Duration: 14 weeks	Social cogniti ve theory & self-determi	Sample: N=18 centres (TD-WCI and N=9 TD-GHI N=9), N= 618 chn (TD-WCI, N=	PA, height and weight status,	Description: Hip Hop to Health Jr. Teacher training Education lessons targeting inclusive of PA	**Length**: Initial PL length, 3hr. 3 additional on-site sessions + weekly meetings (INT) or	Instruments: Actigraph GT1M	**PA-** Sig diff MVPA (p=0.02)

	nation theory	325 chn) and TD-GHI N=293 chn) Age: 3-5yrs	screen time, diet	(20 min lessons), television viewing (TD-WCI)- (INT) - 2 sessions/wk teachers to teach 2 exercise & nutrition lessons/week, each 20min duration+ specific PA 20min lesson, CD, parents received weekly newsletter + homework or (TD-GHI) (CON)- teach 1 session/wk TD-GHI, generalised health. Parents received newsletter, no homework Follow-up: NS Facilitator: NS	1 additional on-site session + monthly meetings (CON). **Mode:** Face-to-face/on-site visits **Content**: NP **No. of educators:** Incentives: Incentive $5 paid for completed homework	Cutpoints: Pate et al 2006 Actigraph 30 times/s @ 15s epoch worn waking hours for 7 days	Sig diff less screen time (p=0.05) **PL**- NP

Goldfield et al 2016, USA	Design: Two-arm, parallel group, cluster RCT Duration :6mths		Sample: N=6 centres (INT N=3, CON N=3), IN=40 chn (INT), N=43 chn (CON) Age: 3-5 yrs	PA, height and weight status	Description: Teacher training targeting structured & unstructured PA targeting locomotor skills, FMS, GMS through active play Follow-up-: NS Facilitator: Master trainer	**Length**: 2x3hr train the trainer workshops + 12 1hr biweekly 'booster' sessions onsite **Mode:** Face-to-Face/onsite **Content**: Training manuals (Healthy Opportunities for preschoolers). Structured & unstructured PA targeting locomotor skills, FMS, GMS through active play **No. of educators:** NP **Incentives:** NP	Instruments: Actical Cutpoints: Adolph et al 2012 & Pfeiffer et al 2006 Actical, 15 s epoch, min. 4hrs wear time on min. 2days/wk	**PA**- MVPA-NS Increases PA (p=0.002), LPA (p=0.004 **PL**- NP
Jones 2011, Australia	Design: 2-arm parallel cluster RCT Duration : 20 weeks	NP	Sample: 2 centres, N=97 chn (N=52 INT & N=45 CON) Age: 3-5yrs	Movement skill, height and weight status, PA	Description: Jump Start (movement skill development PA program, implemented by centre staff) Teacher training: INT group- PA	**Length**: 4x30min workshops **Mode:** Face-to-Face **Content**: NP **No. of educators**: NP I**ncentives**: NP	Instruments: Actigraph GT3X Cutpoints: Sirard et al 2005	**PA**- NS Medium/large effect size jump (d=0.75)

					structured (3xweekly over 20 weeks) & unstructured lessons + specific equipment provided during unstructured lessons. CON group continued with usual program Follow-up: Movement skill, height and weight status, checklists for structured lessons Facilitator: NP		Actigraph -15s epoch, 2 consecutive days wear time	**PL**- staff high satisfaction with program
Jones et al 2015, Australia	Design: 2-arm parallel cluster RCT Duration : 6 mths	Social cogniti ve theory	Sample: N=4 centres, N=150 chn (INT N=77 & CON N=73) Age: 3-5yrs	Gross motor skills (GMS), PA	Description: Evaluate implementation of gross motor skills & PA program (Jump Start) facilitated by ECEC workers in own service.	**Length**: 2x90 min workshops **Mode:** Face-to-Face **Content:** Information GMS, importance GMS, overview Jumpstart + extended period (60min) educators'	Instruments: Actigraph GT3X + Cutpoints: Pate et al 2006 & Everson et al 2008	**PA**- NS- LPA, MVPA, VPA **PL**- NP

					Follow-up: Session evaluation questionnaire Facilitator: Study project manager (early childhood educator trained in Jump Start)	practices practical components structured lesson. Manuals, workshops booklets, video footage of PA sessions developed & used in study **No. of educators:** NP **Incentives:** NP	Actigraph-15s epoch, 2-day wear time	
O'Dwyer et al 2013, UK	Design: Cluster RCT Duration :6 wks	Socio ecological model	Sample: N=12 centres (INT N=6 and CON N=6) , N=240 chn (Con N=131 and INT N= 109) Age: 3-4.9yrs	PA, ST	Description: active play intervention trained staff in delivering an active curriculum to increase PA & decrease ST (target child's teacher and school environment as agents for PA promotion). Staff given resource pack (20 activity cards, user	**Length**: 6x60min sessions delivered using a 2-2-2 delivery. Independent instruction supported by active play professional final 2 weeks **Mode:** Face-to-Face **Content:** NP **No. of educators:** NP **Incentives:** NP	Instruments: Actigraph GTM1 Cutpoints: Sirard et al 2005 Actigraph, 5s epoch, 7 consecutive days	**PA**- NS INT Chn sig. more active than CON (p=0.001). **PL**- NP

					manual, exemplar lesson plans, signposting information, poster promoting play, BUT no guidance given on how to use resource pack. Follow-up: Play intervention- 6 mth follow up Facilitator: Active play professionals from sport & leisure directorate of local authority			
Pate et al 2015, USA	Design: Grouped RCT Duration :2 yrs	Socio ecological model	Sample: N=16 centres, N=379 chn (INT N=191, CON N=188) Age: 3-5yrs	PA	Description: SHAPES (study of Health and Activity in preschool environments)- no scripted curriculum. Teachers used SHAPES curriculum to	**Length:** NP **Mode:** NP **Content**: NP **No. Educators**: NP **Incentives:** Families given $25 gift card end of each data collection period. Preschool given	Instruments: Actigraph GT1M & GT3X Cutpoints: Pate et al 2006 Actigraph- 15s epoch, 5 days wear time	**PA**- Sig. diff MVPA girls (p=0.04), INT- increased MVPA (p=0.02). **PL**- NP

		modify instructional practices & class environments. 3 Key INT goals- structured -led PA in classroom, structured and unstructured PA opportunities, PA integrated into academic lessons + modifications to social & physical environment. Teachers in INT centres received technical assistance in initial trainings, group workshops, site visit & newsletters Follow-up-: NP Facilitator: NP	$250 each year they participated.

Trost et al 2008, USA	Design: RCT Duration : 8 wk	NP	Sample: N=42 chn (INT N=20, CON N=22) Age: 3-5yrs	PA	Description: Move and learn-PA curriculum 8 week move and learn program (INT) normal curriculum program (CON) conducted in a single service, conducted in 1/2-day preschool program. Aim to include 2 move & learn curriculum activities lasting 10mins in each 2.5 hr. session Follow-up: NP Facilitator: A curriculum author	**Length:** 1x3 hr. training session **Mode**: Face-to-Face **Content:** Introduction & discussion of curriculum objectives, demonstration of activities, practice of the move and learn activities plus given video demonstrating the different activities **No. of educators:** NP **Incentives:** NP	Instruments: Actigraph (WAM 7164), OSRAP Cutpoints: Sirard et al 2005 Actigraph, 15s epoch, wear time NP	**PA**- Sig. diff MVPA over final 4 wk INT period ($p<.05$) **PL**- NP

Note: NP= not present, PL= professional learning , NS= non-significant, INT- intervention, CON= control, RCT- randomised control trial, PA= physical activity, SB= sedentary behaviour, ST= sedentary time, chn=children, , MVPA= moderate-to-vigorous physical activity, LPA= light intensity physical activity, BMI= Body Mass Index, TD-WCI= teacher-delivered weight control intervention, TD-GHI=teacher-delivered general health intervention.

Table 2.2: Risk of bias of included studies

Author, year	Selection bias (biased allocation to intervention, inadequate randomisation) Sequence generation	Selection bias (biased allocation to intervention; inadequate allocation concealment) Allocation concealment)	Performance bias (knowledge of allocated interventions during the study) Blinding of participants, personal and outcomes assessors	Detection bias (due to knowledge of the allocated interventions by outcome assessors) Blinding of participants, personal and outcomes assessors	Attrition bias (due to amount, nature or handling of incomplete outcome data) Incomplete outcome data	Reporting bias Selective reporting	Other sources of bias
Alhassen et al 2016	?	?	H	?	?	L	L
Alkon et al 2014	?	?	L	L	L	L	?
Annesi et al 2013	?	?	?	?	?	L	H
Bonvin et al 2014	?	?	L	L	L	L	?
De Marco et al 2015	H	?	H	?	?	L	H
Fitzgibbon et al 2011	?	?	H	?	L	L	L

Author, year	Selection bias (biased allocation to intervention, inadequate randomisation) Sequence generation	Selection bias (biased allocation to intervention; inadequate allocation concealment) Allocation concealment)	Performance bias (knowledge of allocated interventions during the study) Blinding of participants, personal and outcomes assessors	Detection bias (due to knowledge of the allocated interventions by outcome assessors) Blinding of participants, personal and outcomes assessors	Attrition bias (due to amount, nature or handling of incomplete outcome data) Incomplete outcome data	Reporting bias Selective reporting	Other sources of bias
Goldfield et al 2016	?	?	H	?	L	L	L
Jones et al 2015	L	L	L	L	L	L	L
Jones et al 2011	L	L	L	L	L	L	L
O'Dwyer et al 2013	L	?	H	H	L	L	?
Pate et al 2015	L	?	?	?	L	L	L
Trost et al 2008	?	?	?	?	L	L	?
Total Risk of bias low	(4/12) 33.33%	2/12 16.67%	4/12 33.33%	4/12 33.33%	9/12 75%	12/12 100%	6/12 50%

Author, year	**Selection bias (biased allocation to intervention, inadequate randomisation) Sequence generation**	**Selection bias (biased allocation to intervention; inadequate allocation concealment) Allocation concealment)**	**Performance bias (knowledge of allocated interventions during the study) Blinding of participants, personal and outcomes assessors**	**Detection bias (due to knowledge of the allocated interventions by outcome assessors) Blinding of participants, personal and outcomes assessors**	**Attrition bias (due to amount, nature or handling of incomplete outcome data) Incomplete outcome data**	**Reporting bias Selective reporting**	**Other sources of bias**
(%)							
Total Risk of bias high (%)	(1/12) 8.33%	0/12 0%	5/12 41.67%	1/12 8.33%	0/12 0%	0/12 0%	2/12 16.67%
Total risk of bias unclear (%)	(7/12) 58.33%	(10/12) 83.33%	(3/12) 25%	(7/12) 58.33%	(3/12) 25%	(0/12) 0%	(4/12) 33.33%

Note: L=low risk, H=high risk, ? =unclear

2.7 Additional ECEC- based physical activity interventions inclusive of PL component

Since submission of the systematic review (Peden et al., 2018), one other ECEC-based physical activity intervention, inclusive of a PL component, has been published (Adamo et al., 2017). This study was identified using the same search terms and databases used for the original systematic review. This three-arm clustered randomised controlled trial was conducted in ECEC centres (n=18) and aimed to investigate the effect of an ECEC-based physical activity intervention, that did or did not include a parent-facilitated home physical activity component. The primary outcomes included children's (3-5 years) time spent in physical activity and sedentary behaviours and adiposity. The intervention was underpinned by a Socioecological Conceptual Model (Vygotsky 1978). The PL component was based on a train-the-trainer model. Educators attended two times three-hour face-to-face workshops and included content pertaining to the importance of physical activity, understanding the value of structured and unstructured play, age appropriate physical activity recommendations, and promoting physical activity across various learning spaces (indoor and outdoor) in ECEC centres (Adamo et al., 2017).

Educators received a training manual to monitor daily activities, log sheets and a starter kit of equipment. Booster sessions (bi-monthly) were offered, inclusive of researcher's role modeling physical activity structured activities to both children and educators, goal setting (unknown if goals were educator or researcher driven) and mentoring of educators. The number of educators trained using the train-the-trainer model was not reported, nor was the use of any incentives noted. All participating centres were

randomised to one of three groups. Whilst the main findings indicated no significant between group differences in physical activity-related outcomes (i.e., total physical activity, MVPA, sedentary time) from baseline to 6 months, significant time effects were identified as all groups made positive changes for total physical activity, MVPA, and sedentary time.

This additional study provided some information about the mode, duration, and content of the PL component of the intervention, however when viewed collectively with the results from the published systematic review, the conclusions remained the same: no distinctive patterns between type, duration and frequency were identified. Given educators have a critical role in promoting physical activity in ECEC settings and the current practices of some educators (see section 2.4), additional PL in this area is warranted.

2.8 ECEC Professional Learning (PL) models

PL in ECEC encapsulates activities that aim to increase the knowledge and skills of educators in teaching young children. Current literature on PL includes both pre-service training at vocational levels (inclusive of bachelor or post-graduate studies) and in-service training. In-service training or training undertaken by educators' post-formal qualifications (inclusive of training internal to an organisation or sourced from external training providers) is the focus of this thesis. Effective PL allows educators to gain knowledge and further understanding of best practice which is critical for optimal child health and learning.

To date, most ECEC-based interventions which focus on healthy eating behaviours and physical activity use traditional PL models, which typically involve one-off face-to-face workshops. One-off face-to-face PL workshops are usually facilitated off-site and involve one, or perhaps two, educators from a service attending and participating (Androutsos et al., 2014; Hardy et al., 2010; Sheridan, Edwards, Marvin, & Knoche, 2009; Snell, Forston, Stanton-Chapman, & Walker, 2013). Although this model of PL continues to be widely used, it is associated with a number of significant pitfalls. First, on completion of the workshop, the attending educator/s are expected to transfer the 'new' information to other educators in their centre, which generally results in limited transfer of knowledge. Educators attending the face-to-face workshops are often provided with resources (such as pamphlets and examples of activities) (Hardy et al., 2010; Jones et al., 2015) and manuals to aid in this process (De Marco et al., 2015; Goldfield et al., 2016), however transfer and use of the resources is typically limited. Second, face-to-face PL uses a 'top down' approach and typically provides generalised knowledge to groups of educators (Nitecki, 2014; Marklund, 2015) (i.e., one size fits all) rather than contextualised specific knowledge. Third, the one-off workshops generally incorporate minimal or no follow-up thereby transference of an educator's knowledge into their ECEC service is largely unknown (Karagiogi, Kalogirou, Theodosiou, Theophanous, & Kendeou, 2008). Costs associated with attending one-day workshops are generally high and ECEC centres are required to back fill with educators to ensure that educator-to-children ratios align with national regulations. In some studies, educators have been provided funding to cover their cost of travel (Hardy et al., 2010), however this is not the norm and generally educators and ECEC centres must fund attendance at PL workshops themselves. Finally, the reach of these face-to-face

workshops is generally limited with few PL workshops being facilitated in rural and remote settings (where perhaps the need for PL is the greatest) (Broadley, 2012). PL is typically offered to centres within 1.5 hours travel time from the location of the face-to-face PL sessions (Melhuish et al., 2016).

The "*Munch and Move*" intervention as described previously in this section (section 2.4), included a one-day PL workshop. In this study, educators from each intervention ECEC were offered financial support that could be used to assist their attendance at the workshop or to purchase physical activity equipment (Hardy et al., 2010). The one-day workshop covered general information on healthy eating/food-based and physical activity experiences, strategies on limiting children's screen time and engaging children in unstructured physical activity opportunities in play and policy development (Hardy et al., 2010). Although this information is important, it was not contextualised to any of the intervention ECECs and thus may have met some of the needs of the intervention centres whilst not meeting other's needs. Educators were provided with a manual at the end of the face-to-face workshop which included removable, durable pages that contained practical games and experiences, a series of resources that educators could use within the learning environment and fact sheets suitable to distribute to families (Hardy et al., 2010). The provision of such resources is unique and possibly due to the well-funded program. Twenty-eight educators participated in the workshop. The majority (75%) indicated it was the first time they had participated in PL targeting the promotion of physical activity and healthy eating in young children in ECEC centres in the past five years. While the workshop evaluation indicated an improvement in their knowledge and confidence teaching physical activity and healthy eating, a follow-up

educator-survey found non-significant changes in educators' attitudes and confidence in teaching these topics, especially around recommended guidelines for fruit and vegetables and screen time (Hardy et al., 2010). In light of the limitations acknowledged, (insufficiently powered study, relatively short intervention (20 weeks) it is feasible to suggest that the PL may have been less effective than hoped. Despite the opportunity for educators to be sponsored to attend the face-to-face workshops and the resources and the information presented at the face-to-face workshops, the results were not statistically significant. The effectiveness of the face-to-face workshops has not been thoroughly evaluated, however it is interesting to note that the PL for "*Munch and Move*" is now delivered online, suggesting that alternate PL models, such as web-based, maybe perceived to be more feasible and effective in the ECEC sector.

Various PL models (e.g., coaching, mentoring, online, blended) are emerging in the literature, to overcome some of the limitations associated with traditional face-to-face PL. These more recent types of PL seem to be more favourable as they are more effectively addressing the educator's needs. Educators want ongoing PL that is contextualised to their learning environments, offers a place for professional conversation, is informed by educators' interests and learning preferences and reflects the ECEC sector culture (Gomez, Kagan, & Fox, 2015; Linder, Rembert, Simpson, & Ramey, 2016). Coaching and mentoring offer ongoing support from knowledgeable, non-evaluative colleagues (Downer, Locasale-Crouch, Hamre, & Pianta, 2009) or experienced peers or experts (Synder et al., 2012). Although ongoing and contextualised, these PL models are often expensive and time restrictive.

Online PL may be a viable option for the ECEC sector in the promotion of healthy eating and physical activity behaviours. Online PL offers a number of advantages over face-to-face PL, such as flexibility, affordability, convenience, accessibility and time efficient (Gomez et al., 2015). Within the primary education sector, a number of studies involving online PL have been evaluated (Elliott, 2014; Elliott, 2017; Macia & Garcia, 2016). These studies have shown that teachers participating in online PL can effectively collaborate with other teachers from various communities across different social and cultural contexts, build new skills and identify practical teaching strategies that could be contextualised to their students' needs (Broadley, 2012). Furthermore, in these studies, teachers felt less isolated as they had the opportunity to connect with other professionals online through videos, images and sharing of current pedagogical content and critical resources to support everyday practice (Herrington, Herrington, Oliver, Stoney, & Willis, 2001). Few interventions within the ECEC sector have incorporated an online PL component. One study from America reported on ECEC educators' online behaviours and the level of participation (Kyzar et al., 2014). In this study educators spent longer online than anticipated and were particularly supportive of the availability of content being relevant to everyday practice (Kyzar et al., 2014). Whilst online PL has a number of advantages, it also has a number of limitations including: poor connectivity to the Internet, access to and competence in the use of computer-based resources; technical issues or malfunctions (software/hardware problems), educator's limited familiarity and confidence with computers and the Internet, educator's limited technological literacy, and individual and cultural issues (such as emotional barriers and unrealistic expectations about online PL) (Delfina & Persico, 2007; Pianta, Mashburn, Downer, Hamre, & Justice, 2008; Stone-MacDonald & Douglass, 2015). To overcome

the shortcomings associated with exclusive online PL, blended PL models have emerged as a design that adopts the benefits of traditional face-to-face and pure online delivery (Pianta et al., 2008).

Blended PL incorporates a face-to-face component and an online component. The face-to-face component is facilitated usually at the start of the intervention and allows participants to build rapport with one another. This is then followed by an online component where participants continue to learn new knowledge and change practice. Blended PL has a number of similar advantages as online PL models in comparison to face-to-face PL models, for example, the ongoing nature of the PL. However perhaps one of the most notable advantages is the potential for participants to feel more confident in collaborating with peers and facilitators online because they have met face-to-face and have established some rapport with each other (Yeh, Huang, & Yeh, 2011). Although a potential viable model of PL, to date there have been no blended PL interventions evaluated in the ECEC environment. Furthermore, few PL models (both face-to-face and online) are underpinned with quality frameworks. Frameworks like the Community of Practice guide what is provided in PL and could play a critical role in the effectiveness of PL.

2.9 Gaps in the literature

Three gaps in the literature review were identified. First, there was a need to further explore factors in ECEC environments that influence healthy eating and physical activity behaviours, in particular those that focus of physical activity behaviours. To address these gaps, secondary analyses of a physical activity intervention were

conducted. The aim of these analyses was to investigate the relationship between ECEC environments (specifically the quality of the environment in relation to physical activity) and objectively measured physical activity and sedentary behaviour among toddlers and preschoolers. These data have been published and are presented in **Chapter 4**.

Given the importance of best practice in the areas of healthy eating and physical activity, PL ECEC-based interventions that focus on these behaviours are needed. Furthermore, innovative PL models that meet the needs of educators and address the limitations of traditional PL models are needed. To address this second gap, a stepped-wedge cluster randomised controlled trial was conducted. This study tested the effect of a blended PL program on healthy eating and physical activity ECEC centre- and child-level outcomes. These data have been submitted for publication and are presented in **Chapter 5**.

The third and final gap in the literature relates to the dearth of PL programs that are underpinned by appropriate frameworks. **Chapter 6** details how the blended PL intervention described in **Chapter 3** and **5**, was successfully underpinned by this Community of Practice framework and how this may have contributed to the results reported in **Chapter 5**.

Based on the gaps identified in the literature review, the following research questions were addressed in this thesis:

1. What is the relationship between the quality of the ECEC setting and physical activity?

2. How effective is a healthy eating and physical activity blended PL intervention, on child and centre outcomes?

3. Can a blended PL intervention be successfully underpinned by the Community of Practice Framework?

2.10 Summary

The chapter highlighted the benefits of establishing healthy eating behaviours and physical activity patterns from a young age. The role of ECEC settings and ECEC educators in the promotion of healthy eating and physical activity was also explored. Given the increase in attendance at ECEC settings, ECEC settings offer an ideal environment to promote these behaviours. A number of potential correlates related to healthy eating and physical activity in ECEC settings have been identified and were discussed, others are yet to be explored, including those relating to the quality of the environment. This chapter further highlighted the critical role of educators in the promotion of these behaviours and discussed how their influence is attenuated by less than optimal practices, perceptions relating to these behaviours and their own beliefs. The need for ongoing PL for educators to ensure best practice and optimal promotion of these behaviours within ECEC settings was detailed. This chapter explored ECEC-based interventions which focus of healthy eating and physical activity and are inclusive of a PL component. Limitations with traditional PL models were identified and alternate effective modes of PL within the ECEC sector were suggested. The gaps in the literature suggest that blended PL models, underpinned by strong frameworks, may be a

viable option for the ECEC sector. The following chapter describes the research methodology used for the blended PL intervention.

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Chapter 3

Methodology

3.1 Preface

This chapter describes the methodology used to address the second research question- How effective is a healthy eating and physical activity blended PL intervention on child and centre outcomes? Methods used to address the first and third research questions are described in **Chapters 4** and **5**, respectively. Given the unique design of the second research question, the research design, underpinning theory, instruments, participants, sample size, data analysis and ethical considerations are detailed in this chapter.

3.2 Research design

Most physical activity and healthy eating interventions in ECEC settings employ randomised controlled trial (RCT) designs (Adamo et al., 2016; Hesketh & Campbell, 2010; Jones et al., 2011), as it is considered the gold standard for health-based interventions (Schulz, Altman, & Moher, 2010). This blended PL intervention (the second research question), used a stepped-wedge cluster randomised controlled trial (SW-CRCT) (Haines & Hemming, 2018); a design that is increasingly being used in health-based interventions (Grayling, Wason, & Mander, 2017). The SW-CRCT offers a number of advantages over more traditional RCT designs including: not needing as large sample suze as a traditional RCT, as all participants have the opportunity to participate in the intervention (Beard et al., 2015; Dreischulte et al., 2012; Woertman et al., 2013; Zhan et al., 2014); the intervention gives all participants a chance to benefit from participating in the intervention (Hussey & Hughes, 2007) and maximises the opportunuity, as particpants can partake in the intervention at different time points.

Furthermore, data can be collected at different time points when resources may be limited (Hemming, Haines, Chilton, Girling, & Lilford, 2015; Zhan et al., 2014). This design also incorporates a maintenance period which enables additional intervention effects (i.e., possible effects over time) and monitoring of the progressive change to be reported (Brown & Lilford, 2006; Hughes, Granston, & Heagerty, 2015).

The SW-CRCT design involves the participants (in this case, ECEC centres) being randomly assigned to equal sized 'clusters'. The clusters, following the collection of baseline measures, are further randomised into an order for implementation of the intervention (Hemming & Girling, 2013). Each cluster participates in a control phase (in which usual practice is maintained), an intervention phase and a maintenance phase. The intervention phase is consistent in length for each cluster however, the control and maintenance phases vary for each cluster (and are dependent on the randomisation sequence) (Hemming et al., 2015). Data are collected from all clusters at baseline, immediately prior to clusters transitioning from the control phase to the intervention phase and then immediately prior to clusters transitioning to the maintenance phase (Mdege, Man, Taylor, & Torgerson, 2011) (see **Figure 3.1**). To date, few studies have adopted a SW-CRCT in the education field (Farrell & Meyer 1997; Flannery et al., 2003; Grayling et al., 2017; Mhurchu et al., 2013) and no studies have utilised this type of design within the ECEC sector.

In this study, 15 ECEC centres were randomised into three clusters (i.e., Cluster 1, 2 and 3; each cluster containing five ECEC centres). Cluster 1 participated in the intervention first, followed by Cluster 2 and then Cluster 3. Centre- and child-level data

were collected from the same cohort of children and educators throughout the study (Hemming et al., 2015). Centre-level (EPAO) and child-level (accelerometer) data were collected over four time points over a 12-month period, therefore data were collected every 3 months. During the implementation phase, all ECECs centres sequentially participated in a blended PL program which comprised an initial face-to-face intensive session followed by on-going online PL over a 3-month period. **Figure 3.1** shows the SW-CRCT design for this study.

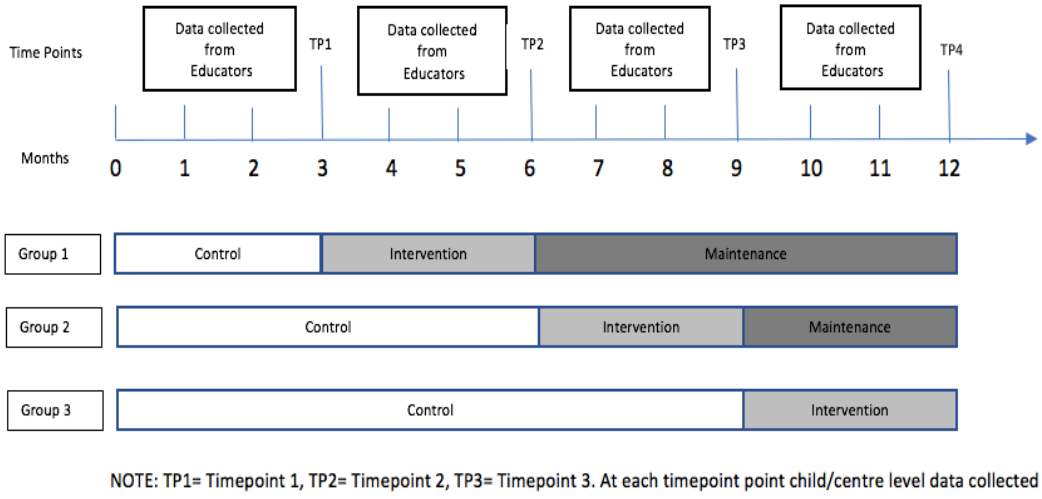

Figure 3.1: Study design – A stepped-wedge cluster randomised control (SW-CRCT) design

3.3 Participant recruitment and eligibility criteria

3.3.1 Recruitment

Fifteen ECEC centres managed by Lady Gowrie in Tasmania were recruited to the study. This included one community preschool (2-5 years), one preparatory school (3-5 years), 12 long day care centres (6 weeks - 5 years) and one family day care (6 weeks - 5 years). Centres from only one organisation were invited to participate to reduce the variability between centres of organisational policies and procedures. Recruitment of centres took place over a three-week period (between January and February 2016) in collaboration with the executive staff of Lady Gowrie. Initially, discussions were held with the executive team of Lady Gowrie, whom then alerted the project to individual centres and in turn recruited centres. Once centres were recruited, the individual centres were contacted by the researcher and educators were recruited into the program. The managers of each centre assisted with the recruitment of the children and families from their centre.

3.3.2 Eligibility criteria

Children recruited into the study adhered to the following inclusion criteria: (1) enrolled as a permanent booking in a participating Lady Gowrie centre; (2) aged 2-5 years; and (3) attended a minimum of two days per week. In total, 313 children aged 2-5 years (mean age=3.25 years) were recruited. There were no specific inclusion criteria for recruiting educators, with all educators from the recruited centres being invited to

participate. All full-time, permanent part-time, part-time or casual educators were invited. A total of 104 educators were recruited.

3.4 Sample size and data analysis

A sample size of 15 centres, divided into three clusters (five ECEC centres per cluster), was deemed adequate to power the main study and was calculated on the centre-level EPAO outcome for PA. The estimated number of centres required for this study was 11 and was based on changes in the physical activity component of the EPAO (an instrument used to assess environmental policy changes at a centre-level (**Appendix D**), of 2.8 units, assuming a SD of 1.15 (Lyn, Maalouf, Evers, Davis, & Griffin, 2013). Based on previous studies, 15 centres were recruited as attrition is common in stepped-wedge designs (Beard et al., 2015). At the child level, the minimum detectable difference based on proposed design was 4% for total physical activity (light-moderate-vigorous-intensity physical activity, LMVPA). All calculations were performed using STATA v14 (V 14 StataCorp LLC, College Station TX). A multi-level mixed effects linear regression model was used to test the effects of the intervention. A mixed syntax was used to perform the analysis and included group (treatment or control) and steps (time period) as categorical variables and centre as clusters or the centre-level variables. For the child-level variables, a further level of child ID was included.

3.5 Theoretical framework

A variety of theoretical frameworks underpin healthy eating and physical activity ECEC-based interventions. In a recent systematic review investigating the mode, length

and frequency of PL in physical activity interventions among preschool-aged children six of the 11 studies were underpinned by a theoretical framework (Peden, Okely, Eady, & Jones, 2018) (**Chapter 2**). Various theories were used including Behaviour Change Theory (Annesi, Smith, & Tennant, 2013), Socioecological Theory (Bonvin et al., 2013, O'Dwyer et al., 2013; Pate et al., 2016) Social Cognitive Theory (Jones, Okely, Hinkley, Batterham, & Burke, 2016; Annesi et al., 2013) and Self-Determination Theory (Fitzgibbon et al., 2011). Although the studies were underpinned by different frameworks, on the whole, limited information pertaining to how the interventions aligned with the theories was provided. Mapping interventions on sound theoretical frameworks is highly recommended (McEachan, Conner, Taylor, & Lawton, 2011) and potentially contributes to the success of interventions.

The blended PL program (**Chapter 6**) was underpinned by Guskey's Evaluation Model (Guskey 2002) and Vygotsky's Zone of Proximal Development theory (Vygotsky 1978), a component of Vygotsky's Social-Cultural Theory. Although these theories are different from those previously used, they were deemed most appropriate in prder to capture the multi-level nature of the program. Theories were needed that focused on environment and behavior change (measured by center- level and child-level data) as well as high quality pedagogical practices in relation to professional learning.

3.5.1 Guskey evaluation model

Guskey's (1986) model of teacher change and associated principles informed the blended PL program. Previously, teacher's engagement within a PL model was evaluated in accordance with their levels of satisfaction, disregarding the impact on

teacher learning, transference of knowledge and skills into new practice, and impact on children's learning outcomes (O'Sullivan & Irby 2011). Guskey's model has evoked a shift in PL paradigm, emphasising the need for meaningful, intentional, ongoing and structured PL, with the overall goal of increasing knowledge, skills, attitudes and levels of self-efficacy. Furthermore, it is inclusive of child learning outcomes as a result of the PL rather than the PL being training or a 'one shot' event (Guskey, 1986; Kulinna, 2012). Guskey recognised that teacher change is a continuing and arduous process (Guskey, 1986). As educators learn to be proficient, understanding aspects of physical activity and healthy eating behaviours, they need to know how to apply this new information into everyday practice in order to elicit positive child outcomes.

Guskey's linear PL evaluation model comprises five levels which include: participants' reactions (what participants thought of the PL); participants' learning (how much new knowledge participants gained as a results of the PL); organisational support and change (support and commitment shown by management); participants' use of new knowledge and skills (pplying the new knowledge and skills in every day practice); and students outcomes (changes in student behavioural and learning outcomes as a result of the PL) (Guskey, 2002). The levels are ordered from simple to complex, and need to be achieved in successive order, with no level being neglected (Guskey, 2014) (**Figure 3.2**).

Participants' reactions were intentionally sought from participants at every stage of the blended PL program. First, educators were asked to complete a post-workshop satisfaction survey (See Appendix F). Using a Likert scale, educators commented on the

aims of the program and the content of the face-to-face workshop, expectations of the program, their willingness and confidence to make changes in their ECEC environment following the workshop and their willingness and confidence to participate in the online components of the program. Second, educators' reactions to the online component were collected through a post-intervention satisfaction questionnaire. Questions pertaining to various aspects of the online component (asynchronous (forum, blogs) & synchronous (live chat sessions) were included in this questionnaire.

The second level of Guskey's evaluation model (participants' learning: assessing educators' acquisition of knowledge and skills) was monitored via the online component. Participants from each centre participated in a face-to-face day-long workshop, as well as the online synchronous and asynchronous sessions. New content was posted weekly in the online environment. Each week educators were asked explicity to try new and different learning experiences centre around nutrition or physical activity. Changes in educators' knowledge and skills were assessed through their comments online, as well as the images that they shared online. Identifying and discussing changes in knowledge and skills was a central component of the synchronous sessions, whereby educators were intentionally provided with ongoing opportunities to highlight how their new knowledge and skills had changed their practice.

Targeted activities in both synchronous and asynchronous platforms were used such as mind mapping, examples of new activities, and a series of critical reflective questions around policies and practices pertaining to the promotion of healthy eating and physical activity for young children. All information within the PL was contextualised to the

National Quality Standard and aligned with the national guidelines for healthy eating and physical activity (DEEWR, 2009).

Organisational support (advocacy, support, accommodation and facilitation and recognition) is the third level of Guskey's evaluation model. In the planning stage and well before implementation of the program, executive managers of Lady Gowrie and the centre managers of the individual centres were actively engaged. The executive recognised the importance of such PL and highly supported the content and approach of the blended PL program. Informed by ongoing conversation with the researchers, they advocated for the program to their educators and highlighted the advantages of being involved. They encouraged all educators to participate in the program. Organisational support was intentional throughout the implementation phase of the program. Both the Executive Manager and the centre managers posted information and responded to educators' posts in the online forum and participated in synchronous sessions showing support for educators and providing recognition for their participation. The Executive Manager also offered various incentives, such as new equipment to centres to support the intervention and financial incentives to educators who provided evidence of their participation within the program.

The fourth level of Guskey's evaluation model focuses on changes resulting from participants' new knowledge and skills (i.e., the quality and degree of implementation). Centre-level changes in healthy eating and physical activity were assessed using a direct observational instrument, known as the Environmental and Policy Assessment Observation (EPAO) (Ward et al 2008). This instrument was intentionally chosen to

address this level of Guskey's evaluation model as educators were seen as the agents of change. Once educators had participated in the PL, they would have the new skills and knowledge to initiate changes to practice at a centre-level (this change was thus assessed by this instrument). Additional detail pertaining to the EPAO is described below in **Section 3.6.1**.

The final level of Guskey's evaluation model highlights the importance of assessing children's performance and achievement (**Figure 3.2**). Changes in children's physical activity were assessed objectively using ActiGraph accelerometers. Physical activity of each child was measured at each time point throughout the study. While individual measurement of children's eating behaviours whist at ECEC would have been valuable to assess, the process of collecting such data is complex and was deemed beyond the scope of this thesis. Thus, only children's physical activity was assessed.

