Contextual and individual factors shaping preschool children’s knowledge of and preference for lifestyle behaviours

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Synopsis

Good health and wellbeing are essential for all children to have the best start in life. Early childhood is the most critical and rapid period of development and provides the foundation for an individual’s acquisition of health behaviours. Physical activity and healthy nutrition are two important contributors to a child’s health, with evidence that these factors impact mental and physical health and psycho-social wellbeing. Lifestyle changes for children in industrialised countries have resulted in altered physical activity levels and food consumption patterns. The combined effect of these changes has important implications for children’s health status, with the complex interplay of factors contributing to adverse consequences on a population level.

Given the importance of physical activity and food intake in early childhood, it is crucial from a public health perspective to understand how and why these behaviours are formed. Social-ecological theory posits that a child’s activity and dietary behaviour result from an interaction between personal characteristics and contextual conditions. This suggestion has been supported by the robust finding that individual characteristics and contextual conditions work together to directly shape child health and health behaviours. This interaction is borne out in circumstances where a child’s understanding of health and health behaviours and their own personal preferences in regard to food and physical activity combine with environmental factors to shape lifestyle behaviours.

This program of research focuses on children’s understandings of health and of factors which shape their knowledge of and preference for food and physical activity. The need to incorporate children’s perspectives in the development and delivery of health education and interventions has emerged as a key theme within the contemporary child health literature. The growing recognition of preschool children’s agency in determining their own health behaviours has triggered a need to better understand their perspectives regarding how they and/or others
make health choices for them. Gaining a child-centric view may help to identify overlooked aspects of the environment that influence lifestyle preferences. To date, limited research has investigated preschool children’s knowledge of and preference for health behaviours, the contextual factors that may impact these variables and how this translates into health behaviours. The aim of this program of research was to address these gaps in current literature.

This thesis incorporates six research studies designed to address the overall research aim. Each of the six studies build on each other to enable a deeper understanding of factors shaping children’s knowledge and preferences for lifestyle behaviours. The findings have been published or are under review in peer-reviewed journals. This research was underpinned by the pragmatic paradigm in order to accommodate the use of a mixed methods approach where the researcher collects, analyses, and integrates both quantitative and qualitative data in a single study or in multiple studies in a sustained program of inquiry. A conceptual framework was developed to guide this research.

Study 1 was a systematic review of the literature that aimed to identify and review data collection techniques used to measure preschool children's knowledge of food and nutrition. Twenty studies met the inclusion criteria and were critically appraised. The findings of this review identified the need for additional research to develop valid and reliable measures of preschool children’s food and nutrition knowledge. Prior to implementing and evaluating a nutrition program, assessment tools need to be pilot-tested, refined, and adapted to suit both the specific audience and the components of the nutrition knowledge being targeted. The findings of this review have been published in a peer-review academic journal and informed the development of Study 3.

Study 2 was a systematic review of the literature that aimed to identify and review data collection techniques used to measure preschool children's knowledge of and preference for physical activity. Fourteen studies met the inclusion criteria and were critically appraised. The
identified studies employed a limited but disparate range of techniques to assess children's physical activity knowledge and preferences and highlighted a need for validated and reliable measures to assess these variables. The review highlighted that greater consideration is required to align data collection techniques with the needs and abilities of the study population. This study has been prepared for submission to a peer-review academic journal and informed the development of studies three and five.

Study 3 was a validation study that assessed the reliability and validity of an adapted computerised (iPad) version of the photo-pair food and exercise questionnaire (PPFEQ). A cross-sectional design was used to incorporate four phases of quantitative investigation, including interviews at four time-points with 86 preschool children, to assess test-retest reliability, internal consistency, sensitivity to change and percent agreement of the questionnaire. The adaption of the PPFEQ resulted in an 18-item questionnaire, titled the Preschool Food and Play Questionnaire [Pre-FPQ]. The Pre-FPQ demonstrated acceptable reliability and sensitivity to change. Test-retest reliability and internal consistency improved with age, though it was evident that the tool was not suitable for children younger than four years of age. The findings of this study have been published in a peer-review academic journal and informed the development of studies four, five and six.

Study 4 included a qualitative cross-sectional study that included 163 preschool children who participated in one-on-one semi-structured interviews. The aim of this study was to explore how preschool aged children speak about health and health behaviours. Findings highlighted the centrality of food in how children speak about health. In contrast, there was limited mention of physical activity as a way to be healthy. The theme ‘reduce risk’ emerged from participant responses and relates to the practice of safety behaviours to prevent injury and illness. The findings of this study have been published in a peer-review academic journal and informed the development of studies five and six.
Study 5 was a qualitative, cross-sectional study that included 40 preschool children who participated in one-on-one semi-structured interviews. The aim of this study was to explore preschool children’s preferences for physical activity and barriers and facilitators to participating in these activities. Participants expressed preferences to play unstructured activities with friends or family, to engage in imaginative, challenging play, as well as to have control over the activity they engage in. Children reported that rules at home and at preschool, the availability of toys, friends, family and having access to a natural environment served as both barriers and facilitators to participating in their favourite activity. This study was prepared in a manuscript format (Manuscript 5), has been submitted to a peer-review academic journal and informed the development of Study 6.

Study 6 was a quantitative study that included 138 parent-child dyads. Parents completed a questionnaire that comprised demographic questions, questions regarding their child’s physical activity/sedentary behaviours and parenting practices thought to influence children’s physical activity and inactivity (e.g. screen time behaviours). Children were asked to complete the Pre-FPQ, which measured children’s knowledge of and preference for physical activity. The results of parent and child questionnaires were matched. The findings of this study revealed that children’s preferences for physical activity were correlated with a number of demographic characteristics and physical activity parenting practices, with the most influential variables being parental age, parental rules around active play outdoors and parental use of screen time to reward/control child behaviour. Children who preferred to be physically active were more likely to engage in physical activity and were less likely to engage in screen time on the weekend. This study was prepared in a manuscript format (Manuscript 6) and submitted to a peer-review academic journal.

Collectively, the findings of this research program highlighted the benefits of using age-appropriate techniques to involve children in the research process, and how this process can
offer important insights into their world. This research identified ways in which active play can be made more enjoyable to preschool children, which may allow children to develop a more positive relationship with physical activity. Finally, this research identified the relationships between demographic factors, physical activity parenting practices and children’s activity preferences and behaviours. The findings from this research can inform public health professionals, educators and researchers of the importance of considering contextual factors that shape children’s knowledge of and preference for healthy lifestyle behaviours and provides recommendations for further action and research. Early childhood is undeniably a crucial life stage that influences health outcomes throughout the life course. How we act to promote health during this life stage may therefore hold the potential to dictate the health challenges of our future society.

**Keywords:** preschool children, lifestyle behaviours, physical activity, nutrition, visual methods, knowledge, preference, public health
I would like to express my gratitude and acknowledge for the assistance I received from numerous individuals who have helped me to complete this research. First and foremost, I would like to thank my supervisory team, Associate Professor Neil Harris, Dr Jessica Lee, and Associate Professor Martin Downes, for their support, advice, expertise and guidance throughout my candidature. A special thank you to Neil for being such a great mentor and friend, for always answering the door when I knocked and for helping me laugh off and guide me through all the road bumps I experienced along the way. Your guidance has truly been invaluable to the development of my thesis, to me and my career and I will be forever grateful. I would like to thank Jessica for her support, expertise and critical perspectives which broadened my thinking and challenged me to continually improve my research, this was invaluable to not only improve my work but also my skills as a researcher. I would like to thank Martin Downes for his statistical advice and expertise which made this thesis possible! Thank you all for your assistance I am grateful to have had the opportunity of working with you.

I would like to acknowledge the support of Griffith University in providing me the scholarships and resources to complete this research. Additionally, I would like to thank the participating parents, children and childcare educators for their contribution, time and patience. I also wish to thank my friends for, providing limitless hugs, support, listening to my constant thesis chat and for always being there to share a wind-down wine. A special thanks to Ernesta, she has been my confidant throughout my PhD and I owe her a large part of my sanity, her encouragement and support made this thesis possible - I am so grateful that this journey brought me such a great friend.

I would like to especially thank my partner Todd, not only for his endless support and encouragement, but for putting up with me when I was frazzled and leaving piles of papers around the house, and for also being someone I could go to when I needed to clear my head even when you yourself are so busy. This thesis would not have been possible without his love and patience, he inspired me endlessly throughout this journey.

Finally, I would like to thank my parents, Lorraine and Tony. I feel so lucky to have been blessed with such supportive, selfless and loving parents. They have forever encouraged me to achieve my goals and to find what makes me happy. Without my parents I would not have been able to get to this point, thank you both for your love and support and for always being so proud of me in everything I do.
Statement of originality

This work has not previously been submitted for a degree or diploma in any university. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

Signed:
Table of Contents

Synopsis i
Acknowledgements vii
Statement of originality viii
Table of Contents ix
List of Tables xi
List of Figures xiii
List of Acronyms and Symbols xiv
Publications, Presentations and Awards in Support of this Thesis xv
Acknowledgement of Papers included in this Thesis xviii

Chapter 1: Introduction 1
1.1 Introduction to the problem 1
1.2 Research aim and questions 4
1.3 The conceptual framework 7
1.4 Significance of the Research 9
1.5 Thesis Orientation and Outline of Chapters 9

Chapter 2: Literature review 13
2.1 Introduction 13
2.2 Physical Activity, Food Intake and Health Outcomes 13
2.3 Brofenbrenner’s Ecological Systems Theory 17
2.4 Childcare Environment 22
2.5 Home and Familial Environment 28
2.6 Child Characteristics 33
2.7 Preschool Children’s Lifestyle Knowledge and the Link to Behaviour 37
2.8 Preschool Children’s Lifestyle Preferences and the Link to Behaviours 41
2.9 Researching Lifestyle Behaviours of Preschool Children 43
2.10 Conclusion 44

Chapter 3: Research Methodology 45
3.1 Introduction 45
3.2 Research Aim: 45
3.3 Study Population and Setting 47
3.4 Research Paradigm 48
3.5 Research Design 49
3.6 Structure of Research 51
3.7 Conclusion 59
### Chapter 4: Techniques Used to Measure Preschool Children’s Knowledge of Food and Nutrition 61

4.1 Study 1- A Systematic Review of the Literature (Manuscript 1) 61
4.2 Abstract 62
4.3 Introduction 63
4.4 Methods 65
4.5 Results 67
4.6 Discussion 75
4.7 Conclusions 81
4.8 References 83

### Chapter 5: Techniques used to measure preschool children’s knowledge of and preference for physical activity 88

5.1 Study 2- A Systematic Review of the Literature (Manuscript 2) 88
5.2 Abstract: 89
5.3 Background 90
5.4 Methods 92
5.5 Results 95
5.6 Discussion 104
5.7 Conclusion 110
5.8 References 112

### Chapter 6: Validation of the Preschool Food and Play Questionnaire 118

6.1 Study 3- Validation of the Preschool Food and Play Questionnaire (Pre-FPQ) (Manuscript 3) 118
6.2 Abstract 119
6.3 Introduction 121
6.4 Methods 124
6.5 Results 129
6.6 Discussion 135
6.7 Conclusions 139
6.8 References 140

### Chapter 7: Preschool children’s understanding of health and health behaviours 146

7.1 Study 4- Preschool children’s understanding of health and health behaviours (Manuscript 4) 146
7.2 Abstract 147
7.3 Introduction 149
7.4 Methods 151
7.5 Results 154
7.6 Discussion 159
7.7 Conclusion 163
7.8 References 164
List of Tables

Table 1.1 Studies, objectives, research questions and data collection methods .......................... 6

Table 3.1 Research Objectives ....................................................................................................... 46

Table 4.1 Summary of data collection techniques used to assess preschool children’s knowledge of food and nutrition ........................................................................................................ 70

Table 5.1 Summary of data collection techniques used to assess preschool children’s knowledge of and preference for physical activity ........................................................................................................ 96

Table 6.1 Photo-pairs used to assess food and activity knowledge and preference .................. 130

Table 6.2 Mean (SD) of the subscale scores of the Pre-FPQ by age group ............................... 131

Table 7.1 Demographic characteristics of participants (n=163) ................................................ 152

Table 7.2 Meaning of healthy (n=145) ....................................................................................... 155

Table 7.3 How to be healthy (n=150) ....................................................................................... 157

Table 8.1 Participants preferred activity ....................................................................................... 177

Table 8.2 Results of thematic analysis including themes, subthemes and representative quotes ........................................................................................................................................ 183

Table 9.1 Descriptive statistics of demographic factors and key independent variables .... 207

Table 9.2 Children’s physical activity preference, knowledge, screen time and outdoor play by demographic factors .................................................................................................................. 211

Table 9.3 Correlations between physical activity parenting practices and children’s physical activity preference, knowledge, screen time and outdoor play ........................................ 212

Table 9.4 Hierarchical Multiple Regression: Factors relating to children’s physical activity preferences ........................................................................................................................................ 213

Table 10.1 Overview of study finding ......................................................................................... 230
List of Figures

Figure 1.1 Conceptual framework of program of research .......................................................... 8

Figure 1.2 Overview of thesis structure .................................................................................. 10

Figure 2.1 Brofenbrenner’s ecological systems theory .......................................................... 19

Figure 3.1 Relationship between studies .................................................................................. 50

Figure 4.1 Flow chart depicting the article filtering process undertaken as part of the systematic review ............................................................................................................. 68

Figure 5.1 PRISMA flow chart depicting the article filtering process undertaken as part of the systematic review ............................................................................................................. 94

Figure 6.1 Study design ......................................................................................................... 128

Figure 6.2 Test-retest reliability of each subscale of the Pre-FPQ for 3, 4 and 5 year old participants .................................................................................................................................. 132

Figure 6.3 Internal consistency of each subscale scale of the Pre-FPQ for 3, 4 and 5 year old participants .................................................................................................................................. 133

Figure 6.4 Improvement in food and physical activity knowledge scores after education session by age group .................................................................................................................. 134

Figure 6.5 Percent agreement between stated preference and actual food and activity choice by age group .................................................................................................................................. 135
**List of Acronyms and Symbols**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABS</td>
<td>Australian Bureau of Statistics</td>
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<tr>
<td>AGHE</td>
<td>Australian Guide to Healthy Eating</td>
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<tr>
<td>AUD</td>
<td>Australian Dollars</td>
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<tr>
<td>AHKA</td>
<td>Active Healthy Kids Australia</td>
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<tr>
<td>DoHA</td>
<td>Department of Health and Aging</td>
</tr>
<tr>
<td>EST</td>
<td>Ecological Systems Theory</td>
</tr>
<tr>
<td>MeSH</td>
<td>Medical Subject Headings</td>
</tr>
<tr>
<td>NHMRC</td>
<td>National Health and Medical Research Council</td>
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<tr>
<td>PA</td>
<td>Physical activity</td>
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<td>Pre-FPQ</td>
<td>Preschool Food and Play Questionnaire</td>
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<td>PPFEQ</td>
<td>Photo Pair Food and Exercise Questionnaire</td>
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<tr>
<td>PRISMA</td>
<td>Preferred Reporting Items for Systematic Reviews and Meta-Analyses RQ</td>
</tr>
<tr>
<td>SPSS</td>
<td>Statistical Package for the Social Sciences</td>
</tr>
<tr>
<td>TV</td>
<td>Television</td>
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<td>WHO</td>
<td>World Health Organization</td>
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Publications, Presentations and Awards in Support of this Thesis

The candidate has produced three publications and three manuscripts which have been submitted to peer reviewed academic journals from the research included in this thesis. The publications and manuscripts are co-authored with other researchers and include two systematic reviews of the literature and four original research papers. The contribution of the research candidate to each publication is outlined at the beginning of the relevant chapter. The details of these publications are listed below.

Published Journal articles:


Manuscripts under review:

- Wiseman N., Rossmann C., & Harris N. (Under Review) A systematic review of data collection techniques used to measure preschool children's knowledge of and preference for physical activity, Submitted to: *Journal of Sport and Health Science*
• Wiseman N., Rossmann, C., Lee J., & Harris N. (Under Review) “It’s like you are in the jungle”: Using the draw-and-tell method to explore preschool children’s play preferences and factors that shape their active play, Submitted to: Health Promotion Journal of Australia.

• Wiseman N., Harris N., & Downes M. (Under Review). Preschool children’s preferences for sedentary activity relates to parent’s restrictive rules around active outdoor play, Submitted to: BMC Public Health

The research candidate has produced four conference presentations using the research within this thesis. The research was presented at two international and one local conference. The details of the presentations are listed in order of recency:


• Wiseman, N. & Harris, N. (2016). Contemporary and innovative strategies to evaluate lifestyle interventions in preschool children. 22nd IUHPE World Conference on Health Promotion. 22 – 26 May 2016, Curitiba, Brazil.


The candidate received one award, one scholarship and three grants during her candidature. The details of the award, scholarships and grants are listed in order of recency:

2017: School of Medicine Best Publication Awards 2017, $1,000.

2016: PhD Researcher Grant, Griffith Health Institute Population and Social Health Research Program, $3000.

2015: Publication Incentive Scheme, Griffith Health Institute Population and Social Health Research Program, $500.

2015: PhD Financial Assistance Scheme, Population & Social Health Research Program, Griffith Health Institute, $500.

2015: Griffith University Postgraduate Research Scholarship, Griffith University.

*Additional outputs:*

The Pre-FPQ iPad application developed and validated through study three is available through the Griffith University page on the iTunes store as a free download.
Acknowledgement of Papers included in this Thesis

All papers included are co-authored

Section 9.1 of the Griffith University Code for the Responsible Conduct of Research (“Criteria for Authorship”), in accordance with Section 5 of the Australian Code for the Responsible Conduct of Research, states:

To be named as an author, a researcher must have made a substantial scholarly contribution to the creative or scholarly work that constitutes the research output, and be able to take public responsibility for at least that part of the work they contributed. Attribution of authorship depends to some extent on the discipline and publisher policies, but in all cases, authorship must be based on substantial contributions in a combination of one or more of:

- Conception and design of the research project
- Analysis and interpretation of research data
- Drafting or making significant parts of the creative or scholarly work or critically revising it so as to contribute significantly to the final output.

Section 9.3 of the Griffith University Code (“Responsibilities of Researchers”), in accordance with Section 5 of the Australian Code, states:

Researchers are expected to:

- Offer authorship to all people, including research trainees, who meet the criteria for authorship listed above, but only those people.
- Accept or decline offers of authorship promptly in writing.
- Include in the list of authors only those who have accepted authorship
- Appoint one author to be the executive author to record authorship and manage correspondence about the work with the publisher and other interested parties.
- Acknowledge all those who have contributed to the research, facilities or materials but who do not qualify as authors, such as research assistants, technical staff, and advisors on cultural or community knowledge. Obtain written consent to name individuals.
Included in this thesis are papers in Chapters 4, 5, 6, 7, 8 and 9 which are co-authored with other researchers. My contribution to each co-authored paper is outlined at the front of the relevant chapter. The bibliographic details including whether the manuscript is published, accepted for publication, prepared or submitted for publication is acknowledged at the beginning of each chapter. Appropriate acknowledgements of those who contributed to the research are included at the beginning of each paper.

Signed                      Candidate: Nicola Wiseman     Date  28/07/2018

Countersigned               Primary supervisor: Neil Harris    Date  28/07/2018
Chapter 1: Introduction

Contextual and Individual Factors Shaping Preschool Children’s Knowledge of and Preference for Lifestyle Behaviours

1.1 Introduction to the problem

Good health and wellbeing are essential for all children to have the best start in life. Early childhood is the most critical and rapid period of development and provides the foundation for an individual’s acquisition of health behaviours (Lanigan, 2011). Physical activity and healthy nutrition are two important contributors to a child’s health, with physical activity participation and maintaining a balanced diet suggested to improve mental and physical health and psycho-social wellbeing (Lobstein et al., 2004; De Rezende et al., 2014; Hesketh et al., 2017). Changes in children’s lifestyle due to industrialisation have resulted in altered physical activity levels and food consumption patterns (De Rezende et al., 2014). The combined effect of these changes has important implications for health status, with the complex interplay of factors contributing to adverse consequences on a population level.

Until recently, it has been believed that young children are naturally very physically active. National physical activity guidelines recommend that children aged 3 to 5 years should participate in moderate to vigorous physical activity every day for at least three hours spread throughout the day (Australian Government Department of Health, 2017). Children of this age should also be limited to less than 1 hour per day of screen time (watching television or other electronic media) (Australian Government Department of Health, 2017). However, researchers and health care professionals are now becoming concerned that many three to five-year-old children may not be as physically active as they need to be to maintain health (Pate et al., 2013). According to the 2012 Australian Health Report, only one in five (19%) 5- to 17-year-old children are doing the recommended 60 minutes of physical activity per day, across all seven days of the week. A longitudinal study of Australian children found that 90% of 4- and 5-year
old children spend more than 2 hours per day participating in sedentary screen time (Baxter & Hayes, 2007). Further, just over half (56%) of preschool children meet physical activity recommendations of three hours throughout the day (ABS, 2016; Australian Government Department of Health, 2017).

In regard to the dietary behaviour of Australian children, many 2- to 3-year-old children are not meeting a number of the national nutritional recommendations (Rangan, Randall, Hector, Gill & Webb, 2008; Hardy et al., 2010). For example, 68% of Australian children aged two to 18 years are not meeting dietary requirements for fruit and vegetable consumption (ABS, 2015). Data also indicate that energy dense, nutrient-poor food consumption contributes to approximately one-third of preschool aged children’s energy intake, and that these ‘extra’ foods displace core or ‘healthy’ foods, compromising the nutritional status of young children (Rangan, Randall, Hector, Gill & Webb, 2008; Hardy et al., 2010). There is strong evidence that lifestyle behaviours established in early childhood continue into adolescence and adulthood (Waters et al., 2011; Tatlow-Golden et al., 2013; Craigie et al., 2011; Biro & Wien, 2010; Barton, 2012). Thus, early childhood presents an opportunity to promote positive behavioural development that may be maintained into adulthood (Nicklas, Baranowski, Cullen, Rittenberry & Olverra, 2001).

Given the importance of physical activity and food intake in early childhood, it is crucial from a public health perspective to understand how and why these behaviours are formed. Socio-ecological theory suggests that physical activity and dietary behaviours result from an interaction between personal characteristics and contextual conditions (Bronfenbrenner, 1989). Bronfenbrenner’s theory has been increasingly applied to understand factors associated with the development of lifestyle behaviours in young children (Doherty & Hughes, 2009). While this body of research is limited, several studies that have applied this theory have reported that individual and contextual conditions in which children live work together to exert a strong
influence over their health and health behaviours (Boonpleng et al., 2013; Gubbels et al., 2014; Decker et al., 2013; Doherty & Hughes, 2009; Larson et al., 2011). Two variables that are shaped by broader environmental factors within a child’s life are their knowledge and understanding of health and health behaviours, and their own preferences in regards to food and physical activity.

The first five years of life is a key period in which children are accumulating knowledge and developing skills that can shape health behaviours (Monasta et al., 2010; Tinsley, 2003). Children’s exposure to a range of health messages from public health campaigns, television programs, commentaries from friends, families and teachers, collectively shape a child’s understanding how a healthy person looks, behaves and talks (Burrows & McCormack, 2014). How children understand health and health behaviours has implications for how they will act to manage their own health (Craigie et al., 2011; Waters et al., 2011; Barton, 2012; Tatlow-Golden et al., 2013). To date, literature is lacking insight into young children’s knowledge and understanding of health behaviours and how children’s experience of the conditions of daily life shape these understandings (Irwin et al., 2006). This doctoral program of research seeks to shed light on the ways preschool children make sense of what they see, hear and come to know of the concept of health through their environment. Insight into how children speak about health behaviours and how to maintain health may help to explain the complexity of how children develop health behaviours and may help to facilitate communication between children, parents and educators.

A young child’s preferences for food and active or sedentary activities is another key proximal indicator of a child’s health behaviour (Irwin et al., 2006). Factors such as child age, gender, ethnicity, weight status, genetic and demographic factors and parental factors may shape children’s lifestyle preferences (Rodenburg et al., 2013; Leary et al., 2008; Irwin et al., 2005). Although literature regarding the development of children’s food preferences is
increasing, there remains little understanding of how children form preferences for active and sedentary play. Further, young children’s voices remain underrepresented in the research into the food and physical activity preferences of Australian children. For the most part, this body of research has relied on the perspectives of parents (Veitch et al., 2006) or has focused on school-aged children (Noonan et al., 2016; Macdonald et al., 2005). Gaining preschool children’s perspectives is essential to understanding how they and/or others make health choices for them. A child-centric view may help to identify overlooked aspects of the environment that influence lifestyle preferences (Alexander et al., 2014).

This program of research focuses on children’s understandings of health and of factors that shape their knowledge of and preference for food and physical activity. In doing so, this research addresses many gaps in this body of literature by: complementing the mounting research that highlights the importance of incorporating children’s perspectives in the development and delivery of health education and interventions to ensure that information presented to children is relevant and beneficial (Alexander et al., 2014); adding to the limited research on preschool children’s knowledge of and preference for health behaviours, the contextual factors that impact these variables and how this translates into health behaviours; and bringing clarity to the issue of inconsistent and not validated tools used to assess children’s knowledge of and preference for food and physical activity. To address these gaps, the program of research has been structured as six discrete studies. Each of the six studies build on each other to enable a deeper understanding of factors shaping children’s knowledge and preferences for lifestyle behaviours.

1.2 Research aim and questions

Research aim and questions. The overall aim of this program of research is to examine individual and contextual factors shaping preschool children’s knowledge of, and
preference for, food and physical activity. This thesis includes nine research questions that seek to address the overall aim of the thesis. The nine research questions are as follows:

**RQ1:** What data collection techniques have been used to effectively measure preschool children's knowledge of food and nutrition?

**RQ2:** What data collection techniques have been used to effectively measure preschool children's knowledge of and preference for physical activity?

**RQ3:** Is the Pre-FPQ a valid and reliable data collection technique to measure preschool children’s knowledge of and preference for food and physical activity?

**RQ4:** How do children understand health and health promoting behaviours?

**RQ5:** Do preschool children’s self-reported understanding of health and health behaviours increase with age or vary by gender?

**RQ6:** What are preschool children’s preferred activities?

**RQ7:** What do preschool children consider to be barriers or facilitators to participation in their preferred activity?

**RQ8:** Do demographic factors and physical activity parenting practices influence children’s knowledge of, and preference for physical activity?

**RQ9:** How does children’s knowledge of and preference for physical activity relate to their participation in physical activity and sedentary behaviours?

This thesis employed a mixed methods approach over a series of six studies to answer nine research questions as outlined in Table 1.1.
Table 1.1 Studies, objectives, research questions and data collection methods

<table>
<thead>
<tr>
<th>Study</th>
<th>Objective</th>
<th>Research Question</th>
<th>Methods</th>
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| Study 1 | To identify and review data collection techniques used to effectively measure preschool children's knowledge of food and nutrition | 1 | Data collection: Systematic review of the literature (n=20 studies)  
Data analysis: Critical appraisal |
| Study 2 | To identify and review data collection techniques used to effectively measure preschool children's knowledge of and preference for physical activity | 2 | Data collection: Systematic review of the literature (n=14 studies)  
Data analysis: Critical appraisal |
| Study 3 | To assess the reliability and validity of an adapted computerised (iPad) version of the photo-pair food and exercise questionnaire (Pre-PFQ). | 3 | Data collection: A cross-sectional design incorporating 4 phases of quantitative investigation (n=86 preschool children)  
Data analysis: Descriptive statistics, Pearson correlation tests, Paired-sampled t-tests and percent agreement |
| Study 4 | To explore how preschool aged children speak about health and health behaviours  
To examine the influence of age and gender on preschool aged children’s self-reported understanding of health and health behaviours. | 4,5 | Data collection: Cross-sectional design incorporating semi-structured interviews (n=163 preschool children)  
Data Analysis: Thematic analysis. |
| Study 5 | To explore preschool children’s activity preferences and identify what children consider to be barriers or facilitators to participating in their preferred activity | 6,7 | Data collection: Cross sectional, qualitative semi-structured interviews (n=40)  
Data analysis: Thematic analysis |
| Study 6 | To determine the influence of demographic factors and parental PA behaviours on children’s physical activity knowledge and preferences  
To examine the influence of preschool children’s knowledge of and preference for physical activity on their participation in physical activity and sedentary behaviours | 8,9 | Data collection:Cross sectional, quantitative surveys used (n=136 parent child dyads)  
Data analysis: Pearson correlation tests, ANOVA, Paired-sampled t-tests, hierarchical regression |
1.3 The conceptual framework

The candidate used contemporary peer-reviewed and grey literature to construct the conceptual framework that underpins this research project (Figure 1.1). The framework provides an overview of the candidate’s understanding of the pathways and factors shaping lifestyle behaviours in preschool children. The figure demonstrates how preschool children’s dietary and physical activity behaviours are influenced by a child’s knowledge of and preference for healthy lifestyle behaviours. This understanding is formed through the interaction between individual, social and environmental factors. Being key environments for a young child, home and childcare factors play an important role in shaping a child’s understanding of health and health behaviours. The framework identifies relevant developmental factors, with physical activity and dietary behaviours being established in early childhood and how these can then track into adolescence and adulthood. Finally, the figure demonstrates the importance of engaging children in the research process in order to understand their own perspectives regarding health behaviours. In summary, the figure draws together and connects the different bodies of literature that have informed the candidates program of research.
Figure 1.1 Conceptual framework underpinning program of research
1.4 Significance of the Research

Research seeking to understand the development of healthy lifestyle behaviours in preschool children is of increasing interest to researchers and public health professionals. This is due to the negative physical, psychological and social health outcomes and financial burden on health services and the wider economy associated with physical inactivity and poor diet in young children (Hesketh, 2016). To date, limited research has investigated preschool children’s knowledge of and preference for health behaviours, the contextual factors which may impact these factors, and how this may translate into lifestyle behaviours. However, the emergence of innovative participatory research techniques has allowed for a shift in how health behavioural research is conducted with young children (Lanigan, 2011). The current research seeks to address this gap in the literature by examining individual and contextual factors shaping preschool children’s knowledge and preference for healthy lifestyle behaviours. Children’s talk exemplifies the sheer volume of health information saturating their worlds and the range of media used to reach them (Burrows & McCormack, 2014). Listening to how children speak about health behaviours may help to explain the complexity of children’s health behaviour, and offer insight into what children make of health messages in their ever-changing environments. This knowledge may help facilitate communication between children, parents and educators.

1.5 Thesis Orientation and Outline of Chapters

The thesis structure is outlined in Figure 1.2. Following an introduction and literature review, the thesis is structured as a series of published papers and manuscripts under review. All manuscripts have been published, submitted or are under review with international peer-reviewed journals. Each manuscript has been written in the style of the journal, including reference style and spelling.

Chapter 1 has introduced the thesis, with an outline of the research aim, research questions, the conceptual framework and the significance of the research. Chapter 2 presents a
Chapter 1: Introduction
Overview of research, conceptual framework, research aims and questions

Chapter 2: Literature Review
Preschool children, physical activity and dietary behaviours, home and child care environments, child characteristics
Linking preschool children’s knowledge of lifestyle with behaviour, lifestyle preferences and researching lifestyle behaviours of preschool children

Chapter 3: Methodology
Research approach, paradigm and methods

Chapter 4:

Chapter 5:
Wiseman N., Rossmann C., & Harris N. (Submitted to academic journal) A systematic review of data collection techniques used to measure preschool children's knowledge of and preference for physical activity

Chapter 6:

Chapter 7:

Chapter 8:
Wiseman N., Lee J., & Harris N. (2018) “It’s like you are in the jungle”: Using the draw-and-tell method to explore preschool children’s play preferences and factors that shape their active play, *Health Promotion Journal of Australia*

Chapter 9:

Chapter 10:
Integration of findings to address research questions, contributions of the research, future research directions, recommendations

**Figure 1.2** Overview of thesis structure
synthesis of the current literature on relevant topics, including dietary and physical activity
behaviours in Australian preschool children, the importance of establishing positive lifestyle
behaviours at a young age and individual and contextual factors shaping these behaviours.
Chapter 3 outlines the methodology and methods of this research to address the nine research
questions. This section provides information on the research paradigm, research design and
briefly outlines each study including data collection and analysis methods in order to set the
scene for the following chapters. Chapters 4 and 5 present Study 1 and 2 respectively, which
include systematic reviews of data collection techniques to measure both knowledge of and
preference for food and nutrition and physical activity. Chapter 6 presents findings of a
validation study, which tested the validity and reliability of an innovative iPad-based
questionnaire to assess preschool children’s knowledge of and preference for food and physical
activity. Chapter 7 presents findings from the cross-sectional qualitative study, which included
one-on-one semi-structured interviews of preschool children to explore how this population
speak about health and health behaviours. Chapter 8 presents findings of a cross-sectional
qualitative study of preschool children’s activity preferences. Chapter 9 presents findings from
a cross-sectional, quantitative survey of parent child dyads. Finally, Chapter 10 discusses the
findings as a body of work and explores the research implications and recommendations for
changes to practice, policy and future research.
Chapter 2: Literature review

2.1 Introduction

This literature review presents the contemporary understanding of preschool children’s lifestyle behaviours, including the role that a child’s knowledge of and preferences for lifestyle behaviours play in establishing physical activity and dietary patterns. First, the review highlights the important role lifestyle behaviours, including physical activity and food intake, play in shaping children’s health outcomes. Next, a socio-ecological approach is used to frame individual and contextual factors that shape the development of lifestyle health behaviours in preschool children. This is followed by a review of literature exploring the link between preschool children’s behaviour and their preferences for and knowledge of food and physical activity. Finally, the review explores current strategies/approaches used to examine lifestyle behaviours in preschool children, including limitations of this research and the need to engage children in the research process.

This review includes peer-reviewed journal articles that were identified through bibliographic databases, including Medline (EBSCO Host), Cochrane library, PsycINFO, Web of Science, PubMed and Scopus. These databases afford broad coverage of health education and public health literature. To complement this search strategy, reference lists and forward citations were cross-matched. Grey literature was sourced when appropriate to provide more comprehensive evidence relevant to the current investigation. References include peer-reviewed journal articles, books, government documents and webpages of professional organisations.

2.2 Physical Activity, Food Intake and Health Outcomes

Physical activity and food intake are essential components of a healthy lifestyle. Establishing a healthy relationship with food and physical activity in early childhood can result in lasting positive benefits for an individual (De Rezende et al., 2014). Poor dietary and physical
activity behaviours are linked to negative physical, social and psychological health outcomes. Regular physical activity is essential for a child’s growth and development and offers wide-ranging health benefits. In infants, toddlers and preschoolers, higher levels of physical activity are related to better social and motor development, improved metabolic health and decreased adiposity. Some researchers have identified a positive correlation between exercise and children’s academic achievement, self-esteem and self-efficacy (Eather et al., 2014; Hesketh et al., 2017; Liu et al., 2015; Poitras et al., 2016). Children with poor dietary habits are reportedly more likely to be overweight, experience dental caries, poor mental health, high blood pressure, earlier onset of puberty and insulin resistance (Marshall, Burrows and Collins, 2014). Long term physical health issues associated with poor diet and physical activity behaviours include coronary heart disease, musculoskeletal disorders, kidney disease, type two diabetes, obesity and certain types of cancers (ABS, 2015; WHO, 2012; De Rezende et al., 2014) and psychological issues include poor self-esteem, anxiety and depression (Freeman et al., 2014). Avoiding the potential adverse health issues associated with these behaviours may be possible by promoting the uptake of positive health behaviours in young children.

**Food intake.** Longitudinal studies with children have shown that higher intakes of energy-dense, nutrient-poor foods and sugar sweetened beverages contribute to weight gain and also increase the likelihood of a child developing a number of adverse health conditions, for example, heart disease and diabetes (Boylan, Hardy, Drayton, Grunseit, & Mihrshahi, 2017; Luger et al., 2017; Perez-Escamilla et al., 2012; van der Bend et al., 2017). In 2014-15, around one in four (27.6%) children aged 5 to 17 years were overweight or obese, comprising 20.2% overweight and 7.4% obese (ABS, 2015). In Australia, many 2- to 3-year-old children are not meeting a number of the national nutritional recommendations (Rangan, Randall, Hector, Gill & Webb, 2008; Hardy et al., 2010). For example, only one in twenty (5.1%) Australian children aged 2 to 18 years are meeting dietary requirements for fruit and vegetable consumption (ABS,
Data also indicates that energy-dense, nutrient-poor food consumption contributed to approximately one-third of preschool aged children’s energy intake, and that these ‘extra’ foods displace healthy foods, compromising the nutritional status of young children (Rangan, Randall, Hector, Gill & Webb, 2008; Hardy et al., 2010). The increasing rates of overweight and obesity may be due to changing food portion sizes in Australia, with van der Bend and colleagues (2017) reporting that vegetable and fruit portion sizes were below the respective serving sizes of 75g and 150g in the Australian Guide to Healthy Eating while portion sizes of some energy-dense, nutrient-poor foods have increased. This is concerning, as nutritionally poor foods generally contribute few micronutrients to the diet, contain substantial amounts of fat and/or sugar and are high in energy (van der Bend et al., 2017).

**Physical activity.** Regular physical activity is essential for a child’s growth and development and offers wide ranging health benefits. In infants, toddlers and preschoolers, higher levels of physical activity are related to better social and motor development, improved metabolic health and decreased adiposity (Hesketh, Lakshman, & van Sluijs, 2017; Hinkley et al, 2012). Some researchers have identified a positive correlation between exercise and academic achievement, children’s self-esteem and self-efficacy (Eather et al., 2014; Hesketh et al., 2017; Hinkley et al, 2012; Liu et al., 2015; Poitras et al., 2016). Until recently, it has been believed that young children are naturally very physically active, and only recently have researchers and health care professionals become concerned that many 3- to 5-year-old children may not be as physically active as they need to be for good health (Pate et al., 2016). National physical activity guidelines recommend that children aged 3 to 5 years should participate in moderate to vigorous physical activity every day for at least three hours spread throughout the day (Australian Government Department of Health, 2017). Children of this age should also be limited to less than 1 hour per day of screen time (watching television or other electronic media) (Australian Government Department of Health, 2017). However, according to a longitudinal
study of Australian children, 90% of four- and five-year-old children spend more than 2 hours per day participating in sedentary screen time activities (Baxter & Hayes, 2007) and just over half (56%) Australian preschool-aged children spend the recommended three hours a day in active play (Okley, Trost, Steele, Cliff & Mickle, 2009). Another Australian study that compared preschool children’s physical activity with national Government guidelines found that only 32% of a sample of 266 children met physical activity physical activity requirements (Dwyer et al., 2011). These findings were similar to those reported by Hinkley and colleagues (2012) who found that of 703 3-5 year old children, virtually no children (<1%) met both the Australian recommendations for PA and screen-based entertainment (Hinkley et al, 2012). The 2011-12 Australian Health Survey [AHS] reported that most Australian 2–4 year olds (84%) meet the recommended 3 or more hours of physical activity per day. In contrast, the seven-day recall component of the AHS indicated that just under three-quarters (72%) of 2–4 year olds were physically active for 3 hours or more per day (ABS, 2012). At the same time, the AHS reported that 2–4 year olds averaged almost one and a half hours (83 minutes) per day in the sedentary activities of watching TV/DVDs or playing electronic games, with only one in four (26%) meeting the screen-based activity recommendations of less than one hour per day (ABS, 2012).