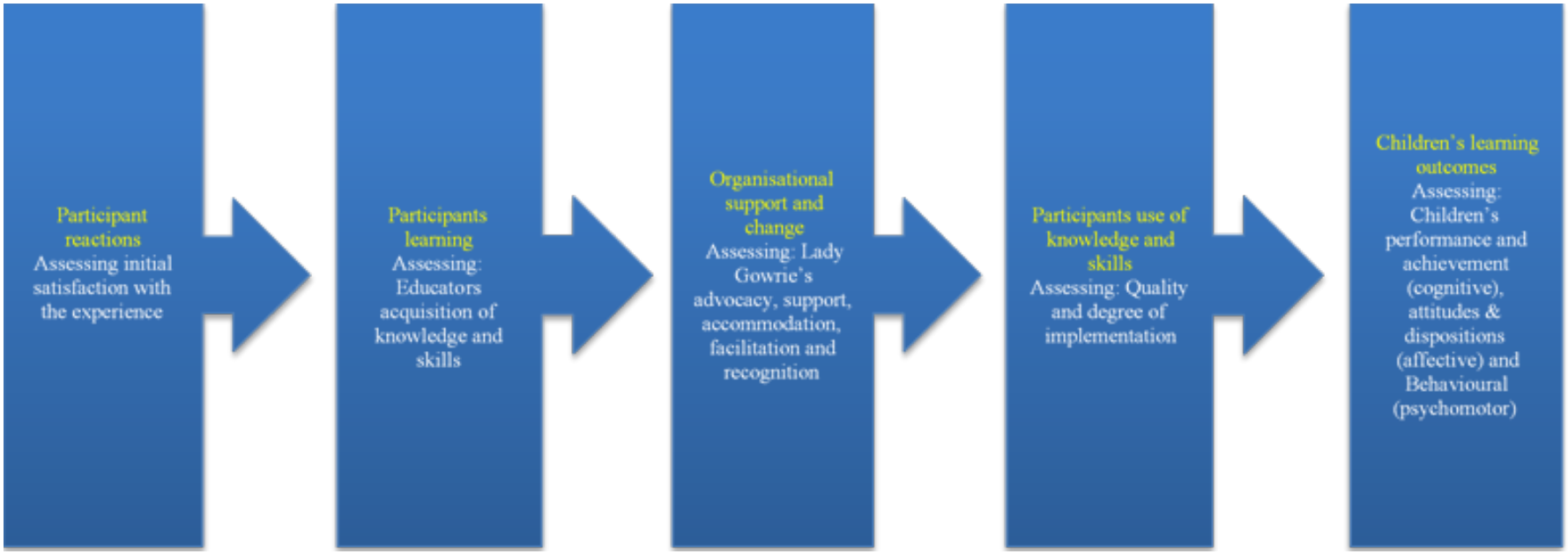

Figure 3.2: Guskey's Linear Professional Learning Model

3.5.2 Socio-cultural theory

Sociocultural Theory from the Vygotskian perspective of learning exemplifies the importance of social interactions between individuals (Vygotsky 1978; Kearns, 2014). Learning, under this theory occurs socially and culturally emphasising the role of the learner in the acquisition of knowledge (Peer & McClendon, 2002; Vygotsky 1978). A major component within sociocultural theory is the 'Zone of Proximal Development' (ZPD) which has been defined as the distance between what participants can achieve or learn on their own without assistance, against what they could achieve or learn within a collaborative learning environment with more capable others or experts (Kearns, 2014; Vygotsky 1978). The Zone of Proximal Teacher Development (ZPTD) (Vygotsky 1978; Warford, 2011) denotes four phases: self-assistance; teacher assistance; internalisation and recurrence. Across these phases the importance of educators reflecting upon their own beliefs, experiences and dispositions about teaching and learning is encouraged. Similarly, being able to demonstrate the ability to practice newly learnt skills and to master new knowledge, whilst abandoning some past methods, is to be replaced by new innovative practices (McMillian et al., 2012; Warford, 2011). **Table 3.1** highlights how the blended PL program aligned with the ZPTD.

Table 3.1: Connections between ZPTD and the Blended Professional Learning Program (HOPPEL)

Zone of Proximal Teacher Development (ZPTD)	**Blended Professional Learning Program (HOPPEL)**
Self-assistance Educators reflect on prior experiences, knowledge and skills with the facilitator/expert acknowledging and validating their prior pedagogical learnings and experiences.	Educators completed a questionnaire which asked questions about their prior experiences with PL, and previously implementing healthy eating and physical activity programs. Educators were given the opportunity to view baseline observational data and then encouraged to reflect on their current healthy eating and physical activity practices and policies within their ECEC centres. Educators were encouraged to think about how their pedagogical experience could be modified.
Teacher assistance Opportunity to critically reflect on current teaching practices with assistance and	Data collection prior to the start of the implementation phase allowed educators to identify areas of strengths and potential areas of improvement in their ECEC program in relation to healthy eating and physical activity. Educators participated in learning across a variety of mediums including face-to-face, online forums and blogs and online

Zone of Proximal Teacher Development (ZPTD)	Blended Professional Learning Program (HOPPEL)
guidance of expert, inclusive of various learning tools.	chat sessions. In all instances, educators had the opportunity to reflect on current practices, discuss current practices with other educators and discuss how current practices could be modified. An expert, with more than 20 years' experience in the ECEC sector was available at all of these sessions.
Internalisation Educators demonstrate newly learnt pedagogical knowledge and skills, educators begin to internally develop strategies to reflect on their strengths and needs, rather	The expert (lead researcher) posted weekly blogs, inclusive of ideas, information and prompts that encouraged educators to critically reflect upon current practices. Educators had the opportunity of gaining a deeper understanding of the content, which led to pedagogical practical changes within the ECEC program targeting healthy eating behaviours and physical activity of children. As rapport built between educators through the implementation phase, educators were encouraged to support each other and rely less on the advice and information from the expert.

Zone of Proximal Teacher Development (ZPTD)	Blended Professional Learning Program (HOPPEL)
than relying on the expert's constant guidance.	
Recurrence Educators are able to apply theory into practice. A collaborative learning approach is important in sustaining ongoing professional growth	The blended PL program aimed to enable educators to collaborate, share and accommodate each other's professional and learning needs. Evidence of environmental changes at a centre level were observed as educators accommodated new information to change learning spaces, educational programs and centre routines to improve overall quality of teaching and learning practices and improve child outcomes. Professional growth was encouraged throughout the 12-week blended PL program.

Note: * PL – Professional Learning

3.6 Research Instruments

3.6.1 Centre-level data

Centre-level data were collected using the Environmental and Policy Assessment Observation (EPAO). (Appendix E). The EPAO is a reliable and valid tool that objectively assesses the physical activity and nutrition environments and practices of ECECs (Ward et al., 2008). Given that the intervention was based on PL for educators it was important to assess changes in both physical activity and healthy eating practices and policies at a centre-level. The EPAO instrument enabled both components to be assessed simultaneously.

The EPAO is divided into two sections: physical activity and nutrition. The physical activity section comprises eight subscales: active opportunities, sedentary opportunities, sedentary environment, portable play equipment, fixed play equipment, staff behaviours, physical activity training and education and physical activity policy (Ward et al., 2008) (**Table 3.2**). The nutrition section comprises of eight subscales; fruits and vegetables, whole grain and low-fat meats, high sugar/high fats foods, beverages, nutrition environment, staff behaviours (nutrition), nutrition training and education and nutrition policy (**Table 3.2**). Documents pertaining to physical activity and nutrition policies, safety checks, curricula and training materials with a physical activity and nutrition focus, educational materials distributed to parents/guardians which focused on physical activity and nutrition and fundraising records related to physical activity or

food related events were also reviewed as part of the EPAO observation (Ward et al., 2008; Lyn et al., 2013). **Table 3.2** provides a summary of the EPAO.

Table 3.2: Subscale descriptions of the Environmental Policy Assessment Observation (EPAO) tool

EPAO Component	Subscale	Description
Physical activity	Active opportunities	Opportunities that increase physical activity includes; structured physical activity & outdoor play (number of times), total active play time (minutes)
Physical activity	Sedentary opportunities	Opportunities resulting in little or no moderate to vigorous physical activity (MVPA); includes; children seated for longer than 30mins time blocks, TV/smart board viewing (total minutes), technology-based games (computer games/iPad apps) (total minutes) (all Y/N) (Vanderloo, 2016)
Physical activity	Sedentary environment,	Resources/equipment in the physical environment that may have promoted sedentary behaviours; TV/DVD/VCR/Smartboard/iPad/computer present in the learning environment (room), physical activity displays, posters, pictures, displayed books (all Y/N)
Physical activity	Portable play equipment	Existence various types of play equipment that could be moved into different locations within the learning environment (indoors, outdoors, both indoors and outdoors); includes; balls, climbing structures, floor play (tumble

EPAO Component	Subscale	Description
		mats), jumping roles, parachute, riding toys, push/pull toys, sand/water toys, slides, twirling play equipment (ribbons etc.) (all Y/N)
Physical activity	Fixed play equipment,	Existence various types of play equipment that is permanently fixed in one location in the centre environment; includes; balancing surfaces, basketball hop, climbing structures, merry-go-round, pool, sandpit, see-saw, slides, swings, bike track, tunnels (all Y/N)
Physical activity	Staff behaviours	Staff engagement levels with children that may have restricted or promoted physical activity; includes; restricting active play, joining in active play, providing positive statements about physical activity, formalised physical activity lessons or extra curricula physical activity programs (fee basis, i.e., an additional payment from parents to cover the cost of the extra curricula physical activity programs. This payment is in addition to the standard child care fees) (all Y/N)
Physical activity	Physical activity training and education	Physical activity education for children, parents and staff that may have increase skills and knowledge of physical activity; includes; physical activity training for staff (Y/N & frequency), documented physical activity curriculum for children, workshop/education materials on physical activity (all Y/N)

EPAO Component	Subscale	Description
Physical activity	Physical activity policy	Early childhood education and care centre written policies covering physical activity; include; active play and inactive play, TV use and TV viewing, play environment, supporting physical activity, physical activity education (all Y/N)
Nutrition	Fruits and vegetables,	Consumption of fruit and vegetables by children (frequency and how many serves) and if servings were consistent with the daily and weekly menu; included; fresh /frozen/canned fruit and vegetables, specific types of vegetables such as dark green, red, orange or yellow vegetables
Nutrition	Whole grain and low-fat meats,	Consumption of whole grain and low-fat meats by children (frequency and how many serves) and if servings were consistent with the daily and weekly menu; some examples; wholegrain bread and pasta, brown rice, baked chicken, fish, deli meats (lean ham, roast beef)
Nutrition	High sugar/high fats foods	Consumption of high sugar/high fats foods by children (frequency and how many serves) and if servings were consistent with the daily and weekly menu; some examples; biscuits/cookies, cakes, muffins, ice cream, chips, garlic bread, anything fried. Some examples that were exempt included; raisin bread, crackers (>10%saturated fats), pancakes.

EPAO Component	Subscale	Description
Nutrition	Beverages	Consumption of water (availability (all Y/N), teachers prompting consumption (all Y/N)), sugar drinks (how many serves) and milk (frequency, how many serves, type e.g. whole, skims, 2%, flavoured etc.)
Nutrition	Nutrition environment	"Resources/equipment in the physical environment that may have promoted nutrition/healthy eating; nutrition displays such as posters, pictures or messages promoting healthy eating or display books reflecting nutritional concepts/healthy eating (all Y/N)"
Nutrition	Staff behaviours	Staff engagement levels with children around eating occasions that may have positive or negative around the consumption of food; includes; staff forcing children to eat, staff serving second helpings without child consent, staff positively encouraging children to try new foods, food used to control behaviours, staff siting with children during lunch, staff eating/drinking less healthy foods, engaging in conversations about healthy foods, formal nutrition education observed (all Y/N, frequency)
Nutrition	Nutrition training and education	Nutrition education for children, parents and staff that may have increase skills and knowledge of nutrition and healthy eating behaviours; includes; nutrition training for staff (Y/N & frequency), documented nutrition curriculum for children, documentation of parent nutrition education/workshop (all Y/N)

EPAO Component	Subscale	Description
Nutrition	Nutrition policy	Early childhood education and care centre written policies covering nutrition; include; fruit & vegetables, fried foods, high fat meats, beverages, menus and variety, meals and snacks, foods offered outside of regular meal times, supporting healthy eating, nutrition education (all Y/N)

All data collectors (n=5) participated in specific EPAO-related training prior to data collecting. This involved attending a 2-hour theory-based workshop and one full-day on site observations. The inter-observer agreement was 78%, which exceeded Ward et al.'s (2008) recommended inter-observer score of 75%. During the day-long observation for the study, data collectors positioned themselves in non-obtrusive positions within the ECECs indoor and outdoor learning environments, whilst educators and children continued with their routine activities.

Each subscale in the physical activity and nutrition component were scored according to Vanderloo et al. (2014) and Bower et al. (2008). Individual items in each subscale were converted to a three-point scale (ranging 0-2). Two subscales (that is, sedentary behaviour and sedentary environment) within the physical activity section were reversed scored, thus, lower scores indicated higher values (Bower et al., 2008). For all the subscales (total 16), the converted responses were tallied and divided by the number of items present in each subscale. In seven ECEC centres food was not supplied, rather children brought their food from home. In these instances, the number of items tallied were adjusted to standardise scoring across all centres. In order to standardise each score, the average was multiplied by 10, which provided an overall score out of 20 for each subscale within the physical activity and nutrition components. A total physical activity score and a total nutrition score were devised by adding the individual subscale scores. An overall total EPAO score was also devised by adding the total physical activity score and the total nutrition score.

3.6.2 Child-level data

Actigraph GT3X+ accelerometers were used to objectively measure the intensity (sedentary, light, moderate and vigorous) and duration of physical activity (Cliff, Reilly, & Okely, 2009). Accelerometry is considered the most valid and objective measure of physical activity in young children (Pate, Almeida, McIver, Pfeiffer, & Dowda, 2006) and its ability to collect data in accordance with spontaneous physical activity patterns of young children (Pate et al., 2006). Furthermore, accelerometers measure both intensity and duration of physical activity (compared to pedometers), are small, light, portable and unobtrusive and remove any bias that might be associated with proxy-report or self-report measures (Reilly et al., 2008; Robertson, Stewart-Brown, Wilcock, Oldfield, & Thorogood, 2011).

GT3X+ accelerometers collect tri-axial data (vertical, horizontal right-left and horizontal front back axis) and have proven validity for children aged 2-3 years old (Costa, Barber, Griffiths, Cameron, & Clemes, 2013; Van Cauwenberghe, Gubbels, De Bourdeaudhuij, & Cardon, 2011). The Actigraph GT3X+ has the capacity of collecting data at sampling frequency rates between 30 and 100 Hertz (Hz). A hertz is a measurement of vibration, that is, 'the number of times a complete motion cycles takes place during the period of one second is called the frequency and is measured in hertz (Hz)' (Broch, 1980, p 4). For this study, the sampling frequency rate was set to 30 Hz or 30 samples per second, and increments of 10 were used, which is consistent with previous studies (Hammersley, Jones, & Okely, 2017; Johansson et al., 2016; Xu, Quan, Zhang, Zhou, & Chen, 2018).

The Actigraph GT3X+ is known as a piezoelectric instrument (Vanhelst et al., 2012) and was used in this study because it had the capacity of detecting accelerations levels of the body, and recorded data as an analog voltage which is sensitive to a vertical direction (Vanhelst et al., 2012). The analog voltage signal was then summarised over a user-defined time, called an epoch, or known as 'counts' (Chen & Bassett, 2005). In other words, the higher the count, the higher the intensity of physical activity. However, depending on the type of accelerometer, the raw data collected (generally recorded in counts/epoch) can be very different.

In this study, children were fitted with an accelerometer (by a data collector or trained educator) when they arrived at the ECEC centre. The monitor was removed (again by a data collector or trained educator) before the child left the centre at the end of the day. All participating children wore accelerometers attached on an elastic belt on their right hip for all hours that they attended the ECEC centre over a period of a week. Children were asked to wear the monitor during all activities including rest/sleep time. Accelerometry data were collected in 15 second epochs, which is consistent with previous studies with preschool aged children (Annesi et al., 2013; Bonvin et al., 2013; Jones et al., 2016; Trost, Way, & Okely, 2006;). Data were considered if a minimum of ≥3 hours of valid wear time during the opening hours of an ECEC centre was collected (Stanley et al., 2016). Non-wear and nap periods (≥ 20 min of consecutive '0' counts) were omitted prior to analyses and 'Pate modified' activity intensity cut points developed for children aged 2-5 years were used (sedentary (<100 counts/min/15); low light-intensity physical activity (LPA-low) (101-800 counts/min); high LPA (801-1679counts/min); moderate- (1680-3367 counts/min); vigorous- (>3368 counts/mins);

moderate- to vigorous-intensity physical activity (MVPA) (>1680) (Carson et al., 2013; Pate et al., 2006). To further monitor wear time, educators were asked to record the time the monitor was placed on a child and the time where the monitor was removed from a child. Children wore the same accelerometer for the whole week (i.e., accelerometers were not shared between children throughout the data collection weeks).

3.6.3 Process evaluation

Educators completed two paper-based questionnaires, one prior to baseline data collection and one at the end of the intervention period. The pre-baseline questionnaire comprised 25 open- and closed-ended questions and took approximately 10 minutes to complete. The questionnaire was divided into three sections: educators' background information (gender, nationality, age, qualifications, past and present employment status); PL (past experiences, preferred PL delivery methods and future PL 'wants') and; educator self-efficacy (confidence levels in participating in an online PL program and associated tasks, potential barriers and suggestions on how to feel comfortable in participating in an online PL program) (**Appendix F**).

The 10-minute post-questionnaire, completed at the end of the intervention phase, asked educators about their opinions of the online PL program (**Appendix G**). Educators were asked to rate and/or comment on all aspects of the blended PL program including the accessibility of the website (log on procedures etc.), synchronous and asynchronous components in terms of functionality, usability and usefulness and barriers to participation. Data from the qualitative responses from the questionnaires, all of the asynchronous and synchronous sessions were coded using NVivo (Version11, August

2017). This was inclusive of transcripts of the live chat sessions between educators, within and between centres, as well as transcripts between educators and the expert, blogs and forums. (refer to **Chapter 6** for further detail).

Process data, such as engagement levels, completion of online activities and frequency and number of posts were also collected during the intervention phase. The levels of engagement in the online activities by each centre were monitored through the use of log in details, competition of challenges set by corresponding researcher, frequency and number of posts contributing to the secured site, and access to web-based resources.

3.7 Professional learning design and content

A blended PL model was chosen for this study to overcome the shortcomings of face-to-face PL models (geographgical barriers, high costs, one-shot workshops) (Broadly, 2010; Broadly, 2012; Brown & Inglis, 2013; Carter & Fewster, 2013; Karagiogi et al., 2008; Sndyer et al., 2012; Wood & Bennett, 2000) and exclusive online PL models (isolation, users levels of competence in technology) (Fisherman et al., 2013; Kubitskey, Fishman, & Marx, 2002). A blended PL model is a compromise between the conventional face-to-face sessions and exclusive online learning that aims to cater for a diverse array of learning styles and teaching styles of both participants and the facilitator (Heinze & Procter, 2004; Yeh, Huang, & Yeh, 2011). The blended PL intervention comprised two phases; an intensive face-to-face workshop, followed by 12 weeks of online PL.

3.7.1 Phase One: Intensive face-to-face workshop

The first phase consisted of an intensive face-to-face workshop conducted over a full day (six hours). All consenting educators were invited to participate in the workshop. The purpose of the face-to-face workshop was to enable educators to meet each other, build a professional and personal rapport with one another around the content area prior to meeting online. The content of the workshop was informed from the results of the baseline EPAO observations and focused on four broad themes; (1) physical activity, (2) healthy eating behaviours, (3) leadership and change management, and (4) online PL. The workshop offered opportunities for educators to interact, collaborate, communicate and discuss each of the four themes. To aid discussion, the results from the EPAO baseline observations were presented to the educators. Educators then had the opportunity to discuss general themes and patterns that emerged from the de-identified data. Educators from each centre were presented with the baseline EPAO data specific for their centre. This enabled educators to assess their strengths and weaknesses and identify areas of concern and areas that could be improved. Furthermore, it enabled the ongoing PL to be contextualised to individual centres and meet the specific needs of the educators. On completion of the workshop all educators were asked to complete an evaluation form to provide feedback to the facilitator about the content covered, the delivery mode and the relevance of the workshop (**Appendix H**).

3.7.2 Phase Two: Online professional learning

Following the face-to-face PL, educators participated in the online component. Each cluster (i.e., cluster 1, 2 and 3) was given access to their own password-protected secure website (i.e., educators randomised into cluster 1 only had access to their website,

educators randomised into cluster 2 only had access to their website). All iterations of the websites were identical, with educators accessing the same online content. This measure was taken to avoid cross contamination between the three clusters and to aimed to protect the privacy of the children, families and educators within each of the three clusters. The online PL comprised synchronous and asynchronous components. The synchronous component involved educators participating in three 'live' real time chat sessions which were facilitated on days and times chosen by the educators. All synchronous sessions were delivered using Adobe Connect, Version 9. Two identical synchronous sessions were facilitated every third week. These sessions were offered at different times (for example, Tuesday 6pm and Thursday 8pm) in an effort to increase the flexibility of the program around educator's professional and personal commitments. The main researcher of the blended PL program (an experienced ECEC teacher trained educator and qualified training facilitator with more than 20 years experience) developed the content and facilitated the synchronous sessions. A second researcher participated in the synchronous sessions to provide technical support where needed. During each of the three 1-hour synchronous sessions educators participated in planned online activities, commented on the content of the program and discussed challenges that they have been facing regarding the implementation of the program. The content of the sessions is outlined in **Table 3.3**.

The asynchronous component enabled educators to access online resources on their own terms (place and time) and in a self-paced learning environment (Olsen, Donaldson, & Hudson, 2010). The main researcher provided new information to educators via weekly blogs which covered a range of topics as shown in **Table 3.3**. The weekly blogs

contained a variety of resources such as: physical activity lesson plans, fact sheets, research-based articles, optional weekly challenges for educators, reflective questions, links to the Australian National Early Years Learning Framework (EYLF) (DEEWR 2009) and Asutralian National Quality Standards (ACEQA 2017), lists of suitable resources such as children's books and links to relevant websites and YouTube video clips. In response to the blogs, educators were encouraged to participate in weekly online forums. Educators were encouraged to share anecdotes and images of their ECEC environment that exemplified high quality learning environments in the area of physical activity and nutrition practices and how their environment had changed as a result of the PL that they were receiving. Furthermore, the forums provided a medium for educators to communicate with other educators from their own centre or educators from other centres.

Table 3.3: Synchronous online sessions for the blended professional learning program (known as HOPPEL)

Session	Content
Session 1 Technical training – How to use Adobe Connect	• Online etiquette • Audio connection & use • Video usage • Adobe Connect functionality • Use of whiteboard (use of pens, typing text) • Use of on-screen chat box • Educator voice- share ideas, experiences, challenges, questions
Session 2 How to promote physical activity in ECEC centres	• Power break • Use of resources to promote physical activity within indoor and outdoor environment e.g. rope, bean bags, hula hoops etc.

Session	Content
	• Holistic programs- examples of how to transform traditional sedentary based lessons into physical activity experiences e.g. literacy • Educator voice- share ideas, experiences, challenges, questions
Session 3 **How to promote healthy eating behaviours in young children in ECEC centres**	• Holistic approach- integrating nutrition across curriculum areas (math, English, science) • Water consumption facts and strategies on increasing water consumption • Fruit/vegetable consumption facts and strategies on increasing fruit/vegetable intake • Milk consumption facts and strategies on increasing milk consumption • Lunch box- Family partnerships/education healthy foods, use of traffic light system • Where to from here (reflective ideas for continuation of program)

Session	Content
	• Educator voice- share ideas, experiences, challenges, questions

Table 3.4: Asynchronous professional learning content

Blogs	Content
Blog 1 Professional learning addressing physical activity and nutrition in ECECs.	• Current trends in PL, linking to the educators identified 'wants' from formative questionnaires • Web-mediated model and an online community. National and international recommendations and guidelines pertaining to physical activity and nutrition • Engaging co-workers, children and families in healthy lifestyles. Importance of quality improvement in alignment with National Quality Framework and Early Years Learning Framework
Blog 2 Promoting physical activity and reducing sedentary behaviours	• Gross motor skills suitable for toddlers and preschoolers. • Research pertaining to children's activity levels and factors associated with rising sedentary behaviours • Practical ways to reduce sedentary behaviours

Blogs	Content
	• Use of structured physical activity lessons • Common barriers associated with structured physical activity lessons • Increasing spontaneous teaching opportunities around physical activity
Blog 3 Health eating behaviours	• Collaborative menu planning strategies • Alternative lunch routines and healthy lunch boxes • Responsive food practices and implications in the promotion of healthy food choices • Reflect outcomes of Australian National Quality Standards (NQS) and Australian Dietary guidelines for toddlers and preschoolers • Teacher-led healthy eating behaviours lessons into everyday routines
Blog 4 Healthy learning environments	• Evidenced-based high quality learning environment • Measures to facilitate positive environmental changes regarding physical activity and

Blogs	Content
	nutrition for both toddlers and preschoolers • Relationship between physical activity, sedentary behaviours and childcare environments
Blog 5 Holistic everyday curriculum	• Planning goals and cycles and the importance of underpinning child development knowledge • Value of play-based learning and promoting physical activity and nutrition across all play-based experiences within a daily routine • Programming for individuals and groups, inclusive of reflective practice
Blog 6 The role of the educator	• Importance of intentional teaching and sustained shared thinking in relation to physical activity and nutrition • Importance of communication in high quality interactions • Difference between supervisors of learning or co-constructors of knowledge

Blogs	Content
Blog 7 Family partnerships	• Increasing family involvement in relation to physical activity and nutritional behaviours of ECEC environment • Overcome common barriers • Importance of family contribution in National Quality Framework and Early Year Learning Framework
Blog 8 Policies and practices	• Managing, implementing and reflecting upon current policies and practices relating to physical activity and nutrition • Practice strategies to include physical activity and nutrition into a centre quality improvement plan (QIP)
Blog 9 Leadership, management and team building	• Importance of leadership roles, and associated impact of on children's learning and development • Fundamentals of a functional team • Reflect upon EPAO results, highlighting strengths, weakness, opportunities and

Blogs	Content
	threats in relation to transforming theory into practice
Blog 10 Professional ongoing support: personal and technical support	• Technical skills needed for online component • Possible barriers, strategies to overcome these barriers and available technical support • Developing a community online and how this will impact child learning outcomes and educator's self-efficacy levels

Note: PL – Professional Learning, EPAO – Environmental and Policy Assessment Observations

3.8 Ethical considerations

All educators and parents of the children recruited to this study provided written consent (**Appendices E-G**). Educators and parents of the children were provided with detailed information sheets, which described the design and implementation of this study (**Appendices H-J**). Educators and the parents/guardians of the children participating were given opportunities to ask questions concerning the procedures and were able to withdraw from the study at any time. Their relationship with the ECECs, the organisation and the University of Wollongong was not harmed if they chose to withdraw from the study. All data were kept in strict confidence and coded appropriately to protect each educator and child's identity. All data collectors had a current Working with Children Check and the study was approved by the University of Wollongong Social Sciences Human Research Ethics Committee (HE15/356) (**Appendix O**).

3.9 Summary

This chapter discussed the methodology related to the second research question of this thesis, the research design, recruitment process research instruments and data collection procedures were outlined. The following chapter will address the first research question of this thesis and will explore the relationship between the quality of the ECEC environment and objectively measured physical activity and sedentary behaviours among toddlers and preschoolers. **Chapter 6** details the results from the blended PL program which aligns with the methods described in this chapter.

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Chapter 4

Relationship between children's physical activity, sedentary behavior, and childcare environments: A cross sectional study

This chapter was published as:

Peden, M. E., Jones, R., Costa, S., Ellis, Y., & Okely, A. D. (2017). Relationship between children's physical activity, sedentary behavior, and childcare environments: A cross sectional study. *Preventive Medicine Reports*, *6*, 171-176. doi.org/10.1016/j.pmedr.2017.02.017

4.1 Preface

This chapter highlights the relationship between the quality of the ECEC environment and toddlers and preschooler's physical activity. A variety of environmental ECEC factors which influence children physical activity have been investigated however the relationships between the quality of the ECEC environment and young children's physical activity has not been investigated. This chapter aimed to investigate this relationship among toddlers and preschoolers. This chapter concludes with recommendations that focus on investigating other environmental factors and the importance of a holistic approach when increasing physical activity among toddlers and preschoolers in ECEC settings.

4.2 Introduction

The early years (0-5 years) is a critical time in establishing healthy levels of physical activity and sedentary behaviour (Reilly et al., 2004). Optimal levels of these behaviours at this age are associated with more favorable health outcomes in childhood and adolescence (Bower et al., 2008; Vanderloo et al., 2014). Of concern is that a high proportion of young children currently do not meet physical activity and sedentary behaviour recommendations (Botey, Bayrampour, Carson, Vinturache, &Tough, 2016; Ellis et al., 2017; Hinkley, Salmon, Okely, Crawford, & Hesketh, 2012, thereby potentially impacting long-term health outcomes.

In recent years, the number of children attending childcare services has escalated with the majority of children in developed countries now attending some sort of formal childcare each week (OECD, 2013). This makes childcare services ideal environments to promote healthy levels of physical activity and sedentary behaviour. Healthy lifestyles (including physical activity and sedentary behaviours) is also a mandated part of most early childhood curricula (ACECQA, 2011; Stegelin, 2005;) and childcare services offer environments, both indoors and outdoors, for active play opportunities (ERIC Digest, 2001).

A number of studies have investigated the relationship between the childcare environment and young children's physical activity (Hesketh & van Sluijs, 2016; Henderson, Grode, O'Connell, & Schwartz, 2015; Vanderloo, Tucker, Johnson, Burke, & Irwin, 2015). Such studies have reported positive relationships with physical activity and the availability of portable or fixed equipment, teacher-led physical activity lessons, and staff behaviours (such as staff intentionally engaging with children in active play or providing positive or negative comments in relation to physical activity) (Bower et al., 2008; Kreichauf et al., 2012: Goldfield, Harvey, Grattan, & Adamo, 2012; Trost, Fees, & Dzewaltowski, 2008). Staff involvement in the promotion of active play, the use of positive statements and prompts about physical activity have been associated with increased child activity within childcare environments (Gubbels et al., 2011; Vanderloo et al., 2014). In contrast, other studies have identified negative relationships between staff participation during indoor play (Brown et al., 2009; Henderson et al., 2015) and larger peer group size with physical activity (Gubbels et al., 2011). Staff participation refers to the levels of staff engagement

with children in active play and how staff initiate play experiences with children (Brown et al., 2009). Whilst peer group size refers to the number of children assigned to a group that is supervised by a staff member (Gubbels et al., 2011). Previous studies have reported an association between social environmental factors and physical activity. Understanding these relationships is important as it helps to identify specific factors that could be targeted within childcare environments to improve children's physical activity and reduce children's sedentary time. However, a number of limitations have been identified with these studies including: the number and type of environmental factors investigated, the instruments used to measure physical activity and/or sedentary behaviour and age range of participants. To date, few studies have reported on such relationships among younger children (i.e., children aged less than 2.5 years) and limited studies have investigated the relationship between childcare environments and objectively measured sedentary behaviour. Therefore, the aim of this study was to investigate the relationship between childcare environments and objectively measured physical activity and sedentary behaviour among toddlers and preschoolers.

4.3 Methods

4.3.1 *S*etting and participants

Cross sectional data were collected between August and November 2013 from 11 childcare services that were part of an overarching administering organisation, operating within the Illawarra and Shoalhaven region of NSW, Australia (population 0.5 million) (Australian

Bureau of Statistics, 2014). Parent consents were obtained prior to data collection. The Human Research Ethics Committee at the University of Wollongong approved the study (HE12/443).

4.3.2 Assessment of the childcare environment

The childcare environment was objectively assessed using the validated Environment Policy and Observation instrument (EPAO) (Gubbels et al., 2011; Ward et al., 2008). Prior to data collection, four data collectors participated in an intensive full day workshop, inclusive of general observational techniques, a review of the EPAO and its uses, description of indoor and outdoor space, lessons on interview techniques and procedures, instructions and demonstration of record keeping and the completion of a mock assessment alongside an experienced observer. An inter-observer agreement was completed with inter-observer agreement averaging 84.5% (Ward et al., 2008). Following the workshop, the trained data collectors unobtrusively completed observations within childcare services over two full days. One day was spent observing the preschool-aged children and the other day observing the toddler-aged children.

The complete EPAO instrument assesses the physical activity, sedentary behaviour, and nutrition environments, policies, and practices. However, for this study only the physical activity and sedentary behaviour component of the EPAO was used. This component comprised eight subscales (Lyn, Maalouf, Evers, Davis, & Griffin, 2013; Ward et al., 2008;), however, only six subscales were reported in this study. The document review

subscale pertaining to policy on physical activity and training and curriculum review were omitted due to all services belonging to the same overarching organisation (thus having identical written policies). The six subscales included in this study were: (1) active opportunities (frequency and total minutes of indoor and outdoor active play, structured-educator led physical activity opportunities and unstructured physical activity opportunities); (2) sedentary opportunities (time spent seated beyond 30 minute period (excluding nap and meal times), use of small screen devices (computers, DVD, iPads); (3) sedentary environments; (4) portable play equipment (e.g. ball play, climbing structures, floor and jumping play equipment, parachute, push/pull toys, riding toys, rocking/twisting toys, sandpit, water play, slides, balancing surfaces, hoops and tricycle tracks); (5) fixed play equipment (e.g., climbing structures and balancing equipment); and (6) staff Bbhaviors (educators restricting play as punishment, engaging in physical activity with children, providing positive or negative prompts relating to physical activity, and providing formal physical activity lessons). Observations also identified the presence of small or large outdoor running spaces (obstructed and unobstructed), suitable indoor space for gross motor activities, and displays, books, and posters relating to physical activity and sedentary behaviour.

Each subscale was scored using recommendations from Vanderloo et al. (2014). Initially, all item responses were converted to a three-point scale (ranging from 0-2). Sedentary opportunities and sedentary environment subscales were reversed scored; thus, lower levels of sedentary behaviour signified higher values (Bower et al., 2008). For each of the six

subscales, the converted responses were then tallied and divided by the number items in each subscale. To standardise each score, the average was then multiplied by 10, which provided an overall score out of 20 for each subscale (Bower et al., 2008). A total EPAO score was calculated by averaging all of the subscale scores, with a more supportive environment equating to a higher score and a less supportive environment equating to a lower score (Vanderloo et al., 2014; Ward et al., 2008). Childcare services were then stratified based on their total EPAO score: centres that scored <70 were classified as low EPAO centres, those scoring 70-79 were classified as medium EPAO centres, and those scoring >80 were classified as high EPAO centres.