Tracking lifestyle behaviours into adulthood. There is evidence to suggest that lifestyle behaviours, including dietary and physical activity behaviours, established in early childhood continue into adolescence and adulthood (Waters et al., 2011; Taltow-Golden et al., 2013; Craigie et al., 2011; Biro & Wien, 2010; Barton, 2012; Whitaker et al., 1997; Trudeau et al., 2004; Telama, 2009; Telama et al., 2005). Thus, the preschool early developmental age is a critical time in which to help children adopt behaviours that will promote good health
throughout their life (Nicklas, Baranowski, Cullen, Rittenberry & Olverra, 2001). This link is demonstrated in a study conducted by Trudeau and colleagues (2004), which described longitudinal trends of physical activity behaviours in participants over 28 years to determine the stability of this behaviour from childhood into adulthood. Results revealed that participants’ physical activity [PA] level in adulthood was significantly associated with their childhood PA in regards to total PA, intensity of PA, and organised and non-organised PA (Trudeau et al., 2004).

Findings regarding the way food consumption patterns track from childhood into adulthood have been mixed, with changes in food consumption patterns being influenced by multiple variables including gender, location and socio-economic status (Gallagher et al., 2006; Bertheke et al., 2001; Lake et al., 2006). However, a longitudinal study conducted by Lake and colleagues, which recorded dietary change over 21 years from late childhood to adulthood found that food intake at age 11 years was a strong predictor of food intake at age 32 years, particularly for three food groups: breads and cereals, fruits and vegetables, and meat, fish and alternatives. These findings may help to explain the limited success of existing lifestyle interventions that target late childhood and adolescence, because eating behaviours and activity preferences are partially established by school age (Dev et al., 2013). Given the importance of physical activity and food intake in early childhood, it is important from a public health perspective to understand the determinants and contextual factors that shape these lifestyle behaviours.

2.3 Brofenbrenner’s Ecological Systems Theory

The development of lifestyle behaviours in preschool children. The way a child develops particular dietary and physical activity behaviours can be examined using Brofenbrenner’s Ecological Systems Theory (See figure 1) (Brofenbrenner, 1979, 1989). Ecological Systems Theory (EST) is a comprehensive theory, which has been increasingly
applied across research, to identify factors associated with the development of lifestyle behaviours in children. This theory highlights the importance of considering the various contexts in which a person is located in order to understand the emergence of a particular characteristic (Bronfenbrenner, 1979, 1989) (Figure 2.1). Essentially, EST suggests that an individual’s behaviours are a product of the interaction between personal characteristics and their environment.

Ecological Systems Theory is illustrated below in Figure 1, with the various levels of the model ordered from the most intimate level to the most distal (Doherty & Hughes, 2009). In the centre of the figure are the child’s personal characteristics. A child’s unique personality traits, knowledge, developmental and biological factors (e.g. sex, genetics) and behaviours (physical activity and food intake) interact with the various systems within their immediate and distal environments (Bronfenbrenner, 1974). The microsystem is the immediate, most personal environment in which the child lives, comprising the daily home, family, or daycare environments.
Figure 2.1 Brofenbrenner’s ecological systems theory

The Mesosystem encompasses the interaction of the different microsystems, for example the interaction between home and childcare. The Exosystem, on the other hand, pertains to the linkages existing between two or more settings, one of which may not contain the child, but affects him or her indirectly (for example, parents’ workplaces, the larger neighbourhood, and extended family members). The Macrosystem is the largest and most distant collection of people and places from the child that still exercise a significant influence (for example, political and economic systems) (Bronfenbrenner, 1974).
Literature indicates that, in addition to child characteristics, both the home and childcare contexts are particularly influential in shaping preschool children’s lifestyle behaviours. This is because, next to parents and the home environment, preschool attendance generally consumes the next most substantial amount of children’s time (Boonpleng et al., 2013; Gubbels et al., 2014; Decker et al., 2013; Larson et al., 2011). This was further demonstrated in an early childhood longitudinal study conducted by Boonpleng and colleagues (2013), which attempted to determine how much the ecological context (home, school and broader community) contributes to early childhood obesity. The study found that the majority of the variance in childhood overweight and obesity was determined at the family level (71%) and the school level (27%), with the community level accounting for 2% of the variance. These findings have been replicated by current research, as although a variety of environments can influence preschool children’s behavioural development, the family/home and childcare environments play a considerably large role (Lytle, 2010). Accordingly, the following literature review adopts an ecological view to examine the correlates of lifestyle behaviours (including diet and physical play) in preschool children, with particular focus being placed on the two most influential environments, the home and childcare settings.

**Behavioural Change Theories**

The socio-ecological emphasis inherent in Bronfenbrenner’s theory can be contrasted with behavioural change theories that place a greater importance on the characteristics of the individual to explain behavioural development. Two prominent behavioural change theories applied to preschool children’s lifestyle behaviours are Self-Determination Theory [SDT] and Behavioural Choice Theory [BCT]. SDT postulates that motivation to perform a behaviour is a process involving the interplay of various psychological, social, and environmental conditions (Ryan & Deci, 2002). The theory considers the way individual personality and motivation
interacts with and depends on the social environment (Christiana et al., 2014; Ryan & Deci, 2002). The theory suggests that self-determined motivation can be supported by environmental factors such as the support a person receives from others related to autonomy. In regard to lifestyle behaviours such as physical activity, literature indicates that engaging in physical activity is positively associated with self-determined motivation and that interventions based on SDT increase youth participation in leisure-time physical activity (Chatzisarantis & Hagger, 2009).

Behavioural Choice Theory [BCT] on the other hand is a theoretical approach that attempts to understand decision-making and how time and responses are allocated given the options available (Epstein, 1998). One principle of the BCT is that the reinforcing value of a decision depends in part on the available alternatives, suggesting that providing a reinforcing alternative can shift choice. For example, if an individual would generally choose to participate in a sedentary activity, choice may shift if the sedentary behaviour is not valued as highly as the active behaviours. This was demonstrated in a study conducted by Saelens and Epstein (1997) in which they provided children the choice between physical activity and high-or–low preference sedentary activities. Children chose to be more physically active when given the choice between a low-preference sedentary activity and physical activity than when the choice was between a high-preference sedentary activity and physical activity. Further, another principle of the BCT is that the reinforcing value of the alternative is not static, but may change over time or be modified by other behaviours (Epstein, 1998). One example of this is that early exposure to an active lifestyle may protect an individual from the reinforcing value of being sedentary.
These behavioural change theories offer alternate frameworks to investigate how lifestyle behaviours are developed by preschool children. The emphasis of such theories is upon characteristics of the individual. In contrast, EST adopts a more inclusive and integrative position to examine population health issues such as lifestyle choices in preschool children. Given the candidate’s public health background, the current program of research will utilise Ecological Systems Theory to underpin the program of research. Utilising EST will encourage a more integrative examination of the factors shaping preschool children’s lifestyle knowledge and preferences consistent with a public health approach.

2.4 Childcare Environment

The landscape of childcare in the developed world has changed dramatically over the last two decades, with the vast majority of children now attending some form of childcare during their preschool years (Gubbels et al., 2014). Approximately 81% of children between the ages of 3 and 5 years living in developed countries receive childcare outside their home (Ward, Belanger, Donovan & Carrier, 2015). In Australia specifically, 60% of four-year-old children attend preschool (Hardy, King, Kelly, Farrell & Howlett, 2010). Childcare centres are therefore key settings for promoting healthy eating and physical activity behaviours in children.

Food Intake. Traditionally, parents and the family environment have been considered to have the most influence over young children’s food intake and food preferences. However, over the past decade, some of this responsibility for the development of children’s eating behaviours has shifted to childcare educators, given the increasing amount of time children are spending in the childcare setting (Nicklas et al., 2000, Larson et al., 2011). Childcare facilities provide a valuable opportunity to promote healthy eating, given that a child who spends a full day in child care should consume one-half to two-thirds of his or her daily food
intake (Gubbels et al., 2009; Story et al., 2008). Children’s food intake within the childcare setting is influenced by a number of factors, for example, the childcare workers’ feeding practices and policies surrounding feeding practices.

Teaching behaviours and feeding styles of childcare educators influence children’s diet and food intake in a range of ways, such as by using food as a reward for behaviours, food modelling and speaking to children about healthy eating (Henderson et al., 2011; Ward et al., 2017). Caregivers’ participation in mealtimes, such as sitting with or eating the same foods as children, can encourage children's acceptance of new foods and provide opportunities for children to learn about and practice healthy eating habits (Erinosho et al., 2012). For example, a study conducted by Gubbels and colleagues (2009) found that children consumed more fibre when staff talked to the children about healthy foods (Gubbels et al., 2009). Ward and colleagues (2017) found that modelling healthy eating, providing nutrition education and not using food as rewards are associated with children’s dietary intake at lunch in childcare centres, highlighting the role that educators play in shaping preschoolers’ eating behaviours (Ward et al., 2017; Ward et al., 2015).

While many childcare providers may agree that mealtime should be used as an opportunity to educate children about nutrition, a study conducted by Nicklas and colleagues (2001) found that only 50% of childcare providers made a comment about nutrition during meals. This may be partially due to a lack of knowledge and training regarding child feeding and nutrition in childcare educators, which is linked to efficacy to encourage children to eat desirable foods (Lanigan, 2012). More research needs to address how the childcare providers share their food-related knowledge and attitudes with children, and the subsequent effects on children’s food consumption (Nicklas et al., 2001).

Positive childcare policies related to menu development and nutrition standards for meals offered in childcare centres also provides an opportunity to influence children’s food
intake and to increase the amount of fruit and vegetables consumed by children (Larson et al., 2011; Nicklas et al., 2001; Henderson et al., 2011; Gubbels, et al., 2009). For example, formal policies that set clear standards about the eating behaviors of caregivers in childcare centres are thought to be effective in promoting positive role modeling and supporting childcare environments that promote healthy dietary behaviors in children (Erinosho et al., 2012). Results of a study conducted by Ward and others (2017) found that while educators’ used modelling and nutrition education, the benefits of these practices were largely dependent on what food the childcare centre offered. This highlights the importance of childcare centre policies and practice as a whole in promoting healthy eating among preschoolers (Ward et al., 2017).

**Physical activity.** Descriptive studies have consistently reported that a child’s physical activity level varies considerably between childcare centres, and this can account for approximately 31% of the variance in preschoooler’s moderate-to-vigorous physical activity level (Trost, Ward & Senso, 2010). This variance may be attributable to the interaction of a number of factors relating to the centre’s physical, social, economic and political environment (Tonge, Jones & Okely, 2016). A systematic review of correlates of children’s physical activity and sedentary behaviours within childcare services found that physical environmental factors, including features of the outdoor environment have been most consistently studied (Tonge et al., 2016).

A number of studies have investigated how specific physical attributes of the childcare environment are associated with preschool children’s physical activity behaviour (Tonge et al., 2016; Copeland, Khoury & Kalkwarf, 2016). The presence of an outdoor play area and access to larger play spaces (total square meterage of the outdoor environment) have emerged as the most significant variables within the physical environment to increase a child’s physical activity participation (Dowda et al, 2009; Niacaise et al, 2011; Boldermann et al, 2006; Gubbels et al, 2011). Lower playground density (fewer children per square metre) and the presence of
vegetation and open play areas have also been identified as having a positive influence on children’s physical activity within the childcare setting. This may be due to larger play spaces permitting more room for children to move about freely and may require more movement between activities. Other studies have placed less emphasis on the size and availability of space and suggest that it is the equipment available that plays the most important role. For example, the availability of both fixed (Dowda et al, 2009; Nicaise et al, 2011; Gubbels 2012) and portable (Dowda et al, 2009; Nicaise et al, 2011; Vanderloo et al, 2014; Gubbels et al, 2014; Van Cauwenberghe et al, 2012) play equipment has been suggested to be associated with increased physical activity. However, these results are inconclusive, physical activity with some studies indicating that the relationship between these features of the outdoor play environment and preschoolers’ physical activity are, at best, modest (Boldermann et al., 2006; Cardon et al., 2008; (Tonge et al, 2016).

Understandably, daily weather together with seasonal weather patterns also contribute to physical activity and screen time participation by preschool children (Olesen et al, 2013; Hinkley et al., 2013; De Decker et al., 2012; Hustyi et al., 2012). Natural features and the ground surface of childcare playgrounds, available shade, ground markings (for example, a bike track), height of equipment, sedentary items (for example, television or computers) and indoor environments have been shown to have no association with children’s physical activity at childcare (Tonge et al, 2016; Copeland et al, 2016; Dowda et al, 2009; Van Cauwnberghe et al, 2012; Trost, Ward & Senso, 2010; Gubbles et al., 2014). Given the conflicting and limited evidence available, more research is needed to explain the way various aspects within the childcare context interact and shape preschool children’s physical activity levels. Some research has identified that social factors may mediate the effects of the physical environment on preschool children’s physical activity levels in a childcare setting (Trost, Ward & Senso, 2010).
The social environment within a childcare centre may also have a considerable impact on a child’s physical activity level (Tonge et al, 2016; Bingham et al, 2016; McClinic & Petty, 2015; Copeland, Kendeigh, Saelens, Kalkwarf and Sherman, 2012; Tucker et al., 2011; Derscheid, Kim, Zittel, Umoren and Henry, 2014). A study conducted by Copeland and colleagues (2012) concluded that preschool children could have very different gross motor and physical activity experiences, even within the same facility and regardless of policies and physical environment, due to the physical activity beliefs, creativity and level of engagement of their teacher (McClinic & Petty, 2015; Copeland et al., 2012; Tucker et al., 2011; Derscheid et al., 2014). Proactive childcare educators may provide a supportive and encouraging social environment helping to increase children’s levels of physical activity (Copeland et al., 2012; Gubbels et al., 2014; Tonge et al., 2016). Interestingly, a review conducted by Tonge and colleagues (2016) found that educator variables were the least studied as potential childcare correlates of children’s physical activity.

Nonetheless, another study contradicted this finding suggesting that despite educators’ efforts to provide a supportive social environment to promote active play, childcare centre policies limit their ability to facilitate play (Coleman & Dyment, 2013). Childcare policy related to children’s safety and supervision during outdoor activity times has been identified as a barrier to promoting active play by childcare workers in several studies (Hesketh, Lakshman & Sluijs, 2017; Coleman & Dyment, 2013; Kleppe, 2017). This literature introduces the idea of the role of a childcare educator as a safety chaperone as opposed to an activity facilitator. Further research should be conducted to determine the impact this may have on children’s active play.

Health promoting physical activity policies in the childcare setting are associated with higher levels of moderate to vigorous physical activity levels (Dowda et al., 2004; Bower, 2008). This was demonstrated in a study conducted by Bower (2008), which found that physical activity related policies and practices in twenty childcare centres accounted for between 40%
and 60% of the variance in physical activity behaviour. For example, policies regarding television and computer use, time allocated to free play, structured activities and amount of outdoor time, field trips, playground density (fewer children per square metre) can shape children’s physical activity or sedentary behaviours (Dowda et al., 2004; Bower, 2008; Gubbels et al., 2014). Less direct policies regarding staff training and education, recruitment and resource allocation are also salient influences on physical activity in preschoolers (Tonge et al, 2016; Dowda, Pate, Stewart, Tros, Almeida & Sirard, 2004; Bower, 2008; Colemand & Dyment, 2013; Sandseter and Sando 2016). As emerging qualitative evidence suggests that policy-based factors may contribute to the marked between-centre variability in children’s physical activity, further research is needed to explore this influence.

There is limited and somewhat conflicting evidence to suggest that a childcare centre’s economic environment may influence children’s physical activity levels. A study conducted by Dowda and colleagues (2004) concluded that children attending preschools that spend more money on physical activity resources, for example, portable play equipment, demonstrated significantly higher levels of moderate to vigorous physical activity. On the other hand, it has been suggested that childcare centres with more financial resources may be more inclined to purchase expensive electronic media, such as televisions, DVD players, and computers, which are linked with sedentary behaviours. Further, childcare centres with a higher financial status may be able to spend more on and attract teachers with higher education and provide more training, which could indirectly increase children’s participation in physical activity. These findings highlight the need for more research to confirm the potential relationship between the economic environment of a childcare centre and a child’s physical activity involvement, and the need to control for or investigate the role of socio-economic status when exploring factors relating to physical activity in the preschool setting (Bower, 2008).
2.5 Home and Familial Environment

Preschool children are very reliant on others to facilitate their behavioural choices and have limited autonomy, thus, parents are critical in influencing children’s attitudes and behaviours (Sleddens et al., 2014). For instance, parents are the gatekeepers of the home food supply and regular physical activity. Research into the way the home environment and specific parenting practices are associated with health behaviours in children has produced inconsistent findings, resulting in largely ineffective lifestyle interventions (Hesketh, Laksham & Sluijs, 2017). Inconsistent findings about the role of parents in shaping children’s health behaviours are likely due to the large diversity of instruments used to assess parenting in this respect, making it difficult to compare findings across studies.

**Food intake.** The parenting and home environment remains an important and fundamental context in which children’s eating behaviours are socialised (Vaughn et al, 2018; Reinaerts, Nooijer, Candel & Vries, 2007; Campbell & Crawford, 2001; Anzman, Rollins & Birch, 2010). Parents control most foods that enter the home, the methods of food preparation and use of food outlets or restaurants (Nicklas et al., 2001). Within the home environment, key factors that appear to have a large influence on young children’s food consumption habits include: food exposure (including availability and accessibility), parental modelling and child-parent interactions around food (Rosenkranz & Dzewaltowski, 2008; Campbell & Crawford, 2001; Anzman, Rollins & Birch, 2010).

Parents and other caregivers contribute to children’s eating habits and diet quality through physical environments by making healthful foods available in the home (Fulkerson et al., 2017) and serving them at meals and snacks. Almost 70% of calories and 80% of snacks consumed by children are eaten at home. Birch (2009) argues that early exposure to fruits and vegetables and foods high in energy, sugar and fat play an important role in establishing a hierarchy of food preferences and selection. This idea is supported by a number of studies that
suggest children are more inclined to prefer food to which they have had more exposure (Campbell & Crawford, 2001; Nicklas et al., 2001; Wyse et al., 2011). Accordingly, food availability and accessibility in the home are believed to be the most important predictors of young children’s food consumption patterns. By providing access to particular foods in the home, parents have the ability to shape the flavours that children become familiar with as they transition to an adult diet (Campbell & Crawford, 2001). Similarly, the mealtime setting is important in regard to dietary intake. For example, eating meals while watching television is associated with poorer dietary quality among youth (Fulkerson et al., 2017). Moreover, family meals in the home provide an opportunity for parents to support healthful eating through role modelling.

Parental role modelling and food availability can have a strong influence on child food consumption patterns (Reinaerts et al., 2007; Anzman et al., 2010). This is because observing others consuming healthy foods can promote children’s acceptance of these foods, particularly when the models eat enthusiastically (Anzman et al., 2010; Lanigan, 2011). Parent-child interaction within the feeding context (for example, parenting practices, styles and rules) is also important in shaping children’s preferences and intake (Birch, 2009). For example, it has been reported that parents who engage in discourse with their children regarding the nutritional reasoning of food choices can positively influence food consumption (Addessi et al., 2005; Reinaerts et al., 2007). Parenting style refers to behavioural methods (for example, permissive or authoritarian) used by parents to “maintain, modify, or control children’s behaviours” (Nicklas et al., 2001, p. 227). Parents with an authoritarian parenting style may force their children to eat particular foods through commands or instructions. This may be counterproductive, as the use of highly palatable, energy-dense foods as a reward to encourage consumption of a target food may result in a decreased preference for the target food (Reinaerts et al., 2007). On the other hand, permissive food-related parenting, that is letting the child eat
what he or she wants, can also have a negative impact on young children’s consumption of healthy foods and has been linked to increased sugar-sweetened beverage consumption (Rosenkranz & Dzewaltowski, 2008). Unfortunately, most research exploring the link between the family environment and children’s food consumption has focused on school-aged children (Anzman et al., 2010).

Finally, it is important to note how broader societal factors may shape the home environment and thus children’s food consumption (Fulkerson et al., 2017). Parental socio-economic status and education level may shape food availability in the home, for example, low socio-economic status is associated with low fruit and vegetable intake (Kristiansen et al., 2016). The increase in media use and television viewing by children has increased children’s exposure to food advertisements, which may influence children’s food preferences. The rise in dual-earner and single-parent families has likely led to reduced participation in meal planning, shopping and preparation with families increasingly opting for more energy dense convenience foods (Fulkerson et al., 2017). Further, research has shown that parents often report barriers to healthful eating due to a child’s personal characteristics, preferences and conflicts associated with food likes and dislikes (Fulkerson et al., 2017; Rosenkranz & Dzewaltoski, 2008; Campbell & Crawford, 2001).

Physical activity. Parents and the home environment are thought to play critical roles in shaping children’s socialisation, including the attitudes, beliefs and behaviours children adopt around physical activity. Nevertheless, this literature is limited in comparison to the influence of parents and the home environment on food consumption. Existing literature has found that parenting styles, practices and behaviours play an important role in shaping preschool children’s physical activity levels and are most influential when children are between the ages of 2 and 11 years (O’Connor et al., 2013; Loprinzi et al., 2013). There are a number of direct (parenting behaviours and practices) and indirect (parental beliefs, attitudes and
expectations) ways in which parents can positively or negatively influence their child’s physical activity behaviours (Loprinzi et al., 2013; Loprinzi et al., 2014). To date, literature exploring this link has been mostly qualitative (Hesketh et al, 2017); quantitative findings have been inconsistent (Hesketh et al, 2017) and have been predominantly conducted among school-aged children. The research findings of older children’s physical activity have erroneously guided research in younger cohorts, resulting in narrow studies of parental and familial characteristics that influence children’s physical activity (Hinkley et al., 2011).

The few studies that have explored parental influence on preschool children’s physical activity have identified parental support for physical activity to be a strong predictor of child physical activity behaviours in the home, through encouragement, providing transport and active participation (Hesketh et al, 2017; Trost & Loprinzi, 2011; Trost et al., 2003). However, it has also been suggested that parental support for child physical activity can be influenced by a number of mediating variables including limited access to an appropriate physical activity location, child self-efficacy, parent’s perceptions of child physical activity competence or knowledge of age appropriate activities (Hesketh et al., 2012; Trost & Loprinzi, 2011; Trost et al., 2003). Parental enjoyment and participation in physical activity are also consistently noted across the literature as being positively associated with school-aged children’s physical activity levels (Hesketh et al., 2017; Hinkley et al., 2013; 2008). This may influence children’s physical activity levels through role-modelling or parents who enjoy physical activity may be more inclined to encourage their children to engage in physical activity or participate with their children. Research also indicates that parental beliefs regarding the benefits of physical activity are equally, if not more, influential in shaping children’s activity participation than parental participation in activity (Trost et al., 2003; Kimiecik & Horn, 1996).

Parents can be limited in their ability to encourage their child’s participation in physical activity (Hesketh et al, 2017). For example, parents have reported that their employment results
in limited time and energy to facilitate their child’s physical activity. Similarly, parents have reported that they often have to juggle multiple schedules within the family, balancing this with the time and financial cost of providing active opportunities, which can limit their child’s activity. These barriers mean that parents tend to use less active modes of transport (for example, stroller or car) due to convenience and time saved (Hesketh et al., 2017).

There has been mixed evidence regarding the influence of physical home environment on children’s physical activity. Parents have reported that a sedentary home, where a television is on persistently and small yard space, as a barrier to physical activity participation. It has also been suggested that the availability of toys or equipment in the home and proximity to and affordability of recreational facilities may encourage physical activity in children (Hesketh et al., 2018). However, a review conducted by Hinkley and colleagues (2008) found that such factors do not appear to be associated with physical activity in preschool aged children. This may be due to physical activity in young children being mostly informal, therefore it may not involve much extra financial cost (Tandon et al., 2012). One such example is the incidental physical activity opportunities for families who live close to a child’s childcare centre and can use active transport (e.g. walking) to get there (Hesketh et al, 2017).

Current literature highlights that parents can influence physical activity for preschool-aged children through the provision of rules (Vaughn et al, 2013). Protective rules stem from parental concern for their child’s safety, for example, stranger danger, accidents, the safety of play equipment or traffic hazards (Hinkley et al., 2011; Hesketh et al., 2017; Hancock, Lawrence & Zubrick, 2014). It has been suggested that children living in households with many restrictive rules for physical activity have comparatively lower levels of observed activity (Vaughn et al, 2013; Sallis et al., 1993). Restrictive rules are believed to partially reflect parents’ perception of their child’s level of physical activity competence and the need for parental supervision. This is demonstrated in a qualitative study by Hesketh and colleagues
(2018), which found that parents identified safety as the most common barrier to physical activity. Further, parental restriction of screen media may influence children’s physical activity behaviour, as children have greater opportunity to be physically active relative to screen time (O’Connor et al., 2013; Loprinzi et al., 2014; de Decker et al., 2013). However, this association is weak and has been predominantly explored with children over the age of nine (O’Connor et al., 2013; Loprinzi et al., 2014; De Decker et al., 2013). Given the modest and contradicting associations between parental factors, the home environment and child PA levels found in current literature, more research is needed to further explain potential contributors.

2.6 Child Characteristics

At the individual level, a number of genetic, cognitive and personal factors can increase a child’s likelihood of participating in health behaviours (Wyse et al., 2011; Monasta et al., 2010). These factors can include knowledge, preferences, attitudes, age, ethnicity and gender (Wyse et al., 2011; Lobstein et al., 2004). Individual factors, such as knowledge, can often be the focus of interventions in young children, as these factors are more readily addressed and can produce short term outcomes (Kellou, Sandalinas, Copin & Simon, 2014). However, by applying an ecological approach, it is possible to see the way individual factors interact with broader social and environmental determinants to influence food intake and physical activity behaviours in preschool children (Dev et al., 2013).

**Food intake.** There are a number of individual factors that can influence preschool children’s dietary behaviours. At preschool age, children’s food preferences and eating behaviours are largely determined by taste and familiarity (Birch, 1999; Alles-White & Welch, 2006). Genetic predispositions related to food intake include the “unlearned, reflexive reactions to basic tastes” including the preference for sweet and salty foods, neophobic reactions to new foods and the predisposition to learn preferences by associating foods with the context and consequences of eating them (Birch, 1999 p. 41). Food neophobia tends to intensify with age,
though the response can be altered with repeated opportunities to eat the new foods (Nestle, 1998). Thus, whether or not these genetically predisposed behaviours develop into healthy or unhealthy dietary behaviours is very much determined by the child’s eating environment, strongly influenced by food availability in the home, in addition to feeding patterns facilitated by primary carers (Fulkerson et al., 2017; Birch, 1999; Hanson et al., 2005; Nemet et al., 2012; Lanigan, 2012). This indicates that it is important for healthy eating interventions to be implemented before children’s taste preferences become dominated by caloric dense foods high in fat, salt and sugar. Surprisingly, approximately 80% of healthy eating programs target school-aged children, when food preferences are predominantly already established (Hanson et al., 2005).

A child’s knowledge and understanding of the benefits of a healthy diet is another individual factor suggested to influence children’s eating behaviours (Sigman-Grant et al., 2013; Baskale & Bahar, 2011; Bannon & Schwartz, 2006; Gripshover & Markman; 2013; Cason, 2001). The first five years of life is a key period in which children are accumulating knowledge and developing skills that can shape health behaviours (Sigman-Grant et al., 2013). Research conducted with older children and adults has demonstrated small, though significant correlations between nutrition knowledge and eating behaviours, which indicates that, although not sufficient on its own, nutrition knowledge is a factor contributing to healthier food choices (Sigman-Grant et al., 2013). This was also demonstrated in a study by Lanigan (2011), which found that children who developed healthy food selection practices applied their knowledge at meal times (Lanigan, 2011). By increasing preschool children’s knowledge of the benefits of eating particular healthy foods, this may in turn increase familiarity and thus the likelihood of children trying such foods and developing preference (Nemet, 2007). To date, little research has explored the relationship between nutrition knowledge and eating behaviour in preschool children.
Research regarding the effect of gender on food intake and preferences in young children is inconsistent (Nemet, 2007). Several studies reported that food preference and eating patterns were very similar for boys and girls (Lytle et al., 2000; Perez-Rodrigo et al., 2003; Sharma et al., 2011). In contrast, other studies have reported that girls are more likely to prefer nutritious food, and boys are more likely to prefer fatty and sugary foods, meat and processed meat (Nemet et al., 2007; Nemet et al., 2012; Rodenburg et al., 2013; Cooke & Wardle, 2005). This may be related to gender differences later in the lifespan where sensory preferences for sweet foods decline with age, at a faster rate for females (Nestle et al., 1989).

**Physical activity.** Individual factors such as age, gender, knowledge, preference, enjoyment, self-efficacy, mobility skills and media use influence preschool children’s participation in physical activity (Davison & Birch, 2001; Nemet et al., 2012; Nemet, 2007; Rodenburg et al., 2013; Gomes et al., 2014; Hesketh et al., 2017; 2017; Tonge et al, 2016; Copeland et al., 2016). Tonge and others (2016) conducted a systematic review of the correlates of preschool children’s physical activity behaviours and found that the most frequent individual correlate reported was gender and age, with boys being more physically active than girls and older children more active than younger children. These findings may be related to children’s motor coordination, which improves with age (Tonge et al., 2016; Hinkley et al., 2008; Nemet et al., 2012; Nemet, 2007; Rodenburg et al., 2013). It has also been suggested that children who are overweight may find sedentary behaviours more reinforcing than active pursuits, thus children with a higher Body Mass Index (BMI) are more inclined to select sedentary behaviours over more active forms of play (Trost et al., 2003). Television viewing and other media use have also been linked with physical activity levels in preschool children (Hinkley et al., 2008; 2010). However, the direction of this relationship is uncertain, as physical activity can be prohibitive for obese children, thus resulting in excessive media use.
A young child’s preference for active or sedentary activities is a key proximal indicator of a child’s physical activity behaviour (Kellou et al., 2014; Irwin et al., 2003). Parents’ ability to facilitate regular physical activity in their children has been found to be a greater challenge for those with children who prefer more sedentary activities (Irwin et al., 2005). Encouraging a child to enjoy active play is often a key objective of physical activity interventions, as children are more likely to participate in physical activities for reasons of fun and enjoyment (Noonan et al., 2016; Kellou et al., 2014). When a child participates in an activity that they enjoy, they are more likely to experience increased sense of emotional well-being, happiness and security (Howard et al., 2013; King et al., 2014). Children have their own perception of enjoyable play, which in most instances differs from adults’ perceptions of what enjoyable play is to children (Howard et al., 2013). Thus, there is a need to gain a child’s account of their own physical activity preferences in order to inform strategies to make physical play more enjoyable to them, this may encourage participation and help to encourage a positive relationship with physical activity.

Knowledge of the health benefits of physical activity has also been found to act as a predictor of physical activity participation for school-aged children, particularly in boys (Kellou et al., 2014; Dilorenzo et al., 1998). Further, children who are able to identify healthy activities are more likely to apply this knowledge and select activities that promote their body’s health (Camissa et al, 2011; Hesketh et al, 2017). Evidence suggests that self-efficacy for physical activity (defined as a personal rating of how good they are at various activities compared to other children of the same age and sex) can influence physical activity participation for school-aged boys (Dilorenzo et al., 1998). This finding was replicated more recently by Maata and colleagues (2014), who found that perceived competence of physical activity ability influenced PA levels for school-aged children. Given the potential ongoing influence of young children’s self-efficacy, knowledge and preference for physical activity, further research is needed to
determine whether these variables are influential at preschool age and how various levels of the socio-ecological model can interact with and influence such factors.

Though it is well established in the literature that the individual and contextual conditions in which children live exert a strong influence over their health and health behaviours, we do not know how children’s experience of these conditions of daily life shape their perspectives of health behaviours (Irwin et al., 2006). As research has shown that children’s health behaviours are, to some extent, an expression of factors within their environment, it can be expected that children’s knowledge, understanding and preferences will also influence their health behaviours. There remains a scarcity of research focusing on children and the contexts in which they live and how these influence their perspectives and preferences for health behaviours.

2.7 Preschool Children’s Lifestyle Knowledge and the Link to Behaviour

“A person’s early conception of health is mirrored over time in attitudes and patterns of health behavior”. (Almqvist, Hellnas, Stefansson & Granlund, 2006, p. 275)

Early childhood is a life stage during which an individual gradually develops an understanding of complex concepts. A child’s knowledge of health relates to the systems of cognitive understandings of health-related concepts and mechanisms, including health causality (Tinsley, 1992). The concept of health has evolved to be understood as a multi-dimensional, dynamic state of wellbeing (Bircher, 2005). How children understand and speak about health has implications for how they will act to promote health and manage risks to their health over time (Whitaker et al., 1997; Tinsley, 2003; Trudeau et al., 2004; Telama et al., 2005; Telama, 2009; Biro and Wien 2010; Craigie et al., 2011; Waters et al., 2011; Barton, 2012; Taltow-Golden et al., 2013). Understanding a child’s knowledge of health and lifestyle behaviours has the potential to inform and improve the design of programs to promote positive health
behaviours in preschool children (Mobley, 1996). Literature has indicated that during the early years of life, children develop health attitudes and patterns of health behaviours, culminating in later childhood and adult health status (Tinsley, 2003; Lanigan, 2011). Although early childhood has been identified as an important period for behavioural development, contextual factors shaping health knowledge in young children remains an under-researched area (Lanigan, 2010; Irwin et al., 2006).

Although contextual realities may limit the application of health knowledge by preschoolers, as children begin to gain independence, they will operationalise knowledge into what they perceive to be appropriate health behaviours (Irwin et al., 2006). Nguyen and colleagues (2011) demonstrated the link between knowledge and health behaviours by examining associations between theoretical and applied health knowledge regarding vegetables, fatty foods, physical activities, and sedentary activities in four-year-old children. Results indicated that children's theoretical and applied health knowledge were positively associated, showing that children who could accurately identify the relative healthiness of foods and activities were more likely to select foods and activities that promote health (Nguyen, Gordon, & McCullough, 2011). Similarly, Kostanjevec and colleagues (2013) attempted to determine whether eating habits were connected to nutrition knowledge for children aged 7 to 11 years. Results demonstrated that children with better nutrition knowledge had healthier eating habits and a more positive attitude towards them than children with poor nutrition knowledge (Kostanjevec et al., 2013).

Although physical activity has been identified as a key behaviour in the promotion of healthy lifestyle, very little is known about preschool children’s understanding of physical activity (Cammisa et al., 2011; Irwin et al., 2006). To date, research has focused on environmental or parental influences on children’s participation in physical activity, rather than children’s understanding of the benefits of physical activity and has predominantly included
children over the age of 7 years (DiLorenzo et al., 1998; Dempsey et al., 1993; Trost et al., 2001; Tucker 2006). Research conducted with older children has found that children’s understanding of physical activity is linked to increasingly active lifestyle behaviours, particularly in boys (DiLorenzo, Stucky-Ropp, Vander Wal, & Gotham, 1998). Furthermore, given the potential ongoing influence of children’s knowledge of nutrition and physical activity throughout their lives, it is important to identify knowledge gaps or misperceptions that may exist at this age, and to establish effective ways to improve this knowledge and understanding. While knowledge alone is not a strong predictor of health behaviours, understanding children’s knowledge of health related behaviours is important as it is easier to establish positive health attitudes than alter negative health behaviour and attitudes in later life (Piko & Bak, 2006).

Previous research has shown that young children can understand complex information if it is presented in appropriate ways, with children as young as 3 years demonstrating the ability to construct understandings of health from their experiences, parents and caregivers, and from the media (Cammisa et al., 2011). Existing research presents mixed findings regarding children's understanding of health and what they consider to be health behaviours. Much of this research has focused on children’s conceptions of illness, or has targeted children aged 7 to 12 years (Irwin et al., 2007; Natapoff, 1982; Normandeau et al., 1998; Piko and Bak, 2006). A number of studies have explored preschool children’s knowledge and understanding of specific health behaviours, for example, food and exercise (Anthamattan et al., 2012; Harrison et al, 2015; Matheson et al., 2002; Macdonald et al., 2005; Pearce et al., 2009; Protudjer et al., 2010; Schultz and Danford, 2016). Interestingly, research that has looked broadly at this population’s understanding of health has found that children know the least about the relationship between food consumption, exercise and their health, and the most about beneficial and harmful practices in the areas of safety and hygiene (Mobley 1996; Olvera-Ezzel et al., 1994). Preschool
children have also been found to view health as being able to participate in desired activities, being engaged and feeling good (Almqvist et al., 2006).

Existing literature suggests that a child’s understanding of, and attitudes toward, health behaviours are usually conceptualised in one of two ways (Tinsley, 2003). The first concept is applied in most research regarding children’s perspectives of health and is called the Piagetian perspective. This perspective suggests that children’s understanding of health behaviours aligns with their age and level of cognitive development, becoming more concrete and comprehensive with age (Almqvist et al., 2006; Tinsley, 2003). According to this perspective, children under the age of 7 years do not develop the cognitive ability to link health and illness, or to link certain behaviours to certain outcomes. However, Piagetian theory has been rejected by several researchers (Alqmvist et al., 2006; Tinsley, 2003; Cammisa et al., 2011; Irwin et al., 2006) due to emerging evidence that children as young as 3 years are able to understand health concepts and consequences of their behavior (Almqvist et al., 2006; Cammisa et al., 2011; Irwin et al., 2006; Lanigan, 2011; Mobley, 1996; Olvera-Ezzell et al., 1994). Thus, it can be suggested that young children’s understanding of health can be developed through interactions between cognitive, personal and environmental characteristics, rather than cognitive development in isolation (Tinsley, 2003, Almqvist et al., 2006).

The second concept relates to ‘individual differences’ in children’s understanding of health-related behaviours. The Individual Differences Perspective suggests that a child’s developmental acquisition of health-related attitudes is mediated by early and sustained exposure to a variety of personal, demographic and social environmental influences (Tinsley, 2003). A study conducted by Normandeau and colleagues (1988) assessed the influence these concepts, by exploring age-related changes in school-aged children’s conception of health behaviours within the context of their daily experiences. Findings confirmed that a child’s
conception of health results from the interplay between experiences and structural changes in
cognitive development.

The literature on children’s understanding of health needs to be interpreted within the
context of its limitations. Much of this research was conducted over a decade ago, with little
recent evidence to show how children’s understanding of health has shifted alongside societal
changes (Almqvist et al., 2006; Mobley, 1996). The field of child health has changed
dramatically in recent years resulting in new healthy eating and active play policies and
interventions to promote health behaviours within childcare settings (Sansilios, Egberg &
Mikkelsen, 2011; Woldenden et al, 2011). Children are increasingly exposed to a variety of
public health messages through media advertisements, education and promotion posters, which
collectively shape a child’s understanding of how to be healthy (Burrows & McCormack, 2014;
Woldenden et al, 2011). Exploring how preschool children speak about health and health
promoting behaviours may offer insight into how children understand health, and thus help to
explain what children make of health messages in their ever-changing environments. In turn,
this knowledge may help to facilitate communication between children, parents and educators.