4.3.3 Physical activity and sedentary behaviour

ActivPAL accelerometers were used to assess physical activity and sedentary behaviour. The activPAL accelerometer has proven to be a practical, reliable and valid instrument that objectively and successfully captures data on children's sitting, standing and stepping activities (De Decker et al., 2013; Dowd, Harrington, Bourke, Nelson, & Donnelly, 2012). The small activPAL device (53x35x7mm) was secured to a child's upper thigh within a pouch using a Velcro garter. The activPAL was fitted upon arrival and removed prior to the children leaving the childcare service in the afternoon. Toddlers (1.0-2.9 years) fitted with an activPAL were all mobile and able to demonstrate competent walking skills. The Centre for Physical Activity and Health Research (CPAHR) MATLAB program with 15 second epoch files were used to calculate sitting/lying, standing, physical activity and non-wear

time for each participant per day (Hamilton, Hamilton, & Zderic, 2004). Children needed to wear the activPAL≥ 180 minutes/day for a day to be considered valid (Ellis et al., 2017). Sitting breaks and bouts were determined from activPAL outputs. Data were collected between 1-5 days depending on the number of days the children attended the service. All the childcare services included in this study scheduled a nap during each day (±1h), this period was excluded from the total wear time (Ellis et al., 2017). Naptime was excluded for toddlers but not for preschool-aged children. This decision was based on the fact that most toddlers still nap, and most preschool-aged children do not nap (Blair et al., 2012; Pattinson et al., 2014). Sitting breaks and bouts were determined from activePAL outputs. Mean breaks per hour of sitting were calculated as the total sum of all the number of bouts (Dowd et al., 2012). Bouts of sitting were categorised as: <1min, 1-4mins, 5-9mins, 10-19mins, 20-29mins or ≥30mins (Carson, Stone, &Faulkner, 2014)

4.3.4 Statistical methods

All analyses were performed using STATA version 13. ActivPAL-specific software (v 5.9.1.1) was used to download activPAL data (Ellis et al., 2017). This program was used to calculate for each participant the sitting, standing, stepping and non-wear time for each day. This time was recorded in epochs of 15 seconds. After the program calculated non-wear time for each participant, data were imported into Microsoft Excel 2011 for Mac (Microsoft Corporation, 2010) to calculate the total minutes of wear time, sitting, standing, and

stepping. Non-wear time was identified and removed if the activPAL recorded series of 0 counts for over 30 minutes (120 consecutive counts). These non-wear bouts were manually removed from the total minutes monitored, and Excel files were transferred into STATA files. Finally, multilevel mixed-effects linear regression was used to calculate mean stepping, standing, and sitting time adjusted for mean wear time.

Multilevel mixed-effects linear regression models were used to investigate the relationship between EPAO and (1) sitting, (2) standing, and (3) stepping. Models were run firstly using overall EPAO, and afterwards with each EPAO subscale as predictor variables. All models were adjusted for clustering at childcare centre level, activPAL wear time and sex. As initial analyses with toddlers and preschoolers combined revealed differences in these relationships between the two age groups, all analyses were subsequently conducted separately for toddlers and preschoolers. As the variability in scores was smaller for the EPAO subscales, it was decided to only use the high and low category scores for these predicted variables. Alpha was set at 0.05.

4.4 Results

Data from 68 toddlers (1.0-2.9 years, mean age (M_{age}) 2.2 years) and 233 preschoolers (3.0-5.9 years, M_{age} 4.12 years) were collected (**Table 4.1**). The 11 childcare centres combined catered for an average of 35 per day. On average, there were 6 toddlers and 18 preschoolers per child care centre who participated in this study. There were no statistically significant differences between high, medium and low EPAO scoring centres in time spent sitting,

standing and stepping among toddlers (**Table 4.2**). Toddlers who attended high EPAO scoring centres sat more (mean [95% CI]) = 8.783 minutes [-3.02, 37.30] and stood less (-13.64 minutes [-29.27, 1.99]) than those who attended low EPAO scoring centres (**Table 4.2**). Toddlers in high EPAO scoring centres spent more time stepping (4.86 minutes [-7.30, 17.02]) compared to those attending low and medium EPAO scoring centres (**Table 4.2**).

Similarly, for preschoolers, there were no statistically significant differences between high, medium and low EPAO scoring centres and time spent sitting, standing and stepping (**Table 4.3**). Preschoolers attending high EPAO scoring centres sat marginally less (mean [95%CI] = -7.81 minutes [-26.64, 11.02]) than those attending low or medium EPAO scoring centres and preschools from high EPAO scoring centres stepped slightly more than those from medium and low scoring centres (7.28 minutes [-1.39, 15.96]) (**Table 4.3**).

Table 4.1: Descriptive characteristics.

Characteristics	Toddlers (1-2.9) (n=68)	Preschoolers (3-5.9) (n=233)
Age (y), mean (SD)	2.2 (0.5)	4.1 (0.6)
Boys (n=145), mean (SD)	2.2 (0.6)	4.2 (0.6)
Girls (n=156), mean (SD)	2.3 (0.4)	4.1 (0.6)
Total EPAO score, mean (SD)	13.17 (3.40)	12.35 (1.74)
Active Opportunities, mean (SD)	11.48 (5.0)	14.85 (3.12)
Sedentary opportunities, mean (SD)	17.78 (3.14)	13.03 (1.00)
Sedentary environment, mean (SD)	12.59 (4.91)	10.91 (3.36)
Portable play equipment, mean (SD)	12.22 (4.6)	13.45 (3.70)
Fixed play equipment, mean, (SD)	8.52 (2.67)	10.20 (2.76)
Staff behaviors, mean (SD)	16.44 (3.98)	11.64 (4.88)
Sitting, mins/day, (SD) % of time*	112 (44), 40%	160 (50), 51%
Standing, mins/day, (SD) % of time*	107 (42), 37%	98 (36), 31%
Stepping, mins/day, (SD) % of time*	62 (25), 22%	58 (23), 18%

Note: * %=proportion of time

Table 4.2: Multi-level mixed effects linear regression - Toddlers

EPAO Category	Sit min/d			Stand min/d			Step min/d		
	Coeff	P	95% CI	Coeff	P	95% CI	Coeff	P	95% CI
Low	ref			ref			ref		
Medium*	17.14	0.10	-3.022,37.30	-8.74	0.30	-25.33,7.86	-8.44	0.20	-21.35,4.46
High*	8.73	0.90	-10.26,27.73	-13.64	0.09	-29.27,1.99	4.86	0.43	-7.30,17.02
Active Opportunities									
Low	Ref			ref			ref		
High	-5.95	0.48	-22.53,10.63	0.36	0.96	-12.57,13.30	5.47	0.34	-5.81,16.76
Sedentary Opportunities									
Low	Ref			ref					
High	3.75	0.67	-13.54,21.05	-7.84	0.24	-21.02,5.34	3.85	0.52	-7.82,15.52
Sedentary Environment									
Low	ref			ref			ref		
High	-16.09	0.08	-34.02,1.84	4.65	0.55	-10.41,19.72	11.43	**0.05**	-0.18,23.03
Portable Play Equipment									
Low	Ref			ref			ref		
High	8.20	0.31	-7.69,24.08	-3.47	0.60	-16.26,9.32	-4.38	0.44	-15.54,6.78
Fixed Play Equipment									
Low	Ref			ref			ref		
High	8.04	0.37	-9.53,25.61	-8.92	0.21	-22.99,5.15	0.85	0.88	-10.14,11.84

EPAO Category	**Sit min/d**			**Stand min/d**			**Step min/d**		
Staff Behaviors									
Low	Ref			Ref			Ref		
High	0.85	0.93	-18.32,20.02	-2.19	0.77	-16.91,12.52	1.61	0.81	-11.36,14.58

Note: CI – confidence interval; Coeff – coefficient; min/day – minutes per day; ref – reference group.
Boldface indicates statistical significance (*$\rho<0.05$)

Table 4.3: Multi-level mixed effects linear regression - Preschoolers

EPAO Category	Sit min/d			Stand min/d			Step min/d		
	Coeff.	**P**	**95% CI**	**Coeff.**	**P**	**95% CI**	**Coeff**	**P**	**95% CI**
Low	Ref			ref			ref		
Medium	1.48	0.88	-17.80,20.76	-2.75	0.64	-14.28,8.78	1.05	0.82	-7.85,9.95
High	-7.81	0.42	-26.64,11.02	0.50	0.93	-10.51,11.51	7.28	0.10	-1.39,15.96
Active Opportunities									
Low	ref			ref					
High	0.55	0.94	-12.92,14.02	-0.90	0.88	-12.18,10.38	0.24	0.96	-8.39,8.88
Sedentary Opportunities									
Low	Ref			ref			ref		
High	-14.94	0.27	-41.50,11.62	5.35	0.50	-10.20,20.90	9.64	0.14	-3.14,22.42
Sedentary Environment									
Low	Ref			ref			ref		
High	5.87	0.49	-10.66,22.40	-5.88	0.20	-14.81,3.05	0.29	0.95	-8.75,8.16
Portable Play Equipment									
Low	ref			ref			ref		
High	-6.69	0.23	-43.77,10.63	6.10	0.48	-10.66,22.86	10.58	0.11	-2.44,23.60
Fixed Play Equipment									
Low	ref			ref			ref		
High	-2.81	0.74	-19.68,14.05	0.75	0.88	-8.97,10.48	2.26	0.60	-6.08,10.61

EPAO Category	Sit min/d			Stand min/d			Step min/d		
Staff Behavior									
Low	ref			ref			ref		
High	-0.55	0.95	-17.81,16.70	-0.82	0.87	-10.88,9.24	1.10	0.80	-7.48,9.96

Note: CI – confidence interval; Coeff – coefficient; min/day – minutes per day; ref – reference group.

Given that no statistically significant differences were identified between the three EPAO levels and time spent sitting, standing and stepping, subsequent analyses were conducted comparing between only the high and low EPAO scoring centres for the six subscales. A significant difference in time spent stepping was found in toddlers attending EPAO scoring centres with a high sedentary environment and those attending at EPAO scoring centres with a low sedentary environment (11.43 minutes [-0.18, 23.03]) (**Table 4.2**).

4.5 Discussion

This is one of the first known studies to explore the relationships between toddlers and preschoolers objectively measured physical activity and sitting time and their childcare environment. No statistically significant differences were found between EPAO categories (high, medium and low) and physical activity/sedentary behaviour (time spent sitting, standing and stepping) for either toddlers or preschool aged children. Although not significant, toddlers attending high EPAO scoring centres stood 13 minutes less than toddlers attending low EPAO scoring centres (p=0.09) and preschoolers attending high scoring EPAO centres stepped an additional 7 minutes per day compared to those in attending low EPAO scoring centres (p=0.1). These findings, although not significantly different, are consistent with other studies that report positive associations between more supportive childcare environments and physical activity levels of young children (Bower et al., 2008; Vanderloo et al., 2014). More supportive environments are characterised by, in part, structured and unstructured physical activity opportunities, accessibility to a variety of

portable play equipment and high levels of intentionality from staff. It is not surprising that when these environmental factors are optimised, physical activity levels increase.

A significant relationship was found between sedentary environments and time spent stepping for toddlers from high EPAO scoring centres compared with those from low EPAO scoring centres: a difference of 11 minutes per day was reported (**Table 4.2**). Additionally, whilst not statistically significant, sedentary environment also had a more meaningful association with toddlers sitting behaviours, as children in the high EPAO environments sat 16 minutes less per day than those in the low EPAO environments (**Table 4.2**). The sedentary environment subscale focused on the presence of televisions and computers, as well as the presence of displays, posters and books relating to physical activity. However, in this study very few (<36%) childcare centres had televisions or computers present in the learning environment, suggesting that these relationships identified maybe attributed to the presence of displays, posters and books in the childcare environment. Thus, the differences in stepping and sitting observed in this study could be related to the toddler's increased observational abilities and levels of curiosity as they engage with their surrounds (Fees, Fischer, Haar, & Crowe, 2015). Children at this age are developing new schemas as they organise and interpret new information available in their learning environment (Kaplan, 1991). Therefore, the use of visual stimuli within a toddler-learning environment, such as posters, pictures and display books could positively impact physical activity (stepping) levels and sedentary behaviours (sitting time). Given that this is the first known study to report on these relationships among toddlers, additional studies in

this area will be needed to confirm this assumption. Furthermore, additional studies will need to consider how aspects of the sedentary environment should be targeted in interventions to reduce sitting in toddlers.

This study identified portable play equipment as having a more meaningful relationship with sitting and stepping for preschoolers compared with toddlers. Although the relationship between portable play equipment and stepping was not significant, preschool children stepped 10 minutes more per day in high scoring EPAO centres compared to low scoring EPAO centres. An additional 10 minutes of physical activity is meaningful in childcare settings given that preschool children spend more than 50% of their time sitting in these settings (Ellis et al., 2017). As previously reported, physical activity is likely to increase when portable play equipment is provided because children are moving whilst engaging with the various types of transportable materials (e.g., bikes, balls) (Vanderloo & Tucker, 2015).

The main strength of this study is the inclusion of both toddlers and preschool aged children physical activity data. Most previous studies investigating the relationships between childcare environments and physical activity/sedentary behaviour include only preschool children (Bower et al., 2008; Gubbels et al., 2011; Vanderloo et al., 2014; Copeland, Khoury, & Kalkwarf, 2016). Identifying relationships for both toddlers and preschool children is important because developmentally toddlers and preschool children are considerably different (Fees et al., 2015), which may mean that the childcare environmental factors relating to physical activity and sedentary behaviour may also be

different. This is important in light of the development and implementation of interventions that focus on physical activity and sedentary behaviour within childcare environments. It is plausible to suggest that interventions may need to be tailored for toddlers and preschool-aged children. Another strength of this study is the objective measurment of sitting and standing time.

4.6 Limitations

The results of this study should be considered in light of the following limitations. First, the moderate sample size may have underpowered potential statistically significant relationships that may have been more apparent in a larger sample. In this sample, the preschool group was adequately powered to detect significant differences however the toddler groups were not adequately powered. The number of toddlers recruited was small as all children involved in the study had to be competent walkers for accurate measurements by the ActivPALs. This meant that some toddlers were excluded from the study. However, given that there are no other studies that have investigated these relationships among toddlers, we suggest that the results from this study are meaningful, despite a number being non significant. In order to confirm the results from this study, larger studies will be needed. Second, the EPAO assesses 'structural characteristics' of childcare environments and does not account for indicators of 'process quality' (i.e., interactions between educators and children and interactions among children themselves) (Gordon, Fujimoto, Kaestner,

Korenman, & Abner, 2013; Vandell & Wolfe, 2000;). Such interactions maybe also important in physical activity/sedentary levels of toddlers and preschool children.

4.7 Conclusions

This study extends previous research by identifying differences between toddlers and preschoolers' physical activity and sedentary behaviours in relation to childcare environments. Childcare environmental factors seem to differ between toddlers and preschool children. These differing environmental factors are important in the development and facilitation of interventions that focus on physical activity and sedentary behaviour opportunities within childcare environments. More tailored interventions are needed. Furthermore, interactions between staff and children are another important environmental factor that need to be considered in future studies. Similarly, research should also investigate the quality and accessibility of staff training in the promotion of physical activity. Given no one environmental attribute was significantly related to an increase in physical activity in each age group, a contextualised and holistic approach in PL should be used to equip educators with the knowledge and skills needed to improve the physical activity levels of toddlers and preschool children in childcare settings.

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Chapter 5

A web-mediated intervention for educators in early childhood education and care settings targeting physical activity and healthy eating behaviours in young children: A cluster randomised stepped-wedge design.

This chapter has been submitted:

Peden, M., Eady, M., Okely, A. D., Patterson, K., Batterham, M. & Jones, R. A. (2018). A web-mediated intervention for educators in early childhood education and care settings targeting physical activity and healthy eating behaviours in young children: The HOPPEL cluster randomised stepped-wedge trial. *American Journal of Preventative Medicine* (under review).

5.1 Preface

This chapter presents the main outcomes for this thesis with regard to the impact of a blended PL program (known as the Healthy Online Professional Program for Early Leaners (HOPPEL), targeting educators within ECEC setting. This chapter presents centre-level changes in physical activity and nutrition (assessed using the Environment and Policy Assessment Observation System (EPAO) and child-level changes in physical activity (assessed using Actigraph accelerometers). Multi-level mixed effects linear regression models were used to test the intervention effects.

5.2 Introduction

Early childhood education and care (ECEC) settings are important environments for targeting young children's physical activity (Vanderloo et al., 2014; Ward et al., 2018) and healthy eating (Markides, Crixell, Thompson, & Biediger-Friedman, 2017; Nicklas et al., 2001). The National Academy of Medicine (NAM) recommend that children should be active for at least 15 minutes per hour while in ECEC (with limited sitting or standing time) (Burn, Parker, & Birch 2011). They also recommend that ECEC settings provide a variety of healthy foods and age-appropriate portion sizes and promote the consumption of water (Burn et al., 2011). Data suggest that only 50% of children met the NAM recommendations for physical activity in ECEC centres and a high proportion of children do not meet dietary guidelines (Ellis et al., 2017; Padget & Briley, 2005; Yoong, Skelton, Jones, & Wolfenden,

2014). For example, one Australian study conducted in ECEC centres (n=46) found no ECEC centre provided meals that were compliant to recommended dietary guidelines (Yoong et al., 2014). As such, innovative and sustainable ECEC-focused interventions that promote physical activity and healthy eating are needed (Erinosho, Hales, McWilliams, Emunah, & Ward, 2012; Lyn, Maalouf, Evers, Davis, & Griffin, 2013; O'Neill, Dowda, Benjamin Neelon, Neelon, & Pate, 2017).

A range of intervention approaches have been used to promote healthy eating and physical activity in ECEC centres. Irrespective of the approach, what is important and well recognised is the role of the educator. Most interventions that promote physical activity and healthy eating usually involve some type of professional learning (PL) for educators (Androutsos et al., 2014; De Silva-Sanigorski et al., 2011; Hardy, King, Kelly, Farrell, & Howlett, 2010; Pate et al., 2016). PL varies considerably in duration and length, from a few hours to multiple full-day sessions (Peden, Okely, Eady, & Jones, 2018). Despite the variations in length and duration, most PL for the ECEC sector is delivered using traditional one-off, face-to-face workshops involving one educator from each centre (Peden et al., 2018). This form of PL is used because it serves to meet an individual educator 'specific learning need, allowing them to seek knowledge and skills from an external facilitator that is least disruptive to the centres routine and budget (Carter et al., 2013). However, it is associated with a number of limitations (e.g., awkward scheduling, cost, knowledge transfer, reach) (Carter & Fewster, 2013; Gable & Halliburton, 2003; Wood & Bennett, 2000). Alternative PL models are needed for the ECEC sector.

Web-mediated or blended PL models (i.e., a combination of face-to-face and online) have been successful in changing educator behaviours in the field of education (Kyzar et al., 2014). These models provide educators with convenient access and greater flexibility to access learning materials (Lotrecchiano, McDonald, Lyons, Long, & Zajicek-Farber, 2013) and with increased ongoing opportunities to reflect upon PL content and share knowledge and resources in an online communal space (McDonald, 2012). Of note is the ability of these models to reach educators in rural and remote areas addressing the opportunities they have available for PL (Broadly et al., 2012; Yoong et al., 2015). Furthermore, educators can participate in a virtual community of practice, whereby opportunities of collaboration, enhanced learning and strong professional relationship building, and mentoring are established and maintained in a virtual community (Brooks, 2010; Cesareni, Martini, & Mancini, 2011). Blended PL models to date, have not been assessed as an approach in the promotion of healthy eating and physical activity in ECEC settings. The aim of this study was to evaluate the efficacy of a 'blended' PL program for early childhood educators, targeting physical activity and healthy eating behaviours among 2-5-year old children.

5.3 Methods

5.3.1 Study Design

A stepped-wedge clustered randomised controlled trial (SW-CRCT) design was used with ECEC centres being the unit of randomisation. This design meant that all centres acted as their own control, therefore fewer centres were required to power the study (Brown &

Lilford 2006). **Figure 5.1** describes this design as it applies to this study. Fifteen ECEC centres were recruited. Following recruitment each centre was randomised into one of three clusters, resulting in three clusters, each with five centres. Baseline data were collected in all centres in February 2016. In March 2016, Cluster 1 participated in the intervention whilst the other clusters maintained usual practice (Step 1). At the beginning of July 2016, data were collected again in all centres. At the end of July 2016, cluster 2 participated in the intervention. Cluster 3 continued with usual practice and Cluster 1 started the maintenance period (which involved the ECEC centres continuing to implement changes within their centres with reduced support) (Step 2). This process was repeated again in September 2016, with cluster 1 continuing in maintenance period, cluster 2 entering maintenance period and cluster 3 then participating in the intervention (Step 3). Final data collection was conducted in December 2016. As per the stepped-wedge design, the control and maintenance periods varied.

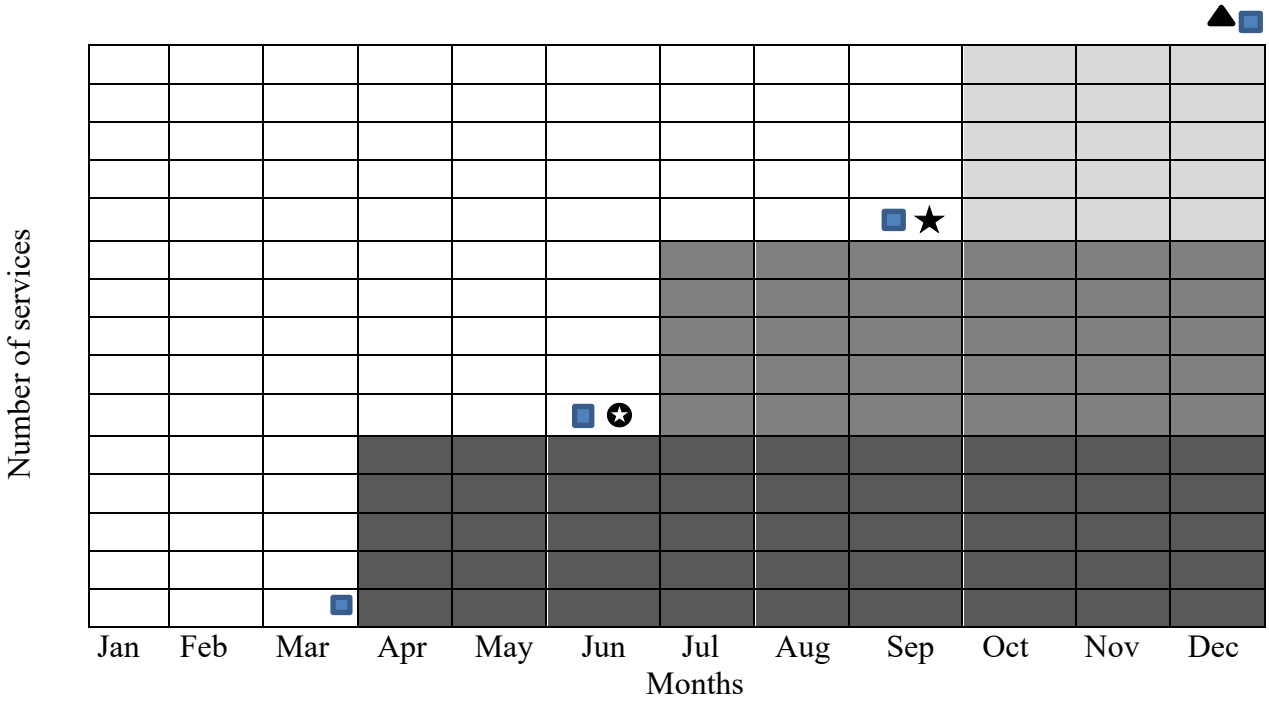

Figure 5.1: Stepped-wedge design for the blended professional learning program

Note:
Cluster 1 - comprised of five ECEC centres (dark grey)
Cluster 2- comprised of five ECEC centres (mid Grey)
Cluster 3- comprises of five ECEC centres (light grey)

- Indicates cross over time point from control to intervention. This is where centres commenced the intervention after being in control period.
- ✪ Post data collection time point for cluster 1, beginning of maintenance phase
- ★ Post data collection time point for cluster 2, beginning of maintenance phase
- ▲ Post data collection time point for cluster 3

The trial followed the CONSORT 2010 cluster extension for reporting stepped-wedge clustered randomised trials (Hemming, Girling, Haines, & Lilford, 2004). The Human Research Ethics Committee, University of Wollongong (HE15/356), approved this trial and it was registered with the Australian New Zealand Clinical Trial Registry (ACTRN12618000346279).

5.3.2 Participants

ECEC educators and children were recruited from 15 ECEC centres from one overarching administrating organisation located in the state of Tasmania (Australia). Centres that catered for children aged 2-5 years within the targeted organisation were eligible to participate in the study. Excluded from the study were (1) children less than 2 years old, (2) children aged 2-5 years enrolled for less than two days per week, (3) special population groups (children with diagnosed physical or intellectual disabilities). Educators in each of the participating centres assisted the primary researcher (MP) in inviting families and children to participate in the study.

5.3.3 Intervention

The intervention was a 12-week blended PL program for ECEC educators. The program, known as HOPPEL (Healthy Online Professional Program for Early Learners), aligned with the physical domain of child development, and focused on physical activity and healthy eating for children aged 2-5 years. Despite the physical domain being a fundamental

component in a number of ECEC curricula, it is often overlooked within ECEC practices (ACECQA, 2011; DfE, 2012; Ministry of Education, 1996). Previously, educators indicated that they had not received PL in this area, leading to limited confidence and competence levels in delivering this domain in practice (Burgeson, Wechsler, Brener, Young, & Spain, 2001; Guskey, 1986).

The PL focused on a number of components related to physical activity including: structured and unstructured physical activity learning experiences, inside and outside physical activity, activity 'power' breaks with the aim of interrupting sedentary time and, designing holistic learning environments that promote physical activity. In relation to healthy eating, the content covered: strategies to increase water intake in both the outdoor and indoor learning environments, suggestions on how to increase milk and fruit and vegetables consumption and, ideas about promoting healthy eating behaviours across all aspects of the daily routine. Components synonymous with both physical activity and healthy eating behaviours such as policy development and promoting family partnerships were also included.

The blended PL program consisted of a face-to-face six-hour workshop, followed by 12 weeks of online PL. The online elements comprised of: asynchronous weekly blogs posted by the expert/lead researcher; asynchronous forums that acted as a medium for educators and the lead researcher to communicate and share ideas and resources on the content areas; and three scheduled synchronous online sessions offered via an online learning platform (Adobe Connect, version 9). Each session lasted approximately one hour and were

conducted in the evening with educators logging on at home or during nightly staff meetings. Educators were mentored through online activities, weekly challenges and professional discussions throughout the implementation of the program. During the control period all centres continued with usual practice and during the maintenance period ongoing access to the asynchronous component and resources posted during the intervention period were available.

5.3.4 Theoretical framework

The blended PL program aligned Guskey's model of teacher change, which is based on meaningful, intentional, ongoing and structured PL focused on increasing knowledge, skills, attitudes and levels of self-efficacy (Guskey, 1986). This was operationalised by providing a highly innovative and engaging ongoing PL program in physical activity and healthy eating behaviours, an area which is under represented in practice within the ECEC setting. This model recognizes the importance of the flow-on effects of teacher change on child outcomes. As such, the blended PL program also focused on the impact of the educator PL on child outcomes (Egert, Fukkink, & Eckhardt, 2018; Guskey, 1986).

5.3.5 Data collection

At each time point centre- and child-level data were collected. The primary outcome was changes in centre-level physical activity and nutrition practices, which were assessed using

the Environmental Policy Assessment and Observation (EPAO) tool (Ward et al., 2008). The secondary outcome was changes in children's physical activity.

The EPAO assesses the physical activity and nutrition (referred to as healthy eating from here on) environment and practices of ECECs (Ward et al., 2008). It is an observation-based instrument that involves one-day of continual observation. Prior to data collection, all data collectors participated in specific EPAO training with the inter-observer agreement between observers being (84.5%) (Ward et al., 2008). Data collectors positioned themselves in non-obtrusive positions within the ECECs and did not disrupt normal routines or activities. Data collectors accessed documents such as policies/procedures pertaining to healthy eating and physical activity, guidelines for celebration foods, fundraising materials, past and present menus, daily program schedules and a copy of the centre layout. Educational materials for parents, curriculum materials and training materials for staff associated with the promotion of healthy eating and physical activity were reviewed. Safety documents pertaining to indoor and outdoor learning environments were checked.

Each of the 16 subscales (eight for physical activity and eight for healthy eating) were scored according to previous studies (Bower et al., 2008; Vanderloo et al., 2014). All item responses were converted to a three-point scale (ranging 0-2). For all 16 subscales, the converted responses were tallied and divided by the number of items present in each subscale. In seven centres, the food was not supplied by the ECEC centre, rather, children supplied their own food. In these instances, the numbers of items tallied were adjusted to

standardise scoring across all centres. Adding the individual subscale scores derived a total physical activity score and a total healthy eating score. Adding the total physical activity score and the healthy eating score derived an overall total EPAO score.

Children's physical activity was assessed using Actigraph GT1M and GT3X+ accelerometers. Educators and/or the researcher placed the accelerometers on the right hip of consenting children on arrival to the centre each day and then removed it at the end of the day. The epoch length was set to 15 second intervals (Cliff, Reilly, & Okely, 2009; Pate, Almeida, McIver, Pfeiffer, & Dowda, 2006). Data were considered valid if a child accumulated 180 minutes on at least one day (Stanely et al., 2016). Twenty minutes of continuous zeros was considered non-wear time during analysis. The Pate modified cut-points were used to define sedentary behaviour (<100 counts/min); low light-intensity physical activity (low LPA) (101-800 counts/min); high LPA (801-1679 counts/min); moderate-intensity physical activity (1680-3367 counts/min); vigorous-intensity physical activity (>3368 counts/mins); moderate- to vigorous-intensity physical activity (MVPA) (>1680) (Pate et al., 2006; Stanley et al., 2016). High light-intensity physical activity was used in this study (as opposed to low or low and high light-intensity physical activity) and referred to thereafter as light physical activity (LPA). Total physical activity was operationalised as time was spent in light-, moderate- and vigorous-intensity physical activity (LMVPA).

5.3.6 Sample size and statistical analysis

The sample size for the study was calculated based on the centre-level EPAO outcome for physical activity. Based on changes in the physical activity component of the EPAO of 2.8 units, assuming a SD of 1.15 (O'Neill et al., 2007), the estimated numbers of centres required was 11. As attrition is common in stepped-wedge designs, 15 centres were recruited (Beard et al., 2015). At the child-level the minimum detectable difference based on the proposed design was 4% in total physical activity (LMVPA). All calculations were performed using STATA v14. The effects of the intervention were tested using a multi-level mixed effects linear regression model. The analysis was performed using the mixed syntax and included, group (treatment or control) and steps (time period) as categorical variables and centre as clusters for the centre level variables. An additional level including child ID was included for the child level variables.

5.4 Results

A total of 15 ECEC centres, 104 educators and 313 children (mean child age=3.25 years) were recruited to this study. **Table 5.1** displays participant (child and educator) characteristics. More children were male, whilst educators were primarily female. The majority of educators were aged between 30-39 years and most had diploma level training. Fewer educators were employed on a full-time basis, with the majority of educators employed for the participating organisation for three to five years. All ECEC centres were retained and data were collected in all centres at baseline, at the end of the intervention period (12-weeks) and at the end of the maintenance period. Ninety educators and 289

children were retained in the study (79% and 92% respectively). Twenty-four educators were not assessed at completion of data collection due to changes in their employment (e.g., resignation or transfer of employment to a non-participating centre) and 23 children left the participating ECEC centres during the study (**Figure 5.2**). No educator or child left the study for reasons related to the study.

Table 5.1: Child and educator characteristics at baseline

Characteristic	**Baseline (Child n=313) (Educator n=104)**
Gender	
Child, Male, n (%)	170 (54)
Child, Female, n (%)	143 (46)
Educator, Male, n (%)	16 (15)
Educator, Female, n (%)	88 (85)
Age (educator), n (%)	
Under 25yrs	15 (14)
26-29yrs	23 (22)
30-39yrs	34 (33)
40-49yrs	22 (21)
50-59yrs	10 (10)
Educator Highest level qualification, n (%)	
Certificate	32 (31)
Diploma	47 (45)
Bachelor degree	16 (15)
Other	9 (9)
Educator Employment status, n (%)	
Full-time	37 (36)
Part-time	65 (63)

Characteristic	Baseline (Child n=313) (Educator n=104)
No Response	2 (1)
Length of time employed as educator, n (%)	
<1yr	1 (1)
1-2yrs	18 (17)
3-5yrs	30 (29)
6-8yrs	8 (8)
>8yrs	47 (45)
Length of time educator employed within organisation, n (%)	
<1yr	8 (8)
1-2yrs	26 (25)
3-5yrs	29 (28)
6-8yrs	14 (13)
>8yrs	27 (26)
Position currently held in organisation, n (%)	
Manager	11 (10)
Educational Leader	1 (1)
Teacher (2nd in charge)	3 (3)
Room leader	24 (23)
Educator	65 (63)

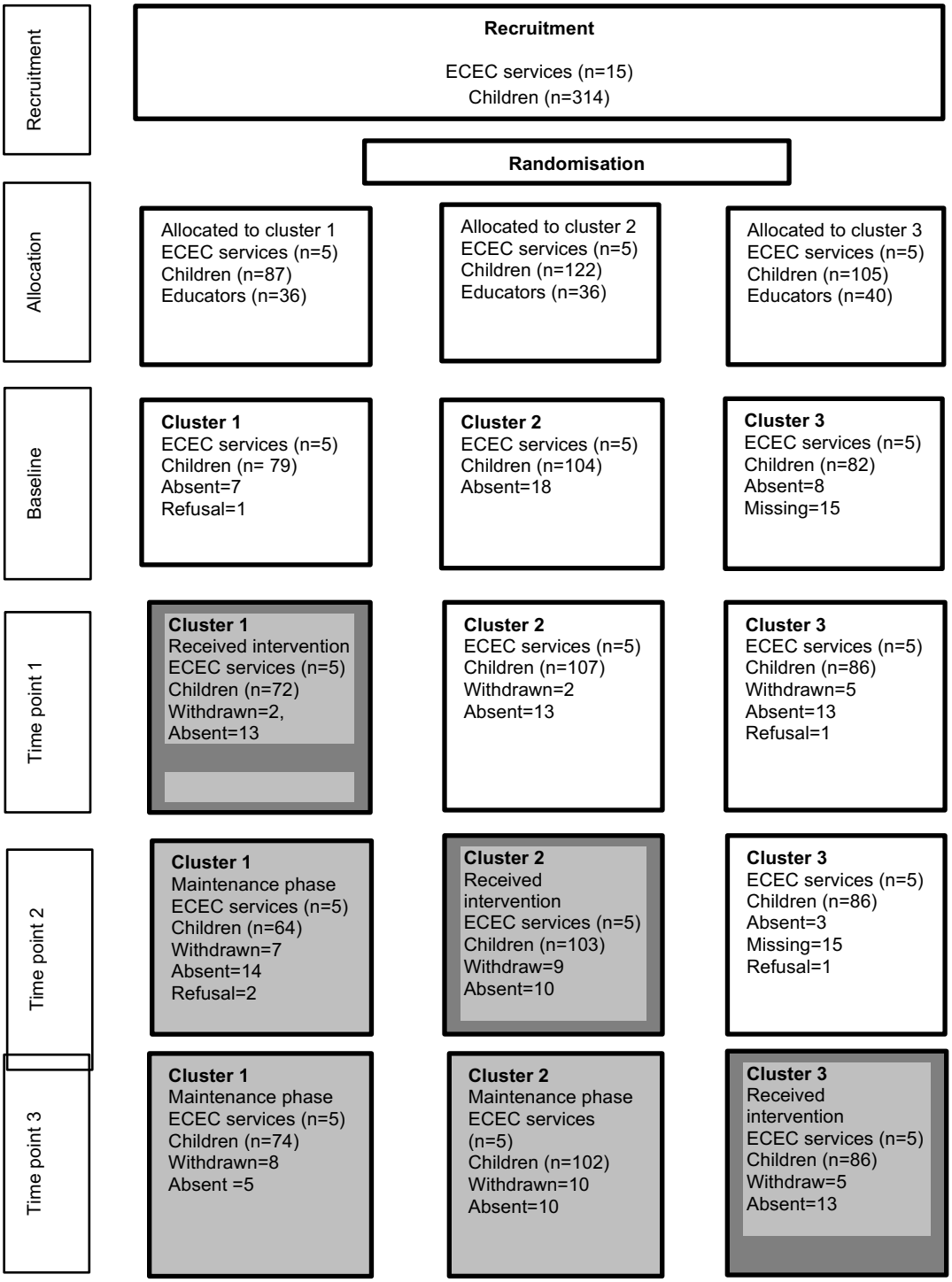

Figure 5.2: Flow of participants - stepped-wedge modified CONSORT diagram

Centre-level results are summarised in **Table 5.2**. The total EPAO score was not significantly different between control and intervention groups at post intervention (adjusted difference =8.94, 95%CI [-0.22,18.09], p=0.06), but was significant at the end of the maintenance period (adjusted difference =14.63, 95% CI [1.33, 27.92], p=0.03). For the total physical activity EPAO score, a significant difference was observed between the intervention and controls groups at the end of the intervention period (adjusted difference=5.33, 95% CI [-0.30,10.37], p=0.04), and this difference was increased at the end of the maintenance period (adjusted difference=8.54, 95% CI [1.61,15.48], p=0.02). The differences between groups for total healthy eating EPAO score were small and not statistically significant.