2.8 Preschool Children’s Lifestyle Preferences and the Link to Behaviours

Food preferences are arguably the most important predictor of young children's food
selection and consumption (Anliker et al., 1991; Desor, Maller, & Andrews, 1975; Desor,
Maller, & Turner, 1977; Mennella, Pepino, & Beauchamp, 2003). It has been suggested that
children’s preferences for particular foods influence consumption more than parental intake or
parental attitudes to child feeding (Mennella, Pepino, & Beauchamp, 2003). Evidence of the
link between children’s food preferences and eating behaviours has been mounting over the last
two decades. Generally, literature highlights the centrality of biological factors in shaping
children’s acquisition of food preferences (Russell, Worsley & Campbell, 2015). That is,
children are born with predispositions for food preferences, such as a preference for sweet
tasting foods or rejection of bitter tasting foods and potentially with varied capacities to ‘taste’ (Anliker et al., 1991; Desor, Maller, & Andrews, 1975; Desor, Maller, & Turner, 1977; Mennella, Pepino, & Beauchamp, 2003; Steiner, 1979). Nonetheless, these biological predispositions are modifiable with experience (Mennella, Jagnow, & Beauchamp, 2001). Parents, via their choice of feeding behaviours, have a critical influence on the development of children's food preferences (Birch, 2002; Birch & Marlin, 1982; Mitchell et al., 2013; Wardle, Cooke et al., 2003; Wardle, Herrera, Cooke, & Gibson, 2003). However, despite the evidence of the importance of food preferences in predicting child eating behaviour, very few studies have examined children’s reports of their own food preferences, with much literature reliant on parents’ reports of child food preferences.

In comparison to food preferences, limited research has investigated the role of preschool children’s activity preferences and how these can influence behaviour. While the socio-ecological theory acknowledges that contextual and situational factors play important roles in shaping activity preferences, for young children, participation in activities that are enjoyable is essential for a physically active lifestyle (Boonpleng et al., 2013; Decker et al., 2013; Doherty & Hughes, 2009). As activity preferences are related to behaviour and have the potential to be changed, research to improve our understanding of the development of such preferences in children is warranted. Very few studies have quantitatively measured the impact of activity preferences in children on their physical activity participation, with literature in this area being predominantly qualitative.

The qualitative literature suggests that, contrary to the assumption that children are naturally active, parents are now reporting that their child’s preference for more sedentary activities is making it difficult for them to encourage their child to engage in physical activity (Hesketh et al., 2017). Parents and carers have also stated that children generally prefer engaging with electronic media over more active pursuits (Noonan et al., 2016).
have a cyclic effect throughout life, as parents report that their activity behaviours and preferences impact their preschoolers; if parents enjoyed physical activity, they pass that enjoyment on to their preschoolers, with the reverse being equally true (Hesketh et al., 2017; Irwin et al, 2005).

Encouraging a child to favour and enjoy active play is often a key objective of physical activity interventions, as children are more likely to participate in physical activities for reasons of fun and enjoyment (Hesketh et al., 2017; Irwin et al, 2005). As discussed in the section above regarding the impact of child characteristics on physical activity, enjoyment is a key factor that shapes engagement in and preference for physical activity. However, due to the lack of research in this area, further research is needed to understand children’s own definition of enjoyable play.

2.9 Researching Lifestyle Behaviours of Preschool Children

A great deal of scholarly work has examined the way individual and environmental factors relate to children’s lifestyle behaviours, particularly with respect to diet and physical activity (Anthamatten, Shao-Chang Wee & Korris, 2012). However, this research has tended to have ‘adult-centric’ approach, with few studies attempting to incorporate the views and perspectives of children regarding their environment and how that relates to their health behaviour (Anthamatten et al., 2012; Pearce et al., 2009). A common agreement across the literature is that young children have limited control of their own lifestyle behaviours. As Anthamatten and others write:

“Children’s choices are, for the most, determined by features of the adult-framed environment encompassing diet, physical activity and culture” (Anthamatten, Shao-Chang Wee & Korris, 2012, p. 2).

The emergence of participatory research has allowed for a shift in how health behavioural research is conducted with young children. Participatory research allows us to
understand children’s perspectives regarding health-related behaviours, behaviour preferences and factors that enable or discourage these behaviours and preferences (Anthamatten et al., 2012; Pearce et al., 2009). Without an understanding of how children think about these healthful lifestyle components parents and educators cannot communicate effectively. Gaining a child-centric view of the individual and environmental determinants of diet and PA may help in the development and delivery of health education and interventions, to ensure that information presented to children is relevant and beneficial (Alexander et al., 2014).

2.10 Conclusion

In summary, the literature review highlighted that there is a scarcity of research focusing on preschool children’s knowledge and understandings of lifestyle behaviours and how the contexts in which they live influence these perspectives, particularly in regard to physical activity. The review also overviewed the role of preference in shaping children’s lifestyle behaviours and how preferences are influenced by contextual and environmental factors. The review identified that researchers need to incorporate the views and perspective of children about how they understand health and health behaviours, and their own reports of factors contributing to their preference for PA and nutrition. This understanding may have the potential to inform and improve the design of health information for young children and may enhance communication about health topics among parents, educators and children (Mobley, 1996).
3.1 Introduction

The literature review presented in Chapter 2 highlighted gaps in the current knowledge of children’s knowledge and preferences for food and physical activity, how these factors are shaped by the broader environment, and how they influence health behaviour. Therefore, the aim of the current program of research is to examine the role of individual and contextual factors shaping preschool children’s knowledge of and preference for lifestyle behaviours. To achieve this aim, the thesis will be structured as a series of discrete studies, guided by Bronfenbrenner’s ecological systems theory (Bronfenbrenner, 1979; 1989). This chapter will first overview the study population, current approaches to conducting research with children and an explanation of the methodological approach of the current research. This will be followed by an explanation of how the proposed studies will work collectively to achieve the stated aim of the research. The chapter will go on to outline each study including the study rationale, objectives and methods.

3.2 Research Aim:

To examine the individual and contextual factors shaping preschool children’s knowledge of and preference for healthy lifestyle behaviours. This aim is supported by six research objectives outlined in Table 3.1.
<table>
<thead>
<tr>
<th>Study</th>
<th>Objective</th>
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<tr>
<td>Study 1</td>
<td>• To identify and review data collection techniques used to effectively measure preschool children's knowledge of food and nutrition</td>
</tr>
<tr>
<td>Study 2</td>
<td>• To identify and review data collection techniques used to effectively measure preschool children's knowledge of and preference for physical activity</td>
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<tr>
<td>Study 3</td>
<td>• To assess the reliability and validity of an adapted computerized (iPad) version of the photo-pair food and exercise questionnaire (Pre-PFQ).</td>
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</table>
| Study 4 | • To explore how preschool aged children speak about health and health behaviours  
• To examine the influence of age and gender on preschool aged children’s self-reported understanding of health and health behaviours. |
| Study 5 | • To explore preschool children’s activity preferences and identify what children consider to be barriers or facilitators to participating in their preferred activity |
| Study 6 | • To examine the influence of demographic factors and parental physical activity behaviours on children's physical activity knowledge and preferences  
• To examine the influence of preschool children’s knowledge of and preference for physical activity on their participation in physical activity and sedentary behaviours |
3.3 Study Population and Setting

The study of preschool children has been identified as important to the field of public health for the following reasons. First, childhood is now perceived as a critical period in the overall development of the individual for the acquisition of health understandings and behaviours (Lanigan, 2011; Little, 2017). Gaining an understanding of factors influencing health behaviours in young children is key to designing effective interventions and education programs that can enable children to live their best life. Literature indicates that, in addition to child characteristics, both the home and childcare contexts are particularly influential in shaping preschool children’s health and lifestyle behaviours. This is because, next to parents and the home environment, preschool attendance represents the most substantial amount of children’s time (Boonpleng et al., 2013; Gubbels et al., 2014; Decker et al., 2013; Larson et al., 2011). Further, the landscape of childcare in the developed world has changed dramatically over the last two decades, with the vast majority of children now attending some form of childcare during their preschool years (Hardy et al., 2010). As more and more children are spending a larger portion of their time in the childcare setting, this presents an opportunity to conduct research within the childcare context.

When conducting research with children, it is important to consider how the research context may affect what children talk about (Fargas-Malet et al., 2010). All data collected from preschool children for this program of research was collected in the childcare environment. In an institutional setting, such as the childcare setting, there is a risk that children may interpret participation in the research as ‘school work’, and thus perceive the researcher in an ‘educator’ role (Fargas-Malet et al., 2010). Therefore, children may be inclined to reproduce the ‘official discourse’ of the institution or feel pressured to give the ‘correct’ answer to the research questions (Fargas-Malet et al., 2010). To minimise the risk of social desirability bias in this
research, interviews were conducted in an informal area of the daycare centre (e.g. the art and activities area of the classroom). Participants were also reassured that there were no ‘right’ or ‘wrong’ answers to the research questions.

**Appropriateness of data collection techniques and methods.** When conducting research with young children it is important to recognise possible complexities and challenges, for example vocabulary problems, limited attention spans and non-responses (Fargas-Malet et al., 2010). The included studies attempted to address these problems through the use of innovative, interactive data collection techniques and by limiting the time required of each participant. Research involving children and young people raises particular ethical concerns about their capacity to understand what the research entails (NHMRC, 2014). Ethical approval for each of the studies was obtained through Griffith University Human Research Ethics Committee.

### 3.4 Research Paradigm

This research was underpinned by the pragmatic paradigm. This research paradigm emphasises practicality, the primary importance of the research question itself, and the use of multiple complementary research methods (Creswell & Clark, 2007). Pragmatism is a deconstructive paradigm that advocates the use of mixed, complementary methods in research, recognises that every method has its limitations and focuses instead on ‘what works’ regarding the research questions under investigation. This paradigm frees a researcher from choosing between positivist and constructivist research assumptions (Creswell & Clark, 2007), which provides flexibility to select the most suitable research design and methods to address the research objective. The pragmatic paradigm fits the current research because it frames the application of a mixed methods approach where the researcher collects, analyses, and integrates both quantitative and qualitative data in a single study or in multiple studies in a sustained program of inquiry (Creswell, 2009; Creswell, Shope, Plano Clark, & Green, 2006;
Sandelowski, 2000). The use qualitative and quantitative methods facilitated a deeper exploration of the socio-ecological factors shaping preschool children knowledge of and preference for food and physical activity.

3.5 Research Design

A mixed method approach was used for this program of research, this enabled a more comprehensive investigation of children’s understandings regarding health behaviours (Creswell & Clark, 2007; Kirby, 2001; Sandelowski, 2000). Using a combination of methods enables triangulation of the findings, which allows the researcher to draw stronger and more reliable conclusions. Moreover, each approach, qualitative and quantitative, complements each other and in this way helps to overcome deficiencies of particular methods (Creswell & Clark, 2007; Haas, 1999). With respect to the current research, each study used quantitative, qualitative or mixed methods to allow a comprehensive understanding of how children understand and prefer health behaviours. Such approaches will allow for a more holistic view that has been lacking in existing literature.

This thesis comprises six studies; two systematic reviews of the literature (Study 1 and 2), a validation study (Study 3), two explorative qualitative studies (Study 4 and 5) and a quantitative study (Study 6). The relationship between the six studies is presented in Figure 3.1.
Study 1: A systematic review of literature  
RQ1: What data collection techniques have been used to effectively measure preschool children's knowledge of food and nutrition?  
Chapter 4: Manuscript 1

Study 2: A systematic review of literature  
RQ2: What data collection techniques have been used to effectively measure preschool children's knowledge of and preference for physical activity?  
Chapter 5: Manuscript 2

Study 3: A Validation study  
RQ3: Is the Pre-FPQ a valid and reliable data collection technique?  
Chapter 6: Manuscript 3

Study 4: A qualitative study  
Child interviews  
RQ4: How do children understand health and health promoting behaviours?  
RQ5: To examine the influence of age and gender on preschool aged children’s self-reported understanding of health and health behaviours.  
Chapter 7: Manuscript 4

Study 5: A qualitative study  
Visual methods  
RQ8: What are preschool children’s preferred activities?  
RQ9: What do preschool children consider to be barriers or facilitators to participation in their preferred activity?  
Chapter 8: Manuscript 5

Study 6: A quantitative study  
Parent-child dyads survey/Pre-FPQ  
RQ6: How do demographic factors and physical activity parenting practices relate to children’s knowledge of, and preference for physical activity?  
RQ7: How does children’s knowledge of and preference for physical activity relate to their participation in physical activity and sedentary behaviours?  
Chapter 9: Manuscript 6

Figure 3.1 Relationship between studies
3.6 Structure of Research

Study 1 and two are systematic reviews of data collection techniques used to assess preschool children’s knowledge of healthy eating and knowledge of and preference for physical activity. These systematic reviews provided a basis for understanding how preschool children’s knowledge of food and knowledge and preference for physical activity have been evaluated to date. Results of the Study 1 and two indicated the need for a valid and reliable means to assess these variables in preschool children. Therefore, Study 3 included a methodological paper which assessed the reliability and validity of an adapted computerised questionnaire to assess food and exercise knowledge and preferences in preschool children. As part of Study 3, preschool children were asked a series of open-ended questions regarding health and health behaviours. This formed the data for Study 4, which explored how children understand health and health behaviours. Studies three and four assisted in the development of studies five and six by identifying environmental and social factors that may influence children’s understanding of and preference for physical activity. From children’s responses in studies three and four, it was evident that children placed considerable emphasis on safety as a health promoting behaviour, further, this emphasis had a confounding effect on children’s answers in regards to their preference for active play and their understanding of the importance of physical activity.

Study 5 followed on from the findings of studies three and four to gain more detailed insight into activities preschool children prefer and what they consider to be barriers and facilitators to participating in their preferred activity. Finally, Study 6 built on the findings of Study 5. Study 6 quantitatively examined the relationship between demographic factors, physical activity parenting practices and children’s physical activity knowledge, preference and subsequent behaviours. The next subsections provide a brief description of the studies and methods used for data collection and analysis.
**Study 1.** Systematic literature reviews gained recognition in research, policy and practice due to the well-organised approach and application of robust scientific methods to synthesise evidence and answer a focused question (Baker, Costello, Dobbins, & Waters, 2014). It aims to comprehensively identify relevant studies, evaluate studies against inclusion and exclusion criteria, assess risk of bias, and summarise and interpret the findings of all relevant individual studies on the topic under investigation (Baker et al., 2014). Systematic literature reviews help to identify gaps in the literature that could be used as a guide for future research (Petticrew & Roberts, 2008). Therefore, the first two studies in this program of research included systematic reviews. Study 1 was a systematic review to identify the techniques being used to effectively measure 3- to 5-year-old children’s knowledge of food and nutrition. The purpose of the review was to examine how these techniques align with accepted methods for assessing young children, including the methodological concerns of validity and reliability, and provide recommendations for the future use and development of these techniques.

**Methods.** This review was conducted in accordance with the Preferred Reported Items for Systematic Reviews and Meta-Analyses (PRISMA) statement checklist. For the purpose of this review, preschool children were defined as children aged 3 to 5 years. Food and nutrition knowledge was defined as “the ability of children to identify foods particularly high in certain nutrients and relate basic nutrients to their own development toward adulthood.” Studies that included the evaluation of preschool children’s ability to identify foods, food origins, and food transformations were also included. Articles for this review were sourced from seven online databases: CINAHL, MEDLINE, PsycINFO, ScienceDirect, PubMed, ProQuest, and ERIC. Searches for MeSH headings and key words were conducted to identify publications for inclusion using combinations of the following terms: nutrition, health*, knowledge, diet, food, child*, early childhood, preschool*, 3- to 5-year-old, health knowledge, attitudes, and practice,
evaluation, intervention, techniques, assess*, and methods. Titles and abstracts were scanned for relevancy. In addition, forward citation searching was undertaken on the reference lists of articles considered for review. Further methodological details are provided in Chapter 4.

**Study 2.** Study two is a systematic review of the literature which aimed to identify the techniques being used to effectively measure 3- to 5-year-old children’s knowledge of and preference for physical activity. The purpose of the review was to examine how existing data collection techniques align with accepted methods for assessing young children, including the methodological concerns of validity and reliability, and included recommendations for the future use and development of these techniques.

**Methods.** The review was conducted in accordance with the PRISMA statement checklist. For the purpose of the review, physical activity knowledge was defined as the ability to distinguish between sedentary and active activities and to identify the need to be physically active to promote health. Physical activity preference was defined as a child’s likes and dislikes of organised and unorganised activities, also related to relative liking of one type of activity more than the other. Articles were sourced from eight online databases including: ProQuest, CINAHL, Embase, Scopus, ERIC, PubMed, MEDLINE and ScienceDirect. The search was conducted during the first three weeks of October, 2017, using the following key words to identify publications for inclusion: preschool*, kindergarten, early childhood, child*; physical activity, exercise, sport; knowledge, understanding, preference*, data collection, technique, measurement, assessment, evaluation and health. The search was limited to articles in English language and published between 1980 and 2017. The authors scanned titles and abstracts for relevancy. Reference lists of selected articles were also reviewed. Further methodological details are provided in Chapter 5.
Study 3. Results of Study 1 and Study 2 indicated the need for a valid and reliable means to assess lifestyle knowledge and preferences in preschool children. Therefore, Study 3 included a methodological paper which aimed to assess the reliability and validity of an adapted computerised (iPad) version of the PPFEQ called the Pre-FPQ (preschool food and play questionnaire).

Methods. Study 3 involved four phases of investigation:

Phase 1: Adaptation of Pre-FPQ
Phase 2: Test Reliability
Phase 3: Preference validity testing
Phase 4: Knowledge Validity testing

Interviews were conducted at the participating childcare centres and took approximately 10 minutes at each time point with each child. The design of this study was guided by the one used to evaluate the paper-based PPFEQ, as well as additional research evaluating the comparative reliability of questionnaires administered in both paper-based and computer/iPad modalities. The adapted iPad based questionnaire is titled the Preschool Food and Play Questionnaire (Pre-FPQ). Participants were recruited using convenience sampling at daycare centres located in Gold Coast, Australia. Parental consent was obtained for all children who participated in the study. To be eligible for inclusion in the study, participants had to be aged between 3 and 6 years at the beginning of the study. The sample size was determined using two sample-size calculations to assess both the validity and reliability of the Pre-FPQ.

This study protocol was approved by the Griffith University Human Research Ethics Committee (MED/32/15/HREC). An information sheet and introductory letter to invite participants/children to participate in the study is included in Appendix 1. Further methodological details are provided Appendix 2 and in Chapter 6.
**Study 4.** As part of Study 3, preschool children were asked a series of open-ended questions regarding health and health behaviours. This provided the data for Study 4, which explored how children understand health and health behaviours. Exploring how preschool children speak about health and health promoting behaviours will help to explain what children make of health messages in their environments, and may help to facilitate communication between children, parents, and educators. The objective of Study 4 was to explore how children understand health and health promoting behaviours, and to explore the influence of age and gender on children’s self-reported understanding of health and health behaviours.

**Methods.** Convenience sampling was used to recruit 163 preschool children aged 3 to 5 years, from South East Queensland, Australia. This qualitative study was part of a larger intervention study conducted to evaluate the Get Up and Grow healthy lifestyle program for preschool children and data used to evaluate the Pre-FPQ in Study 3 (Wiseman, Harris & Lee, 2016). To gain an understanding of how preschool children speak about health and health behaviours, semi-structured interviews were conducted with each participant individually. The interviews took approximately 10 minutes with each child and were conducted by a researcher within hearing distance of classroom educators. The researcher conducting interviews followed a set protocol with each participating child. Prior to commencing the interviews, each participant was asked verbally if he/she would like to participate. Interviews were structured with two open-ended questions. The questions used were drawn from a previous study conducted by Calfas and colleagues (1991). First, each child was asked ‘Can you tell me what healthy means?’ After responding, the participant was then provided with an age-appropriate explanation, ‘Being healthy means that you can play outside, you don’t get sick and you feel good’. The participant was then asked ‘Can you tell me some things that you might do to be healthy?’ Further methodological details are provided in Chapter 7.
This study protocol was approved by the Griffith University Human Research Ethics Committee (MED/32/15/HREC). Further methodological details are provided in Chapter 7.

**Study 5.** Study 5 was informed by the results of studies three and four. From children’s responses in these prior studies, it was evident that children placed considerable emphasis on safety as a health promoting behaviour, which had a confounding effect on children’s self-reported preference for active play and understanding of the importance of physical activity. The purpose of Study 5 was to gain preschool children’s account of what activities they prefer and their perspective on what they consider to be barriers and facilitators to participating in their preferred activity. This understanding will allow parents and educators to make physical play more enjoyable to their children, which may encourage participation and a more positive relationship with physical activity.

**Methods.** Study 5 employed a cross-sectional design. Data collection was completed over a two-week period in December, 2017. Participants were recruited using convenience sampling and included 40 children, aged 3 to 5 years attending childcare centres located on the Gold Coast, Australia. Data collection included child semi-structured interviews. The interviews were conducted two at a time by two researchers, with one researcher sitting with one child each. Both the child-researcher dyads were seated at the same table to ensure participants had a peer nearby so that they would feel comfortable, but far enough from each other to prevent children copying from each other. The interviews were conducted in a quiet part of the classroom monitored by the childcare room educator at the participating childcare centre and took approximately 20 to 30 minutes (including the drawing task). Interviews were conducted using an interview guide to ensure that the most central issues of inquiry were covered with all participants, while still keeping an open mind and appreciating the children’s own initiative for telling stories that they were eager to communicate. The questions were asked while the child was drawing so that the activity was not perceived to be an interview-testing
situation. The interview questions used were drawn from a study conducted in Europe by Cammisa and colleagues (2011). While at the childcare centre, two field researchers compiled general field notes regarding the physical activity environment of the childcare centre. These notes related to observed activities at the centre, available equipment (fixed, portable, electronic), the indoor and outdoor space, and the social environment (for example, rules or encouragement for physical play). The notes were used to assess whether any environmental variables aligned with children’s drawings. Further methodological details are provided in Chapter 8.

This study protocol was approved by the Griffith University Human Research Ethics Committee (2017/944). An information sheet and introductory letter to invite participants/children to participate in the study is included in Appendix 3. The interview protocol is included in Appendix 4. Further methodological details are provided in Chapter 8.

**Study 6.** Study 6 was informed by the results of studies three, four and five and aimed to further explore the emphasis children had placed on safety as a health promoting behaviour. A recent systematic review conducted by Hesketh and colleagues (2017) identified safety concerns of parents as a central and consistent barrier to physical activity participation of young children. A number of studies in the review reported that parents were worried that a physically active child could hurt themselves and were therefore likely to limit their child's activity (Hesketh et al, 2017). Further, children reported that adults' fears in relation to their safety and their health limited their activity levels (Camissa et al, 2011). Despite safety being a consistent and plausible determinant of young children's activity behaviours, the impact of restrictive parenting behaviours has rarely been explored in the quantitative literature (Hesketh et al., 2017).

Study 6 sought to address this gap in the literature by examining the link between preschool children’s knowledge and preference for physical activity and matching this with
parental data regarding restrictive and supportive physical activity parenting practices. Physical activity parenting practices refers to the behaviours or actions (intentional or unintentional) performed by parents for child rearing purposes that influence their children's attitudes, behaviours, or beliefs around physical activity (Vaughn et al., 2018). The study also builds on existing literature regarding the relationship between children’s physical activity knowledge and preferences and how this links to children’s activity and sedentary behaviour. This understanding may lead to development of more targeted interventions to address declining physical activity participation in young children.

Methods. Study 6 followed a cross-sectional design and comprised two components of data collection. The first component of data collection included a parental questionnaire. The questionnaire included demographic questions, questions regarding their child’s physical activity/sedentary behaviours and parenting practices thought to influence children’s physical activity and inactivity (screen time behaviours). The questionnaire was validated in a study conducted by Vaughn and colleagues (2013) and measured 14 parent practices used to either control (6) or support (9) children’s physical activity or screen time. This included questions regarding: the physical home environment, controlling parenting practices (such as rules around indoor and outdoor active play and screen time) and supportive practices (such as the encouragement and praise of physical activity).

The second component of data collection included child interviews. Upon return of parental questionnaire/consent forms, children were asked to complete the Pre-FPQ. The Pre-FPQ is a validated iPad activity that measures preschool children’s knowledge of and preference for physical activity. Child interviews were 5 to 10 minutes in duration and conducted in the free play area, which was visible to childcare educators. Results of the parent and child questionnaires were matched to determine any association between parental practices
related to physical activity and preschool children’s knowledge and preference of physical activity, and physical activity behaviours.

One-hundred and thirty-eight parent-child dyads were recruited using convenience sampling from 19 childcare centres across North Eastern New South Wales and South East Queensland, Australia. Only children aged between three and five years were included in the study. The required sample size was based on previous knowledge of the expected effect size of independent variables to detect an effect size ($f^2$) of 0.08 with an alpha error of 0.05 and a power of 80%. Further methodological details are provided in Chapter 9.

This study protocol was approved by the Griffith University Human Research Ethics Committee (2016/628). An information sheet and introductory letter to invite participants/children to participate in the study is included in Appendix 5. The parental questionnaire is included in Appendix 5. Further methodological details are provided in Chapter 9.

3.7 Conclusion

This chapter outlined the research methodology and methods of this thesis. First, the pragmatic research paradigm was identified as the most appropriate paradigm to frame the overall research. This moved into an explanation of the overall research design, which outlined the aims and design of each of the six studies that make up this body of research. In addition, the methods used to collect and analyse data for each study were described. The following six chapters present findings from each study, which are presented in a journal article format. All manuscripts have been either accepted in international peer-reviewed journals, submitted for review or are under review. Each manuscript has been written in accordance with specific journal style requirements, including reference style and spelling.
Chapter 4: Techniques Used to Measure Preschool Children’s Knowledge of Food and Nutrition

4.1 Study 1- A Systematic Review of the Literature (Manuscript 1)

Reader’s Note. The information in this section has been published as an original research paper in a peer-reviewed journal: Journal of Nutrition Education and Behavior


Reference
The co-authors of this publication confirm that the research candidate has made the following contributions to this manuscript:

- Developed the study design;
- Performed data search and article selection against inclusion and exclusion criteria;
- Participated in critical appraisal of articles;
- Participated in performing quality assessment;
- Prepared manuscript for submission to the journal

Signed: Date: 28/06/18
4.2 Abstract

Objective: To identify and review data collection techniques used to measure preschool children’s knowledge of food and nutrition.

Design: A systematic review of published research guided by the Preferred Reported Items for Systematic Reviews and Meta-analyses statement.

Participants: Published journal articles between 1980 and 2013 reporting research involving the measurement of preschool children’s (aged 3–5 years) knowledge of food and nutrition.

Results: Twenty studies were eligible for inclusion. The studies reported the use of a range of innovative age-appropriate techniques to assess children’s knowledge of food and nutrition. Data collection techniques were grouped under 3 broad approaches: (1) interviews, (2) use of stimulus material and prompts, and (3) structured play-based activities. Only 3 of the reviewed studies tested for both reliability (test-retest and internal consistency) and face and content validity. Only 9 of the reviewed studies reported pilot-testing their instruments before use.

Conclusions and Implications: Results from this review suggest that additional research is needed to develop more valid and reliable measures to assess preschool children’s knowledge of food and nutrition. Assessment tools need to be pilot-tested, refined, and adapted to suit both the specific audience and the components of the nutrition knowledge being targeted by an intervention before implementing a nutrition education program.

Key Words: child–preschool, evaluation, food/classification, nutrition knowledge, systematic review
**Title:** A systematic review of data collection techniques used to measure preschool children’s knowledge of food and nutrition

### 4.3 Introduction

Childhood overweight and obesity is one of the most serious public health challenges of the 21st century with the prevalence increasing in both developed and developing countries.\(^{(1,2)}\) Although the mechanisms responsible for the increasing prevalence of childhood obesity are not completely understood, unhealthy nutritional habits play an important role.\(^{(1,3)}\) Early childhood has been identified as a critical life-stage in the prevention of overweight and obesity, as the knowledge children gain about food and associated health benefits can influence dietary preferences and food choices in later life.\(^{(2,4)}\) Therefore, nutrition education is a crucial tool for shaping children’s attitudes towards food, food choices and eating habits.

In the last five years there has been rapid growth in the number of nutrition interventions targeting young children.\(^{(5)}\) To determine the need for and to maximize the effectiveness of these interventions, a detailed understanding of what and how young children think about food and nutrition is required. This will enable early childhood educators and early years health promoters to design and implement interventions that are developmentally appropriate.\(^{(6,7)}\) As such, the measurement of preschool children’s knowledge of food and nutrition is an emergent area of research that will grow with the increased interest in lifestyle interventions targeted at this age group.

Over the past few decades, there has been an increase in literature examining children’s perspectives on their own lives.\(^{(8)}\) Historically, research has been conducted on, or about children through exploring the views of their caretakers rather than involving children
directly.\(^{(9)}\) Data obtained from young children was considered unreliable or invalid, as it was believed that children lacked the cognitive, verbal and social skills necessary for providing good quality responses.\(^{(8,9)}\) However, through the emergence of new, age-appropriate research methodologies children are able to communicate their own thoughts, perceptions and interests within a research context.\(^{(8)}\) A number of innovative research methods have been developed to align with preschool children's competence, knowledge and interests. These techniques can be broadly grouped into three categories:

**Interviews:** One-on-one and group interviews incorporating the use of open-ended and closed questions.\(^{(10)}\)

**Use of stimulus material and prompts:** The use of a range of prompts and materials to stimulate children’s responses, including written prompts (e.g. sentence completion, unfinished stories to complete) or material prompts (e.g. pictures, objects).\(^{(8)}\)

**Structured play-based activities:** Participatory task-centred activities guided by the researcher, using a set of rules to achieve specific objectives (e.g. board games, drawings, doll play)\(^{(8,11)}\)

Whatever strategy is employed, it is crucial that the technique aligns with the cognitive and communication capabilities specific to preschool children including brief attention span, limited verbal skills and lack of fine motor skills.\(^{(10)}\)

To date, a number of methods and techniques have been developed and used to measure of food and nutrition knowledge in preschool children. As interest in improving this population’s knowledge of food and nutrition is experiencing considerable growth, it is timely to examine the techniques being used with regard to accepted strategies for the assessment of preschool children. This will offer researchers and practitioners a useful foundation upon which to select,
improve or develop an effective approach to assess children’s knowledge of food and nutrition. Therefore, the purpose of this paper is to systematically review the techniques being used to measure three to five-year-old children’s knowledge of food and nutrition. The review will examine how these techniques align with accepted methods for the assessment of young children and provide recommendations for the future use and development of these techniques.

4.4 Methods

This review was conducted in accordance with the Preferred Reported Items for Systematic Reviews and Meta-Analyses (PRISMA) statement checklist.\textsuperscript{(12)} For the purpose of this review, ‘preschool children’ were defined as children aged three to five years old. Food and nutrition knowledge was defined as ‘The ability of children to identify foods particularly high in certain nutrients and relate basic nutrients to their own development toward adulthood’.\textsuperscript{(7,13)} Studies that included the evaluation of preschool children’s ability to identify foods, food origins and food transformations were also included.

Search Strategies

Articles for this review were sourced from seven online databases: CINAHL, MEDLINE, PsychINFO, ScienceDirect, PubMed, ProQuest and ERIC. Searches for MeSH headings and key words were conducted to identify publications for inclusion. This search was undertaken during the first 2 weeks of February, 2014. Searches were performed using combinations of the following terms: “nutrition,” “health*,” “knowledge,” “diet,” “food,” “child*,” “early childhood,” “preschool*,” “3-5 year old,” “health knowledge, attitudes, and practice,” “evaluation,” “intervention,” “techniques,” “assess*,” and “methods.” One of the authors (NW) scanned titles and abstracts for relevancy. In addition, forward citation searching was undertaken on the reference lists of articles considered for review.
Inclusion and exclusion criteria
All studies were evaluated according to the following inclusion criteria: (1) reported the evaluation of preschool children’s knowledge of food and nutrition; (2) described data collection technique used in detail; (3) study participants included preschool children aged 3-5 years without mental health or learning difficulties; (4) if the age range of participants extended beyond 3 to 5 years, the mean age of the study sample was ≥ 3 years and ≤ 5.5 years; (5) the year of publication fell between 1980 and 2013; and (6) the publication was available in the English language.

Study Selection
After removing duplicates and scanning titles and abstracts for relevancy, a list of potentially relevant studies were identified and exported to EndNote version X5 (Thomson Reuters, Philadelphia, PA, 2011). The remaining articles were read independently by 2 reviewers (NH and NW) to verify whether they met the inclusion criteria. Ineligible articles were removed and the reason for exclusion was noted. Differences in selection were resolved by discussion and consensus between the 2 reviewers. If the reviewers were unable to reach consensus, a third reviewer was asked to look at the article in question. The PRISMA flow diagram (Figure 4.1) demonstrates the systematic review search and selection processes of the study.12

Data Extraction and Analysis
One researcher (NW) extracted key information from included studies using a data extraction table for comparison.14 Data extracted included author, year of publication, study design, sample size, sample characteristics, evaluation technique used to assess food and nutrition knowledge, whether the instrument used was new or adapted, type of nutrition topics assessed, and information regarding reliability, validity, and pilot-testing (Table 4.1).
Methodological Quality Assessment

Two independent researchers (NW and NH) assessed the methodological quality of each study using the Nutrition Evidence Library quality checklist; any variations in quality ratings were discussed and resolved. This checklist includes 10 validity questions based on the Agency for Healthcare Research and Quality domains for research studies. Through the use of this tool, the quality attributes of each study were classified as positive, neutral, or negative (Table 4.1).

4.5 Results

In total, 3,094 articles were identified through the initial search of 7 databases. A total of 157 articles were retrieved for full article review, 20 of which met inclusion criteria (Figure 4.1). The most frequent reasons articles were excluded were: (1) the study sample was not predominantly preschool children (aged 3–5 years), (2) the study was not relevant, and (3) the study did not include a sufficient description of the food and nutrition knowledge evaluation technique. Table 4.1 summarizes each study included for review. The studies were published between 1985 and 2013 and included 13 cross-sectional studies, 2 randomized control trials, and 5 pre- and posttest designs. The number of participants ranged from 10 to 795 and the average age of participants ranged from 3 to 5.5 years. Preschool children’s knowledge of food and nutrition was assessed through either a one-on-one assessment or a group-based activity with 2–3 children. The time required to assess food and nutrition knowledge also varied, ranging from 5 to 30 minutes.
Figure 4.1 Flow chart depicting the article filtering process undertaken as part of the systematic review

Study Quality and Methodological Practices Used to Test Identified Data Collection Techniques

Quality attributes of each study were classified as positive, neutral, or negative according to the Nutrition Evidence Library quality checklist. Overall, the quality of the reviewed articles was acceptable; all but 1 of the reviewed studies received a positive rating (results and conditions of ratings are provided in the Table 4.1). However, information regarding pilot-testing, reliability, and validity of the evaluation instruments used to assess children’s knowledge of food and nutrition was limited (Table 4.1). Seven of the included studies tested assessment techniques for validity, including face validity20 or both face and content validity. 7,18,24,25,27,28 In terms of reliability, 11 of 20 studies reported testing for at least 1 type of reliability. Six studies tested for internal consistency,15,18,22,25-27 with 4 reporting adequate levels of internal
consistency (Cronbach α/KR21 >.60).\textsuperscript{15,25-27} Seven studies reported acceptable levels of test-retest reliability (intra-class correlation, kappa [k] statistics, or Pearson/Spearman correlation [r] > .6).\textsuperscript{4,15,18,22,24,26,27} Inter-rater reliability was tested in 5 of the 20 studies \textsuperscript{5,7,17,18,21}; all reported good to excellent inter-rater reliability (ranging from k .70% to 100%). Only 9 of the reviewed studies reported pilot-testing their instruments before use.\textsuperscript{4,7,13,20,22,25,27}
Table 4.1 Summary of data collection techniques used to assess preschool children’s knowledge of food and nutrition

<table>
<thead>
<tr>
<th>Study Design</th>
<th>Assessment Method</th>
<th>Technique</th>
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<tbody>
<tr>
<td>Author, year</td>
<td>Study Design</td>
<td>Assessment Method</td>
</tr>
<tr>
<td></td>
<td>R C T</td>
<td>Cross-sectional</td>
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<tr>
<td>Atcherberg et al, 1992</td>
<td>x</td>
<td>4-7 yrs M=5.1 yrs n=60</td>
</tr>
<tr>
<td>Anliker et al, 1990</td>
<td>x</td>
<td>3-4 yrs n=10</td>
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<tr>
<td>Calfas et al, 1991</td>
<td>x</td>
<td>3-8 yrs (3-4 yrs n=16)</td>
</tr>
<tr>
<td>Gorelick &amp; Clark, 1985</td>
<td>x</td>
<td>3-5 yrs n=187</td>
</tr>
<tr>
<td>Holub &amp; Mushers-Eizenman, 1988</td>
<td>x</td>
<td>3-6 yrs M=5 yrs n=69</td>
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<tr>
<td>Hendricks et al, 1988</td>
<td>x</td>
<td>3-5 yrs n=311</td>
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<tr>
<td>Study</td>
<td>Age Range</td>
<td>Sample Size</td>
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<td>Lanigan, 2011</td>
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<td>Lawatsch, 1990</td>
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<td>5 yrs</td>
<td>n=103</td>
</tr>
<tr>
<td>Mobley &amp; Evashevski, 2000</td>
<td>2.3 to 6.6 yrs</td>
<td>M=4.5yr n=308</td>
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<td>Natsiopoulou et al, 2010</td>
<td>4-5 yrs</td>
<td>n=125</td>
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<td>Nemet et al, 2007</td>
<td>3.8-6.8 yrs</td>
<td>M=5.2 yrs</td>
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<tr>
<td>Nemet et al, 2012</td>
<td>4-6.5 yrs</td>
<td>M=5.5yr n=109</td>
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<td>Nguyen et al, 2011</td>
<td>4 yrs</td>
<td>n=53</td>
</tr>
<tr>
<td>Study</td>
<td>Title</td>
<td>Age Range</td>
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<tr>
<td>Nix et al, 1999</td>
<td>x</td>
<td>3-6 yrs</td>
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<tr>
<td>Plum et al, 1998</td>
<td>x</td>
<td>2.5-5 yrs</td>
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<td>Sigman-Grant, et al, 2013</td>
<td>x</td>
<td>3-5 yrs</td>
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<td>Slaughter &amp; Ting, 2010</td>
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<td>5 yrs</td>
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<td>x</td>
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<td>Zarnowieki et al, 2011</td>
<td>x</td>
<td>5 yrs</td>
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</tbody>
</table>

NR = Information not reported, n= number of participants, M= mean age of participants, RCT= Randomized controlled trial, k=Kappa coefficient, PC = Pearson correlation coefficient, ICC=Intra-class correlation coefficient, KR21= Kruder-Richardson Formula 2, Quant=Quantitative methods, Qual= Qualitative methods

*Study quality rating according to the Nutrition Evidence Library (NEL) quality checklist*:5

**Positive overall score (+):** This score is given if most of the validity criteria are met, including criteria 2, 3, 6, 7 and at least one additional ‘criterion.

**Neutral overall score (?)**: This score was given if the answers to validity criteria questions 2, 3, 6 and 7 do not indicate that the study is exceptionally strong.

**Negative overall score (-):** This score is given if 6 or more of the validity criterion are not met.
Overview of data collection techniques

Although many of the studies cited particular theories as underpinning the development of the intervention being reported, such as Bronfenbrenner’s Theory of Ecological Development, none explicitly identified a theoretical approach that informed the evaluation process. Of the 20 included studies, 2 reported the use of qualitative research methods, 7 employed quantitative methods, and 11 used mixed research methods (Table 4.1). To assess the various components of food and nutrition knowledge in preschool children, a number of studies incorporated the use of multiple data collection phases. The number of phases varied between studies from 1 to 5 (Table 4.1). Each phase represented the use of an additional data collection technique to assess children’s knowledge of food and nutrition. Consistent with the literature on researching with preschool children, these techniques have been clustered into 3 categories: (1) interviews, (2) use of stimulus material and prompts, and (3) structured play-based activities.