The results for child-level physical activity data are presented in **Table 5.2**. A significant difference in percentage of time spent in LPA was reported between control and intervention groups at the end of the intervention period (adjusted difference=0.01, 95% CI [0.00,0.01], p=0.02] as well at the end of the maintenance period (adjusted difference= 0.01, 95% CI [0.00,0.02], p=0.04). For all other variables, no significant differences were reported at the end of the intervention period or at the end of the maintenance period.

Table 5.2: Differences between groups for physical activity and healthy eating outcomes

	Post-Intervention Period				**Post-Maintenance Period**			
	Control	**Int**	**Coeff (95%CI)**	***p*-value**	**Control**	**Int**	**Coeff (95%CI)**	***p*-value**
EPAO-Nutrition	101.81 ± 4.11	105.41 ± 4.75	3.60 (2.98,10.19)	P=0.28	100.09 ± 4.73	105.33 ± 4.73	5.24 (-4.65,15.12)	P=0.30
EPAO-PA	109.72 ± 1.56	115.09 ± 2.40	5.33 (0.30,10.37)	**P=0.04**	106.81 ± 2.50	115.36 ± 2.50	8.54 (1.61,15.48)	**P=0.02**
Total EPAO	211.56 ± 4.47	220.49 ± 5.56	8.94 (-0.22,18.09)	P=0.06	206.48 ± 5.50	221.10 ± 5.50	14.63 (1.33,27.92)	**P=0.03**
SB	0.62 ±0.02	0.61 ±0.02	-0.01 (-0.03, 0.01)	P=0.20	0.63 ±0.02	0.60 ±0.02	-0.02 (-0.05,0.01)	P=0.11
LPA	0.11 ±0.01	0.12 ±0.01	0.01 (0.00,0.01)	**P=0.02**	0.10 ±0.01	0.12 ±0.01	0.01 (0.00,0.02)	**P=0.04**
MPA	0.10 ±0.01	0.10 ± 0.01	0.00 (-0.01,0.01)	P=0.86	0.10 ±0.01	0.11 ±0.01	0.01 (-0.00, 0.02)	P=0.12
VPA	0.03 ± 0.00	0.03 ± 0.00	-0.00 (-0.00,0.00)	P=0.70	0.03 ±0.00	0.03 ±0.00	-0.00 (-0.00,0.01)	P=0.66
MVPA	0.13 ±0.01	0.13 ± 0.01	0.00(-0.01,0.01)	P=0.80	0.13 ±0.01	0.14 ±0.01	0.01 (-0.01,0.02)	P=0.19

LMVPA	0.24 ± 0.02	0.25 ± 0.02	0.01 (-0.01,0.03)	P=0.26	0.23 ±0.02	0.25 ±0.02	0.02 (-0.00,0.05)	P=0.10

Note: Boldface indicates statistical significance (*ρ<0.04, **ρ<0.03, ***ρ<0.02). All control and intervention values for physical activity intensities are a percentage of time. EPAO values are absolute values Evaluation Policy Assessment Observation (EPAO); Total values for the EPAO subscores were used rather ahn averages as this was deemed more appropriate for a mixed anayslis under a stepped wedge design.LMVPA Light Moderate Vigorous Physical Activity All; LPA, Light Physical Activity; MPA, Moderate Physical Activity; MVPA, Moderate Vigorous Physical Activity; PA, Physical Activity SB, Sedentary Behaviour; VPA, Vigorous Physical Activity. Control – time when services were not participating in the intervention; Intervention – the time when the services were participating in the intervention.

5.5 Discussion

The results of this stepped-wedge randomised control-led trial show that a blended program PL program for ECEC, was effacious in eliciting small significant positive changes in centre- and child-level physical activity outcomes. Given the uniqueness of this blended PL program in an ECEC setting, the findings of this program are noteworthy. The importance of educators participating in an alternative PL model is a promising approach for promoting healthy eating behaviours and physical activity in ECEC settings and warrants further investigation in the future.

Significant small effects in total EPAO score, EPAO for physical activity scores and light-intensity physical activity were found at the end of the intervention period. The small significant changes in physical activity increased at the end of the maintenance period, providing evidence that these changes can be sustained. To date, only one study has simultaneously reported changes in both the physical activity and healthy eating EPAO components. Similar to this study, Lyn et al 2013 reported significant changes in the total PA EPAO score ($p<0.001$) at the end of the intervention period (12-months) (Lyn et al., 2013). This study extends these findings by reporting on the total EPAO score and measures effects at the end of the maintenance period. Furthermore, the blended PL program included results on the changes in objectively measured child physical activity to supplement the results from the direct observational tool.

The significant changes in the centre-level and child-level physical activity outcomes can be attributed to the educators' level of engagement with the PL program. This finding is consistent with previous studies reporting the value of ongoing PL programs

(Buysse, Castro, & Peisner-Feinberg, 2010; Desimone, Birman, & Yoon 2001; Norris, 2001; Garet, Porter). Data from a recent study which also implemented a PL intervention (focusing on a different content area) and measured centre- and child-level outcomes showed that several PL sessions were far superior than a one-off PL session. The same study showed that involving more educators in the PL was also superior than just involving one educator (Siraj-Blatchford, 2008). These principles were similar to those in this study, where a number of ongoing PL sessions were offered over a 12-week period and all educators were encouraged to participate in the face-to-face PL session, as well as the online component of the PL.

In this study, baseline data were made available to all centres at the beginning of the intervention period, enabling the content of the PL to be tailored to meet the specific needs of each centre. Given that physical activity and healthy eating behaviours are often unrepresented within the ECEC context, it was important to highlight key areas where centres were performing well, as well as highlight areas for improvement. The synchronous online sessions provided regular opportunities for educators to communicate, share and collaborate with the expert and their colleagues (Pyrko, Dörfler, & Eden 2016; Snyder & Wenger 2010). It was in this environment, that educators could speak freely about their new knowledge and skills. This ongoing collaboration and familiarity with other educators may have encouraged educators to make sustainable changes within their settings.

However, the physical activity content, which was delivered as part of HOPPEL, may have contributed to the changes reported in physical activity. In contrast to other studies

(Alhassan et al., 2012; Annesi, Smith, & Tennant, 2013; Finch et al., 2014), a prescribed amount of physical activity was not mandated throughout the intervention, rather the content provided suggestions related to physical activity learning experiences, as well as probing questions for educators to discuss in staff meetings and weekly challenges. Furthermore, the content also focused on the importance of the ECEC environment and the role of the educator in terms of offering physical activity opportunities for children. This approach aligns with the philosophy of educators and perhaps educators felt less threatened by this approach and were more willing to provide enhanced physical activity opportunities for the children. Further exploration of this was beyond the scope of the study, however, could be investigated further in future studies.

While many studies have reported on changes in objectively measured physical activity (Finch et al., 2014) at the end of an intervention, fewer studies have reported sustainable significant changes beyond the intervention period (that is, during a maintenance period). After educators participated in the blended PL program for 12 weeks, educators entered the maintenance period whereby they were still able to access the online forum to exchange ideas, however synchronous weekly blogs and asynchronous live chat sessions facilitated by the lead researcher ceased. During this maintenance period, significance changes in physical activity continued, which could be attributed to educators' willingness to engage in ongoing supportive peer behaviours, educators' ability to independently reflect upon and showcase changes to pedagogical practices on a specified topic, and educators' increased knowledge and skills which led to enhanced levels of confidence and autonomy in promoting physical activity and healthy eating practices. Thus, the small positive changes recorded in the present study are perhaps

more significant and meaningful as the PL focused on two areas: physical activity and nutrition within one intervention.

The absence of significant findings in the healthy eating EPAO score at the end of the intervention as well as the end of the maintenance period could be related to the disparity between centres with regard to the recording of eating occasions (food, beverages, staff behaviours) and the menu review (observed food and beverages). Nearly half of the centres (46%) were lunch box only centres. A lunch box centre is where parents/carers are asked to provide children's food (snacks and lunch) whilst attending the centre. The remaining centres provided children with all meals. Therefore, within this study, a true audit could not be completed using the EPAO given the participating centres were all operating under different eating occasions and use of menus.

5.6 Strengths and limitations

This study has several strengths. First, it adopted a stepped-wedge design that allowed all centres to act as their controls and allowed for all centres to receive the intervention. This is one of the first studies within the ECEC sector to adopt such a design. The SW-RCT is becoming increasing more utilised in interventions because of ethical reasons, for example, by all centres receiving the intervention, the control groups were not denied the hypothesised benefits of the intervention (Sharma, Chuang, & Hedberg, 2011). Additionally, the stepped-wedge has an inbuilt maintenance period, allowing data to be collected from centres over a prolonged period of time (i.e., in this study over a 12-month period). A second strength is the reporting of both centre- and child-level

data using validated instruments (Prost et al., 2015). Third, this study was underpinned by a strong foundational framework that aimed to increase the knowledge and skills of educators via a blended PL program, whilst accounting for the impact on child learning outcomes (Egert et al., 2018; Guskey, 1986). Fourth, the study recruitment and retention rates were high, with all centres remaining in the study and more than 90% of children being retained, suggesting high feasibility of such an approach. Finally, this study employed a novel and alternative form of PL to elicit changes in children's physical activity and healthy eating behaviours that has not been previously reported.

This study is not without limitations. Although the SW-CRCT design offers a number of advantages over traditional intervention designs, it involves a number of additional data collection points, thus data collection is costlier and time consuming (Howie, Brown, Dowda, McIver, & Pate, 2013). Second, in this study the collection of data for time points 2 and 3 coincided with school holidays, resulting in increased absenteeism of children which may have potentially impacted the changes in child-level data reported. A large portion (46%) of the centres did not provide the food for the children throughout the day (i.e., the children brought their food from home), a practice that is not uncommon in some ECEC centres, in Australia. Therefore, this may have impacted the centre-level healthy eating component of the EPAO. Although accelerometers are superior to other data collection methods, they are limited by the fact that do not capture data related to the context in which physical activity occurs (Oliver, Schofield, & Kolt, 2007). There is also ongoing debate to the most appropriate accelerometer cut points to use for preschool children. The cut point used in this study have been widely used in several other studies with preschool aged children and at the time of publication were

deemed the most appropriate (Pate et al 2006). Finally, accelerometers are limited by their classificiation of certain phsycial activities, for example standing is classified as sedentary but in fact it should be classified as light-intensity physical activity.

5.7 Conclusion

To our knowledge, this is the first study to evaluate the efficacy of blended PL program for ECEC educators, targeting both physical activity and nutrition among 2-5-year olds and using a stepped-wedge design. In contrast to many other studies within the ECEC sector, significant results were reported for the physical activity outcomes at the end of the intervention period, which were increased at the end of the maintenance period. The ECEC environment is a critical setting for the promotion of physical activity and healthy eating behaviours (Vanderloo et al., 2014, Ward et al., 2018) and thus interventions need to be effective yet innovative in their approach. The blended PL program addresses both of these criteria and has the potential to be used widely across all geographical and socioeconomic ECEC settings. Equipping educators with the knowledge and skills to promote physical activity and healthy eating is paramount for children's health and wellbeing.

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Chapter 6

Healthy Online Professional Program for Early Learners (HOPPEL): Creating an online community of practice for early childhood educators

This chapter has been submitted: Peden, M. E., Okely, A. D., Eady, M. J., and Jones, R. A. Healthy Online Professional Program for Early Learners (HOPPEL): Creating an online community of practice for early childhood educators. *Professioanl Development in Education* (under review).

6.1 Preface

This chapter presents the qualitative data associated with the blended professional learning (PL) program (HOPPEL). This chapter highlights how the blended PL was underpinned by the Community of Practice (CoP) framework.

6.2 Introduction

Managing effective pedagogical change in Early Childhood Education and Care (ECEC) environments is a difficult and complex process (Maskit & Firstater, 2016) requiring educators to construct new contextualised knowledge and skills (Campbell & McNamara, 2010). In order for meaningful change to occur in these settings, innovative and engaging professional learning (PL) and ongoing support is required.

Traditionally, ECEC PL consists of one face-to-face workshop, however, this approach is associated with a number of pitfalls (e.g., limited transfer of knowledge, excessive costs, limited reach) (Karagiorgi, Kalogirou, Valentina, Theophanous, & Kendeou, 2008). Blended PL, which combines face-to-face and online components, has been suggested as a viable alternative. The first blended PL program (HOPPEL) for the ECEC sector was recently evaluated (Peden et al., 2018). The 12-week PL program closely aligned with all components of Guskey's model of PL and Vygotsky's Zone of Proximal Development Theory (Guskey, 1986; Vygotsky, 1978). Underpinning the intervention with these theories ensured that the contextualized content was engaging and offered opportunities for educators to reflect on current practice and be supported in change. Additional elements, based on the PL needs of educators and the underlying

culture of the ECEC sector, were included in the blended PL program. For example, opportunities for educators to build professional communities, participate in regular professional conversations and opportunities to establish ongoing meaningful relationships were also embedded throughout the program. The aim of this study was to determine if these additional components retrospectively aligned with the Community of Practice (CoP) three domains and associated themes and subthemes (Lave and Wenger, 1991; Wenger & Snyder, 2000; Wenger, McDermott, Snyder, 2002). In contrast to Guskey's model and the Zone of Proximal Development theory, which both focus on the potential of individuals (i.e., educators reflecting and critiquing their own practice, gaining and applying new knowledge and skills in practice), the CoP emphasises the importance of social interactions within the learning process and the importance of establishing supportive professional communities. This focus was considered important given the nature of the PL. Programs underpinned by sound frameworks are generally more successful than those that are not (Birman, Desimone, Porter, & Garet, 2000; Desimone, 2009). Thus, it was important to determine if all aspects of the blended PL were underpinned by sound theories and frameworks.

6.3 Methods

6.3.1 Setting and participants

Educators and children (mean age = 3.25 years) were recruited from 15 ECEC centres operating within southeast, northeast and east coast regions of Tasmania, Australia. All participating centres were part of an overarching administrating organisation. Written

and verbal information was provided to management of the organisation, and written consent was sought from educators and parents of children prior to data collection. Ethical approval was obtained from the University of Wollongong (HE15/356) and data were collected from educators and children between February and December 2016 from educators and children.

6.3.2 Study program and design

The blended PL program (HOPPEL) was 12-weeks and comprised of a day-long face-to-face workshop, followed by 12 weeks of online PL. The online element involved asynchronous components, such as weekly blogs and forums and three synchronous sessions (Adobe Connect, version 9). The PL was facilitated by an experienced ECEC educator and qualified training facilitator with more than 20 years experience in the sector.

The PL content focused on physical activity and healthy eating for children aged 2-5 years and aligned directly with the physical child-learning domain of child development. The physical domain is frequently overlooked within ECEC practices, despite it being a key component of a number of ECEC curricula (ACECQA, 2012; Department of Education, 2014; Ministry of Education, 1996). Furthermore, recent data suggest that most educators have not received PL in this area and have limited confidence and competence in this domain (Burgeson, Wechsler, Brener, Young, & Spain, 2001; Martyniuk & Tucker, 2014). In brief, the content focused on the following: structured and unstructured physical activity learning experiences, inside and outside physical activity experiences, activity ‘power breaks’ (where time spent sedentary is

broken up) and creating holistic learning environments that promote increased levels of physical activity. In relation to healthy eating, the content focused on increasing water intake in both indoor and outdoor learning environments, boosting milk consumption, promotion of family style eating, improving consumption of fruits and vegetables and promoting healthy eating during every day routines. Policy development and family partnerships were discussed.

This study used a stepped-wedge design (Hemming, Lilford, & Girling, 2015), which resulted in all 15 ECEC centres participating. Prior to data collection, ECEC centres were randomised into three clusters (five ECEC centres per cluster). Baseline data were collected in all centres in February 2016. In March 2016, cluster 1 participated in the program whilst the other clusters maintained usual practice. At the beginning of July 2016, data were collected again in all services. At the end of July 2016, cluster 2 participated in the program. Cluster 3 continued with usual practice and cluster 1 started the maintenance period (which involved the centres continuing to implement changes within their services, accompanied with limited support from the experienced ECEC educator - referred to as expert from now on). This process was repeated again in September 2016, with cluster 3 then participating in the program. Final data collection was conducted in December 2016.

6.3.3 Data collection and analysis

Child-level data were collecting using acceleometers and centre-level data were using the Environmental Policy Assessment Observation (EPAO) tool. The EPAO was developed to objectively examine the physical activity and healthy eating behaviours of

children in ECEC settings (Ward et al., 2008). Data were collected by trained researchers. Further detail pertaining to these data collection measures are provided in the main outcome paper (Peden et al., 2018). Several process evaluation data were also collected and are explained in detail here as these data are used in this study. Educators completed a questionnaire before and after the intervention period. The pre-questionnaire asked questions about each educator's prior PL experiences (duration, frequency, content) as well as their future PL needs, including the promotion of physical activity and healthy eating behaviours. The post-questionnaire asked educators to comment on their experience of the program and in particular the online components (asynchronous components e.g., blogs, online forum, and the synchronous components e.g., live chat sessions) and to describe their feelings and any potential benefits and/or barriers of participation. Data from all of the asynchronous and synchronous sessions (i.e., transcripts between educators within and between centres, as well as transcripts between educators and the expert, blogs and forums) were coded and matched with the CoP themes and subthemes using thematic analysis (Boyatzis, 1998), NVivo (Version11, August 2017). The qualitative responses from the questionnaires were also coded in a similar fashion. Intentionally, the analyses focused on identifying examples from the data to highlight the alignment with the CoPs framework (see **Table 6.1**).

6.4 Results

Table 6.1 summarises the CoP elements, their associated subthemes and provides examples of how the program aligned with the CoP elements and subthemes.

Table 6.1: Evidence of how the blended professional learning program aligns with the elements and themes from the Community of Practice Framework

CoP Elements	CoP Theme	CoP Evidence	Examples from HOPPEL
Domain	Common identity	Create common ground/sense of identity	Educators recruited from one organization Similar demographics of educators All educators had participated in limited PL in the area of physical activity ar healthy eating.
Domain	Inspires contribution/ participation	Topics of focus, connects people	Supported by Executive Specific content which was identified as important by educators Exclusivity of community encouraged safe and confident interactions with ot
Domain	Affirms purpose and value to members	Five cycles of value creation: (1) immediate value; (2) potential value; (3) applied value; (4) realized value; (5) reframing value	Face-to-face workshop identified potential areas of change Educators participated in synchronous and asynchronous professional discussions. Online blogs and forums involved weekly challenges. Online conversations were guided by the needs of individual services.

CoP Elements	CoP Theme	CoP Evidence	Examples from HOPPEL
Community	Mutual engagement	Collaboration, building relationships, supportive learning environment, regular interactions, sense of belonging	Fostering of online collaborative and supportive professional network by exp via asynchronous forums and scheduled synchronous live chat sessions. Online forums, blogs and live chat sessions guided professional dialogue, opportunities to reflect on feelings around participating in online PL and aspe of online PL that best suited personal learning and interests.
Community	Joint enterprise	Common goals, shared interests, collective understanding	Use of reflective questions. Broad common goals of the HOPPEL program a the specific centre-based goals. Online professional conversation encouraged collective understanding of the HOPPEL program.
Community	Shared repertoire	Stories, concepts, social fabric of learning, mutual concepts, language, resources	Rapport between educators was established in the face-to-face session as wel online, which resulted in all services sharing their new resources and learning experiences in online forums and live chat sessions.
Practice	Participation & reification	Interacting with others via shared conversations and producing documents & images with the intent to share ideas and resources	All services participated in the asynchronous and synchronous sessions. Participation varied between weeks and time of synchronous sessions, 67 out 111 consenting educators participated by viewing the posts, posting, viewing posting, and responding to other posts.

CoP Elements	CoP Theme	CoP Evidence	Examples from HOPPEL
Practice	Engagement, imagination & alignment	Enable dialogue, producing and using artifacts, reflecting, generating knowledge, working towards a common goal	Face-to-face workshops were interactive, fun-based and personalized, inclusi of technology component of HOPPEL. Live chat sessions and forum, not prescriptive, interactive and encouraged creative posts. For example, sharing ideas on developing HOPPEL mind maps as displays in services, presenting & vegetables platters, using recycled materials as props for physical activity experiences preparing obstacle courses and establishing vegetable gardens. Online interactions inclusive of professional and personalized anecdotes and images linked to overarching HOPPEL themes.

Note: HOPPEL = Healthy Online Professional Program for Early Learners; CoP= Community of Practice. ECEC = Early Childhood Education and Care; PL = Professional Learning

6.4.1 Domain

A common domain of interest for HOPPEL was the promotion of physical activity and healthy eating in ECEC settings. The presence of three overarching themes within the Domain element were explored: (1) common ground and identity, (2) inspires contribution and participation and (3) affirmation, purpose and value (Wenger, 1998; Wenger, Trayner, & De Laat, 2011).

6.4.1.1 Common ground or identity

A number of aspects highlighted a common ground and identity for educators participating in the program. All educators were employed by one organisation and all centres were situated in outer regional and remote locations. Educators' demographics were similar with more than 60% of educators at each service having a formal ECEC qualification and having been employed within the organisation for a minimum of three years. Most of the educators (84%) had not previously been involved in PL in the area of physical activity and healthy eating, nor had they participated in 'blended' PL. Furthermore, initial meetings with the executive staff prior to the design and implementation of HOPPEL identified the gap in PL in this content area and expressed the importance in increasing educators' knowledge and skills in this area.

6.4.1.2 Inspires contribution and participation

The Executive from the organisation worked hard to inspire contribution from all educators in the HOPPEL program. Prior to the start of the program the Executive spoke with all of the ECEC directors and discussed the immediate- and long-term benefits of being involved in the program. Although involvement was not mandated, it

was strongly encouraged from the Executive. Following the face-to-face workshops, educators were further inspired by Executive to participate in the online components of the HOPPEL program. Educators expressed their excitement about being able to share ideas and collaborate with others:

> *"Thank you so much for such a well informed and enjoyable session. I am excited to implement some new learning into the space in regard to physical activity and children's nutrition/healthy eating…"* (Educator, forum post - cluster one)

Educators were further motivated and inspired to contribute and interact online as the content focused on their interests, which were identified in a pre-questionnaire. Educators expressed interest in the physical activity and healthy eating guidelines, managing and incorporating physical activity and healthy eating across a variety of play spaces, and strategies on how to implement physical activity and healthy eating policies, all of which was addressed in the online content.

6.4.1.3 Affirms purpose and value to members

This theme focuses on the professional benefits and value of being part of a community and comprises five cycles (Wenger et al., 2011).

Cycle 1: Immediate value

The immediate value (Wenger et al., 2011) of HOPPEL was initiated in the face-to-face workshop, where centres were provided with data pertaining to the strengths and weaknesses of physical activity practices and healthy eating behaviours of their centre. Educators had the opportunity to reflect upon their pedagogical practices in these areas

and identify areas of improvement. For each centre a number of areas of weakness were identified. These areas were subsequently addressed in the asynchronous and synchronous sessions with educators making a number of comments of anticipated immediate value of the HOPPEL program on the forums:

> *"Hi to all who have registered in this forum! This is a fantastic opportunity to work together in this important area of children's learning and development. We are all looking forward to the weekly blogs…"* (Educator, forum post-cluster two)

Members of the Executive, who also contributed to the online forums, supported such comments. For example, one Executive member commented online that the initial face-to-face workshop provided opportunities for further conversations with educators:

> *"I was at [centre name] today, and I was very happy to see very motivated and active educators outside! Seeing the results of the observation [i.e. the information provided at the face-to-face workshop] has allowed the educators and myself to start the conversations about the whole routine of the day, and to highlight what is important to the children."* (Middle management, forum post-cluster one)

Cycle 2: Potential value

'Potential value' refers to the value produced over a period of time (Wenger et al., 2011). The potential value of the HOPPEL program was reiterated continually throughout the program, initially in the face-to-face workshops and then throughout the online component. At the beginning of the online component, educators shared few anecdotes and images of children and educators participating in physical activity and healthy eating activities. As time progressed, this changed and there was an obvious

shared understanding of the potential value of the program for the children, educators and the broader organisation. As educators witnessed positive changes in the children, such as children being more active trying new foods and increasing their water intake, the potential value of the program was reiterated for educators and educators expressed this in the forums.

> *"I think incorporating veggies onto our platters has been a huge success…the more willing children have become to embrace them…. I think as the children observe the habits of others, they consider their choices and are more willing to try something that their mate next to them has just selected…"* (Educator, forum, cluster two)

Cycle 3: Applied value and Cycle 4: Realised value

'Applied and realised value' focuses on applying and adapting new knowledge to improve performance and achieve new goals (Wenger et al., 2011). New information was shared with the educators on a weekly basis using online blogs. This information specifically aligned with the needs and interests of the educators. To encourage educators to change or modify practices within their settings and to further grasp the applied value of the HOPPEL program, non-compulsory challenges were embedded into the weekly blogs. For example, educators were 'challenged' to include a number of activity breaks or 'power breaks' in their daily routine. Activity breaks involve high intensity movement for a short period of time, for example 5 minutes, and have been shown to enhance improvements in higher intensity physical activity levels among young children (Alhassen et al., 2016). Most educators (84%) indicated these were 'helpful or very helpful' in increasing their knowledge and skills in the focus area.

Educators who facilitated the "challenges' found them to be positive experiences for the children, despite some resistance from other educators:

> *"The power breaks are actually working wonders in our room whenever children have all that built up energy. I have been taking the majority of the power break sessions, I'm finding some educators are harder to get on board with changes in routine. I'm hoping if me being the team leader is role-modeling change, I can hopefully help build confidence as a 'new normal…."* (Educator, forum, cluster one)

The majority of educators (97%) indicated that they were able to apply their new knowledge to their everyday practice. Educators were encouraged to regularly reflect on the changes in their services and share their experiences with other educators, thereby motivating others to adapt similar daily practices and experience the full potential of the HOPPEL program. Educators were encouraged to post comments and photos online that highlighted areas of change and the potential of the program:

> *"This week the 2-3 yrs. have ventured out to use our paddock for their physical activity session- it was great to see the educators really involved demonstrating ways to move their bodies!! This has been a new addition to the program after reflecting on the use of the normal playground area and discussions in the last team meeting around the HOPPEL project. As a manager, I am feeling very positive about how rooms are embracing the information that is coming through!! "*(Service manager, forum post-cluster two)

Educators suggested that sharing such changes reiterated the 'applied and realised value' of the program for the learning community. Modifications were introduced into their daily program and practice, the children were excited, interested and motivated to

join in these new learning experiences, thereby further emphasising the 'applied and realised value' of the program to the educators.

Cycle 5: Reframing value

'Reframing value' occurs when the social learning involves the redefining of success (Wenger et al., 2011). Educators were encouraged participate in online discussions pertaining to strategies, goals and values and were encouraged to create new goals pertaining to existing structures, policies and procedures at a centre- and organisational-level. A number of possibilities were identified including the ongoing incorporation of HOPPEL into meeting agendas.

> *"One idea to continue the HOPPEL journey would be to add HOPPEL to each rooms' team meeting agenda from which is completed each month during team meetings by each rom. This would keep HOPPEL in our minds on an ongoing basis…HOPPEL has become part of the everyday program …the educators are very keen to incorporate many of the curriculum ideas into their curriculum… "(*Educator, forum post-cluster 2)

Numerous educators offered suggestions via the online forum on how HOPPEL could remain a sustainable and valuable source of PL within individual centres and throughout the organisation.

6.4.2 Community

In this study, three overarching themes of the community element were explored: (1) mutual engagement, (2) joint enterprise and (3) shared repertoire (Wenger, 1998).

6.4.2.1 Mutual engagement

Mutual engagement requires the PL participants to support each other and participate in mutual discussions and exchange of ideas (Wenger, 1998). Educators were encouraged to regularly participate in online conversations and share images, experiences and anecdotes on the forums. To enhance the online discussion and exchange of ideas the expert responded to all posts on the forum and encouraged specific educators to respond to questions. The expert posted 282 times over the year, averaging 94 posts per cluster. The majority of educators (93%) found the responses from the expert were very helpful.

Mutual engagement was also encouraged through the tri-monthly synchronous sessions, where the expert facilitated specific conversations and 'white board activities' with educators. These 'live' discussions offered another opportunity for mutual discussions and exchange of ideas. The online discussions and white board activities resulted in deeper professional relationships between educators (evidenced by the length and depth of conversations) and created a place where educators felt that they belonged and could talk openly. The presence of mutual engagement between educators was supported in the post-questionnaire responses. For example, results from the questionnaire showed that the majority of educators felt supported online (69%), were willing to share resources online (65%), try new things (73%) and felt they were part of a group with similar interests (58%). Almost half (48%) felt that the opportunity to interact with other educators from different centres via the synchronous platform (i.e., the online forum) was helpful.

6.4.2.2 Joint enterprise

Joint enterprise emphasises the importance of a shared interests and common goals (Wenger, 1998). The shared interest and common goals underpinning HOPPEL were two-fold: (1) to increase the knowledge and skills of educators in promoting physical activity and healthy eating in ECEC services and (2) to positively impact physical activity and healthy eating child outcomes through holistic programing involving all developmental areas. Educators were encouraged to focus on the common goal by engaging in fact sheets and challenges posted on the weekly blogs. A list of reflective questions was also provided weekly, with the aim of reiterating the central themes and common goals of HOPPEL (i.e., physical activity and healthy eating) and to initiate professional conversation about policy and practice. The broad goals were similar for all centres, however the individual centre goals varied slightly depending on the greatest area of need. A number of educators shared their experiences on the forum, which in turn encouraged other educators to make changes towards the common goals of HOPPEL:

> *"Hi everyone, we have made several changes to our program since we have started the HOPPEL…. First our biggest one is adding vegetables to morning and afternoon tea platters…children are also drinking a lot more water…we have found taking water to them they will drink more. …we have taken chairs away from the table top experiences and have incorporated the power breaks to both indoor and outdoor environments."* (Educator, forum, cluster three)

6.4.2.3 Share repertoire

Overtime, a shared repertoire of resources and ideas was established between educators, with educators sharing resources, images and anecdotes in the online forums. All 15

centres shared images pertaining to the promotion of physical activity and healthy eating practices. These images in part included healthy fruit and vegetable platters, innovative water stations, cooking experiences, outdoor obstacle courses, and yoga lessons. Eighty-seven percent of centres shared with others how they modified their equipment to enhance physical activity learning experiences, 40% of centres shared how to promote increased water consumption, and 53% of centres shared their experiences of being off-site to promote physical activity. Moreover, 87% revealed how they modified their practices to increase daily servings of fruit and vegetables, and 40% shared images and descriptions of displays showcasing HOPPEL based initiatives to parents, children and community members presented within common areas of their services. Educators continually shared how they modified daily routines as a result of the PL and suggested that these changes would be sustained following the PL.

> *"In the 3-5-year room we have started having a small group time after morning tea where we do some exercises to warn up our bodies ready for the day…' (*Educator, forum, cluster two)

> *"HOPPEL will stay alive in our room as we have dedicated and passionate educators who genuinely care about children's health and well-being. There is no going back now! We have implemented change, a positive and healthy change."* (Educator, Room leader, forum, cluster 2)

6.4.3 Practice

Two themes were explored in the area of practice: participation and engagement/imagination and alignment (Wenger, 1998) Participation at a centre-level was high, with each centre in each cluster, participating in face-to-face workshop (49%

of educators participated) and the majority of the asynchronous and synchronous sessions. At an individual level, participation varied. Educators chose their level of online participation and could either just view the information or view and post information or view, post and respond to other posts. The number of educators just viewing posts was consistently higher than those actively viewing and posting on the forums. Some of the highest viewed posts included images of children engaging in various physical activity experiences (57 views, week four); a YouTube healthy eating video narrated by an international celebrity chef (62 views, week two); a post promoting a mini Olympics (73 views, week nine); and a post discussing the sustainability of HOPPEL (75 views, week twelve). Despite some weeks being more popular than others, participants consistently participated in the forums. Sixty-four percent of educators posted and responded to posts on the forums and participated in the synchronous sessions. Individual educators posted between 1 and 39 times throughout the program.

6.4.3.1 Engagement, imagination and alignment

The online components of the program were developed using a basic interface, with the aim of maximising usability and engagement of the educators. Activities in the synchronous and asynchronous sessions were intentionally interactive, fun and light-hearted to ensure that educators felt comfortable and relaxed and enjoyed participating in the PL. Furthermore, to enhance engagement, educators were encouraged to be as creative and imaginative as they liked. For example, educators were encouraged to modify their resources and use recyclable materials to promote physical activity. In response to these suggestions, educators used long pool noodles and recycled plastic

containers to create hurdles for children, drew images of people in different yoga poses for children to imitate, and fashioned cardboard boxes as targets to practice throwing. One educator posted alongside a series of images;

> *"We used pillow cases for jumping sacks, perfect size and great recycling too! The hurdles are ice-cream containers and pool noodles, tyres for climbing and jumping from- simple everyday resources. And the parachute- a forgotten resource that we need to visit more often."* (Educator, forum, cluster 1)

Furthermore, educators were highly imaginative in presenting healthy foods in different arrangements, for example, rainbow fruit and vegetables platters. Other educators posted about their flavoured water combinations using fruit, vegetables and herbs to encourage children to increase their water intake.

> *"One of our children picked some of our mint from the garden and they asked if they could put it our water jug for mint water, (educator) why not! So, then we decided to think of another fruit/plant/herb and orange was suggested so we cut an orange up and placed in the water jug."* (Educator, forum, cluster 3)

All online professional conversations and practical changes initiated by educators aligned with the common purpose and aims of HOPPEL and the organisation. Although the online conversations were moderated by the expert, there were very few occasions where the conversation deviated to another topic, which further highlighted the engagement of the educators. Educators commented that they were also appreciative that the content directly aligned with the National Quality Framework (NQF) (the overarching framework that ensures the quality of ECEC policies and practices in Australia). Within the Australian context, educators' practices are often driven by the NQF as close alignment with the NQF results in higher service rankings. Ensuring that

the content was closely aligned with the NQF incentivised educators to continue to engage in the program and make ongoing modifications.

> *"You have all been working so hard to incorporate the HOPPEL concepts into the program and succeeding really well. The networking and brainstorming that is happening is excellent and fits in so well with the National Quality Framework around reflection, collegiality and engagement."* (Service manager, forum-cluster 1)

6.5 Discussion

This study explored how HOPPEL, a blended PL program for the ECEC sector, aligned with the elements and subthemes of the CoP. Underpinning blended PL programs with well-established frameworks, such as the CoP is important to initiate meaningful and sustained change. Cultural change within any organisation is often met with resistance and the ECEC sector is no different. Given the dearth of blended PL programs with the ECEC sector, underpinning HOPPEL with a sound framework was important.

The HOPPEL program aligned closely with the elements and subthemes of CoP. Educators expressed a sense of common identity and a connectedness to the HOPPEL program. They were inspired to participate and engage in the program, as the content was contextualised to their professional 'needs'. This is in contrast to most PL within the ECEC sector where generalised information is provided. As a result of participating in the HOPPEL program educators were willing to modify their daily practices and engage in professional conversation with other educators.