Interviews. Interviews involved assessment techniques incorporating open-ended questions or a combination of both open-ended and closed questions to assess children’s food and nutrition knowledge (Table 4.1). In all studies the questions were read aloud. Closed-ended questions were used to determine a child’s concept of health and how food and nutrition fitted with this concept: for example, Are people who eat the right kind of foods healthier than people who don’t eat the right kind of foods? Often, open-ended questions were used in conjunction with various material stimuli and prompts to elicit further reasoning to answers. Only 2 studies were found to exclusively use open-ended or closed questions without additional stimulus material.
Use of stimulus material and prompts. Material stimulus and prompts were used extensively throughout included studies as a way to stimulate children’s responses and encourage participation. Stimuli included photo-graphs,\(^3,4,13,15-29\) story-books,\(^21\) and plastic food replicas.\(^5,24\) Pictorial prompts were used in 18 of the 20 included studies.\(^3,4,13,15-29\) Color photographs of age-appropriate food and beverages were used to assess children’s knowledge of food groups and their ability to categorize foods as healthy or unhealthy. Two recurrent methods that involved the use of photographs included multiple choice \(^3,13,15,18,19,22,24-26,28\) and picture sorting.\(^4,9,17\) Pictorial prompts were also used in conjunction with a sentence completion activity\(^20\) to assess children’s ability to classify foods as healthy or unhealthy. For example, children were shown a picture of a food product and asked, Is ___ healthy or un-healthy? Another study included the use of a storybook as a prompt to assess children’s ability to classify foods as healthy or unhealthy.\(^21\) For example, after being read the story, children were asked to select foods to help the main character grow big, strong, and healthy.\(^23\)

Structured play-based activities. Structured play-based activities were employed in 11 of the 20 reviewed studies and involved activities such as meal creation tasks, play kitchen observations, board games, and role-play.\(^3,5,13,16,17,19-21,23,24,26\) One study used pictures of food items for a meal creation task in which children were asked to assemble 3 meals classified as healthy, unhealthy, and preferred, by placing 4 pictures at a time on a mat depicting a place setting.\(^16\) Six studies included the use of dolls to assess pre-school children’s knowledge of food and nutrition.\(^3,5,13,19,26,24\) Finally, a board game was employed as another structured play-based technique to assess children’s knowledge of food and nutrition, using photo-matching activities conducted in groups of 2–3 children.\(^23\)
4.6 Discussion

The review demonstrated that to date, a variety of interactive and task-centered techniques have been used to assess components of food and nutrition knowledge in preschool children. These techniques support practice, because they were mostly developed to evaluate interventions. The methodological shortcoming of such an approach is that the instrument or technique created is often not explicitly theory-driven, which has been identified as central to building strong evaluation frameworks.\textsuperscript{30-36} To consider the efficacy of assessment techniques, the literature under-pinning these techniques and, more broadly, research with children is discussed next. This is followed by a discussion regarding the validity and reliability of these instruments, with recommendations for the future development and use of these techniques.

A key strength of the reviewed studies was that most of the data collection techniques used were developed to align with participants’ developmental capabilities, including brief attention spans, limited verbal skills, and lack of fine motor skills.\textsuperscript{13} To work within children’s attention span, 13 of the studies incorporated multiple phases of data collection that segmented the data collection process into smaller age-appropriate periods of time. The inclusion of multiple inter-related data collection phases of short duration to assess nutrition knowledge in preschool children may be more effective in measuring this multifaceted construct. Only 8 studies reported the completion time of data collection instruments used.\textsuperscript{5,7,20,21,23,24,27,28} Of these studies, only 1 exceeded the practical completion time for young children (20 minutes).\textsuperscript{5,31} Response burden remains a critical issue when conducting research with young and school-aged children that must be actively considered in the development of evaluation instruments.\textsuperscript{34}

**Stimulus material and prompts.** Pictorial prompts were used extensively throughout the included studies as an interactive way to engage children directly. Photographs can help
researchers control for limited verbal abilities and timidity by allowing children also to communicate responses through pointing.\textsuperscript{18} Although few of the studies tested the reliability of this technique, those that did reported acceptable to high levels of reliability with test-retest correlation values of 0.68 to 0.89.\textsuperscript{15,18,22,25} This indicates that when they are used on their own, picture-based tasks can be a reliable measure of children’s nutrition knowledge. Wiley and Hendricks\textsuperscript{32} conducted a review of the reliability of picture identification tools to assess health knowledge in preschool children, and suggested that when using this technique, pictures should represent 1 food portion size. Of the reviewed studies, only 1 reported considering portion sizes in presented photos.\textsuperscript{16}

The form in which pictures are presented to children to assess nutrition knowledge also warrants consideration. Several studies used computer-generated, picture-based assessment tools in an effort to engage children throughout the assessment process.\textsuperscript{3,19,22,26} However, to date, differences in validity and reliability between paper and computer-based picture activities to measure nutrition knowledge have not been assessed. One study observed differences between the 2 methods, noting that children who participated in the printed version of a photo-based nutrition knowledge quiz became tired or distracted before completion and did not complete all test items, whereas children who completed the computer-based version of the quiz were eager to take their turn and maintained focus and enthusiasm to complete all test items.\textsuperscript{22} Thus, the computer-assisted test format appears to be highly acceptable to preschool children and could enable researchers to administer more extensive testing to young children in a manner that engages their full cooperation and effort.\textsuperscript{22}

**Interviews.** Ten of the reviewed studies incorporated open-ended questioning to assess preschool children’s food and nutrition knowledge.\textsuperscript{4,5,7,13,16,17,20,21,23,27} However, only the study
by Achterberg and colleagues tested the open-ended (and closed) questions they used for face and content validity, internal consistency, and inter-rater reliability. The study indicated that open-ended questions revealed improved understanding of food and nutrition concepts, whereas closed-ended questions indicated no effect. Achterberg and colleagues concluded that closed-ended questioning was not an appropriate technique to measure changes in food and nutrition knowledge with preschool children. This is consistent with a report by Fargas-Malet and others, which suggested that closed, dichotomous, and limited choice questions should be avoided or used in conjunction with follow-up questions to ensure the child is not guessing. Therefore, it is important for researchers to be cautious in using closed ended, forced choice evaluation procedures when assessing the effect of a nutrition intervention on improvements in children’s knowledge, because the results may not reflect children’s abilities or the program’s effectiveness.

**Structured play-based activities.** Structured play-based activities are considered to be good practice when assessing preschool children and were used by 11 of the included activities offer a means to engage children more deeply in the research process by providing age-appropriate, task-centered methods of assessment. Many of the reviewed studies that employed this method reported that it was helpful in assessing the diversity of nutrition concepts understood by preschool children. Only 2 of the studies tested for reliability and reported a test-retest correlation value of 0.7226 and internal consistency (KR21) of 0.84.25. More work needs to be done to examine the validity of play-based activities to increase confidence in their application.

A recurring play-based technique employed by 6 of the included studies was doll play. Doll play is a projective technique that has been used extensively with young children. At this age, children’s ability to categorize foods as healthy or unhealthy can be
influenced by their food preferences. To reduce the influence of food preferences on responses, several studies conducted role-play activities in which children were asked to select food items from a collection of photographs of high-nutrient and low-nutrient foods to help a doll grow strong and healthy.\textsuperscript{3,13,19,25,26} Dolls were used to encourage children to assume a caretaking approach, and thereby reduce likelihood of choices based on personal preference.\textsuperscript{3,9,13,25,26} None of the reviewed studies evidenced the use of dolls to elicit a caretaker response in preschool children. Thus, further research is required to evaluate the validity of this technique for measuring food knowledge. Only 2 of the studies that included the use of dolls to assess children’s nutrition knowledge tested for reliability, and reported test-retest correlation values of 0.72 and 0.75.\textsuperscript{25,26}

**Validity and Reliability**

The current review revealed that few of the data collection techniques being used were tested for validity and/or reliability. This shortcoming makes it difficult to compare the effectiveness of techniques (Table 4.1). The lack of emphasis on examining the properties of the techniques may be linked to the focus of many of the articles on reporting the success of a project’s stated curricular objectives with an instrument developed specifically for this purpose. Although this approach can be beneficial in assessing the effectiveness of a specific program, when using a scale of unknown validity or reliability, it is almost impossible to know whether it is actually measuring what it claims to (ie, nutrition knowledge).\textsuperscript{33} Furthermore, the lack of attention to confirming the merit of the techniques developed lessens confidence in their properties and in turn, it negatively affects up-take and usability.\textsuperscript{33-35}

Of the reviewed studies, only 7 of 20 tested data collection tools for content or face validity through expert reviews or by pilot-testing the technique.\textsuperscript{7,18,20,25,27,28} This is concerning because
validity and pilot-testing are essential components of tool development that help to identify limitations and appropriateness of the tool before it is applied.\textsuperscript{33} This is important, because for a tool to be a valid indication of a child’s knowledge of a concept, the child should be able to recognize and understand what is being pre-sented.\textsuperscript{15} Hence, familiarity with food products is an important factor to consider when assessing young children’s nutrition knowledge, particularly when using stimulus materials such as pictorial prompts or food models.\textsuperscript{31} Recent literature suggests that to ensure preschool children are familiar with pictures of foods presented, before the pictures are used, demographic information should be collected from parents, such as food allergy and intolerance information and home exposure to food items (frequency, types, and forms of food consumed).\textsuperscript{31} However, of the reviewed studies, only 1 reported asking parents which foods they most frequently served their children as snacks before testing.\textsuperscript{28} Interestingly, several of the reviewed studies reported recognition issues and having to alter or replace pictures of food after pilot-testing the instrument.\textsuperscript{4,5,22,26} This recurrent finding across the studies confirms that it is good practice to embed strategies such as pilot-testing to confirm children’s familiarity with foods depicted in photographs, to increase confidence in instrument validity.

Reliability testing was also limited across the reviewed studies and was most commonly assessed using the test-retest method. Overall, 7 studies reported acceptable levels of test-retest reliability. However, it was difficult to compare reliability of data collection tools across studies because of the variety of statistical tests used to establish reliability levels (intra-class correlation, k statistics, or Pearson/Spearman correlation). Only 4 of the studies reported adequate levels of internal consistency (Cronbach a/KR21).\textsuperscript{15,25-27} This lack of reliability testing is a key weakness across the reviewed studies, because when researchers use instruments with low reliabilities, it is unlikely they will attain a good estimate of the effect size of the theoretical
relationship being assessed. Overall, 3 of the reviewed studies tested for both reliability (test-retest and internal consistency) and face and content validity. However these tools were not pilot-tested across diverse populations, which reduces the generalizability of these instruments. These findings are consistent with a recent review conducted by Hernandez-Garbanzo and colleagues on psychosocial measures used to assess the effectiveness of nutrition education programs in school-aged children. This review, published in the Journal of Nutrition Education and Behavior, found that greater attention to the testing of evaluation instruments and techniques, in particular with more diverse populations of interest, is required to evaluate nutrition education programs more effectively.

Only 3 of the reviewed studies reported testing tools for discriminate validity. When preschool children are asked to sort and categorize food as healthy or unhealthy, there is a need to include food items of varying degrees of difficulty and discriminability. The inclusion of food items of varying degrees of difficulty is important to distinguish children with more complex nutrition knowledge from those who have only a basic understanding. This technique may also help identify strengths and weaknesses in children’s knowledge of the various components of nutrition and contribute to the better development of nutrition education programs.

Limitations

The current systematic review is subject to limitations. First, included studies were limited to those that described data collection techniques with sufficient detail; consequently, some studies that may have used relevant assessment techniques were excluded. To address this concern, the reference list of such studies was searched for other potentially eligible articles presenting more elaborate descriptions of assessment techniques. Second, evidence of the effectiveness of data collection techniques was based on that reported by authors. Therefore,
results may be subject to bias because limitations of these techniques may not have been reported. Finally, only 1 author conducted the initial database search for this review. This is a limitation because the use of multiple independent investigators during study selection enhances objectivity and reduces the likelihood of rejecting relevant reports.12

4.7 Conclusions

This review demonstrated that a variety of innovative and age-appropriate techniques have been used to measure preschool children’s knowledge of food and nutrition. However, it is evident that further instrument development and psychometric research need to be conducted with more diverse populations to improve usability and generalizability of these techniques. Based on the findings of this review, when developing tools to assess preschool children’s knowledge of food and nutrition, 3 key factors warrant consideration.

1. Picture-based multiple choice or sorting activities can be reliable data collection techniques and may be highly beneficial in research projects with time and resource constraints. However, more rigorous psychometric testing is needed than in those that have been reported to date. Tools should also include food items of varying degrees of difficulty and discriminability.

2. Multiple phases incorporating complementary interactive data collection techniques should be used to engage preschool children directly. However, more work needs to be done to examine the validity of play-based activities to increase confidence in their application. Future research should also investigate the validity of role-play with dolls in generating a caretaking response in preschool children for the selection of healthy food options.
3. Overall, the current review has highlighted the need for additional research to develop more valid and reliable measures to assess pre-school children’s knowledge of food and nutrition. Assessment tools need to be pilot-tested, refined, and adapted to suit both the specific audience and the components of the nutrition knowledge being targeted by an intervention before implementing a nutrition education program. The development of valid and reliable assessment techniques is essential and will allow for more accurate and meaningful results to be comparable across studies, and to be a true indication of the effectiveness of nutrition education programs.
4.8 References


33. Paramenter K, Wardle J. Evaluation and design of nutrition knowledge measures. *J Nutr*


Chapter 5: Techniques used to measure preschool children’s knowledge of and preference for physical activity

5.1 Study 2- A Systematic Review of the Literature (Manuscript 2)

Reader’s Note:
The information in this section has been submitted as a review paper in a peer-reviewed journal: Journal of Sport and Health Science

Wiseman N, Rossmann C, Harris N. (Under Review) A systematic review of data collection techniques used to measure preschool children's knowledge of and preference for physical activity: Journal of Sport and Health Science

Reference
The co-authors of this publication confirm that the research candidate has made the following contributions to this manuscript:

- Developed the study design;
- Assisted with data search and article selection against inclusion and exclusion criteria;
- Participated in critical appraisal of articles;
- Participated in performing quality assessment;
- Prepared manuscript for submission to the journal with CR

Signed: Date: 30/06/18

Signed: Date: 28/06/18
**Title:** A systematic review of data collection techniques used to measure preschool children's knowledge of and preference for physical activity

**5.2 Abstract:**

**Background:** Early childhood has been identified as a crucial period in which children develop physical activity preferences and behaviours. Both knowledge of and preferences for physical activity are key proximal indicators of activity choices in children. Thus, accurate data collection tools are required to measure these variables.

**Methods:** This paper evaluates data collection techniques that have been utilised to assess preschool children’s knowledge of and preference for physical activity. The review examines the validity and reliability of existing techniques and how these techniques fit with accepted methods of assessment of preschool children.

**Results:** Fourteen studies were eligible for inclusion in the review. The identified studies employed a limited but disparate range of techniques to assess children's physical activity knowledge and preferences. Findings reveal that four techniques were consistently used across the reviewed studies, including; interviews, structured play-based activities, questionnaires and observation.

**Conclusion:** There is a need for validated and reliable measures to assess children's knowledge of and preference for physical activity. Greater consideration is required to align data collection techniques with the characteristics, needs and abilities of this study population.

**Keywords:** physical activity, preference, knowledge, child-preschool, evaluation
5.3 Background

Childhood overweight and obesity is an important public health concern, with over 41 million children being overweight globally (1). Overweight and obesity can affect a child’s immediate physical and mental health, educational attainment and quality of life (1, 2, 3). Obese children are very likely to remain obese as adults, placing them at risk of chronic illness (1, 4, 5). There are many factors that contribute to the rising prevalence of childhood overweight and obesity, with physical inactivity and screen time being key factors (6). Early childhood has been identified as a crucial period to establish positive activity behaviours, as this is a key age in which children develop preferences for physical activity (PA) and learn important motor skills (7, 8, 9, 10). Thus, promoting and encouraging PA within early childhood may facilitate a pattern of participation in PA across the lifespan.

Over the last decade, there has been a dramatic increase in interventions that seek to promote PA participation in young children (11). These interventions often measure increases in PA through the use of heart rate monitors, motion sensors (accelerometers, pedometers) and indirect measurements, including self-report measures, interviews, proxy-reports and diaries (11, 12, 13, 14, 15). The effectiveness of PA interventions targeting overweight and obesity have often been evaluated through measures of weight, BMI, BMI z-scores and waist circumference (11, 12, 13, 14, 15). Emerging research has begun to incorporate the measurement of preschool children’s lifestyle knowledge and preferences as proximal outcomes that shape PA (16).

Both knowledge of and preferences for PA have been linked to PA choices in preschool children (7, 17). The first 5 years of life is a key period in which children are accumulating knowledge and developing skills that can shape health behaviors (8, 10). Several studies have revealed that
children as young as 3 years have the ability to identify activities that make their body healthy (7, 18, 19). Children who are able to identify healthy activities may be more likely to apply this knowledge and select activities that promote their body’s health (20). As preschool children get older and gain autonomy, children operationalise these understandings into health behaviours (21).

PA factors such as child age, gender, ethnicity, weight status and parental factors, such as parental modelling and activity preferences, may shape children’s activity preferences (22, 23). Beyond these factors, children are more likely to participate in physical activities for reasons of fun and enjoyment, if they are ‘good’ at the activity or if a friend participates (24). Parents’ report that facilitating regular PA for their children is most difficult with children who prefer more sedentary activities (25). Measuring a child’s preferences for PA can therefore be a useful means to develop targeted and effective lifestyle interventions, determine the impact of such interventions, and to understand why children participate in certain activities. Given the diverse range of factors shaping a child’s PA preferences, a child’s account of their own PA preferences might differ from that reported by their parents. Thus, working with children to obtain self-reported activity preferences is important (26).

As the assessment of a child’s PA knowledge and preference gains recognition as a means to measure the proximal impact of PA interventions targeted at this age group, and as more techniques to assess these variables become available, there is a need to ensure that these measures are effective and reliable (20, 21). This paper will examine the techniques that have been used to measure 3- to 5-year-old children’s PA knowledge and preferences by reviewing the validity and reliability of these techniques and how they are supported by literature (27).
This review will offer educators and public health professionals a resource that may assist in the development, selection or improvement upon techniques to evaluate PA interventions.

5.4 Methods

This review was conducted in accordance with the Preferred Reported Items for Systematic Reviews and Meta-Analyses (PRISMA) statement checklist (28). For the purpose of the review, PA knowledge was defined as the ability to distinguish between sedentary and active activities and to identify the need to be physically active to promote health. Physical activity preference was defined as a child’s likes and dislikes of organised and unorganised activities, also related to relative liking of one type of activity more than the other.

Search strategies

Articles were sourced from eight online databases including: ProQuest, CINAHL, Embase, Scopus, ERIC, PubMed, MEDLINE and ScienceDirect. The search was conducted during the first week of October, 2017, using the following key words to identify publications for inclusion: preschool*, kindergarten, early childhood, child*; physical activity, exercise, sport; knowledge, understanding, preference*, data collection, technique, measurement, assessment, evaluation and health. The search was limited to articles in English language and published between 1980 and 2017. Titles and abstracts were scanned for relevancy by one author (CR). Reference lists of selected articles were also reviewed.

Study selection

The PRISMA flow diagram (presented in figure 5.1) shows the systematic literature search and selection processes followed by the authors. The selected studies were transferred to EndNote, version X8 and were assessed by two reviewers (NW and CR) to determine whether they met
the inclusion criteria. This enabled authors to identify any disagreements relating to study suitability. During this process, articles that did not align with the inclusion criteria were removed and the reason for exclusion was recorded.