A number of integral factors helped HOPPEL align closely with the CoP. First, all centres and in turn educators were from one organisation which were led by a strong executive team. The executive team were particularly passionate about improving outcomes in all key learning domains of early childhood. They recognised that physical domain was under represented within their practices and were eager to encourage educators to modify their practices to ensure that this domain was also developed. The executive team were in regular contact with the educators and encouraged them to participate in all components of the program. Additionally, a number of the executive team members participated in the online components of the program that helped establish mutual engagement between educators and affirmed the joint enterprise of HOPPEL. The executive team specifically encouraged educators from all centers to share resources and their HOPPEL experiences with other educators. The presence of an executive/ leadership team with CoP is important in order to foster trust among participants, motivate, guide participants and encourage change in practice and in turn working towards a common goal (Atkinson & Mackenzie, 2015; Hao & Yazdanifard 2015; Wenger et al., 2002)

Second, the ongoing presence of the expert (ECEC educator with more than 20 years' experience) was important. The role of the expert was twofold: (1) to develop meaningful and trusting relationships with the educators and (2) to lead and guide educators in professional discussions and initiating changes to daily practice (Wenger et al., 2002). Trusting relationships are central to the success of online CoPs and it is only when trusting relationships are established that participants have a sense of mutual engagement, joint enterprise and are inspired to actively participate and contribute

(Linton, 2015, Zhang et al., 2017). Meaningful and trusting relationships were initiated during the face-to-face workshop and then further developed online throughout the program. Activities included in the face-to-face workshops and online were intentionally chosen to build rapport between the expert and the educators. As the relationships strengthened, individual educators' identities were reinforced and communication between educators became more meaningful. The expert continually provided positive leadership, support and guidance which empowered individual educators to participate in the online components of the program and have the confidence to modify their daily practices (Ryman, Burrell, Hardham, Richardson, & Ross, 2009).

Although the HOPPEL program on the whole aligned closely with the CoP elements and subthemes, several areas were identified that could be revised in future reiterations of the program. It would be anticipated that if these areas were specifically addressed, then a PL program resulting in meaningful and relevant changes of daily practice could be developed. Given that this was one of the first blended PL programs within the ECEC sector, participation rates were higher than expected. However, participation of individual educators was perhaps lower than anticipated. On average 15 educators from each cluster actively participated in the online components of the program, (i.e. were involved in both the asynchronous and synchronous sessions). Given the limited complexity and high accessibility of the program it was anticipated that more individual educators would have been actively involved. Lower than expected individual educator participation may have been influenced by a number of factors, identified in the post-questionnaire, including, availability, time, access to computers and internet

connectivity. These findings align with previous literature that suggests that blended learning communities can face numerous challenges such as learning new technologies (Voos, 2003) and participants becoming disengaged due to poor internet connectivity or technical issues (Welker & Berardino, 2005).

Additionally, the focus topic may not have been of interest to some educators. Although a strong Domain was established and the aim and focus of HOPPEL was clear to all educators, it is possible that some educators simply did not see the importance of the content and thus chose not to engage in the program (Wenger et al., 2002). Although participation in HOPPEL was highly encouraged, it was not mandated. Additionally, educators could participate at different levels from just viewing the content online or actively contributing to the forums and online live chat sessions. Varying degrees of participation as seen in HOPPEL is common for programs underpinned by CoP (Wenger et al., 2002). Participation could potentially be enhanced in future reiterations by establishing a core group, who become community leaders, and encourage peripheral members to be more actively involved (Wenger et al., 2002). Engagement and participation over a longer period of time may further enhance trust between the core group members and in turn provide them with the confidence of approaching other educators to be involved.

Educators suggested in the post questionnaires that participation rates of individual educators might have been higher if time was allocated for them to participate during work hours. It is likely that if more educators actively participated in the HOPPEL

program that mutual engagement of the CoP would be enhanced as well as levels of commitment of the community members.

6.6 Future considerations

Future blended PL programs for ECEC educators could consider the following: aligning closely with the CoP elements and associated themes; optimising participation by offering additional on-site mentoring/coaching sessions and providing additional information on educator confidence and competence in relation to information technology. Furthermore, participation could potentially be increased by offering time to engage in the PL during work hours or nomination of a HOPPEL representative within each service.

6.7 Conclusion

A blended PL program developed for ECEC educators successfully aligned with the CoP framework. Applying a CoP framework to an ECEC based blended PL program potentially would advance educators' learning within a social cultural context by encouraging educators to co-construct their knowledge, attitudes and beliefs around current pedagogical practices. Furthermore, building a PL model around a CoP framework would enable educators to share their areas of expertise, collaborate and reflect on meaningful shifts in practice through ongoing PL opportunities. There is a need for ECEC blended PL programs which are underpinned by sound frameworks.

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Chapter 7

General Discussion and Conclusion

7.1 Preface

This chapter provides an overall discussion of this doctoral thesis which aimed to address the following research questions:

1. What is the relationship between the quality of the ECEC setting and physical activity?

2. How effective is a healthy eating and physical activity blended PL intervention on child and centre outcomes?

3. Can the Community of Practice Framework successfully underpin a blended PL intervention?

This chapter addresses the research questions, highlighting the significance of the results from each of the four papers included in this doctoral thesis, and how they add to the current body of literature. **Chapter 2** provided an extensive overview of the literature and explored the importance of ECEC educators in the promotion of healthy eating behaviours and physical activity. It also reviewed the literature pertaining to environmental variables associated with the promotion of healthy eating and physical activity in ECEC settings. The importance of educators was reiterated at the conclusion of this section and need for ongoing PL was highlighted. The latter part of **Chapter 2** reviewed ECEC-based intervention studies, inclusive of a PL component and focused on healthy eating behaviours and physical activity. A published systematic review that reported the length, mode and content of PL offered as part of physical activity

interventions conducted in ECEC settings was included in **Chapter 2**. **Chapter 3** highlighted the methods used the main outcomes study. **Chapter 4** investigated the relationship between the quality of the ECEC environment and young children's (toddlers and preschoolers) physical activity levels. **Chapter 5** investigated the efficacy of a physical activity and healthy eating blended PL program for educators within ECEC centres on centre- and child-level outcomes. **Chapter 6** described how the blended PL program aligned with the Community of Practice (CoP) framework.

This chapter summarises the strengths and limitations of this doctoral thesis in relation to the research questions. Future directions and recommendations based on the findings of this thesis are presented before the conclusion.

7.2 Discussion

7.2.1 Research question 1 - What is the relationship between the quality of the ECEC setting and physical activity?

The results of **Chapter 4** contribute to the existing body of literature that focuses on the environmental factors associated with children's physical activity in ECEC settings (Bower et al., 2008, Vanderloo et al., 2014). The study described in **Chapter 4** objectively assessed the quality of the ECEC environment using the Environmental Policy and Observation (EPAO) instrument (Ward et al., 2008). The physical activity and sedentary behaviour components of the EPAO were used, and a total EPAO score was reported: a higher quality environment, with regard to physical activity and sedentary behaviour, was associated with a higher EPAO score and a lower quality

environment was delineated by a lower EPAO score (Vanderloo et al., 2014; Ward et al., 2008). Physical activity was objectively measured using activPALs which measure sitting, standing and stepping.

In this study, there were no differences between high, medium and low EPAO scoring centres and time toddlers and preschool-aged children spent sitting, standing and stepping. Additional sub-analyses, involving the six subscales of the EPAO, showed a significant difference in time spent stepping and sitting in toddlers attending centres with high sedentary environments compared with those attending centres with a low sedentary environment.

The quality of the sedentary environment was assessed on the presence of televisions and computers, and looked at the number of posters, displays and books related to physical activity and seated activities in the ECEC context. In this study, few ECEC centres had televisions and computers, suggesting that the positive relationship reported may have been attributed to the posters, books and displays in the learning environment.

Given the significant relationships (albeit small significance values) identified in this study with toddlers, changes in the sedentary environments that are tailored more towards preschool-aged children maybe important to consider. The difference in stepping and sitting among toddlers observed in this study could be attributed to developmental changes occurring within this age. For example, toddlers heightened observational abilities and levels of curiosity as they engage in their surrounds (Fees, Trost, Bopp, & Dzewaltowski, 2015), could impact their physical activity (stepping) and sedentary (sitting) behaviours, as a result of the visual stimuli present within their

learning environment. Conversely preschool children may not be as inquisitive (Kaplan 1991) and hence such stimuli within the learning environment may not have been enough to impact their physical activity levels.

Few studies to date have specifically investigated how the quality of the sedentary environment can be enhanced. A recent study investigated the potential efficacy of a standing preschool intervention on sitting, standing and stepping, utilised a number of unique and innovative methods to improve the sedentary environment of ECEC centres (Ellis et al., 2018). In this study vertical LEGO boards and standing tables were introduced into centres. Additionally, a number of extra easels were introduced to the ECEC environment, which encouraged children to paint and draw in a standing position rather than in a sitting position. Rubbish bins were placed away from tables (specifically at meal times) to encourage children to get up from their seats to dispose of their rubbish. The intervention encouraged children to spend the majority of their day standing or stepping rather than sitting. The intervention was shown to be highly feasible and acceptable (Ellis et al., 2018).

Given the complexity of the ECEC environment, a myriad of environmental factors could potentially be associated with children's physical activity levels. Some of these have been investigated more thoroughly than others. For example, preschool children who are provided with more active opportunities to move about are more active than those provided with less active opportunities. Larger outdoor environments are consistently associated with more physical activity than those with smaller environments (Tonge, Jones, & Okely, 2016). However, other environmental factors,

such as the quality of the ECEC environment, as measured in this study, have had little attention. Quality within ECEC settings is complex, multi-dimensional and is categorised into two types. The first is structural quality which focuses on aspects such as education, training and PL opportunities for educators, staff and children ratios, curriculum content, quality standards and safety of the physical environment and indoor and outdoor learning spaces (Myers, 2005). The second type of quality with ECEC settings is categorised as "process quality". This is quality that focuses on relationships and interactions between children and educators, the importance of meeting individual needs and connection with families (Burchinal, Magnuson, Powell, & Hong 2015). Given the importance of relationships and interactions between children and educators in the promotion of physical activity, as previously discussed in **Chapter 2**, it is important that quality measures include both structural and process quality components.

The EPAO instrument used in this study was considered the most valid instrument available at the time of data collection. An issue with using this instrument, however, is that it mainly assesses components of structural quality (for example, provision of structured and unstructured physical activities, equipment, physical space and environment) and only a few minor aspects of process quality are assessed.

Since this study was published, the EPAO instrument has been updated and further validated (Ward, Mazzucca, McWilliams, & Hales, 2015) however it still (perhaps intentionally) largely focuses on structural quality rather than process quality (Erinosho et al., 2018; Mazzucca et al., 2018). Specifically, the items pertaining to adult-child interactions and critical thinking of educators in relation to the promotion of physical

activity, and sustained shared thinking focused on physical activity, have not been included. The Movement Environment Rating Scales (MOVERS©), published in 2017, is the first instrument that comprehensively assesses the structural and process quality of ECEC environments in relation to physical activity (Archer & Siraj, 2017). There are 11 items in MOVERS©: (1) arranging environmental space to promote physical activity, (2) providing resources including portable/and or fixed, (3) gross motor skills, (4) body movements to support fine motor, (5) staff engaging in movement with children indoors and outdoors, (6) observation and assessment of children's physical development indoors and outdoors, (7) planning for physical development indoors and outdoors, (8) supporting and extending children's movement vocabulary, (9) encouraging sustained shared thinking by communicating and interacting through physical activity, (10) supporting children's curiosity and problem solving indoors and outdoors, (11) staff inform families about children's physical development and the benefits to their learning, development and growth (Archer & Siraj, 2017, p4). Of the 11 items, nine (82%) specifically relate to the process quality and focus on educators' engagement in physical activity learning experiences, interactions between educators and the children and their families and the intentionality of educators in their actions and conversations (Archer & Siraj, 2017). Whilst this rating scale is still undergoing reliability and validity testing, it addresses some of the limitations with previous instruments like the EPAO.

It should be acknowledged, however, that while the MOVERS©addresses a number of the limitations with the EPAO instrument, it only measures quality in the physical domain, whilst the EPAO measures quality for physical activity and nutrition. Given the importance of both healthy eating and physical activity for children's well-being (See

Chapter 2) the quality of both aspects should be measured. To the best of the author's knowledge, no instrument is available which solely assesses the process quality of the ECEC environment in relation to healthy eating behaviours. Thus, future studies should use a combination of assessment tools, for example, MOVERS© and EPAO may be needed. MOVERS© and EPAO are currently being used simultaneously in a small pilot study, final data collecting which is testing the potential efficacy of the MOVERS© PL, is currently underway (Kazmierska-Kowalewska et al., 2018). Assessing quality using a number of instruments obviously increases the time and resources for data collection, however if these barriers can be overcome, thorough assessment of the quality of the ECEC environment is preferable.

7.2.2 Research question 2 - How effective is a healthy eating and physical activity blended PL intervention on child and centre outcomes?

To answer this research question 15 ECEC centres, 104 educators and 314 children (mean child age 3.25 years) were recruited from an overarching ECEC organisation. The blended PL intervention (HOPPEL), as described in **Chapter 5**, adopted a stepped-wedge design, whereby all educators participated in face-to-face and online PL components. The study was underpinned by Guskey's PL framework and Zone of Proximal Development theory (Guskey, 1986; Lave & Wenger, 1991). Changes in centre-level outcomes were assessed using the EPAO and changes in child-level outcomes were assessed using accelerometry. At the end of the intervention phase, significant changes in the total EPAO score and the total physical activity EPAO score were reported. These changes were sustained at the end of the maintenance phase.

Significant changes in time spent in light-intensity physical activity was also reported at the end of the intervention period and again were sustained at the end of the maintenance period.

A number of factors may have contributed to the success of this blended PL intervention, many of which were reported in **Chapter 5**. Two key factors are further discussed in this chapter and include: (1) the importance of appropriate PL models and (2) the importance of ongoing PL.

7.2.2.1 Importance of appropriate PL models

The study described in **Chapter 5** is the first known study within an ECEC setting to utilise a blended PL model. Traditionally, the most common form of PL for the ECEC sector is face-to-face delivery. As previously described, (see **Chapter 2**) face-to-face PL is associated with many shortfalls and thus alternate PL models are needed for the sector. As the availability of technology has increased, alternative PL models, such as online PL have been introduced (Olsen, Donaldson, & Hudson, 2010; Reeves & Pedualla, 2011). Online PL has proved to be beneficial in overcoming some of the barriers associated with face-to-face delivery (for example, increased access, reduced travel costs and self-paced learning and collaborations) (Oslen 2010; Stone-MacDonald & Douglass 2015). Online PL however, as an exclusive mode of delivery, also poses some challenges (Barnes, Guin, & Allen, 2018). For example, educators have suggested that they feel less supported and less motivated to implement change within their centres following PL that is delivered exclusively online. Additionally, educators have expressed their frustration about their inability to ask questions and receive immediate

contextualised feedback whilst participating in online PL (Barnes et al., 2018). To overcome the barriers of both traditional-face-to-face PL and exclusive online PL, a blended PL model was employed. The blended PL model provided ongoing opportunities for educators to build rapport with each other, initially through the face-to-face session and subsequently through the ongoing online component. The rapport that was established between educators during the program resulted in meaningful professional conversations and networking opportunities and provided a place for educators to be vulnerable as they implemented changes in relation to healthy eating and physical activity into their centres. Generally, educators have few opportunities to connect and establish relationships with other educators from other centres. The blended PL provided a unique opportunity for educators to work collaboratively rather than in their "silos" and encouraged them to feel they belonged to a professional community (Hodges & Cady, 2013; Irvine & Price, 2014; Nolan, Morrissey, & Dumenden, 2013; Thompson & Kanuka, 2009; Trust & Horrocks, 2017). The opportunities that were provided through the blended PL program may have spurred educators to make meaningful changes within their centres resulting in the positive centre- and child-level outcomes.

Successful PL must consider the complexity of the sector as well as meeting the needs of the educators. The ECEC sector is complex given the vastly different qualifications and workplace experience of educators, the different roles and responsibilities of educators within a centre, the high turnover of educators and the continual adjustments and changes to national regulations and quality rating systems (Siraj et al., 2017). The PL for this study deliberately considered the complexity of the ECEC sector. First, the

PL was facilitated and supported by a highly experience ECEC educator, who had experience in a number of different roles within the sector and comprehensively understood the sector. Second, the content of the PL was contextualised and delivered in a meaningful and engaging manner. All educators, irrespective of qualifications, experience and role were invited to participate in the PL and they were provided with many opportunities to engage with the content. All educators were encouraged to initiate changes within their centre in the areas of healthy eating and physical activity. Furthermore, the content of the PL was highly applicable and appropriate (as it was developed by an educator for educators) and aligned closely with the current Australian recommendations for healthy eating and physical activity as well as the current quality ratings. Addressing the complexity of the ECEC environment in the development and facilitation of the PL may have also contributed to the significant results reported.

7.2.2.2 Importance of ongoing PL

The significant results reported at the end of the intervention period and at the end of the maintenance period could also be attributed to the ongoing nature of the PL. In this study, the PL was delivered over a 12-week period. Educators were provided with weekly opportunities to engage with the content and each other through synchronous and asynchronous PL sessions. The ongoing nature of the PL meant that educators were continually reminded of the key messages of the sessions and were made accountable for the changes that they were initiating in their centres. The ongoing nature also fostered the professional collaborations and conversations and educators were inspired to report back how their learning activities had been modified and how they were implementing change into their centres. The regular contact (positive online discussions

via synchronous and asynchronous platforms, as well as maintained regular email contact and conducted follow-up phone calls) between the facilitator and the educators may have influenced the centre-level and child-level outcomes.

To date few ECEC-based intervention studies have offered ongoing PL (Peden, Okley, Eady & Jones, 2018). To the best of the author's knowledge this is the only study in the areas of healthy eating and physical activity to incorporate ongoing PL. Other ECEC-based intervention studies, which have facilitated ongoing PL as part their intervention, have been in other content areas. For example, the Foster Effective Early Learning study (Melhuish, 2016) was a blended PL program, targeting ECEC educators. This study assessed changes in centre-level (ECEC quality in relation to self-regulation) and child-level outcomes in literacy, numeracy, self-regulation and social development (Melhuish, 2014). Significant changes in primary and secondary outcomes were reported (Siraj et al., 2018) Educators involved in a blended leadership PL program in New Zealand suggested that they preferred the blended PL program as they felt less isolated and the ongoing sharing enhanced their learning and professional growth (Thornton, 2009). These studies, as well as those described in **Chapter 5**, attribute the success of their programs to the ongoing delivery of the PL provided to educators.

There is convincing evidence to suggest that educators who engage in continuous or ongoing PL offer higher quality care and education than those who never participate in training or attend training intermittently (Elliott, 2006; Norris, 2001; Snell, Forston, Stanton-Chapman, & Walker, 2013). Supporting and sustaining a culture of ongoing PL for educators is important in enhancing positive changes in children's health and

learning (Guskey, 2000), alongside personal benefits (Early and Bubb 2004), continuity and stability in the quality of ECEC programs (Melhuish et al., 2016; OECD, 2012).

Ongoing PL is perhaps the most preferable type of PL for the ECEC sector for a number of reasons including the fact that it accommodates the high turnover of educators within the sector (Siraj et al., 2017). The ongoing PL, as described in **Chapter 5**, was specifically designed in a way that if an educator left the centre during the study, co-educators were still able to motivate each other, and have the confidence and competency levels to mentor any new educators employed. The newly employed educators were invited to join and contribute to the ongoing PL sessions. If the PL described in the study in **Chapter 5** had not been ongoing then there would have been a significant break in knowledge transfer and behaviour change (Webster-Wright, 2009).

Ongoing PL also allows more diverse content to be thoroughly explored and discussed. Many ECEC-based interventions, which include one-off PL sessions, focus on one area of behaviour change, such as increasing consumption of fruits and vegetables (Bell, Hendrie, Hartley, & Golley, 2015; Briley et al., 2012; Sweitzer et al., 2010; Truelove et al., 2018) or increasing time spent outside (Tucker et al., 2017). However, there is evidence to suggest that the health and wellbeing of children is influenced by a number of factors and multicomponent interventions are warranted (Hinkley et al., 2014; Mehtälä, Sääkslahti, Inkinen, & Poskiparta, 2014). In the study described in **Chapter 5**, a number of topics related to healthy eating and physical activity promotion were included. For example, behaviour change in relation to healthy eating and physical activity, educators' roles in this area, and the importance of family partnerships and

policies and practices. Furthermore, the ongoing nature allowed the topics to be revisited and extended. For example, the promotion of physical activity using 'power breaks' (short 5-minute bouts of high intensity physical activity), was first introduced on the weekly blogs, then was revisited on the forum (exchange of ideas via dialogue and images), and then finally revisited during an online synchronous session. The ongoing nature of the PL provided time for educators to explore and consolidate their new knowledge and skills and in turn increase their competence and confidence in these areas. This is important because a recent study has shown that by increasing educator's knowledge and skills through PL, it can lead to positive changes in child development outcomes (Siraj et al., 2018).

Although ongoing PL was employed in this study, significant changes were not reported for all outcomes, namely the EPAO nutrition subscale. Modifying eating behaviours within ECEC settings is highly complex and is influenced by a number of individual-, environmental-, social- and familial-factors. Individual (e.g., food choices, attitudes, preferences, biological and demographic) (Larson & Story, 2009), environmental (e.g., physical spaces where children eat, availability of different foods) (Larson & Story, 2009), and social (e.g., peers, social networks, interactions with others, group size) (Lumeng & Hillman, 2007; Ward et al., 2017) factors were not measured or accounted for in the analyses. Assessing these factors was beyond the scope of the study, however this could be an area of consideration in future studies. Additionally, the EPAO instrument used to assess the quality of the environment only assessed the provision of food (type and amount) and educators' behaviours. Changes in milk consumption, availability of water within the indoor and outdoor environments, vegetable intake and

presence of ‘family style’ meal occasions (i.e., children independently serving and monitoring their own food intake) were recorded, however these changes may not have been consistent or large enough to influence the final EPAO nutrition score. Additionally, the EPAO instrument only assesses food provided within the centres and does not assess food that is brought from home. In nearly half of centres (46%) parents provided lunch and snacks and thus the high percentage of centres that did not provide all the food for children may have influenced the results of this study.

Educators suggested that the blended and ongoing nature of the PL was highly acceptable. All sessions of the program were facilitated as intended and the retention rates were high with 100% of centres, approximately 80% of educators and 90% children retained. Although this type of PL is new to the ECEC sector, based on the results of this study, it has potential scalability for the ECEC sector. It is feasible to suggest that this type of PL could elicit positive child and centre outcomes irrespective of the content area targeted in the PL component. As a result of presenting this work at various conferences, further information in this type of PL model (blended and ongoing) has been requested from ECEC Governing bodies in far North Queensland, Australia. In this region, the ECEC Governing body is associated with ECEC centres across approximately 50 communities, covering around 770 kilometers. PL is limited in these settings, however the ECEC Governing body could see how this type of PL would easily provide an opportunity for ongoing learning, thereby increasing educators’ knowledge and skills in pedagogical practices, and impacting on changes in everyday practice and child outcomes.

7.2.3 Research question 3 - Can a Community of Practice Framework successfully underpin a blended PL intervention in the ECEC sector?

The study described in **Chapter 5** was underpinned by two theories: Guskey's model of PL (Guskey, 1986; Guskey, 2000; Guskey, 2002; Guskey, 2014; Eun, 2008; Shabani, Khatib, & Ebadi, 2010) and Vygotsky's Zone of Proximal Development (ZPD) (Vygotsky, 1978). The components of the blended PL program were intentionally chosen to align with various components of these theories (as described in **Chapter 3**). Aligning with Guskey's model, contextualised content was developed and engaging activities were included in the PL to ensure educators had the opportunity reflect on current practices and to be supported in the changes that they made within their centre. Additionally, different learning strategies were incorporated in the PL in order to maximise changes in centre-level and child-level outcomes (see **Chapter 3**). Influenced by Vygotsky's Zone of Proximal Development (Vygotsky 1978), practical strategies were suggested which encouraged educators to collaborate with colleagues and support each other as they changed their practice.

However, additional elements, based on the PL needs of educators and the underlying culture of the ECEC sector, were included in the blended PL program. Educators have expressed that PL should be inclusive of opportunities to build professional communities, opportunities for regular professional conversations and opportunities to establish ongoing meaningful relationships (see **Chapter 2**). Furthermore, the ECEC sector is founded upon positive multi-layered relationships and communities (i.e.,

relationships between educators and children, between educators and educators and educators and families). Establishing strong relationships and communities are promoted in national and international ECEC curricula (DEEWR 2009; Ministry of Education 1996; Britain 2014) as relationships underpin all that occurs within an ECEC environment and it is through high-quality relationships that children learn and develop in these early years. Thus, in addition to those elements that aligned with the aforementioned theories, the blended PL was inclusive of several opportunities for educators to participate in professional conversations, establish meaningful relationships and establish a sense of belonging to a community with a common focus. The different elements of the blended PL are shown in **Figure 7.1**.

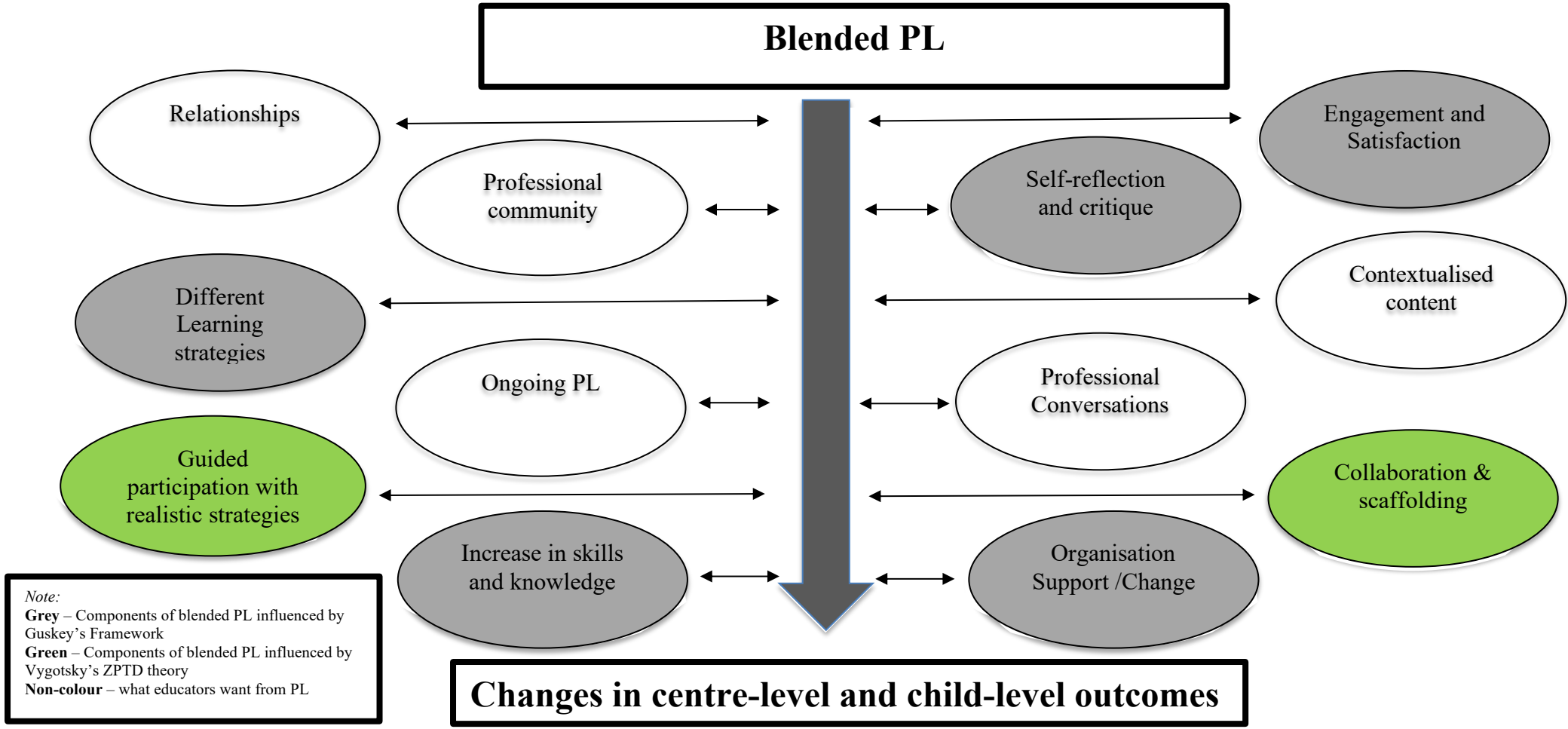

Figure 7.1: Elements of the blended PL program

Given the importance of relationships and communities within the ECEC sector, it was crucial to ensure that the blended PL program was underpinned by a well-established theory (similar to Guskey's PL model and the Zone of Proximal Development). It was anticipated that if all key components of the blended PL could be underpinned by theory then the success of the program in future iterations would possibly be heightened. **Chapter 6** described how the blended PL retrospectively aligned with the Community of Practice (CoP) Framework (Lave and Wenger, 1991). In contrast to Guskey's model and the Zone of Proximal Development theory, which both focus on the potential of individuals (i.e., educators reflecting and critiquing their own practice, gaining and applying new knowledge and skills in practice), the CoP emphasises the importance of social interactions within the learning process and the importance of establishing supportive professional communities.

The CoP framework suggests new knowledge is constructed and cemented through social interactions as individual learners' network with each other and with experts in a collaborative environment (Vygotsky, 1978; Wenger 2011; Christ & Wang, 2015; Li et al., 2009). It encourages members of a community to share common interests and goals around a joint interest to improve skills by working alongside more experienced members (Lave & Wenger 1991). CoPs are based on three fundamental elements (Domain, Community and Practice) and a number of associated themes (Lave & Wenger 1991; Wenger, McDermott, & Snyder, 2002). For example, within the Domain element, the subthemes include common identity inspires contribution/participation, affirms purpose, and value to members. These elements and subthemes were guided the results of **Chapter 6**.

As described in **Chapter 6**, the blended PL program aligned closely with all three elements of the CoP framework. Centres were recruited from one overarching organisation and the support of the executive management of the organisation and an expert were components that aligned with the Domain element of the CoP. The elements of Community were evident in the synchronous and asynchronous sessions where educators had the opportunity to build rapport with each other and participate in professional conversations and networking opportunities. Community was further evident by the mutual engagement from educators who had a joint enterprise and shared repertoire (i.e., all educators gained new knowledge and skills in the areas of healthy eating and physical activity). Practice elements were evident by the high engagement levels of educators in the all aspects of the program as well as the high and continual participation rates from centres as a whole.

One area of the blended PL program that did not align with the CoP was the participation rates of individual educators (as opposed to centres as a whole). Consistent with other online programs (Miller, 2009), individual participation levels remained a challenge and receded as the program progressed. As described in detail in **Chapter 5**, time, access to computer and web-connectivity were factors that may have influenced the individual participation rates. ECEC settings are dynamic environments with a number of competing demands resulting in educators being time poor. Time is often allocated to tasks that are related to compliance issues thus minimising time for PL and up-skilling. In general, educators have limited time off the 'floor' to participate in PL during work hours, thus must be committed to participate in PL in their own hours which many educators (particularly those with basic qualifications) are not prepared to

do. These barriers need to be further explored in future studies and innovative solutions specific to the ECEC sector need to trialled. As a starting point, furthering educators' understanding of the importance of healthy eating and physical activity in all aspects of child development (including social and emotional, cognitive and language) and reiterating the critical role of educators in promoting these behaviours might be needed.

Despite individual educator participation being lower than intended, the blended PL program retrospectively aligned very closely with the CoP framework. A possible explanation for this is the presence of the Vygotsky's Social Cultural Theory (SCT) (Vygotsky, 1978). The CoP framework originates from this theory which broadly supports learning within a social environment through sharing and creating (Alrushiedat & Olfman, 2013). It is well documented that fundamentally ECEC pedagogical practices and policies are founded upon the key values of SCT and that these values influence the quality of ECEC pedagogy and child development outcomes (Smith 1996). National and international ECEC curricula resonate with the SCT by emphasising that all learning and development begins with social interactions, based on interpersonal relationships and social partnerships, within a cultural context (DEEWR, 2009). Given that an experienced educator (i.e., the author of this thesis), who was very familiar with the ECEC pedagogical practice and polices and was highly educated, elements of the SCT and in turn the CoP theory may have been unintentionally considered. Despite this, the process of retrospectively aligning the components of the blended PL with CoP framework was helpful in highlighting areas of refinement in future iterations.

7.3 Strengths and limitations

There are a number of strengths and limitations to the research presented in this doctoral thesis. The systematic review presented in **Chapter 2** aimed to evaluate the impact of PL on physical activity interventions among preschool (2-5 years) children. This review followed the PRISMA statement (Moher, Liberati, Tetzlaff, & Altman, 2009) and PICO (population, intervention, intervention/exposure, comparator/control and outcome) recommendations (Schardt, Adams, Owens, Keitz, & Fontelo 2007). Additionally, all studies included in the review were assessed for quality and risk of bias using the Cochrane Collaborations assessment tool and reported objectively measured physical activity. Objective measures of physical activity reduce the likelihood of bias, by eliminating under-report or over-report which is associated with proxy reporting of physical activity (Reilly et al., 2008).

The systematic review presented in **Chapter 2**, was limited by the fact that the studies were delimited to English. While an extensive search across numerous databases was conducted, it is possible that some articles may have been overlooked. In addition, it was challenging to compare studies given the inconsistent measures of physical activity used and the disparity of reporting of the PL components used in the interventions. Given the small number of studies that met the inclusion criteria, it was difficult to ascertain any potential patterns between PL in physical activity interventions facilitated in ECEC settings. Finally, a meta-analysis could not be performed due to the inconsistent report of the results in the included studies.

The cross-sectional study, described in **Chapter 4**, investigated the relationship between the quality of the ECEC environment and physical activity and sedentary behaviours of both toddlers and preschoolers. To the author's knowledge, this was one of the first studies to explore the relationship between both toddlers and preschools objectively measured physical activity and the quality of the ECEC environment (Peden et al., 2017). The inclusion of toddlers into physical activity ECEC centre-based interventions is important, as children of this age are starting to create new schemas as they begin to interpret newly available information within their learning environments (Kaplan, 1991). Toddlers high levels of curiosity, exploration and investigation is often expressed through physical activity (Worley & Goble, 2016), thus capitalising on these behaviours in interventions might be beneficial.

The study described in **Chapter 4** was limited by the small sample size. A total of 68 toddlers (1.0-2.9 years) and 233 preschoolers (3.0-5.9 years) from 11 ECEC centres were included in the sample and as such the toddler sample was slightly underpowered. While the preschoolers' group was adequately powered, the toddler group was not. To be included in the study toddlers had to be competent walkers which reduced the sample size significantly. Given that a number of relationships were close to significant, a larger sample, inclusive of an appropriate number of toddlers could have potentially resulted in more significant relationships. Another limitation to this study was the fact that the EPAO mainly assessed structural quality of the ECEC environment, rather than structural and process quality. Important environmental factors such as educators' engagement and interactions with children was not assessed.

The efficacy study described in **Chapter 5** has several strengths, First, the blended PL intervention was underpinned by two strong theoretical frameworks. Second, the model of PL (blended PL) and the nature of the PL (ongoing) was acceptable for educators and offered a place for interaction, professional conversation and community and ongoing contextualised learning and support. This type of PL (blended and ongoing) could potentially have a greater impact on teaching and learning practices, opposed to participating in disconnected one-off traditional PL workshops which are typical in the ECEC sector. Third, this study was the first known study within the ECEC sector to adopt a stepped-wedge design where all participating centres acted as their own controls and received the intervention. The stepped-wedge design has a built-in maintenance phase, which allowed data to be collected over a prolonged period of time. Fourth, this study reported both centre- and child-level data using validated instruments. Fifth, this study was fully powered with 15 ECEC centres being recruited. Finally, high retention rates (100% of centres, nearly 80% of educators and 90% of children), suggested high feasibility of such an approach.

Although a number of strengths were identified, there were also some limitations to this study. The stepped-wedge design was costlier and more labour intensive (given the additional data collection points), thus data collection took longer than anticipated at each time point. Furthermore, two out of the four time points coincided with the school holidays, which resulted in increased absenteeism of children. This may have possibly impacted the changes seen in the child-level data. The EPAO is typically used in cross sectional studies (Bower et al., 2008; Vanderloo & Tucker, 2015; Tucker, Vanderloo, Burke, Irwin, & Johnson, 2015; Peden et al., 2017) rather than intervention studies, and

although it has been developed for intervention studies, the limited number of intervention studies available to compare with meant that comparison was limited. Furthermore, the EPAO assesses minimal aspects of 'process quality'. Whilst elements of 'process quality' such as additional changes in interactions and engagement levels between educators and children may have resulted from the study, they were not assessed. Some educators had difficulties in navigating the technology used in the online component of the intervention, and thus this may have impeded on their confidence to engage fully in the program. Although extensive technical support was provided, further investigation in problem solving these issues may be needed in future studies. Lastly accelerometers are not without limitations. There is ongoing debate about the most effective cut points to use for preschool aged children and the activities that should be classified as light-intensity physical activity are often classified as sedentary (Pate et al 2006: Trost, Fees, Haar, Murray, Crowe, 2012).

Chapter 6 described how the blended PL program aligned with Community of Practice (CoP). This study indicated strong links with a CoP framework, whereby the content of the PL program was contextualised to the 'needs' of the educators. Educators were given the opportunity to personally engage with other educators in a face-to-face workshop, which enabled educators to build up rapport and develop confidence with colleagues before entering the online platforms. The strengths of this study include educators being affiliated with one overarching organisation which meant that the educators had already had some, although limited, connection with other educators involved in the program. It was limited however, by the lower than expected individual

participation rates and the availability of time, web connectivity, and access to computer posed a barrier for educators, therefore, possibly impacted the final results this study.

7.4 Recommendations and future research

The research and results from this Doctoral thesis suggest a number of recommendations and areas to be considered for future research. ECEC settings are unequivocally complex environments and aim to cater for the needs and wants of a diverse group of children and families. Despite their complexity they have a huge potential to inform children's health, social, emotion and academic trajectories both in the short- and long-term. The quality of the environment as well as the PL that educators participate in informs these trajectories, thus high-quality ECEC environments (inclusive of the interactions between educators and children) and meaningful, well presented and applicable PL is critical.

The following general recommendations and future research are posed:

1. Healthy eating and physical activity focused PL – Few opportunities are available for educators to participate in PL related to healthy eating and physical activity. The early years (between 0-5 years) are critical years for informing these behaviours. Given the increase in the number of children attending ECEC settings and the time that they spend in these settings, ECEC environments need to play a pivotal role in promoting these behaviours. Educators need to be continually taught and re-taught about how to successfully promote and change these behaviours in young children. Currently, within the Australian context,

there are very few opportunities for educators to participate in PL that is related to healthy eating and physical activity (Peden et al., 2017). Future studies could investigate ways in which wide spread PL in this area could be provided. This would likely involve support at a Government level and meaningful collaboration with Government and training agencies. Furthermore, there is limited research on the impact of PL in the area of healthy eating and physical activity targeting young children in ECEC centres, thus further research in this area is warranted (Peden et al., 2017).

2. Ongoing PL – Ongoing PL is far more superior than a one-off PL (Sheridan et al., 2009). Despite this, the ECEC sector is still largely tarnished with one off PL sessions (Synder et al., 2012). A number of advantages are apparent following ongoing PL (as described in **Chapter 5** and earlier in this chapter) including the opportunity for educators to participate in regular professional conversations, be challenged to change behaviours over a period of time, supported by professional mediators and build collaborations. Future studies should investigate options for ongoing PL rather than one off PL sessions. Additionally, longer ongoing PL is required. In the study described in **Chapter 5**, the PL was facilitated over a 12-week period. Although this was considered long for the ECEC sector, even longer PL (i.e., over months or years) is highly recommended to ensure sustainable and meaningful change in educators' practice and children's behaviours.

3. Appropriate PL models – PL for educators is highly encouraged within the

ECEC sector and is often utilised as a form of ongoing training for educators (Sheridan, Edwards, Marvin, & Knoche, 2009). Traditionally PL has been delivered using face-to-face workshops, however over time, as the sector has advanced, the needs and wants of educators have changed, alternate PL models are needed (Synder et al., 2012). The use of blended PL is a viable and feasible option, where by educators have the opportunity to initially meet face-to-face and then collaborate online. The blended PL model overcomes a number of limitations associated with face-to-face PL or PL that is delivered exclusively online (Garcia Valcarcel et al., 2014; Kliger & Pfeiffer, 2011; Masie, 2002). Future research will need to explore the most appropriate types of technology that could be integrated into a blended PL model. Given the increasing popularity of the use of portable digital devices, such as tablets, smart phones, and touch screen devices, future research interests need to consider how feasible and effective these devices would be to increase flexible, accessible, portable and cost-effective PL across a broader geographical population of educators. Based on the outcomes of the study detailed in **Chapter 5**, it is recommended that educators participating in future blended PL models are provided with extensive technology support/training to evaluate and promote their confidence and in turn the online participation levels of educators. This could be in the form of recruiting technology champions within the ECEC sector, to further support the online community. Furthermore, these models would need to be supported by clear theoretical frameworks, to ensure these blended PL models in the ECEC sector explore factors beyond the logistics of these models (pleasure, flexibility,

supportive learning environments) and measure if these PL environments equate to successful learning outcomes for children across a broad range of curriculum areas. Moreover, the integration of various face-to-face components of a blended model could be explored, such as the inclusion of face-to-face mentoring and coaching sessions to be held on-site and conducted along-side online platforms. Blending face-to-face delivery with a technology-based component, would enable *all* educators within a team to be active learners, as they collectively participate in new ways to communicate and collaborate with other professionals outside their immediate work environment (Drysdale, Graham, Spring, & Halverson, 2013; Garcia Valcarcel et al., 2014), rather than PL opportunities being limited to one or two educators from a single ECEC centre.

4. Assessment of structural and process quality – Quality of ECEC environments is directly related to child- and centre-level outcomes. That is, higher quality results in better child- and centre-related outcomes (Melhuish, 2014; Melhuish et al., 2016; Siraj & Kingston, 2015). Like all key learning domains for young children, interactions between educators and children are paramount and critically important. Within the physical activity context children are more active when educators participate with them in activities or provide positive prompts (Gubbels et al., 2011; Brown, Googe, McIver, & Rathel, 2009; Trost et al., 2008). Additionally, children are more active when educators implement intentionally planned experiences such as games/group physical activity experiences (Gubbels et al., 2011). Children eat healthier food when educators participate in eating occasions with them and role model appropriate food

practice. Ensuring high quality environment involves the assessment of both structural and process quality (**section 7.2.1**). A combination of valid and reliable instruments to measure ECEC quality is highly recommended in future interventions.

5. Interventions for toddlers and preschool aged children – To date, most interventions focus on preschool-aged children with very few focusing on the toddler group (Peden et al., 2017; Trost, Fees, Haar, Murray, & Crowe, 2012). This might be in part due to the fact that most validated instruments to measure healthy eating and physical activity are for preschool-aged children. Additionally, data collection with older children is often considered easier due to their increased cognitive ability. However, the toddler age group is a critical age group to target with the promotion of healthy eating and physical activity encouraged from birth. The blended PL program described in **Chapter 5**, was successfully facilitated for educators working with toddlers, thus future studies should focus on both toddlers and preschool-aged children as early promotion and habit forming is critical.

6. Larger sample sizes – Although the study described in **Chapter 5** was fully powered, all educators were recruited from one overarching organisation. In this instance, this was advantageous in that the executive of the organisation strongly promoted the blended PL program, however, to ensure scalability of such a program it will be important in future studies to diversify recruitment to be inclusive of educators from different organisations. Recruiting educators from

many organisations is a complex process but is encouraged in future studies.

7.5 Conclusion

In conclusion, this Doctoral study aimed to add to the evidence-based research literature focusing on the role of educators within ECEC settings in relation to the promotion of healthy eating behaviours and physical activity. The literature review highlighted the role of educators with ECEC settings pertaining to healthy eating and physical activity and summarised the literature pertaining to ECEC interventions in the area of healthy eating and physical activity inclusive of a PL component. The systematic review, described in **Chapter 2**, investigated PL models (length, mode, content) offered as part of objectively measured physical activity early childhood-based interventions. This review concluded that potential patterns between the length, mode and content of PL for educators and child PA outcomes was difficult to identify given the disparity in how information relating to PL is reported. Therefore, the gaps identified in systematic review shaped the development and implementation of the blended PL program (HOPPEL).

In addition to the systematic review, three additional peer-reviewed papers were published (or submitted for publication) as a result of the work completed in this doctoral thesis. The first (**Chapter 4**), reported on a cross-sectional study which investigated the relationship of ECEC quality and physical activity and sedentary behaviours of toddlers and preschoolers. This study supported previous findings further highlighting that ECEC environments are important for child outcomes (Bower et al., 2008; Vanderloo et al., 2014; Ward et al., 2008). This was the first study to investigate these relationships with both toddlers and pre-school aged children and identified

specific aspects of the environment that are related to physical activity and sedentary behaviour of children whilst attending ECEC settings. This study highlighted the importance of comprehensively assessing the quality (inclusive of structural and process) of ECEC environments.

Chapter 5 reported on the efficacy of a blended PL program for early childhood educators, targeting physical activity and healthy eating behaviours among 2-5-year old children. Prior to this study, no known studies from within the ECEC sector had investigated the effectiveness of alternative ongoing PL models, such as blended PL programs, which focus on physical activity and healthy eating. Further, to the best of the author's knowledge, this is the first study within the ECEC sector that has used a stepped-wedge clustered randomised controlled trial design. This study concluded that a blended PL program, was effacious in eliciting positive changes to both centre- and child-level outcomes. Significant effects in total EPAO score, EPAO for physical activity scores and light-intensity physical activity were found at the end of the intervention period. Additionally, significant changes at the end of the maintenance period were reported, suggesting that these changes can be sustained. Given the uniqueness of this blended PL program in an ECEC setting, the findings of this program are noteworthy and highly applicable for the ECEC sector.

The final paper (**Chapter 6**) was a qualitative-based study and investigated how the blended PL program aligned with the Community of Practice (CoP), specifically with the three main elements (Domain, Community and Practice). As past research has indicated that PL programs underpinned by sound theoretical frameworks are more

successful than those that are not (Desimone, 2009), it was important to evaluate if a blended PL model could be aligned to a well-established framework, such as CoP. To the best of the author's knowledge, no studies have investigated how closely a healthy eating and physical activity blended PL intervention can be underpinned by the CoP. This study showed that the blended PL program on the whole aligned closely with CoP elements and the subthemes. Educators expressed a sense of common identity and connectedness to the blended PL program through meaningful relationships that were established during the face-to-face workshop, and then further developed online throughout the program. Future studies investigating how to maximise individual online participation are needed.

The findings of this thesis further support the role of educators within ECEC settings and provides evidence pertaining to innovative and sustainable ECEC PL interventions in the areas of physical activity and healthy eating. The complexity of the ECEC environment (specifically in relation to quality) and thus potential ECEC environmental factors that may influence physical activity and healthy eating need to be considered. Creative PL models, which are underpinned by sound theoretical frameworks, also need to be considered to ensure sustainable changes in the areas of healthy eating and physical activity. This thesis provides one viable creative PL model which could be built upon in future studies. Finally, this doctoral thesis has the potential to inform ECEC pedagogical leaders and policy makers about the importance of the ECEC environment and educators in the promotion of healthy eating and physical activity for young children. Promoting these behaviours from a young age is essential and promoting these behaviours within the ECEC setting is paramount to ensure that young

children grow to their full potential. This thesis encourages future researchers to investigate alternative research designs, such as a stepped-wedge design, to assess the sustainability of research outcomes over a prolonged period.

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Appendix A

Statement of contribution of others

Michele Peden worked together with her supervisors, Dr Rachel Jones, Senior Professor Tony Okely and Dr Michelle Eady to plan and implement this doctoral research. All aspects of the thesis were designed in collaboration of all supervisors. The candidate along with a supervisor (RJ) approached one overarching early childhood organisation in Tasmania to participate in the blended PLprogram and assist with recruitment of ECEC centres, their educators and children (aged 2-5 years). The candidate trained all data collectors and was involved in all data collection. The candidate cleaned, analysed and interpreted data (with assistance of supervisors and statistical consultant), and drafted and revised this thesis under the guidance of all supervisors.

Michele E Peden

Rachel A Jones

Anthony D Okely

Michelle J Eady

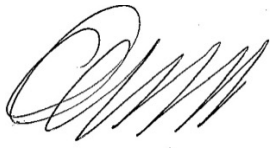
Author contributions

Published article from Chapter 2:

Peden, M. E., Okely, A. D., Eady, M. J., & Jones, R. A. (2018). What is the impact of professional learning on physical activity interventions among preschool children? A systematic review. *Clinical obesity*, *8*(4), 285-299. https://doi.org/10.1111/cob.12253

We confirm that Michele Elizabeth Peden contributed to the above paper. MEP registered the systematic review with PROSPERO international prospective register of systematic reviews (registering number CRD42016032941). MEP and RAJ screened based articles on titles, followed by MEP and RAJ screening abstracts then full-text independently Any discrepancies were resolved by further discussed until a consensus was reached. Risk of bias was completed independently by MEP, RAJ & MJE. ADO contributed to the concept and focus of the systematic review. All authors reviewed and edited the manuscript and approved the final version.

Rachel A Jones



Anthony D Okely

Michelle J Eady

Published article from Chapter 4:

Peden, M. E., Jones, R., Costa, S., Ellis, Y., & Okely, A. D. (2017). Relationship between children's physical activity, sedentary behavior, and childcare environments: A cross sectional study. *Preventive Medicine Reports*, *6*, 171-176. doi.org/10.1016/j.pmedr.2017.02.017

We confirm that Michele Elizabeth Peden contributed to the above paper. YE cleaned the data. The candidate analysed the data with the assistance of SC. The candidate drafted and revised this thesis under the guidance RAJ and ADO. All authors reviewed and edited the manuscript and approved the final version.

Rachel A Jones

Anthony D Okely

Silvia Costa

Yvonne Ellis

Submitted article from Chapter 5:

Peden, ME., Eady, MJ., Okely, AD., Patterson, K., Batterham, M., Jones, RA. (2018). A web-mediated intervention for educators in early childhood education and care settings targeting physical activity and healthy eating behaviours in young children: A cluster randomised stepped-wedge design. *American Journal of Preventive Medicine* (under review).

We confirm that Michele Elizabeth Peden contributed to the above paper. The candidate along with a supervisor (RAJ) approached one overarching early childhood organisation in Tasmania to participate in the program and assist with recruitment of ECEC centres, their educators and children (aged 2-5 years). The candidate trained data collectors and was involved in all data collection. The candidate cleaned, analysed and interpreted data (with assistance of supervisors and statistical consultant), and drafted and revised this thesis under the guidance of RAJ, ADO, ME. All authors reviewed and edited the manuscript and approved the final version.

Rachel A Jones

Anthony D Okely

Michelle J Eady

Marijka Batterham

Kira Patterson

Submitted article from Chapter 6:

Peden, ME., Okely, AD., Eady, MJ., Jones, RA. (2018). Healthy online professional program for early learners (HOPPEL): Creating an online community of practice for early childhood educators. *Professioanl Development in Education* (under review).

We confirm that Michele Elizabeth Peden contributed to the above paper. The candidate along with a supervisor (RAJ) approached one overarching early childhood organisation in Tasmania to participate in the program and assist with recruitment of ECEC centres, their educators and children (aged 2-5 years). The candidate trained data collectors and was involved in all data collection. The candidate analysed and interpreted the qualitative data, from the synchronous and asynchronous digital platforms (blogs, forums) using a thematic analysis using NVivo (Version 1, August 2017). The candidate drafted and revised this paper under the guidance of all supervisors. All authors reviewed and edited the manuscript and approved the final version.

Rachel A Jones

Anthony D Okely

Michelle J Eady

Appendix B

Published article: What is the impact of professional learning on physical activity interventions among preschool children? A systematic review.

Peden, M. E., Okely, A. D., Eady, M. J., & Jones, R. A. (2018). What is the impact of professional learning on physical activity interventions among preschool children? A systematic review. *Clinical obesity*, *8*(4), 285-299. https://doi.org/10.1111/cob.12253

clinical obesity

doi: 10.1111/cob.12253

Review Article

What is the impact of professional learning on physical activity interventions among preschool children? A systematic review

M. E. Peden[1,2], A. D. Okely[1,2,3], M. J. Eady[2] and R. A. Jones[1,2,3]

What is already known about this subject

- Physical activity intervention facilitated in early childhood education and care setting are relatively successful.
- Physical activity intervention facilitated in early childhood education and care settings are diverse in length, duration and approach.
- Key components that result such interventions remain unresolved. Professional learning for educators may be important in successful physical activity interventions

What this study adds

- No studies have identified potential patterns between professional learning and children's objectively measured physical activity in early childhood education and care settings following implementation of physical activity interventions.
- Additional information detailing professional learning content, mode and length is needed.
- Professional learning is important within early childhood education and care sector. Alternate delivery options, such as blended or multi-mode professional models need to be considered.

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Received 26 November 2017; revised 25 February 2018; accepted 30 March 2018

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Summary

The purpose of this systematic review was to investigate professional learning models (length, mode, content) offered as part of objectively measured physical childcare-based interventions. A systematic review of eight electronic databases was conducted to June 2017. Only English, peer-reviewed studies that evaluated childcare-based physical activity interventions, incorporated professional learning and reported objectively measured physical activity were included. Study designs included randomized controlled trails, cluster randomized trials, experimental or pilot studies. The search identified 11 studies. Ten studies objectively measured physical activity using accelerometers; five studies used both accelerometer and direct observation tools and one study measured physical activity using direct observation only. Seven of these studies reported statistically significant intervention effects. Only six studies described all components of professional learning, but only two studies reported specific professional learning outcomes and physical activity outcomes. No patterns were identified between the length, mode and content of professional learning and children's physical activity outcomes in childcare settings. Educators play a critical role in modifying children's levels of physical activity in childcare settings. The findings of this review suggest that professional learning offered as part of a physical activity intervention that potentially impacts on children's physical activity outcomes remains under-reported.

Keywords: Children, intervention, physical activity, professional learning.

Appendix C

Published article: Relationship between children's physical activity, sedentary behavior, and childcare environments: A cross sectional study.

Peden, M. E., Jones, R., Costa, S., Ellis, Y., & Okely, A. D. (2017). Relationship between children's physical activity, sedentary behavior, and childcare environments: A cross sectional study. *Preventive medicine reports*, *6*, 171-176.

Preventive Medicine Reports 6 (2017) 171–176

Contents lists available at ScienceDirect

Preventive Medicine Reports

journal homepage: http://ees.elsevier.com/pmedr

Relationship between children's physical activity, sedentary behavior, and childcare environments: A cross sectional study

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ARTICLE INFO

Article history:
Received 11 October 2016
Received in revised form 15 February 2017
Accepted 18 February 2017
Available online 21 February 2017

Keywords:
Child care
Physical activity
Preschool
Intervention

ABSTRACT

The purpose of this study was to investigate the relationship between the childcare environment and physical activity and sedentary behavior of toddlers and preschoolers.

A total of 68 toddlers (1.0–2.9 years) and 233 preschoolers (3.0–5.9 years) were recruited from 11 childcare services in 2013 within the Illawarra and Shoalhaven region of NSW, Australia. For this study analysis was conducted in 2016. The childcare environment was assessed using the Environment and Policy Assessment Observation (EPAO) instrument, and childcare services categorized as low, medium, or high based on their scores. Time spent in physical activity and sitting was assessed over one week using activPAL accelerometers. Relationship between EPAO and children's physical activity and sedentary behavior was assessed using multilevel mixed-effects linear regression.

Toddlers who attended high EPAO services sat more (8.73 min [−10.26, 27.73]) and stood less (−13.64 min [−29.27, 2.00]) than those who attended low EPAO services. Preschoolers who attended high EPAO services sat less than those in low and medium services (mean [95%CI] = −7.81 min [−26.64, 11.02]). Sub-categories of the EPAO that were associated with less time sitting were: sedentary environments for toddlers and portable play equipment for preschoolers.

This study extends previous research by identifying differences between toddlers and preschooler's physical activity and sedentary behaviors in relation to childcare environments. A greater understanding of how the childcare environment relates to sitting time for both toddlers and preschool aged children is needed.

1. Introduction

The early years (0–5 years) is a critical time in establishing healthy levels of physical activity and sedentary behavior (Reilly et al., 2004). Optimal levels of these behaviors at this age are associated with more favorable health outcomes in childhood and adolescence (Bower et al., 2008; Vanderloo et al., 2014). Of concern is that a high proportion of young children currently do not meet physical activity and sedentary behavior recommendations (Hinkley et al., 2012; Pujadas Botey et al., 2016; Ellis et al., n.d.), thereby potentially impacting long-term health outcomes.

In recent years, the number of children attending childcare services has escalated with the majority of children in developed countries now attending some sort of formal childcare each week (OECD, 2016). This makes childcare services ideal environments to promote healthy levels of physical activity and sedentary behavior. Healthy lifestyles (including physical activity and sedentary behaviors) is also a mandated part of most early childhood curricula (Stegelin, 2005; Australian Children's Education and Care Quality Authority (ACECQA), 2011) and childcare services offer environments, both indoors and outdoors, for active play opportunities (ERIC Digest, 2001).

A number of studies have investigated the relationship between the childcare environment and young children's physical activity. (Hesketh Kvan Sluijs, 2016; Vanderloo and Tucker, 2015; Henderson et al., 2015) Such studies have reported positive relationships with physical activity and the availability of portable or fixed equipment, teacher-led physical activity lessons, and staff behaviors (such as staff intentionally engaging with children in active play or providing positive or negative comments in relation to physical activity) (Bower et al., 2008; Kreichauf et al., 2012; Goldfield et al., 2012; Trost et al., 2009). Staff involvement in the promotion of active play, the use of positive statements and prompts about physical activity have been associated with increased child activity within childcare environments (Vanderloo et al., 2014; Gubbels et al., 2011). In contrast, other studies have identified negative

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http://dx.doi.org/10.1016/j.pmedr.2017.02.017

Appendix D

Environmental and Policy Assessment and Observation (EPAO) Instrument

8818607480

EPAO Observation

Center Name

Date of Observation: ☐☐ / ☐☐ / ☐☐☐☐ (month / day / year)

Observer ID#: ☐☐

Start time: ☐☐ : ☐☐

Number of children in classroom: ☐☐

Ages of children: *[Mark all that apply]*

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5
- ○ 6

Eating Occasions Observed: *[Mark all that apply]*

- ○ Breakfast
- ○ AM Snack
- ○ Lunch
- ○ PM Snack

Total Physical Activity occasions observed: ☐☐

End time: ☐☐ : ☐☐

_____
Initials of Teacher Observed

Weather:

Eating Occasions - Foods

1. How was **breakfast** served? *[Choose one.]*

   - ○ family style
   - ○ delivered and served in prepared portions
   - ○ delivered in bulk and portioned by staff
   - ○ N/A

2. How was **a.m. snack** served? *[Choose one.]*

   - ○ family style
   - ○ delivered and served in prepared portions
   - ○ delivered in bulk and portioned by staff
   - ○ N/A

3. How was **lunch** served? *[Choose one.]*

   - ○ family style
   - ○ delivered and served in prepared portions
   - ○ delivered in bulk and portioned by staff
   - ○ N/A

EPAO Observation

4. How was **p.m. snack** served? *[Choose one.]*

- O family style
- O delivered and served in prepared portions
- O delivered in bulk and portioned by staff
- O N/A

5. How many times was **fruit** served the day of observation?

O 0 O 1 O 2 O 3 O 4 O 5 O other ➔ ☐☐

6. How many times was **fruit** served fresh, frozed or canned in own juice the day of observation?

O 0 O 1 O 2 O 3 O 4 O 5 O other ➔ ☐☐

7. How many times was **100% fruit juice** served the day of observation?

O 0 O 1 O 2 O 3 O 4 O 5 O other ➔ ☐☐

8. How many times were **vegetables** (not including French fries or fried vegetables) served the day of observation?

O 0 O 1 O 2 O 3 O 4 O 5 O other ➔ ☐☐

9. How many times were **dark green, red, orange or yellow vegetables** served the day of observation?

O 0 O 1 O 2 O 3 O 4 O 5 O other ➔ ☐☐

10. Was **margarine, butter, or meat fat** visible on vegetables?

- O yes
- O no ➔ 10a. According to staff, during the day of observation were vegetables prepared with added fat? O yes O no O unsure
- O no vegetables served

EPAO Observation

11. Are vegetables **typically** served with added fat? (ask classroom staff or cook) ○ yes ○ no ○ unsure

12. How many times were **fried or pre-fried vegetables** (e.g., tator tots, french fries, fried okra, fried zucchini and hashbrowns) served the day of observation? ○ 0 ○ 1 ○ 2 ○ 3 ○ other → ☐☐

13. How many times were **fried or pre-fried meats** (e.g., chicken nuggets, fish sticks) served the day of observation? ○ 0 ○ 1 ○ 2 ○ 3 ○ other → ☐☐

14. How many times were **high fat meats** (e.g., ground beef, bologna, hotdogs, ham) served the day of observation? ○ 0 ○ 1 ○ 2 ○ 3 ○ other → ☐☐

15. How many times were **lean meats/fish** (e.g., baked chicken or turkey breasts, baked fish, deli turkey, tuna and salmon) served the day of observation? ○ 0 ○ 1 ○ 2 ○ 3 ○ other → ☐☐

16. How many times were **beans/lentils** served the day of observation? ○ 0 ○ 1 ○ 2 ○ 3 ○ other → ☐☐

17. How many times were **high sugar and/or high fat foods(not condiments)** served the day of observation? ○ 0 ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ other → ☐☐

18. How many times were **high sugar and/or high fat condiments** served the day of observation? ○ 0 ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ other → ☐☐

19. How many times were **high fiber grains** served the day of observation? ○ 0 ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ other → ☐☐

EPAO Observation

Eating Occasions - Beverages

20. Was drinking water for children visible in the classroom?

- ○ yes → 20a. How accessible was drinking water to children in the classroom?
  - ○ available for self-serve (child-level fountain or pitcher/cups on table)
  - ○ available by request only
- ○ no

20b. If no, is there a water fountain in a nearby hallway?

- ○ yes → 20b_1. How accessible is this fountain to children?
  - ○ available by request only (must ask permission to leave classroom)
  - ○ during teacher-designated water breaks
- ○ no

21. Did you witness teachers prompting children throughout the day to drink water?

- ○ yes, regularly (multiple times throughout the day, not just specific occasions such as coming in from outdoor play)
- ○ yes, at specific times only (such as coming in from outdoor play)
- ○ no

22. How many times were **sugar drinks** (Kool-aid, sports drinks, sweet tea, punch, sodas) served the day of observation?

○ 0 ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ other → ☐☐

23. How many times was **milk** served the day of observation?

○ 0 ○ 1 ○ 2 ○ 3 ○ other → ☐☐

24. What type of **milk** was served **to the majority** of children at a majority of meals? *[Mark only one.]*

○ Whole	○ Skim	○ Rice milk
○ 2%	○ Whole, flavored	○ Soy milk
○ 1%	○ Lower fat, flavored (2%, 1%, skim)	○ Lactaid

25. Note other types of **milk** served to **selected** children: *[Mark all that apply.]*

O Whole	O Skim	O Rice milk
O 2%	O Whole, flavored	O Soy milk
O 1%	O Lower fat, flavored (2%, 1%, skim)	O Lactaid

Eating Occasions - Staff Behavior

26. Did staff push children to eat more than they want to (e.g., clean your plate, you won't get dessert until you finish lunch)?

O yes → 26a. How many eating occasions was the behavior observed?
O no — O 1 O 2 O 3 O 4 O 5 O other → ☐☐

27. Did staff serve children second helpings without being asked for more by the child (see an empty plate and add food without request by child)?

O yes → 27a. How many eating occasions was the behavior observed?
O no — O 1 O 2 O 3 O 4 O 5 O other → ☐☐

28. Did staff positively and gently encourage children to try new or less favorite foods?

O yes → 28a. How many eating occasions was the behavior observed?
O 1 O 2 O 3 O 4 O 5 O other → ☐☐

O no (children resisted eating but were not encouraged)

O no children resisting eating observed

29. Was food used to control behavior?

O yes → 29a. How many eating occasions was the behavior observed?
O no — O 1 O 2 O 3 O 4 O 5 O other → ☐☐

EPAO Observation

30. Did staff sit with children during lunch?

O yes → 30a. Did staff consume the same food as children? → O yes O no

O no

31. Did staff eat and/or drink less healthy foods in front of children?

O yes → 31a. How many meals? O 1 O 2 O 3 O 4 O 5 O other → ☐☐

O no

O did not observe staff eating

32. Did staff talk with children about healthy foods?

O yes → 32a. How many separate times did you observe staff talking to chilcren about healthy foods? O 1 O 2 O 3 O 4 O 5 O other → ☐☐

O no

33. Was any **formal** nutrition education for children observed?

O yes O no

Physical Activity - Child Behaviors

34. How many minutes of total active play time was observed (includes indoor, outdoor, structured and unstructured)?

☐☐☐ *minutes*

35. Was structured physical activity observed?

O no

O yes ↓

35a. How many occasions? O 1 O 2 O 3 O 4 O 5 O other ↓

35b. Total minutes of structured PA observed: ☐☐☐ *minutes* ☐☐

35c. Was the structured PA optional for children? O yes O no

EPAO Observation

36. Did you observe any outdoor active play?

O yes → 36a. How many times/day? O 1 O 2 O 3 O 4 O 5 O other →

O no → 36b. Was it due to weather (too hot, too cold, rain/snow)?

O yes O no O unsure

37. How many total minutes of outdoor active play (structured and unstructured) was observed?

☐☐☐ *minutes*

38. Was drinking water for children available outdoors?

O yes O no O no outdoor time observed → 38a. Did you see a drinking fountain located in the outdoor play area? O yes O no

39. While outdoors, did you witness teachers prompting children to drink water?

O yes O no O no outdoor time observed

Sedentary Activities - Child

40. Did you observe children seated for more than 30 minutes at a time (excluding nap and meal times)?

O yes → 40a. How many times/day? O 1 O 2 O 3 O 4 O 5 O other →

O no

40b. How many total minutes of seated activity (majority of the class seated) was observed?

☐☐☐ *minutes*

EPAO Observation

41. Was a TV present in the room? ○ yes ○ no

42. Was TV viewing observed?

○ yes → 42a. Total minutes TV was on: ☐☐☐ *minutes*

○ no

42b. Was it on during meals? ○ yes → 42b_1. If yes, how many meals? ○ 1 ○ 2 ○ 3 or more

○ no

42c. Was the TV used only for viewing educational programs? ○ yes ○ no

43. Was a VCR/DVD present in the room? ○ yes ○ no

44. Was there a video game system present in the room? ○ yes ○ no

45. Was a computer present in the room for use by children? ○ yes ○ no

46. Was video game or computer game playing observed?

○ yes → 46a. Total number of minutes computer/video game playing was observed: ☐☐☐ *minutes*

○ no

46b. Was it being used for educational purposes only? ○ yes ○ no

46c. How many total children participated in computer/video game playing during the entire day? ☐☐ *# of children*

EPAO Observation

Physical Activity - Staff Behaviors

47. Did you observe restricting active play as punishment?

O yes → 47a. How many times/day? O 1 O 2 O 3 O 4 O 5 O other → ☐☐

O no

48. Did staff join in active play?

O yes → 48a. How many times/day? O 1 O 2 O 3 O 4 O 5 O other → ☐☐

O no

49. How many positive statements were made about physical activity (e.g., Good throw!, Running is fun!, I like the way you threw that ball!)?

O 1 O 2 O 3 O 4 O 5 O other → ☐☐

50. Did staff provide prompts to **increase** physical activity (e.g., Can you jump higher?, Can you hop on one foot?)?

O yes → 50a. How many times/day? O 1 O 2 O 3 O 4 O 5 O other → ☐☐

O no

51. Did staff provide prompts to **decrease** physical activity (e.g., Slow down!, Give it a rest! Don't climb on the slide!)?

O yes → 51a. How many times/day? O 1 O 2 O 3 O 4 O 5 O other → ☐☐

O no

52. Were any **formal** physical education lessons for children observed? O yes O no

53. Were any extra-curricular (special) physical activity programs provided to children on a fee basis (e.g., Tumbling Tots, Tumble Bus)?

O yes → 53a. Were any active alternatives provided for those children that did not participate? → O yes O no

O no

Center Environment

54. Where were soda and other vending machines located?

- ○ in entrance or front
- ○ in public areas, but not the entrance → 54a. Did they contain only healthy options (e.g., water, milk, 100% fruit juice, granola bars, pretzels, nuts)? → ○ yes ○ no
- ○ out of sight of parents and kids
- ○ no vending machines on site

Please indicate where these pieces of physical activity equipment (both fixed and portable) were located:

55. Fixed Play Equipment	*indoors only*	*outdoors only*	*both indoors & outdoors*	*not present*
a. balancing surfaces (balance beams, boards, etc.)	○	○	○	○
b. basketball hoop	○	○	○	○
c. climbing structures (jungle gyms, ladders, etc.)	○	○	○	○
d. merry-go-round	○	○	○	○
e. pool	○	○	○	○
f. sandbox	○	○	○	○
g. see-saw	○	○	○	○
h. slides	○	○	○	○
i. swinging equipment (swings, rope, etc.)	○	○	○	○
j. tricycle track	○	○	○	○
k. tunnels	○	○	○	○

EPAO Observation

56. Portable Play Equipment	indoors only	outdoors only	both indoors & outdoors	not present
a. ball play equipment	O	O	O	O
b. climbing structures (ladders, jumble gyms, etc.)	O	O	O	O
c. floor play equipment (tumbling mats, carpet squares, etc.)	O	O	O	O
d. jumping play equipment (jump ropes, hula hoops)	O	O	O	O
e. parachute	O	O	O	O
f. push/pull toys (wagon, scooters, etc.)	O	O	O	O
g. riding toys (tricycles, cars, etc.)	O	O	O	O
h. rocking & twisting toys (rocking horse, sit-n-spin, etc.)	O	O	O	O
i. sand/water play toys (buckets, scoops, shovels, etc.)	O	O	O	O
j. slides	O	O	O	O
k. twirling play equipment (ribbons, scarves, batons, etc.)	O	O	O	O

57. Was outdoor running space . . .

- O unobstructed with plenty of space for groups games (tag, red rover, etc.)
- O some obstruction, but space was adequate for individual play (running, skipping, etc.)
- O plenty of space for play, but obstructed with play equipment
- O little running space or completely obstructed

58. Did staff limit or restrict outdoor play area in a way that substantially affect active play (more than 1/3 of total play space or quipment)?

O yes → 57a. How many outdoor play occasions? O 1 O 2 O 3 O 4 O 5 O other → ☐☐

O no

59. Was indoor play space suitable for . . .

- ○ quiet play (classroom is small and not a lot of room for movement)
- ○ limited movement/some active play (able to translocate by walking, skipping, hopping, jumping, etc.)
- ○ all activities (easily able to perform all gross motor activities)

60. Were any posters, pictures or displayed books about **physical activity** present in the observation room?

- ○ yes → 60a. How many were present? ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ other ☐☐
- ○ no

61. Were any posters, pictures or displayed books about **nutrition** present in the observation room?

- ○ yes → 61a. How many were present? ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ other ☐☐
- ○ no

Section 1: Menu Review - Observed Foods & Beverages

Date of Assessment: ☐☐ / ☐☐ / ☐☐☐☐ (month / day / year)

ID#: ☐☐

Fruits and Vegetables

1. Fruit (not juice):

a. Is the menu consistent with observation for frequency served?

○ yes ○ no → a1. How many times does fruit appear on the menu ***for the day of observation*** only? ○ 0 ○ 1 ○ 2 ○ 3 ○ other ↓ ☐☐

b. Is menu consistent with observation for type served?

○ yes ○ no ○ type not specified on menu

c. How many total times does fruit appear on the menu ***for that full week?*** ☐☐

2. Vegetables (not including fried or prefried vegetables):

a. Is the menu consistent with observation for frequency served?

○ yes ○ no → a1. How many times do vegetables appear on the menu ***for the day of observation*** only? ○ 0 ○ 1 ○ 2 ○ 3 ○ other ↓ ☐☐

b. Is menu consistent with observation for type served?

○ yes ○ no ○ type of vegetable not specified on menu

c. How many total times do vegetables appear on the menu ***for that full week?*** ☐☐

3. Dark green, red, orange, or yellow vegetables:

a. Is the menu consistent with observation for frequency served?

○ yes ○ no → a1. How many times do vegetables (dark green, red, orange or yellow) appear on the menu **for the day of observation** only? ○ 0 ○ 1 ○ 2 ○ 3 ○ other ↓ ☐☐

b. Is menu consistent with observation for type served?

○ yes ○ no ○ type of vegetable not specified on menu

c. How many total times do dark green, red, yellow or orange vegetables appear on the menu ***for that full week?*** ☐☐

4. Added fat for cooked vegetables:

a. Is added meat fat, margarine, or butter specified on the menu for cooked vegetables?

○ yes ○ no → a1. How many total times does it appear on the menu **for the day of observation** only? ○ 0 ○ 1 ○ 2 ○ 3 ○ other ↓ ☐☐

b. How many total times do vegetables **with added fat** appear on the menu ***for that full week?*** ☐☐

Fried Foods and High Fat Meats

5. Fried or pre-fried meats (chicken nuggets) or fish (fish sticks):

a. Is the menu consistent with observation for frequency served?

○ yes ○ no → a1. How many times do fried or pre-fried meats appear on the menu **for the day of observation** only? ○ 0 ○ 1 ○ 2 ○ 3 ○ other ↓ ☐☐

b. Is menu consistent with observation for type served?

○ yes ○ no

c. How many total times do fried or pre-fried meats appear on the menu ***for that full week?*** ☐☐

6. Fried or pre-fried vegetables (French fries, tater tots, hash browns, fried okra):

a. Is the menu consistent with observation for frequency served?

○ yes ○ no → a1. How many times do fried or pre-fried vegetables appear on the menu **for the day of observation** only? ○ 0 ○ 1 ○ 2 ○ 3 ○ other ↓ ☐☐

b. Is menu consistent with observation for type served?

○ yes ○ no

c. How many total times do fried or pre-fried vegetables appear on the menu ***for that full week?*** ☐☐

7. High fat meats (sausage, bacon, hot dogs, bologna, ground beef):

a. Is menu consistent with observation for frequency served?

O yes O no → a1. How many total times do high fat meats appear on the menu **for the day of observation** only? O 0 O 1 O 2 O 3 O other ↓ ☐☐

b. Is menu consistent with observation for type served?

O yes O no

c. How many total times do high fat meats appear on the menu for ***that full week?*** ☐☐

8. Lean meats (baked or broiled chicken, turkey or fish):

a. Is the menu consistent with observation for frequency served?

O yes O no → a1. How many times do lean meats appear on the menu **for the day of observation** only? O 0 O 1 O 2 O 3 O other ↓ ☐☐

b. Is menu consistent with observation for type served?

O yes O no

c. How many total times do lean meats appear on the menu ***for that full week?*** ☐☐

9. Beans/Lentils:

a. Is the menu consistent with observation for frequency served?

O yes O no → a1. How many times do beans/lentils appear on the menu **for the day of observation** only? O 0 O 1 O 2 O 3 O other ↓ ☐☐

b. Is menu consistent with observation for type served?

O yes O no

c. How many total times do beans/lentils appear on the menu ***for that full week?*** ☐☐

Beverages

10. 100% fruit juice:

a. Is the menu consistent with observation for frequency served?

O yes O no → a1. How many times does 100% fruit juice appear on the menu **for the day of observation** only? O 0 O 1 O 2 O 3 O other ↓ ☐☐

b. Is menu consistent with observation for type served?

O yes O no

c. How many total times does 100% fruit juice appear on the menu ***for that full week?*** ☐☐

11. Sugar drinks (Kool-aid, sports drinks, sweet tea, punches, soda) other than 100% fruit juice:

a. Is the menu consistent with observation for frequency served?

O yes O no → a1. How many times do sugar drinks appear on the menu **for the day of observation** only? O 0 O 1 O 2 O 3 O other ↓ ☐☐

b. Is menu consistent with observation for type served?

O yes O no

c. How many total times do sugar drinks appear on the menu ***for that full week?*** ☐☐

12. Milk:

a. Is the menu consistent with observation for frequency served?

O yes O no → a1. How many times does milk appear on the menu **for the day of observation** only? O 0 O 1 O 2 O 3 O other ↓ ☐☐

b. Is menu consistent with observation for type served?

O yes O no O type not specified on menu

c. How many total times does milk appear on the menu ***for that full week?*** ☐☐

d. What type is indicated on the menu as ***"usually"*** served?

O Whole O Skim O Rice milk
O 2% O Whole, flavored O Soy milk
O 1% O Lower fat, flavored (2%, 1%, skim) O Type not specified on menu

Menus and Variety

13. Menus include high fiber grain foods (whole wheat bread, oatmeal, brown rice, Cheerios):

a. Is the menu consistent with observation for frequency served?

O yes O no → a1. How many times do high fiber grain foods appear on the menu **for the day of observation** only? O 0 O 1 O 2 O 3 O other ↓ ☐☐

b. Is menu consistent with observation for type served?

O yes O no

c. How many total times do high fiber grain foods appear on the menu ***for that full week?*** ☐☐

Meals and Snacks

14. High sugar and/or high fat foods (not including condiments):

a. Is the menu consistent with observation for frequency served?

O yes O no → a1. How many times do high sugar and/or high fat foods appear on the menu **for the day of observation** only? O 0 O 1 O 2 O 3 O other ↓ ☐☐

b. Is menu consistent with observation for type served?

O yes O no

c. How many total times do high sugar and/or high fat foods appear on the menu ***for that full week?*** ☐☐

15. High sugar and/or high fat condiments:

a. Is the menu consistent with observation for frequency served?

O yes O no → a1. How many times do high sugar and/or high fat condiments appear on the menu **for the day of observation** only? O 0 O 1 O 2 O 3 O other ↓ ☐☐

b. Is menu consistent with observation for type served?

O yes O no

c. How many total times do high sugar and/or high fat condiments appear on the menu ***for that full week?*** ☐☐

Section 2: Menu Review - Weeky Menus

Menus and Variety

16. Weekly menus include foods from a variety of cultures:

a. How many times are foods from a different culture present on the menu ***for the observation week*** only?

○ 0 ○ 1 ○ 2 ○ 3 ○ 4 ○ other ➔ ☐☐

Section 3: Guideline ReviewS

Foods offered outside of regular Meals and Snacks

17. Does the center have written guidelines addressing holiday/celebration foods?

○ yes ➔ a. If yes, are healthier items encouraged? ○ yes ○ no

○ no

○ no documents received from center

18. Did you review past/future fundraising projects or guidelines?

○ yes ➔ a. If yes, how many were non-food only?
- ○ all
- ○ more than half
- ○ half
- ○ less than half
- ○ none

○ Center guidelines do not address the type of fundraising, or fundraising at all

○ Center doesn't do fundraising

Nutrition Policy

19. Does the center have a written policy on nutrition and food service?

○ yes ➔ a. If yes, what areas of NAP SACC are covered? *[Mark all that apply.]*

○ no

○ no documents received from center

- ○ F&V
- ○ Fried food
- ○ High fat meats
- ○ Beverages
- ○ Menus and variety
- ○ Meals and snacks
- ○ Foods offered outside of reg meals & snacks
- ○ Support for healthy eating
- ○ Nutrition education

Play Environment

20. Did you review any documentation of safety checks?

- O yes → a. If yes, frequency of checks:
  - O only when installed
  - O once a week
  - O once a year
  - O other →
  - O once a month
- O no

Center Physical Activity Policy

21. Does the center have written policy on physical activity?

- O yes → a. If yes, what areas of NAP SACC are covered? *[Mark all that apply.]*
  - O Active play and inactive time
  - O Supporting PA
  - O TV use and TV viewing
  - O PA education
  - O Play environment
- O no
- O no documents received from center

Section 4: Training & Curriculum Review

Nutrition Education For Children, Parents and Staff

22. Does the center provide nutrition training for staff?

- O yes → a. If yes, how often?
  - O 2 times/year or more
  - O 1 time/year
  - O less than 1 time/year

  b. If yes, what was the content of the trainings?
- O no
- O no documents received from center

23. Does the center have a documented nutrition curriculum for kids?

- O yes → a. If yes, what was the content of the curriculum?
- O no

24. Does the center have documentation of parent nutrition education/workshop materials?

- O yes → a. If yes, what was the content of the education workshops?
- O no

Physical Activity Education For Children, Parents and Staff

25. Does the center provide physical activity training for staff?

- O yes → a. If yes, how often?
  - O 2 times/year or more
  - O 1 time/year
  - O less than 1 time/year
  - b. If yes, what was the content of the trainings?
- O no
- O no documents received from center

26. Does the center have a documented physical activity curriculum for kids?

- O yes → a. If yes, what was the content of the curriculum?
- O no

27. Does the center have documentation of physical activity education/workshop materials?

O yes → a. If yes, what was the content of the workshops?

O no

Please use the following citation when referencing this instrument:

Ball SC, Benjamin SE, Hales DP, Marks J, McWilliams CP, Ward DS. 2005. The Environment and Policy Assessment and Observation (EPAO) child care nutrition and physical activity instrument. Center for Health Promotion and Disease Prevention, University of North Carolina at Chapel Hill.

Please use the following citation when referencing instrument protocol and interobserver agreement:

Ward DS, Hales D, Haverly K, Marks J, Benjamin SE, Ball SC, Trost S. An instrument to assess the obesogenic environment of child care centers. Am J Health Behavior. 2008 Jul-Aug;32(4):380-6.

Appendix E

EPAO scoring system

EPAO Scoring Guidelines

Areas

1. Total Nutrition = (FV+ Grains+HSHF+ Bev+ NutrEnv+SBnutr+ NutrTE+NutrPol)/8
2. Total Physical Activity = (Act+ Sed+ SedEnv+ PortEnv + Fix Env + PaTE +SBpa+ PaPol)/8

Sub-Areas

1. Fruits and Vegetables = FV
2. Whole grains and low fat meats = Grains
3. High sugar/high fat foods = HSHF
4. Beverages = Bev
5. Nutrition Environment = NutrEnv
6. Staff Behaviors-Nutrition = SBnutr
7. Nutrition Training and Education = NutrTE
8. Nutrition Policy = NutrPol
9. Active Opportunities = Act
10. Sedentary Opportunities = Sed
11. Sedentary Environment = SedEnv
12. Portable Play Environment = PortEnv
13. Fixed Play Environment = FixEnv
14. Staff Behaviors-Physical Activity = SBpa
15. Physical Activity Training and Education = PaTE
16. Physical Activity Policy = PaPol

Nutrition

1. FV = (sum of question scores/9) x 10 Range = 0-20

	Question	Answer	Score (0, 1, or 2)
Observation #5	How many times was fruit served the day of observation?	0	0
		1	1
		2 and greater	2
Doc Review #1c	How many total times does fruit appear on the menu for that full week	0-3	0
		4-6	1
		7 and greater	2
Observation #6	How many times was fruit served fresh, frozen or canned in own juice the day of observation	0	0
		1	1
		2 and greater	2
Observation #8	How many times were vegetables (not including French fries or fried vegetables) served the day of observation	0	0
		1	1
		2 and greater	2

Vanderloo, L. M. (2016). Assessing Physical Activity and Sedentary Time in the Early Years. P192-203. Accessed https://ir.lib.uwo.ca/cgi/viewcontent.cgi?article=5979&context=etd

Doc Review #2c	How many total times do vegetables appear on the menu for that full week	0-3	0
		4-6	1
		7 and greater	2
Observation #9	How many times were dark green, red, orange or yellow vegetables served the day of observation	0	0
		1 or greater	2
Doc Review #3c	How many total times do dark vegetables appear on the menu for that full week	0-3	0
		4 or greater	2
Observation #10	Was margarine, butter, or meat fat visible on vegetables	No	1
		Yes	0
		No vegetables served	missing
Observation #11	Are vegetables typically served with added fat?	No	1
		Yes	0
		Unsure	missing
Doc Review #4a	Is added meat fat, margarine, or butter specified on the menu for cooked vegetables	No	2
		Yes	0

2. Grains = (sum of question scores/6) x 10 Range = 0-20

	Question	Answer	Score (0, 1, or 2)
Observation #15	How many times were lean meats/fish served the day of observation	0	0
		1 or greater	2
Doc Review #8c	How many total times do lean meats/fish appear on the menu for that full week	0	0
		1 or greater	2
Observation #16	How many times were beans/lentils served the day of observation	0	0
		1 or greater	2
Doc Review #9c	How many total times do beans/lentils appear on the menu for that full week	0	0
		1 or greater	2
Observation #19	How many times were high fiber grains served the day of observation	0	0
		1 or greater	2
Doc Review #13c	How many total times do whole grains appear on the menu for that full week	0	0
		1-3	1
		4 or greater	2

3. HFHS = (sum of question scores/9) x 10 Range = 0-20

	Question	Answer	Score (0, 1, or 2)
Observation #12	How many times were fried or pre-fried vegetables served the day of observation	0	2
		1	1
		2 or greater	0
Doc Review #6c	How many total times do fried or pre-fried vegetables appear on the menu for that full week	0	2
		1-3	1
		4 or greater	0
Observation #13	How many times were fried or pre-fried meats served the day of observation	0	2
		1	1
		2 or greater	0
Doc Review #5c	How many total times do fried or pre-fried meats appear on the menu for that full week	0	2
		1	1
		2 or greater	0
Observation #14	How many times were high fat meats served the day of observation	0	2
		1	1
		2 or greater	0
Doc Review #7c	How many total times do high fat meats appear on the menu for that full week	0	2
		1	1
		2 or greater	0
Observation #17	How many times were high sugar and/or high fat foods (not condiments) served the day of observation	0	2
		1	1
		2 or greater	0
Doc Review #14c	How many total times do high sugar and/or high fat foods (not condiments) appear on the menu for that full week	0	2
		1-3	1
		4 or greater	0
Observation #18	How many times were high sugar and/or high fat condiments served the day of observation	0 or 1	2
		2	1
		3 or greater	0

4. Bev = (sum of question scores/11) x 10 Range = 0-20

	Question	Answer	Score (0, 1, or 2)
Observation #7	How many times was 100% fruit juice served the day of observation	0	2
		1	1
		2 or greater	0
Doc Review #10c	How many total times does 100% fruit juice appear on the menu for that full week	0-1	2
		2	1
		3 or greater	0
Observation #20	Was drinking water for children visible in the classroom?	No	0
		Yes	2
Observation #20b	If no, is there a water fountain in a nearby hallway?	Yes	1
		No	0
** Observation #20 and 20b are combined questions and should be included as one question.			
Observation #21	Did you witness teachers prompting children throughout the day to drink water?	Yes, regularly	2
		Yes, at specific times only	1
		No	0
Observation #38	Was drinking water for children available outdoors?	Yes	2
		No	0
		No outdoor time observed	Missing
Observation #39	While outdoors, did you witness teachers prompting children to drink water?	Yes	2
		No	0
		No outdoor time observed	Missing
Observation #22	How many times were sugar drinks served the day of observation	0	2
		1 or greater	0
Doc Review #11c	How many total times do sugar drinks appear on the menu for that full week	0	2
		1 or greater	0
Observation #23	How many times was milk served the day of observation	0	0
		1	1
		2 or greater	2

Observation #24	What type of milk was served to the majority of children at a majority of meals	Whole	0
		2%	1
		1%	2
		Skim	2
		Whole, flavored	0
		Lower fat, flavored	1
		Rice milk	2
		Soy milk	2
		Lactaid	2
Doc Review #12c	How many total times does milk appear on the menu for that full week	0-3	0
		4-6	1
		7 or greater	2

5. SBnutr = (sum of question scores/6) x 10 Range = 0-20

	Question	Answer	Score (0, 1, or 2)
Observation #26	Did staff push children to eat more than they wanted to?	Yes	0
		No	2
Observation #27	Did staff serve children second helpings without being asked for more by the child?	Yes	0
		No	2
Observation #28	Did staff positively and gently encourage children to try new or less favorite foods	Yes	2
		No	0
		No children resisted eating	Missing
Observation #29	Was food used to control behavior	Yes	0
		No	2
Observation #30	Did staff sit with children during lunch	Yes	1
		No	0
Observation #30a	Did staff consume the same food as children	Yes	1
		No	0
**Observation #30 and 30a are combined questions and should be scored as one question			
Observation #31	Did staff eat and/or drink less healthy foods in front of children	Yes	0
		No	2
		Did not observe staff eating	1

6. NutrEnv (sum of question scores/3) x 10 Range = 0-20

	Question	Answer	Score (0, 1, or 2)
Observation #3	How was lunch served?	Family style	2
		Delivered and served in prepared portions	0
		Delivered in bulk and portioned by staff	0
		N/A	0
Observation #54	Where were soda and other vending machines located	In entrance or front	0
		In public areas, but not front	0
		Out of sight of parents and kids	0
		No vending machines on sight	2
Observation #54a	Did they contain only healthy options?	Yes	1
		No	0
** Observation #54 and 54a are combined questions and should be scored as one question			
Observation #61	Are any posters, pictures or books about nutrition displayed in observation room	No	0
		Yes	2

7. NutrTE = (sum of question scores/5) x 10 Range = 0-20

Variable Name	Variable Label	Answer	Score (0, 1, or 2)
Observation #32	Did staff talk with children about healthy foods	No	0
		yes	2
Observation #33	Was any formal nutrition education for kids observed	No	0
		Yes	2
Doc Review #23	Does the center have a documented nutrition curriculum for kids?	No	0
		Yes	2
Doc Review #24	Does the center have documentation of parent nutrition education/workshop materials?	No	0
		Yes	2

Doc Review #22	Does the center provide nutrition training for staff?	No	0
		Yes	0
		No documents received	0
Doc Review #22a	If yes, how often	2 times/year or more	2
		1x/year	2
		Less than 1x/yr	0
**Doc Review #22 and 22a are combined questions and should be counted as one question.			

8. NutrPol = (sum of question scores/3) x 10 Range = 0-20

	Question	Answer	Score (0, 1, or 2)
Doc Review #17	Does the center have written guidelines addressing holiday/celebration foods?	No	0
		Yes	0
		No documents received	Missing
Doc Review #17a	Healthier items encouraged	No	0
		Yes	2
**Doc Review #17a and 17a1 are combined questions and should be scored as one question.			
Doc Review #18	Did you review past/future fundraising projects or guidelines?	No	0
		Yes	0
		Center doesn't do fundraising	2
Doc Review #18a	If yes, how many were non-food only	All	2
		More than half	2
		Half	1
		Less than half	0
		none	0
**Doc Review #18a and 18a1 are combined questions and should be scored as one question.			
Doc Review #19	Does the center have a written policy on nutrition and food service?	No	0
		Yes	0
		No documents received	Missing
19a1	*These are filled/not filled questions. If one of 19a1-19a9 is filled (1) then score as 1, if more than one are filled (1) then score as 2. If DRV19a=1, but none of the 19a1-19a9 is filled then score as a 0.		
19a2			
19a3			
19a4			
19a5			
19a6			
19a7			
19a8			
19a9			

Physical Activity

9. Act = (sum of question scores/3) x 10 Range = 0-20

	Question	Answer	Score (0, 1, or 2)
Observation #34	How many minutes of total active play time was observed?	0-59 min	0
		60-119 min	1
		120 or greater	2
Observation #35	Was structured physical activity observed	No	0
		Yes	0
Observation #35a	If yes, how many occasions	1-2	1
		3 or greater	2
**Observation 35 and 35a are combined questions and should be counted as one question.			
Observation #36	Did you observe any outdoor active play	No	0
		Yes	0
Observation #36a	If yes, how many times/day	1	1
		2 or greater	2
**Observation 36 and 36a are combined questions and should be counted as one question. If ORF36 =1 and 36a is blank score as a 1.			

10. Sed =(sum of question scores/3) x 10 Range = 0-20

	Question	Answer	Score (0, 1, or 2)
Observation #40b	How many total minutes of seated activity was observed	0-59 min	2
		60 or greater min	0
Observation #42	Is TV Viewing observed	No	2
		Yes	0
Observation #42a	Total minutes TV was on	0-29 min	1
		30 or greater min	0
**Observation #42 and 42a are combined questions and should be counted as one question.			
Observation #46	Is video game or computer game playing observed	No	2
		Yes	0

11. SedEnv =(sum of question scores/3) x 10 Range = 0-20

	Question	Answer	Score (0, 1, or 2)
Observation #41	Is a TV present in the room	No	2
		Yes	0
Observation #45	Is a computer present in the room for use by children	No	2
		Yes	0
Observation #60	Are any posters, pictures or books about physical activity displayed in observation room	No	0
		Yes	2

12. PortEnv =(sum of question scores/7) x 10 Range = 0-20

	Question	Answer	Score (0, 1, or 2)
Observation #56a	Is ball play equipment present at site	Indoors only	2
		Outdoors only	2
		Both indoors and outdoors	2
		Not present	0
Observation #56d	Is jumping play equipment present at site	Indoors only	2
		Outdoors only	2
		Both indoors and outdoors	2
		Not present	0
Observation #56e	Is a parachute present at site	Indoors only	2
		Outdoors only	2
		Both indoors and outdoors	2
		Not present	0
Observation #56f	Are push/pull toys present at site	Indoors only	2
		Outdoors only	2
		Both indoors and outdoors	2
		Not present	0

Observation #56g	Are riding toys present at site	Indoors only	2
		Outdoors only	2
		Both indoors and outdoors	2
		Not present	0
Observation #56h	Are rocking/twisting toys present?	Indoors only	2
		Outdoors only	2
		Both indoors and outdoors	2
		Not present	0
Observation #56k	Is twirling play equipment present at site	Indoors only	2
		Outdoors only	2
		Both indoors and outdoors	2
		Not present	0

13. FixEnv =(sum of question scores/8) x 10 Range = 0-20

	Question	Answer	Score (0, 1, or 2)
Observation #55b	Is a basketball hoop present at site	Indoors only	2
		Outdoors only	2
		Both indoors and outdoors	2
		Not present	0
Observation #55e	Is a pool present?	Indoors only	2
		Outdoors only	2
		Both indoors and outdoors	2
		Not present	0
Observation #55h	Are slides present?	Indoors only	2
		Outdoors only	2
		Both indoors and outdoors	2
		Not present	0

Observation #55j	Is a tricycle track present?	Indoors only	2
		Outdoors only	2
		Both indoors and outdoors	2
		Not present	0
Observation #55k	Are tunnels present at site	Indoors only	2
		Outdoors only	2
		Both indoors and outdoors	2
		Not present	0
Observation #57	Was outdoor running space...	Unobstructed with plenty of space for group games	2
		Some obstruction, but space was adequate for individual play	1
		Plenty of space for play, but obstructed with play equipment	1
		Little running space or completely obstructed	0
Observation #58	Did staff limit or restrict outdoor play area in any way that affected active play?	Yes	0
		No	2
Observation #59	Was indoor play space suitable for...	Quiet play	0
		Limited movement/some active play	1
		All activities	2

14. SBpa = (sum of question scores/5) x 10 Range = 0-20

	Question	Answer	Score (0, 1, or 2)
Observation #47	Did you observe restricting active play as punishment	No	2
		Yes	0
Observation #48	Did staff join in active play	No	0
		Yes	2
Observation #49	How many positive statements were made about physical activity	0	0
		1 or greater	2

Observation #50	Did staff provide prompts to increase physical activity?	Yes	2
		No	0
Observation #51	Did staff provide prompts to decrease physical activity?	Yes	0
		No	2

15. PaTE = (sum of question scores/4) x 10 Range = 0-20

	Question	Answer	Score (0, 1, or 2)
Observation #52	Were any formal physical education lesions for children observed	No	0
		Yes	2
Doc Review #25	Does the center provide physical activity training for staff?	No	0
		Yes	0
		No documents received	0
Doc Review #25a	If yes, how often	2 times/year or more	2
		1x/year	2
		Less than 1x/yr	0
**Doc Review #25 and 25a are combined questions and should be scored as one question.			
Doc Review #26	Does the center have a documented physical activity curriculum for kids?	No	0
		Yes	2
Doc Review #27	Does the center have documentation of physical activity education/workshop materials?	No	0
		Yes	2

16. PaPol=scorex10 Range = 0-20

	Question	Answer	Score (0, 1, or 2)
Doc Review #21	Does the center have a written policy on physical activity?	No	0
		Yes	0
		No documents received	Set as missing
21a1	*These are filled/not filled questions. If one of 21a1-21a6 is filled (1) then score as 1, if more than one are filled (1) then score as 2. If DRV21a=1, but none of the 21a1-21a6 is filled then score as a 0.		
21a2			
21a3			
21a4			
21a5			

Please use the following citation when referencing instrument scoring:
Ward DS, Hales D, Haverly K, Marks J, Benjamin SE, Ball SC, Trost S. An instrument to assess the obesogenic environment of child care centers. Am J Health Behavior. 2008 Jul-Aug;32(4):380-6.

Appendix F

Baseline data collection educator's pre-questionnaire

Date:

Section A: Background Information

A1. What is your gender?

Male ☐ Female ☐

A2. What is your nationality?

A3. How old are you?

a. Under 25 ☐
b. 25-25 ☐
c. 30-39 ☐
d. 40-49 ☐
e. 50-59 ☐
f. 60+ ☐

A4. What is the highest level of formal education that you have completed?

a. Certificate ☐
b. Diploma ☐
c. Bachelor degree ☐
d. Master degree ☐
e. Other (please specify): ☐

A5. What is your employment status as an educator?

Full time ☐ Part Time ☐

A6. How long have you been employed as an educator?

a. <1 yr ☐
b. 1-2 yrs ☐
c. 3-5 yrs ☐
d. 6-8 yrs ☐
e. >8 yrs ☐

A7. How long have you been working for Lady Gowrie?

a. <1 yr. ☐
b. 1-2 yrs. ☐
c. 3-5 yrs. ☐
d. 6-8 yrs. ☐
e. >8 yrs. ☐

A8. Which ECEC do you currently work at? Please tick appropriate box/s.
Southern Lady Gowrie Services

a. Battery Point ☐
b. Cambridge ☐
c. North Hobart ☐
d. Lower Sandy Bay ☐
e. Moonah ☐
f. Richmond ☐
g. Sandy Bay ☐
h. South Hobart ☐
i. Kingston ☐
j. Oatlands ☐
k. Swansea ☐
l. Family Day Care scheme ☐

Northern Lady Gowrie Services

a. Alanvale ☐
b. Newnham ☐
c. Norwood ☐

A9. What position do you currently hold at the ECEC mentioned in question 8?

a. Manager ☐
b. Educational leader ☐
c. Teacher (2nd in charge) ☐

d. Room leader ☐
e. Educator ☐
f. Assistant ☐
g. Support staff (supporting children with additional needs) ☐
h. Untrained ☐

Section B: Professional learning

Professional learning in this questionnaire is defined as any type of training, instruction or learning experience designed to enhance educators' skills, knowledge and dispositions in order to provide quality learning experiences for young children.

For the purposes of this questionnaire, please consider professional learning you have undertaken after the completion of your formal teaching qualifications.

B1. During the *past 12months*, have you participated in any professional learning? (If yes, please go to question B2, if not got to B9)

Yes ☐ No ☐

B2. What was the content area of the professional learning?

B3. Who facilitated the professional learning (for example, educator from Lady Gowrie, external organisation, another educator)?

B4. What format did your professional learning experience in the past 12 months follow?

	Yes	No
a. Single face-to-face session only		
b. Online sessions only		
c. Face-to-face and online sessions		
d. Follow- up (e.g. reporting back about changes made in your ECEC as a result of the professional learning)		
e. Advice from experts following professional learning		

f. Contextualised content (i.e. content that was specific for your centre)		
g. Information about changing your ECEC culture and routines		

B5. Did you participate in any of the following types of formal or informal professional learning activities in the *past 12 months* (Part A) and how would you rate their impact on your everyday teaching practices (Part B)? If answered yes in part A, please complete part B.

	Part A) Participation		Part B) Impact				
	Yes	No	No impact	Little impact	Unsure	Moderate impact	Large impact
a. Short Course/workshop (face-to-face) – single session							
b. Short course/workshop (face-to-face) – multiple sessions							
c. Short Course/workshop (online)							
d. Conference							
e. Qualification program e.g. Formal qualification							
f. Network meetings involving educators from other services							
g. Mentoring/peer observation/ coaching							
h. Centre visits to other services							
i. Staff meetings							
j. Professional networking meetings (Lady Gowrie services only)							
k. Reading professional literature (journals,							

	evidence-based papers)							
l.	Online professional literature (professional face book, on line professional blogs)							
m.	Engaging in professional dialogues							

B6. In the past 12 months, how many days of professional learning did you participate in?

a. 1 ☐
b. 2 ☐
c. 3 ☐
d. 4 ☐
e. 5+ ☐

B7. Of these, how many days were compulsory for you to attend as part of your current employment as an educator?

a. 1 ☐
b. 2 ☐
c. 3 ☐
d. 4 ☐
e. 5+ ☐

B8. For the professional learning opportunities attended in the past 12 months, did you attend the professional learning during regular working hours?

Yes ☐ No ☐

During 2016, you will have the opportunity to participate in a unique professional learning experience, which will be facilitated face-to-face and online. This professional learning will focus on physical activity and healthy lifestyles and will

equip you as an educator to make significant changes within your services to improve child and educator outcomes.

B9. In the past 12 months have you participated in professional learning related to physical activity and nutrition for young children?

Yes ☐ **No** ☐

B10. How helpful do you think professional learning focusing on physical activity and healthy eating would be for your professional practice?

a. Not helpful at all ☐
b. A little bit helpful ☐
c. Unsure ☐
d. A bit helpful ☐
e. Very helpful ☐

B11. What information would be helpful to cover in professional learning sessions that focus on physical activity and healthy eating?

	Not helpful at all	A little bit helpful	Somewhat helpful	Helpful	Very Helpful
a. Recommendations/ guidelines for physical activity					
b. How to link NQS requirements to physical activity and healthy eating practices within a service program					
c. Recommendations/ guidelines for nutrition					
d. Teaching gross motor skills					
e. How to increase physical activity through all learning activities throughout the day					

f. How to incorporate physical activity and healthy eating across a variety of play spaces					
g. How to promote physical activity and healthy eating with families					
h. How to manage and implement physical activity and nutrition policy in a centre					
i. How to support others in providing physical activity learning opportunities					
j. How to increase educator accountability in relation to physical activity and healthy eating opportunities within ECEC					

B12. Which of the following presentation formats best suits your professional needs and interests? Please mark as many reasons as appropriate in each row.

Presentation format	No interest	Little interest	Unsure	Moderate interest	High interest
a. Practical workshop face-to-face?					
b. Lecture face-to-face?					
c. Online training					
d. Demonstration in service					
e. Web Seminar					
f. Blended (face-to-face and online)					
g. Video conferencing/Skype					
h. Other					

Section C: Educator Self Efficacy

C1. How confident are you in participating in an online (web-based) professional learning program?

Very High ☐ High ☐ Unsure ☐ Low ☐ Very low ☐

C2. How confident are you with the following tasks?

Online tasks	Very confident	Confident	Somewhat confident	A little but confident	Not at all confident
a. Uploading and sharing images from my ECEC online					
b. Sharing programming ideas related to physical activity online					
c. Participating in a professional blog/ online conversation					
d. Applying newly learnt web-based information into everyday practice					

C3. What barriers would you suggest might be associated with professional learning delivered online?

C4. What do you believe would assist you feel more comfortable/confident in participating in an online professional learning program?

Thank -You for your participation in this survey.
Please return survey to:
Wollongong University of Wollongong

Appendix G

Post blended PL questionnaire

EARLY START RESEARCH INSTITUTE

UNIVERSITY OF WOLLONGONG AUSTRALIA

HOPPEL project

Post HOPPEL questionnaire for educators

At the beginning of 2016 you agreed to participate in the HOPPEL program. The HOPPEL program involved both face-to-face professional development and professional development delivered online.The online component involved engaging in information delivered online and three synchronous (live) chat sessions. This questionnaire should take approximately 30mins.

We value your opinion about the HOPPEL program and would appreciate if you could please complete the following questionnaire. The answers to the questionnaire will be helpful in us improving the HOPPEL program in the future.

Confidentiality

All information obtained in this questionnaire will be treated confidentially. Whilst results will be public, you are guaranteed both you or your service will be identified in any related publications relating to this study and anonymity will be preserved.

SECTION A- Background information

1. What is your employment status as an educator?

- ◯ Full time
- ◯ Part time

2. Which ECEC do you currently work at? Please tick appropriate box/s.

- ◯ Battery Point
- ◯ Cambridge
- ◯ North Hobart
- ◯ Lower Sandy Bay
- ◯ Moonah
- ◯ Richmond
- ◯ Sandy Bay
- ◯ South Hobart
- ◯ Kingston
- ◯ Oatlands
- ◯ Swansea
- ◯ Family Day Care

3. What position do you currently hold at the ECEC you are employed at?

- ◯ Manager
- ◯ Educational leader
- ◯ Teacher (2nd in charge)
- ◯ Room Leader
- ◯ Educator
- ◯ Assistant
- ◯ Support Staff (supporting children with additional needs)
- ◯ Untrained

4. Did you attend the face-to-face training day which was held on a Saturday?

- ◯ Yes
- ◯ No

SECTION B- PRIOR ONLINE PROFESSIONAL LEARNING

5. Have you participated in online learning before?

- ◯ Yes
- ◯ No

6. If yes, have you participated in live time online learning before?

- ◯ Yes
- ◯ No

7. Before the HOPPEL program, how would you rate your knowledge of online learning

- ◯ I am an expert computer technologist
- ◯ I am confident in my use of computers
- ◯ I am somewhat confident in my use of computers
- ◯ I am not confident in my use of computers
- ◯ A computer? No thanks!!!

8. In the past 12 weeks have you logged onto the HOPPEL website?

- ◯ Yes
- ◯ No

9. If yes, how often did you log onto HOPPEL website over the 12 weeks?

- ◯ 1-3 times
- ◯ 4-6 times
- ◯ 8-10 times
- ◯ 10+ times

10. Once involved in the HOPPEL program whether on the website or in the live time sessions, did you feel;

- ◯ Safe
- ◯ Supported
- ◯ Willing to try new things
- ◯ Willing to share
- ◯ Part of a group with similar interests

11. If you did not access the HOPPEL website, what were the barriers that prevented you to log on? Please tick appropriate responses/s.

- ◯ Did you know how to access the HOPPEL site
- ◯ Did not realise all educators could contribute on the site
- ◯ Release time not offered to access site in work hours
- ◯ Lack of time out of work hours
- ◯ Internet connection problems
- ◯ Did not own personal computer to access site out of works hours
- ◯ Not interested
- ◯ Was not part of centers program
- ◯ Was not encouraged to log on
- ◯ Other

12. If you were not able to access the HOPPEL website, what could we do differently next time to ensure that you would access the website?

Section C- The HOPPEL website.
The following questions pertain to the 'whole' HOPPEL website.

13. If you accessed the HOPPEL website, please comment on the following;

	Yes	No
The structure of the website was clear	○	○
It was easy to navigate around the site	○	○
Text font was easily read	○	○
It provided me with increased knowledge pertaining to the promotion of physical activity for toddlers and preschools in ECEC settings	○	○
It provided me with increased knowledge pertaining to the promotion of healthy eating habits for toddlers and preschools in ECEC settings	○	○
I was able to apply the newly learnt web-based information about physical activity into my everyday practice	○	○
I was able to apply the newly learnt web-based information about healthy eating behaviours into my everyday practice	○	○
I am confident in uploading and sharing images from my ECEC setting on the HOPPEL website	○	○

SECTION D- FORUM FUNCTIONAILTY

The following questions relate to the 'FORUM' section within the HOPPEL website where educators were encouraged to post information and images about how they were promoting physical activity and healthy eating behaviours in their ECEC service with other educators, Lady Gowrie management and the UOW facilitator (Michele).

14. Did you read the information posted by educators and the UOW facilitator on the forum?

○ Yes

○ No

15. Did you interact on the FORUM in any of the following ways? Please tick appropriate response/s.

- ◯ Posted comments on the forum
- ◯ Read comments on the forum, but did not post anything
- ◯ Read and posted responses to fellow colleagues posts

16. If you posted a comment on the FORUM, how often did you comment?

- ◯ 1-2 times
- ◯ 3-4 times
- ◯ 5-6 times
- ◯ 7-8 times
- ◯ 9-10 times
- ◯ 10+

17. Which aspects of the FORUM best suited your professional learning and interests? Note: Michele was the UOW corresponding researcher for the HOPPEL project

	Not helpful	A little helpful	Unsure	Moderately helpful	Very helpful
Colleagues posts about their services activities (images)	◯	◯	◯	◯	◯
Colleagues posts about their services activities (text only)	◯	◯	◯	◯	◯
Responses made by Michele to service activities	◯	◯	◯	◯	◯
Reminders of challenges posted by Michele	◯	◯	◯	◯	◯
Opportunity to interact with each other educators in different services	◯	◯	◯	◯	◯
You Tube clips posted by Michele	◯	◯	◯	◯	◯
Accessing information resources/information with ease	◯	◯	◯	◯	◯
Option of writing comments and receiving feedback	◯	◯	◯	◯	◯
Ease of posting an image and receiving feeddback	◯	◯	◯	◯	◯

18. What barriers prevented you from commenting or looking on the FORUM? Please tick the appropriate response/s.

- ◯ Did not know about the FORUM section of the website
- ◯ Did know know how to access the FORUM section of the website
- ◯ Lack of time outside of work hours
- ◯ Internet connection of problems
- ◯ Did not have access to computer at work place
- ◯ Do not own personal computer to access site out of work hours
- ◯ Confidence in posting on the FORUM
- ◯ Support provided from management regarding participation in HOPPEL program

SECTION E- BLOGS

The following questions relate to the 'BLOG' section. The BLOG section was where the UOW facilitator (Michele) posted weekly information sheets and information pertaining to the promotion of physical activity and healthy eating behaviours.

19. Did you read the information posted on the online BLOG that focused on physical activity and healthy eating?

- ◯ Yes
- ◯ No

20. If you read the information posted on the online BLOG section of the website, please comment on the following statements

	Not helpful at all	A little bit helpful	Somewhat helpful	Helpful	Very helpful
The information about how to increase physical activity learning experiences	◯	◯	◯	◯	◯
The information about healthy eating habits in ECEC settings	◯	◯	◯	◯	◯
Family participation information sheets	◯	◯	◯	◯	◯
Holistic learning information sheets	◯	◯	◯	◯	◯
Challenges embedded into the information sheets	◯	◯	◯	◯	◯

21. If you read the information on the BLOG, please comment on the following statements

	Yes	No
Information on the BLOG was new (i.e not previously aware of the information provided)	○	○
The information was relevant to my service	○	○
The weekly 'challenges' (e.g post a photo photo of your water station) helped in making changes to my service	○	○
I participated in some of the 'challenges' that were asked in the BLOGS	○	○
The information provided on the BLOGS was about the right length	○	○
The frequency of the information posted on the BLOGS (e.g. new information weekly) was about rght	○	○
The information on the BLOG enhanced or extended my professional learning in the area of physical activity and healthy eating habits	○	○
The content was organised,well prepared and easy to follow	○	○

22. What barriers prevented you from reading the posts presented on the BLOG.

- ○ Did not know about the BLOG section on the website
- ○ Did not know how to access the BLOG section on the website
- ○ Release time not offered to access site in work hours
- ○ Lack of time out of work hours
- ○ Internet connection problems
- ○ Did not have access to a computer to access website outside of work hours
- ○ Confidence in accessing BLOG information
- ○ Support provided from management regarding participation in HOPPEL program

SECTION F- LIVE CHAT SESSIONS

The following questions relate to the planned 'LIVE CHAT' sessions within the HOPPEL website where the UOW facilitator (Michele) facilitated 'live chat' sessions at specified times and dates.

23. Did you participate in any of the 'live chat' sessions?

	Yes	No
Session 1- How to use the synchronous 'live chat' session functions	○	○
Session 2- Promoting physical activity in ECEC settings	○	○
Session 3- Promoting healthy eating habits in ECEC settings	○	○

24. If you participated in any of the 'live chat' sessions please comment on the following statements

	Yes	No
These session were well run	○	○
These sessions provided an opportunity for me to interact with other educators	○	○
The activities in the 'live chat' sessions were relevant	○	○
The activities in the 'live chat' sessions were helpful	○	○
The activities in the 'live chat' sessions were about right	○	○
It was easy to log onto the 'live chat' sessions	○	○
It was easy to be an active participate in the 'live chat' sessions (i.e write comments and participate in the activities)	○	○
Reminders via email or phone about the 'live chat' sessions were helpful	○	○

25. If you are an educator, did your manager pass on all of the information sent by Michele about the 'live chat' sessions?

	Always	Very often	Sometimes	Rarely	Never
Information verbally communicated by manager	○	○	○	○	○
Flyers printed and displayed in prominent area e.g. staff room, programming space, sign in book	○	○	○	○	○
A personal email was sent to all staff	○	○	○	○	○
You were not informed by manager, but heard via a colleague	○	○	○	○	○
You were never informed about the 'live chat' sessions	○	○	○	○	○

26. If you did not participate in the 'live sessions', what barriers prevented you from participating in the 'live chat' sessions.

- ○ Did not know about the 'live chat' sessions on the website
- ○ Did not know how to access the 'live chat' session on the website
- ○ Release time not offered to access site in work hours
- ○ Lack of time out of work hours
- ○ Internet connection problems
- ○ Did not have access to a computer to access website outside of work hours
- ○ Confidence in accessing 'live chat' sessions
- ○ Support provided from management regarding participation in HOPPEL program

SECTION G- Online professional learning

27. What aspects of the online component of the HOPPEL program supported your overall professional learning experience

	Not helpful	A little helpful	Unsure	Moderately Helpful	Very helpful
The availability of technical support	○	○	○	○	○
Opportunity to interact with other educators in a virtual online professional community	○	○	○	○	○
Opportunity to showcase what services were implementing in response to HOPPEL content	○	○	○	○	○
Additional support provided by Michele regarding phone calls, emails etc.	○	○	○	○	○
As the information provided online meaningful and relevant to your service	○	○	○	○	○

28. What part of the online professional learning project (HOPPEL) did you find most useful and interesting? Please tick the appropriate response/s.

- ○ BLOG
- ○ FORUM
- ○ Live chat sessions
- ○ Challenges
- ○ Other

29. After the HOPPEL program how would you rate how you felt about the idea of online learning?

	Yes	No
I would do it again	○	○
It was worth the try but not for me	○	○
I'm still unsure about online learning	○	○
I am not convinced and will continue to try to stay away from computers	○	○
I will not do it again	○	○

30. Is there additional content that you would recommend to be included in the HOPPEL program?

31. Do you feel the management of Lady Gowrie supported your participation in the HOPPEL project?

- ◯ Yes
- ◯ No

32. If yes, explain how you felt supported?

33. If no, what suggestions would you suggest provide Lady Gowrie management to further support services participation in HOPPEL program?

34. Please rank the effectiveness of the online learning compared to a one off face-to-face professional learning session.

	Online is or might be much more effective	Online is or might be somewhat more effective	Online is or might be equally more effective	Online is or might be somewhat less effective	Online is or might be much less effective
The online HOPPEL program is convenient	◯	◯	◯	◯	◯
Meeting individual learning needs	◯	◯	◯	◯	◯
Contributing to effective communication within group	◯	◯	◯	◯	◯
Increasing your sense of community with the UOW facilitator and educators from other services	◯	◯	◯	◯	◯
Promoting greater educator participation and interaction	◯	◯	◯	◯	◯

Appendix H

Face-to-face workshop evaluation form

Please indicate, by circling the most appropriate number, how much you agree or disagree with the following statements.

PL = Professional Learning

	Strongly disagree	Disagree	Neither agree nor	Agree	Strongly agree
Overall, the content of the PL was relevant.	1	2	3	4	5
Overall, the content of the PL was explained clearly.	1	2	3	4	5
I enjoyed the 'hands on' and practical components of the PL.	1	2	3	4	5
Following the PL, I understand the aim of **HOPPEL**.	1	2	3	4	5
I understand what I need to do in my service to ensure that **HOPPEL** is facilitated as intended.	1	2	3	4	5
By the end of the PL, I understood what was expected of me.	1	2	3	4	5

By the end of the PL, it was clear what I needed to do within my service.	1	2	3	4	5
By the end of the PL, I felt empowered to make change within my service.	1	2	3	4	5
By the end of the PL, I understood the importance of promoting physical activity and healthy eating from a young age.	1	2	3	4	5
I enjoyed participating in an intensive PL session (rather than several shorter sessions).	1	2	3	4	5
I was happy with the length of the session (i.e. 5 hours).	1	2	3	4	5
The ***physical activity*** component was explained clearly.	1	2	3	4	5
Facilitating *the promotion of physical activity* in my service will most likely be easy.	1	2	3	4	5
Following the PL, I am confident that I will be able to facilitate a *structured physical activity* lesson.	1	2	3	4	5

Following the PL, I am confident that I will be able to facilitate an *activity/power break*.	1	2	3	4	5
The outcomes and feedback based on *physical activity* will be useful for quality improvement	1	2	3	4	5
The *physical activity* component was reflective of outcomes and feedback and relevant to my service	1	2	3	4	5
I felt that the outcomes and feedback report on *physical activity* was useful	1	2	3	4	5
The ***healthy eating*** component was explained clearly.	1	2	3	4	5
Facilitating the *promotion of healthy eating* will most likely be easy.	1	2	3	4	5
Following the PL, I am confident that I will be able to facilitate the *healthy eating-based experiences* as part of everyday routine.	1	2	3	4	5

The outcomes and feedback based on *healthy eating* will be useful for quality improvement	1	2	3	4	5
The *healthy eating* component was reflective of outcomes and feedback and relevant to my service	1	2	3	4	5
I felt that the outcomes and feedback report on *healthy eating* was useful	1	2	3	4	5
The **Online** component was explained clearly.	1	2	3	4	5
Following the PL, I feel confident that I will be able to access HOPPEL website	1	2	3	4	5
Following the PL, I feel confident that I will be able to access *Adobe connect*- live chat forums	1	2	3	4	5
By the end of the PL, I understood what was expected of me when participating in *online* component	1	2	3	4	5

Following the PL, I understand the purpose of using an online component as part of **HOPPEL**.	1	2	3	4	5
I understand what I need to do in my service in regard to **online component**.	1	2	3	4	5
I felt that the orientation guide on *navigating the website and Adobe connect* will be useful	1	2	3	4	5

Was there additional content that was not included and should have been or content that was not explained clearly?

What were the strengths of the professional learning session?

What were the weaknesses of the professional learning session?

Thank you for your time.

Appendix I

Director consent form

University of Wollongong

CONSENT FORM FOR DIRECTORS and/or EDUCATIONAL LEADERS (D1)

Evaluation of an evidence-based technology mediated professional learning package for ECEC addressing physical activity and nutrition behaviours of young children

Researchers: Michele Peden, Prof Tony Okely and Dr. Rachel Jones

I have been given information about the research study entitled '*Evaluation of an evidence-based technology mediated professional learning package for ECEC addressing physical activity and nutrition behaviours of young children'*. I understand that this research is a part of Michele Peden's PhD degree at the University of Wollongong supervised by Tony Okely and Rachel Jones.

I understand that if I consent to participate in this research study, while I am at my Early Childhood Education and Care Service, I will be asked to:

1. Participate in on line questionnaire prior to professional learning

This questionnaire will take approximately 25 minutes to complete and can be completed in your own time and electronically returned to the researchers. An example item is: What reasons would encourage you to participate in a professional learning opportunity?

2. Participate in a face-to-face workshop (duration 8 hours)

The duration of this workshop will be 6-8 hours, held in a convenient location and time agreed upon between the participants and the researcher. This content specific professional learning workshop will cover 10 sections pertaining to the promotion of physical activity, reduction of sedentary behaviours and healthy eating behaviours, healthy learning environments, holistic everyday curriculum, the role of the educator, family partnerships, polices, leadership, change management, team building and accessing technical support for the on-line component of professional learning program.

3. Participate in online on-going professional learning activities with researcher and other educators (duration 10 minutes per week)

The online on-going professional learning content comprises 10 sessions that will follow on from the intensive face-to-face- workshops. The online professional program will cover information pertaining to the promotion of physical activity and reduction of sedentary behaviours, healthy eating behaviours, healthy learning environments, holistic everyday curriculum, the role of the educator, family partnerships, policies, leadership, change management, team building and technical support to use the online component of the professional learning program. The content will consistent with the sections covered in the face-to-face component; however, it will be based on practical and contextualized activities. Researchers recommended a team of educators should spend collectively one hour per week online. We request permission for the corresponding researcher to monitor and collect data based on the centre levels participation in the online professional development learning activities with the researcher and other participating educators. The researcher will be

collecting data based on services log on details, completion of online activities set by the corresponding researcher, frequency and amount of posts contributing to secured site and access to web base resources (lesson plan materials, fact sheets, research-based articles, images of early childhood environments). Please note no images will contain images of people.

4. Be observed for a period of a day

Observations will be completed by the researcher, using the EPAO (Environmental Policy Assessment Observation) tool and will be completed during normal daily activities with the children. This will not interfere with your normal daily activities.

5. Participate in an on-line questionnaire after professional learning program completed

This online questionnaire will take approximately 20mins to complete. An example item is: Were there any barriers (negative) and enabling (positive) factors associated with participating in the TMPL program?

All data collected will remain confidential and kept in a secure location.

The information gathered will be used in a thesis, future grant submissions, presentations and publications.

I understand that there are no potential risks or burdens associated with this study.

I have had an opportunity to ask Michele Peden any questions that I may have about the research and my participation. I understand that my participation in this research is voluntary and I am free to refuse to participate and I am free to withdraw from the research at any time. My refusal to participate or withdrawal of consent will not affect my relationship with the Faculty of Social Sciences, School of Education at the University of Wollongong, or the service that I am currently employed at.

If I have any questions about the research, I can contact Michele Peden XXXXXX.

If I have any concerns or complaints regarding the way the research is or has been conducted, I can contact the Ethics Officer, Human Research Ethics Committee, University of Wollongong on XXXXXX or email XXXXXX.

By signing below, I am indicating my consent to participate in the research as has been described to me in the Information Sheet for Directors and/or Educational Leaders. I understand that the data collected from my participation will be used primarily for a PhD Thesis, in future grant submissions and may also be used in presentations and publications, and I consent for it to be used in that manner.

Signed ……. Date: ……/……/……

Name (please print) ……..

Appendix J

Educator consent form

University of Wollongong

CONSENT FORM FOR EDUCATORS (E1)

Evaluation of an evidence-based technology mediated professional learning package for ECEC addressing physical activity and nutrition behaviours of young children

Researchers: Michele Peden, Prof Tony Okely and Dr. Rachel Jones

I have been given information about the research study entitled '*Evaluation of an evidence-based technology mediated professional learning package for ECEC addressing physical activity and nutrition behaviours of young children'.* I understand that this research is a part of Michele Peden's PhD degree at the University of Wollongong supervised by Tony Okely and Rachel Jones.

I understand that if I consent to participate in this research study, while I am at my Early Childhood Education and Care Service, I will be asked to:

1. **Participate in on line questionnaire prior to professional learning**

This questionnaire will take approximately 25 minutes to complete and can be completed in your own time and electronically returned to the researchers. An example item is: What reasons would encourage you to participate in a professional learning opportunity?

2. **Participate in a face-to-face workshop (duration 8 hours)**

The duration of this workshop will be 6-8 hours, held in a convenient location and time agreed upon between the participants and the researcher. This content specific professional learning workshop will cover 10 sections pertaining to the promotion of physical activity, reduction of sedentary behaviours and healthy eating behaviours, healthy learning environments, holistic everyday curriculum, the role of the educator, family partnerships, polices, leadership, change management, team building and accessing technical support for the on-line component of professional learning program.

3. **Participate in online on-going professional learning activities with researcher and other educators (duration 10 minutes per week)**

The online on-going professional learning content comprises 10 sessions that will follow on from the intensive face-to-face- workshops. The online professional program will cover information pertaining to the promotion of physical activity and reduction of sedentary behaviours, healthy eating behaviours, healthy learning environments, holistic everyday curriculum, the role of the educator, family partnerships, policies, leadership, change management, team building and technical support to use the online component of the professional learning program. The content will consistent with the sections covered in the face-to-face component; however, it will be based on practical and contextualized activities. Researchers recommended a team of educators should spend collectively one hour per week online. We request permission for the corresponding researcher to monitor and collect data based on the centre levels participation in the online professional development learning

activities with the researcher and other participating educators. The researcher will be collecting data based on services log on details, completion of online activities set by the corresponding researcher, frequency and amount of posts contributing to secured site and access to web base resources (lesson plan materials, fact sheets, research-based articles, images of early childhood environments). Please note no images will contain images of people.

4. **Be observed for a period of a day**

Observations will be completed by the researcher, using the EPAO (Environmental Policy Assessment Observation) tool and will be completed during normal daily activities with the children. This will not interfere with your normal daily activities.

5. **Participate in an on-line questionnaire after professional learning program completed**

This online questionnaire will take approximately 20mins to complete. An example item is: Were there any barriers (negative) and enabling (positive) factors associated with participating in the TMPL program?

All data collected will remain confidential and kept in a secure location.

The information gathered will be used in a thesis, future grant submissions, presentations and publications.

I understand that there are no potential risks or burdens associated with this study.

I have had an opportunity to ask Michele Peden any questions that I may have about the research and my participation. I understand that my participation in this research is voluntary and I am free to refuse to participate and I am free to withdraw from the research at any time. My refusal to participate or withdrawal of consent will not affect my relationship with the Faculty of Social Sciences, School of Education at the University of Wollongong, or the service that I am currently employed at.

If I have any questions about the research, I can contact Michele Peden XXXXXX.

If I have any concerns or complaints regarding the way the research is or has been conducted, I can contact the Ethics Officer, Human Research Ethics Committee, University of Wollongong on XXXXXX or email XXXXXX.

By signing below, I am indicating my consent to participate in the research as has been described to me in the Information Sheet for Directors and/or Educational Leaders. I understand that the data collected from my participation will be used primarily for a PhD Thesis, in future grant submissions and may also be used in presentations and publications, and I consent for it to be used in that manner.

Signed ……. Date: ……/……/……

Name (please print) ……

Appendix K

Parent/Carers consent form

University of Wollongong

CONSENT FORM FOR PARENTS / CARERS ON BEHALF OF THEIR CHILD (P1)

Evaluation of an evidence-based technology mediated professional learning package for ECEC addressing physical activity and nutrition behaviours of young children'

Researchers: Prof Tony Okely, Dr Rachel Jones and Michele Peden

I have been given information about the research study entitled '*Evaluation of an evidence-based technology mediated professional learning package for ECEC addressing physical activity and nutrition behaviours of young children'.* I understand that this research is a part of Michele Peden's PhD degree at the University of Wollongong supervised by Tony Okely and Rachel Jones.

I understand that if I consent for my child to participate in this research study, while they are at the Early Childhood Education and Care Service, s(he) will be asked to:

- wear a lightweight activity monitor over a period of a week while they are at the service

I understand that my child's contribution will be confidential and that there will be no personal identification in the data that I agree to allow to be used in the study. All data collected will be stored securely at UOW.

Additionally, we also request your permission to observe a period of time over one day of the week (from opening to closing). Whole group observations will be completed by the researcher, using the EPAO (Environmental Policy Assessment Observation) tool and will be completing during normal daily activities with all children. This will not interfere with their normal daily activities, and individual children will not be identified.

I understand that there are no potential risks or burdens associated with this study.

I understand that my child's participation in this research is voluntary and I am assured that my child is free to refuse to participate and I am free to withdraw my child from the research at any time.

If I have any questions about the research, I can contact Michele Peden XXXXXXXX and/or Tony Okely XXXXXX. If I have any concerns or complaints regarding the way the research is or has been conducted, I can contact the Ethics Officer, Human Research Ethics Committee, University of Wollongong on XXXXXX or email XXXXXX.

By signing below, I am indicating my consent for my child to participate in the research as it has been described in the Information Sheet for Parents/Carers. I understand that the data collected from my child's participation will be used primarily for a PhD Thesis, in future grant submissions and may also be used in presentations and publications, and I consent for it to be used in that manner.

I give permission for my child (child's name) ……. to participate in this research.

Parent / Carer Signature……

Date ……/……/……

Name (please print) ……..

Appendix L

Director information form

University of Wollongong

PARTICIPANT INFORMATION SHEET FOR DIRECTOR and/or

EDUCATIONAL LEADER (D1)

TITLE

Evaluation of an evidence-based technology mediated professional learning package for ECEC addressing physical activity and nutrition behaviours of young children.

PURPOSE OF THE RESEARCH

The purpose of the research is to evaluate the feasibility and acceptability of a technology-mediated professional learning (TMPL) package delivered to Lady Gowrie Early Childhood Education and Care service (ECECs) in Tasmania. This project will investigate the effects of educators initially participating in intensive face-to-face PL and continuing their PL experiences through innovative technology-based learning.

The research is being undertaken for a PhD at UOW by student Michele Peden, and will be supervised by Prof Tony Okely and Dr Rachel Jones. These researchers may be contacted if you have any questions about the research.

RESEARCHERS

Prof. Tony Okely	Dr Rachel Jones	Michele Peden
Early Start Research Institute Institute	Early Start Research Institute	Early Start Research
School of Education	School of Education	School of Education
Faculty of Social Sciences Sciences	Faculty of Social Sciences	Faculty of Social
XXXXXX	XXXXXX	XXXXXX

METHOD AND DEMANDS ON PARTICIPANTS

Your Early Childhood Education and Care Service has agreed to be involved in this study. You have the opportunity to participate in this study, as you are the Director and/or the Educational Leader within this service.

If you choose to participate, you will be asked to:

1. Participate in on line questionnaire prior to professional learning

This questionnaire will take approximately 25 minutes to complete and can be completed in your own time and electronically returned to the researchers. An example of a question may be included in this questionnaire is: What reasons would encourage you to participate in a professional learning opportunity?

2. Participate in a face-to-face workshop (duration 8 hours)

The duration of this workshop will be 6-8 hours, held in a convenient location and time agreed upon between the participants and the researcher. This content specific professional learning workshop will cover 10 sections pertaining to the promotion of physical activity, reduction of sedentary behaviours and healthy eating behaviours, healthy learning environments, holistic everyday curriculum, the role of the educator, family partnerships, polices, leadership, change management, team building and accessing technical support for the on-line component of professional learning program.

3. Participate in online on-going professional learning activities with researcher and other educators (duration 10 minutes per week)

The online on-going professional learning (PL) content comprises 10 sessions that will follow on from the intensive face-to-face- workshops. The online PL will cover the same information as the face-to-face workshop; however, it will be based on practical and contextualized activities. Evidence suggests a team of educators would benefit from spending one hour per week online. We request permission for the corresponding researcher to collect data based on the level's participation in the online PL activities with the researcher and other participating educators. The researcher will be collecting data based on services log on details, completion of online activities set by the corresponding researcher, frequency and amount of posts contributing to secured site and access to web base resources (lesson plan materials, fact sheets, research-based articles, images of early childhood environments). Please note no images will contain images of people.

4. Be observed for a period of a day

Observations will be completed by the researcher, using the EPAO (Environmental Policy Assessment Observation) tool and will be completed during normal daily activities with the children. This will not interfere with your normal daily activities.

5. Participate in an on-line questionnaire after professional learning program completed

This online questionnaire will take approximately 20mins to complete. An example of a question that may be included in the on-line questionnaire after the completion of the PL program is: Were there any barriers (negative) and enabling (positive) factors associated with participating in the TMPL program?

All data collected will remain confidential and kept in a secure location.

The information gathered will be used in a thesis, future grant submissions, presentations and publications.

BENEFITS AND RISKS INVOLVED IN THIS STUDY

This study will benefit your Early Childhood Education and Care Service by providing information upon the relationship between educator engagement and interaction on children's physical activity. This study will also provide a basis for the development of programs to support educators' interactions with children during physical activity experiences.

Through this study, educators may become more aware of physical activity and healthy eating educational programs in an ECEC service in relation to the National Quality Standards (NQS) and National physical activity recommendations for children. Following the study, the researcher may visit the service and provide information on the results.

Your involvement in the study is voluntary and you may withdraw your participation from the study at any time and withdraw any data that you may have provided to that point. Refusal to participate in the study will not affect your relationship with the University of Wollongong or the service, which you are currently employed at, or the organisation in which you are employed by. If you wish to withdraw your participation during the course of the study, please contact the corresponding researcher Michele Peden using the above contact details.

ETHICS REVIEW AND COMPLAINTS

The Human Research Ethics Committee of the University of Wollongong has reviewed this study. If you have any concerns or complaints regarding the way this research has been conducted, you can contact the UOW Ethics Officer on XXXXXX or email XXXXXX.

Thank you for your interest in this study.

Appendix M

Educator information form

University of Wollongong

PARTICIPANT INFORMATION SHEET FOR EDUCATORS (E1)

TITLE

Evaluation of an evidence-based technology mediated professional learning package for ECEC addressing physical activity and nutrition behaviours of young children

PURPOSE OF THE RESEARCH

The purpose of the research is to evaluate the feasibility and acceptability of a technology-mediated professional learning (TMPL) package delivered to Lady Gowrie Early Childhood Education and Care service (ECECs) in Tasmania. This project will investigate the effects of educators initially participating in intensive face-to-face professional learning (PL), and continuing their PL experiences through innovative technology-based learning.

The research is being undertaken for a PhD at UOW by student Michele Peden and will be supervised by Prof. Tony Okely and Dr. Rachel Jones. These researchers may be contacted if you have any questions about the research.

RESEARCHERS

Prof. Tony Okely	Dr Rachel Jones	Michele Peden
Early Start Research Institute Institute	Early Start Research Institute	Early Start Research
School of Education	School of Education	School of Education
Faculty of Social Sciences Sciences	Faculty of Social Sciences	Faculty of Social
XXXXX	XXXXXX	XXXXXX

METHOD AND DEMANDS ON PARTICIPANTS

Your Early Childhood Education and Care Service has agreed to be involved in this study. You have the opportunity to participate in this study, as you are an educator within this service.

If you choose to participate, you will be asked to:

1. **Participate in on line questionnaire prior to professional learning**

This questionnaire will take approximately 25 minutes to complete and can be completed in your own time and electronically returned to the researchers. An example item in this

questionnaire is: What reasons would encourage you to participate in a professional learning opportunity?

2. **Participate in a face-to-face workshop (duration 8 hours)**

The duration of this workshop will be 6-8 hours, held in a convenient location and time agreed upon between the educators and the researcher. This content specific professional learning workshop will cover 10 sections pertaining to the promotion of physical activity, reduction of sedentary behaviours and healthy eating behaviours, healthy learning environments, holistic everyday curriculum, the role of the educator, family partnerships, polices, leadership, change management, team building and accessing technical support for the on-line component of professional learning program.

3. **Participate in online on-going professional learning activities with researcher and other educators (duration 10 minutes per week)**

The online on-going professional learning (PL) content comprises 10 sessions that will follow on from the intensive face-to-face- workshops. The online PL will cover the same information as the face-to-face component; however, it will be based on practical and contextualized activities. Evidence suggests a team of educators would benefit from spending one hour per week online. We request permission for the corresponding researcher to monitor and collect data based on the centre levels participation in the online PL activities with the researcher and other participating educators. The researcher will be collecting data based on services log on details, completion of online activities set by the corresponding researcher, frequency and amount of posts contributing to secured site and access to web base resources (lesson plan materials, fact sheets, research-based articles, images of early childhood environments). Please note no images will contain images of people.

4. **Be observed for a period of a day**

Observations will be completed by the researcher, using the EPAO (Environmental Policy Assessment Observation) tool and will be completed during normal daily activities with the children. This will not interfere with your normal daily activities.

5. **Participate in an on -line questionnaire after professional learning program completed**

This online questionnaire will take approximately 20mins to complete. An example item is: Were there any barriers (negative) and enabling (positive) factors associated with participating in the TMPL program?

All data collected will remain confidential and kept in a secure location.

The information gathered will be used in a thesis, future grant submissions, presentations and publications.

BENEFITS AND RISKS INVOLVED IN THIS STUDY

This study will benefit your Early Childhood Education and Care Service by providing information regarding the relationship between educator engagement and interaction and children's physical activity. This study will also provide a basis for the development of educator professional development and programs to support educators' interactions with children during physical activity experiences.

Through this study, educators will be participating in a blended technology based professional learning program aimed at improving the physical activity and healthy eating behaviours of young children in ECECs. This increased level of knowledge and skills may impact how educators plan, implement and engage with children relating to physical activity and healthy eating. This may result in improved practices, policies and procedures, as well as improved physical activity and healthy outcomes for children. Following the study, the researcher may visit the service and provide information on the results.

Your involvement in the study is voluntary and you may withdraw your participation from the study at any time and withdraw any data that you may have provided to that point. Refusal to participate in the study will not affect your relationship with the University of Wollongong and the service in which you are currently employed at. If you wish to withdraw your participation during the course of the study, please contact the corresponding researcher Michele Peden using the above contact details.

ETHICS REVIEW AND COMPLAINTS

The Human Research Ethics Committee of the University of Wollongong has reviewed this study. If you have any concerns or complaints regarding the way this research has been conducted, you can contact the UOW Ethics Officer on XXXXXX or email XXXXXXX.

Thank you for your interest in this study.

Appendix N

Parent/Carers information form

University of Wollongong

INFORMATION SHEET FOR PARENTS / CARERS (P1)

Dear Parent / Caregiver

Your child has been invited participate in a research project conducted by the University of Wollongong. The project is entitled *"Evaluation of an evidence-based technology mediated professional learning package for ECEC addressing physical activity and nutrition behaviours of young children".* We write to seek your approval and assistance to conduct research and to involve your child as a participant.

PURPOSE OF THE RESEARCH

The purpose of the research is to evaluate the feasibility and acceptability of a technology-mediated professional learning (TMPL) package delivered to Lady Gowrie Early Childhood Education and Care services in Tasmania. This project would investigate the effects of educators initially participating in intensive face-to-face professional learning and continuing their professional learning experiences through innovative technology-based learning addressing physical activity and healthy eating behaviours of young children in Early Childhood Education and Care sector.

The research is being undertaken for a PhD at UOW by student Michele Peden and will be supervised by Prof Tony Okely and Dr Rachel Jones. These researchers may be contacted if you have any questions about the research.

RESEARCHERS

Prof. Tony Okely	Dr Rachel Jones	Michele Peden
Early Start Research Institute Institute	Early Start Research Institute	Early Start Research
School of Education	School of Education	School of Education
Faculty of Social Sciences Sciences	Faculty of Social Sciences	Faculty of Social

METHOD AND DEMANDS ON PARTICIPANTS

The Early Childhood Education and Care Service your child attends have agreed to be involved in this study. If you agree for your child to be included, they will be asked to wear a lightweight activity monitor on the days that they attend the service for one week. The activity monitor will be attached to a belt and worn around their waist. It will monitor their level of physical activity during the day. These monitors are non-intrusive and will not interfere with normal daily activities (i.e. children will be able to participate in all activities planned for that day and the normal curriculum will be able to be implemented).

Whole group observations will be completed by the researcher, using the EPAO (Environmental Policy Assessment Observation) tool and will be completing during normal daily activities with all children. Group observations will be collected over one day of the week (from opening to closing). This will not interfere with their normal daily activities, and individual children will not be identified.

All data collected will remain confidential and kept in a secure location.

The de-identified information gathered will be used in a thesis, future grant submissions, presentations and publications.

BENEFITS AND RISKS INVOLVED IN THIS STUDY

This study will benefit the Early Childhood Education and Care Service your child attends by providing information on the feasibility and acceptability of a blended technology-based professional learning package that focuses on physical activity and nutrition in childcare settings. This study will also provide a basis for the development of supportive physical activity and healthy eating programs in Early Childhood and Education Care services provided by educators for the benefit of children's health and well being.

Through this study, educators will participate in a blended technology based professional learning program aimed at improving the physical activity and healthy eating behaviours of young children in Early Childhood Education and Care services. This increased level of knowledge and skills may impact how educators plan, implement and engage with children relating to physical activity and healthy eating. This may result in improved practices, policies and procedures, as well as improved physical activity and healthy outcomes for children. Following the study, the researcher may visit the service and provide information on the results.

Apart from the short time that it takes to place the activity monitor on and off each day over the week, we foresee no risks for your child. Your child's involvement in the study is voluntary and you may withdraw your child from the study at any time and withdraw any data that may have provided to that point. Withdrawal or refusal to participate in the study will not affect your relationship with the service that your child is enrolled in, nor the University of Wollongong. If at any stage, you would prefer your child not to participate in the study, please notify, Michele Peden using the above contact details. Your child may still be exposed to changes within the centre that may result as part of the professional learning, however individual data will not be collected on your child if you choose for your child to withdraw from the study.

Confidentiality is assured, and your child will not be identified in any part of the research.

ETHICS REVIEW AND COMPLAINTS

This study has been reviewed by the Human Research Ethics Committee of the University of Wollongong. If you have any concerns or complaints regarding the way this research has been conducted, you can contact the UOW Ethics Officer on XXXXXX or email XXXXX.

Thank you for your interest in this study.

Appendix O

Ethics approval letter

UNIVERSITY OF WOLLONGONG
AUSTRALIA

APPROVAL LETTER
In reply please quote: HE15/356

16 October 2015

Mrs Michele Peden
Faculty of Social Sciences
University of Wollongong
NSW 2522

Dear Mrs Peden,

Thank you for your response dated 14 October 2015to the HREC review of the application detailed below. I am pleased to advise that the application has been approved.

Ethics Number:	HE15/356
Project Title:	Evaluation of an evidence based technology mediated professional learning package for Early Childhood Education and Care services addressing physical activity and nutrition behaviours of young children
Researchers:	Mrs Michele Peden, Professor Anthony Okely, Dr Rachel Jones

Documents Approved:

- Initial Ethics Application
- Response to Review (13/10/15)
- Appendix 1 Formative Professional Learning Questionnaire – V2 (30/7/15)
- Appendix 2 Post Professional Learning Questionnaire – V2 (30/7/15)
- Appendix 3 Environmental and Policy Assessment Observation – V1 (30/7/15)
- Appendix 4 Participant Information Sheet for Educators – V3 (13/10/15)
- Appendix 5 Consent Form for Educators – V3 (13/10/15)
- Appendix 6 Participant Information Sheet for Parents/Carers – V3 (13/10/15)
- Appendix 7 Consent Form for Parents – V3 (13/10/15)
- Appendix 8 Participant Information Sheet to Care Service Director – V3 (13/10/15)
- Appendix 9 Consent Form for Directors – V3 (13/10/15)
- Appendix 10 Participant Information Sheet for Director – V3 (13/10/15)

Ethics Unit, Research Services Office
University of Wollongong NSW 2522 Australia
Telephone (02) 4221 3386 Facsimile (02) 4221 4338
Email: rso-ethics@uow.edu.au Web: www.uow.edu.au

Approval Date: **16 October 2015**

Expiry Date: **15 October 2016**

The University of Wollongong/Illawarra Shoalhaven Local Health District Social Sciences HREC is constituted and functions in accordance with the NHMRC *National Statement on Ethical Conduct in Human Research*. The HREC has reviewed the research proposal for compliance with the *National Statement* and approval of this project is conditional upon your continuing compliance with this document.

Approval by the HREC is for a twelve month period. Further extension will be considered on receipt of a progress report prior to expiry date. Continuing approval requires:

- The submission of a progress report annually and on completion of your project. The progress report template is available at http://www.uow.edu.au/research/ethics/human/index.html. This report must be completed, signed by the researchers and the appropriate Head of Unit, and returned to the Research Services Office prior to the expiry date.
- Approval by the HREC of any proposed changes to the protocol including changes to investigators involved
- Immediate report of serious or unexpected adverse effects on participants
- Immediate report of unforeseen events that might affect continued ethical acceptability of the project.

If you have any queries regarding the HREC review process, please contact the Ethics Unit on phone 4221 3386 or email rso-ethics@uow.edu.au.

Yours sincerely,

[redacted]

Associate Professor Melanie Randle
Chair, UOW Social Sciences
Human Research Ethics Committee