The following inclusion criteria was used to assess the relevance of each study: (1) assessed preschool children’s knowledge and/or preferences of PA; (2) the technique used to assess each of the variables was explained in detail; (3) participants included children between the ages of 3 and 5 years; (4) the paper was published in English. In cases where a study replicated a data collection technique developed in a previous study, the original article was sourced and included instead.
Records identified through database searching (n = 170)  
Additional records identified through reference lists (n = 20)  
Records after duplicates removed (n = 150)  
Records screened (n = 150)  
Full-text articles assessed for eligibility (n = 30)  
Studies included in qualitative analysis (n = 14)

Figure 5.1 PRISMA flow chart depicting the article filtering process undertaken as part of the systematic review

Data extraction and assessment of methodological quality

Information extracted from selected studies included: study design, assessment method, sample size, age of participants, description of the instrument, data regarding tool validity, reliability and pilot testing when available. Two independent researchers (NW and CR) assessed the quality of the selected papers using the “Quality Assessment of Before-After (Pre-Post) Studies With No Control Group” from the National, Heart, Lung, and Blood Institute (29). The tool includes twelve questions about the integrity and preciseness of information presented in the study including: study design, sample size, description of methods, outcome measures and statistical analysis, each study was classified as good, fair or poor accordingly (Table 5.1). The
quality assessment instrument was identified as the most appropriate given the diversity of study designs used in the included studies.

5.5 Results

A total of 190 articles were initially identified from eight databases. After removing duplicates and adding articles identified from reference lists, 150 articles were screened for relevancy. In total, 30 journal articles were retrieved for full review, of those, 14 articles met the inclusion criteria (see figure 5.1). The most frequent reasons for exclusion of articles were (1) non-relevance of the study (2) if parents answered PA related questions on behalf of their child, and (3) child’s age.
<table>
<thead>
<tr>
<th>Author, year</th>
<th>Outcome of interest</th>
<th>Sample</th>
<th>Assessment method</th>
<th>Data collection technique</th>
<th>Phases</th>
<th>Participants per assessment</th>
<th>Time per assessment</th>
<th>Quality rating</th>
<th>Validity</th>
<th>Reliability</th>
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</thead>
<tbody>
<tr>
<td>Bélanger, Waite (30)</td>
<td>PA preferences, PA knowledge</td>
<td>n=811</td>
<td>x</td>
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<td>NR</td>
<td>NR</td>
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<td>Calfas, Sallis (36)</td>
<td>PA preferences</td>
<td>n=81</td>
<td>4.0-8.0 y.</td>
<td>x</td>
<td>x</td>
<td>4</td>
<td>NR</td>
<td>good</td>
<td>x</td>
<td>NR</td>
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<tr>
<td></td>
<td>PA knowledge</td>
<td>n=81</td>
<td>4.0-8.0 y.</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Cammisa, Montrone (20)</td>
<td>PA preferences</td>
<td>n=49</td>
<td>4.0-5.0 y.</td>
<td>x</td>
<td>x</td>
<td>2</td>
<td>1-21</td>
<td>NR</td>
<td>good</td>
<td>NR</td>
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<tr>
<td>Céspedes, Briceño (16)</td>
<td>PA knowledge</td>
<td>n=1216</td>
<td>3.0-5.0 y.</td>
<td>x</td>
<td>x</td>
<td>1</td>
<td>1</td>
<td>NR</td>
<td>good</td>
<td>x</td>
</tr>
<tr>
<td>Darbyshire et al (1st method) (35)</td>
<td>PA preferences, PA knowledge</td>
<td>n=204</td>
<td>4.0-12.0y.</td>
<td>x</td>
<td>x</td>
<td>3</td>
<td>NR (focus group)</td>
<td>NR</td>
<td>fair</td>
<td>NR</td>
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<tr>
<td>Darbyshire, P. et al. (2nd method) (35)</td>
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<td>n=204</td>
<td>4.0-12.0y.</td>
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<td>x</td>
<td>1</td>
<td>1</td>
<td>NR</td>
<td>fair</td>
<td>NR</td>
</tr>
</tbody>
</table>

**Predictive validity**
1. PA Knowledge scale: Calculating the extent of improvement on knowledge scores following a brief intervention: non-significant result
2. PA Preferences scale: Calculating the percent agreement between stated preferences and actual choices of activities (chance level, 56.3%)

**Test retest reliability**
PA Knowledge scale: r=.43, p=.001
PA Preference scale: r=.22, p=.03

**Face and content validity**
Scale reliability Cronbach α = .64

**Table 5.1 Summary of data collection techniques used to assess preschool children’s knowledge of and preference for physical activity**
<table>
<thead>
<tr>
<th>Study</th>
<th>Participants</th>
<th>PA preferences</th>
<th>n</th>
<th>Age Range</th>
<th>Interrater reliability</th>
<th>Predictive validity</th>
<th>Test-retest reliability</th>
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</thead>
<tbody>
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<td>Jihene, Sonia (37)</td>
<td>PA preferences; PA knowledge</td>
<td>577</td>
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<td>NR</td>
<td>fair</td>
<td>x</td>
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<tr>
<td>Lanigan (7)</td>
<td>PA preferences; PA knowledge</td>
<td>81</td>
<td>3.0-5.0 y.</td>
<td>2</td>
<td>1</td>
<td>NR</td>
<td>good</td>
</tr>
<tr>
<td>Lasky and Eichelberger (18)</td>
<td>PA knowledge</td>
<td>75</td>
<td>4.0-6.0 y.</td>
<td>4</td>
<td>1</td>
<td>NR</td>
<td>fair</td>
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<td>Leary, Adams (23)</td>
<td>PA preferences</td>
<td>27</td>
<td>x</td>
<td>x</td>
<td>1</td>
<td>NR</td>
<td>poor</td>
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<td>PA preferences</td>
<td>38</td>
<td>5.0-7.0 y.</td>
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<td>x</td>
<td>x</td>
<td>3-3</td>
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<td>Nguyen, Gordon (32)</td>
<td>PA knowledge</td>
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<td>3.88-4.96 y.</td>
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<td>x</td>
<td>2</td>
<td>1</td>
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<td>Parrish, Iverson (33)</td>
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<td>1881</td>
<td>4.0-9.0 y.</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>1</td>
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<tr>
<td>Talbot Nix, d'Agostino Ibanez (34)</td>
<td>PA knowledge</td>
<td>51</td>
<td>3.0-6.0 y.</td>
<td>x</td>
<td>x</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Wiseman, Harris (6)</td>
<td>PA preferences; PA knowledge</td>
<td>n=86</td>
<td>x</td>
<td>3.08-5.5 y.</td>
<td>x</td>
<td>2</td>
<td>1</td>
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**Face validity**

- Knowledge scale: \( \alpha = 0.59 \)
- Preference scale: \( \alpha = 0.53 \)
Studies included in the review were published between 1985 and 2017, including eleven cross-sectional studies (6, 7, 18, 20, 23, 30, 31, 32, 33, 34, 35), one pre-post study (36), one quasi-experimental study (37) and one randomized controlled trial (RCT) (16). The number of participants ranged from 17 to 1,881 and included children aged 3 to 12 years. Of the reviewed articles, four studies assessed PA knowledge, five asked for PA preference and five studies tested for both PA knowledge and preference. The assessment of children’s knowledge and preferences were conducted one-on-one, in small groups with either two, three or five participants or in focus groups with 12 to 21 children (see Table 5.1). Time per assessment ranged from ten to 30 minutes (31, 32, 33), though in most cases this information was not reported. The quality ratings for the 14 included studies were mostly good (six studies) or fair (seven studies), with one study rated as poor quality (see Table 5.1) (29).

**Overview to techniques**

The reviewed studies utilised a limited but disparate range of techniques to measure preschool children’s PA knowledge and preferences. Three of the fourteen studies incorporated qualitative research methods, seven used quantitative measurements and four employed a mixed-method approach (Table 5.1). Techniques were assembled into four key types of method categories including: (1) interviews, (2) structured-play-based activities, (3) questionnaires and (4) observation. In seven of fourteen articles, a combination of two data collection techniques were used (Table 5.1).

**Interviews**

As a technique, interviews can be defined as one-on-one or group interviews incorporating the use of open-ended and closed questions (38). Six studies used interviews to measure physical activity knowledge and preferences (7, 18, 23, 31, 32, 35). In most cases, interviews were
conducted one-on-one (7, 18, 20, 23) or with two to three participants (31); only Darbyshire, Macdougall (35) assessed PA knowledge and preferences in a focus-group. Of the reviewed studies, interviews took place in the child’s childcare center (7, 20, 23), school (7, 31, 35) or home (18). One study did not provide information about the setting of the interview (32).

Two studies (18, 31) incorporated open-ended questions, for example “What is the best reason that exercising keeps us healthy?” (18) to assess PA knowledge, and one study used a combination of both open- and closed-ended questions to assess PA preferences (20), such as “Can or can’t you play [the child’s favorite activity] at the kindergarten?” with the following question “Why?” Nguyen, Gordon (32) used closed-ended questions to assess PA knowledge, for example, “To have a healthy body, would you ride a bike?” Three studies did not provide any examples of the questions asked (23, 31, 35).

**Structured play-based activities**

Seven studies used play-based activities incorporating tasks such as role play, drawings and photo collages. Structured play-based activities can be defined as task-centred activities in which the investigator uses set instructions to achieve a clear objective such as a drawing or doll play (39). Several studies incorporated craft/drawing activities as techniques to measure PA preference. For example, Bélanger and colleagues (30) used photo collages, picturing active and sedentary activities. Children were asked to order activities to reflect their preferences, for example placing a green sticker for their first preference, a yellow sticker for their second and a red sticker for their third preferred activity. In the study by Cammisa, Montrone and Caroli (20), children were asked to draw themselves in their preferred way of playing. This was followed by an interview in a quiet part of the classroom asking questions on the basis of the drawing, such as, “What is your favourite game?” and “Why do you like it?”
Role play was used in three of the fourteen reviewed studies (6, 7, 36). In these studies, participants were asked to take care of a doll/bear and make decisions for the doll/bear. The caretaking role was used to ensure that the child’s choices were more likely about their knowledge of PA rather than their preferences. These studies measured PA knowledge by asking children to point to the activity that makes the doll “healthy and grow big and strong” or “helps the doll to stay healthy”. To determine PA preferences, children were asked to point to the activity they like best. Calfas, Sallis (36) also asked the children further to rate their preferences on a scale from one to three; this was to assess the consistency of children’s responses. To measure PA knowledge, Lanigan (7) allowed more freedom during the role-play activity. Children suggested leisure-time activities and responded to “less healthy requests” from the dolls, which included barriers to PA such as bad weather, inability to master a skill or preference for watching television.

Darbyshire and others (35) conducted focus group interviews with children and incorporated activities to stimulate their thinking and responses regarding PA. At first, they used the ‘show me’ and ‘interested idiot’ approach, which have demonstrated efficacy in stimulating thinking and responses of the children regarding PA. The ‘show me’ approach asked children to demonstrate activities and show where they participated in these activities. The ‘interested idiot’ approach involved the facilitator acting as an ‘idiot’ who had forgotten what play and activity was like as a child and needed the help of the children to solve this problem. Second, to make focus groups more interactive, children were asked to draw and discuss a map of their social environments where they were most likely to participate in PA. This approach is called ‘mapping’. Third, to ensure that quieter children were engaged in the study, ‘photovoice’ was used to gather complementary data. Children were provided with disposable cameras and asked to take photos over one week and write a brief comment for each photo they took to explain
what they wished to express with the photograph in relation to PA. For younger children, if necessary, the task was accomplished with an adult.

**Questionnaires**

Of the fourteen reviewed articles, six studies used a questionnaire to assess PA knowledge and preferences (6, 16, 33, 34, 36, 37). In all six studies, questions were read out loud to participants and pictures were used to facilitate activities in which children were asked to sort a selection of photographs according to which activity they prefer (PA preference), or according to which activity would contribute positively towards health and which would not (PA knowledge). Children were asked to point or circle the picture of an activity and were often presented with two pictures at a time, one showing children engaging in sedentary activities, such as playing with Lego (36) or active activities, such as climbing (6). The study conducted by Calfas and colleagues (36) was the only study to offer a detailed description of photographs used, stating that children represented in the photographs were 5 to 6 years old and from several ethnic groups (36). Further, Calfas and colleagues (36) described that when presenting children with photo pairs (one being sedentary and the other active), the activities displayed in both photos in the pair were of similar intensity, location (either outside or inside), solitary or group-based and required the same amount of equipment. Two studies used electronic devices (computer or iPad) to present questionnaires and to display images (6, 34). The assistance of an adult to read questions aloud and use the electronic devices was needed in all studies except one (33).

**Observation**

Two studies used observation of children’s activities as a tool to assess preferred activities (31, 33). Lopez-Dicastillo and others (31) observed children’s breaks and school meal times, everyday routine activities, school trips and end-of-term activities (31). Parrish and others (33)
observed children’s playground activities with the purpose of identifying common activities to inform the development of a picture-selection questionnaire (33).

**Validity and reliability**

Only four out of fourteen of the included studies reported assessing the validity of the data collection tool used and six reported testing the measures for at least one type of reliability (see Table 5.1). Pilot-testing of the instrument was done in six studies (6, 16, 30, 32, 36, 37).

**Physical Activity Knowledge**

Two studies reported assessing the validity of their tool by measuring the extent of improvement in PA knowledge after a brief intervention. Calfas and colleagues (36) could not achieve significant results by measuring the extent of improvement in PA knowledge after a brief intervention, whereas a significant improvement was measured by Wiseman et al., (6) \( (t=-3.40; p<.001) \). Céspedes and others (16) tested their instrument for face and content validity based on the opinions of a panel of experts in psychology, qualitative research, paediatrics, nutrition, child development and education (16). In regards to reliability testing, three studies (34, 36, 6) assessed the test-retest reliability of their tool, resulting in low values, respectively \( (r=.43, p<.001; r=.47, p<.01; r=.58, p<.001) \). Céspedes and colleagues (16) attained a medium level for internal consistency \( (\alpha = .64) \). Lanigan (7) tested for inter-rater reliability and findings indicated .764 agreement (40).

**Physical Activity Preferences**

To test the validity of their PA preference tool, Calfas and others(36) calculated percent agreement between stated preferences and actual choices of activities. Results indicated that the overall the percent agreement was at a chance level (i.e., 56.35%) (36). Wiseman and others (6)
calculated the percent agreement between stated activity and PA preferences at 63%, though this declined with age. Parrish et al. (33) assessed the validity of their tool using measures of convergent validity through the comparison of (1) an Actigraph Accelerometer Activity Data and the Children’s Activity Questionnaire (CAP), and (2) observed playground activities and the CAP-data. Findings yielded non-significant correlations (see Table 5.1) (33). Test-retest reliability of tools measuring PA preference was assessed in three studies (6, 33, 36), resulting in low values for correlation respectively ($r=.22$, $p=.03$; $r=.407$, $p<.0001$; $r=.03$, $p<.01$). Wiseman et al also tested for internal consistency ($\alpha = .53$)(6).

5.6 Discussion

Physical activity knowledge and preferences are both key indicators of a child’s PA behaviour (7, 17). This systematic review reveals that, to date, few studies have assessed PA knowledge and preferences in preschool children. The primary goal of this review was to identify the tools being used, examine whether these techniques align with the specific needs of young children, including age-related developmental capabilities (short attention spans, limited verbal skills and lack of fine motor skills), and make practical suggestions for the future measurement of preschool children’s PA knowledge and preferences. In most studies, researchers complemented their data collection technique with additional materials, such as photographs/sketches, drawings or diaries, to stimulate the child’s responses. The literature underpinning the data collection techniques used in the reviewed studies, together with the reported testing for validity and reliability, will be used to consider the efficacy of assessment techniques.

Selecting interview questions

Six studies used interviews to measure PA knowledge and preferences. None of the reviewed studies that used an interview tested the authenticity of measures, nor provided any information
regarding pilot-testing. This represents a key limitation of techniques used to date, as pilot testing is crucial to identifying misunderstandings resulting from miscommunication between the participating child and researcher, problems with response sets or graphics, potential barriers, or other testing issues (41). Nonetheless, pilot testing may have been conducted and not reported in the study.

Open-ended, closed-ended and a combination of both question types were used. Some researchers suggest open-ended questions in the absence of other verbal prompts or cues, particularly at the beginning of an interview, may be too challenging for children (42). This could have been an issue in the study of Lasky and Eichelberger (18), who received a high percentage of no answers (40%) or non-sense answers to the question “What do you think is the best reason that exercising keeps you healthy?”. Due to limited cognitive and verbal capabilities of children, closed-ended questions at the beginning of an interview can help a child settle in to the interview process (42). However, using only closed-ended questions might neglect the child’s full experiences. It is more likely that the child is going to guess the “right” answer to please the adult or guardian (34, 43). Cammisa and colleagues (20) used both open- and closed-ended questions and formulated short questions, such as, “What is your favourite game?” followed by, “Why do you like it?”. This method allows the child to become familiar with the topic and prepare for more complex questions (39). Due to limited attention spans and linguistic processing capacity, easy-language, short questions and one question at a time helps to reduce misunderstandings in the interview (44). Giving additional more prompts and asking direct questions in the beginning of the interview may help to engage in the topic (42).

Using structured-play based activities
Play-based activities were used in six of the fourteen reviewed studies and included tasks such as role play, drawings, ‘mapping’, ‘photovoice’ and ranking games. Drawing and craft activities served as engaging, task-centred data collection techniques to measure PA preferences. Cammisa and others (20) asked participants to draw themselves in their preferred way of playing, followed by an interview that was guided by the drawing (20). The use of drawings facilitated communication between child and researcher as it can help to overcome the brevity of their verbal responses. Facilitating discussion with children allows for more elaborate responses that are more likely to reveal their knowledge and reflection of an event or concept, rather than their ability to repeat directives from caretakers. Further, a meta-analysis by Driessnack (46) provides strong evidence that the use of drawings is an appropriate and efficient method to facilitate communication with children (46). Bélanger, et al. (30) had participants rank their PA preferences on a photo collage, although this is an age-appropriate method to assess PA preferences, several weaknesses to this technique were evident (30). For example, the number of sedentary activities and active activities were uneven (eleven active vs. three sedentary activities), so this may bias results due to the unequal representation of sedentary activities. Further, children’s responses may have been influenced by the responses of other children, who were in the same group. A similar issue was also evident in the study conducted by Cammisa and others (20), in which children within the same group reported similar PA preferences. Thus, although group activities can be a fun way to engage children in research, steps should be taken to minimise peer influence on responses (47).

Darbyshire, Macdougall and Schiller (35) used a ‘mapping’ technique, in which participants were asked to draw and discuss a map of their social environments where they were most likely to participate in PA (35). This study also incorporated, ‘photovoice’, this technique was used so that children who might be hesitant to contribute to a group discussion would feel more
confident and autonomous if asked to take their own photographs. Limited information about the given instructions of the task, such as the number of photos, makes it difficult to replicate the methodology. Nevertheless, photographs were seen as a “valuable, visual complement to the focus group interviews with children” (35). Thus, the use of photographs, in conjunction with a small description of what the child wants to express, is recommended (43). Without the child’s interpretation, such analysis of this data would lack important insights and remain adult-centric. Therefore, it is suggested that children should be included in the interpretation element when using this technique (35).

Role-play, in conjunction with the provision of a doll/bear, is a technique that has been developed to help children explain thoughts and behaviours (45). In the reviewed studies, the use of bears/dolls appeared to be an effective way to measure PA knowledge (6, 7, 36). Using dolls/bears allowed children to assume a caretaking role of the doll/bear and encouraged them to select activities for the bear/doll to participate in that will help the doll/bear “to grow big and strong and healthy”. Researchers who used this technique suggest that the ‘caretaker’ approach is an effective method to measure children’s PA knowledge because it enables the researcher to control for the influence of a child’s personal activity preferences (6). However, the effectiveness of the use of dolls to elicit a caretaker response in children has not been adequately measured or tested and requires further research. Lanigan (7) also applied the caretaker approach, in which children suggested leisure-time activities and responded to “less healthy requests” from the dolls. While this was based on empirical evidence (as reported by the study), no validity or reliability measurements have been conducted.

*Questionnaires and the selection of materials and prompts.*
Questionnaires were used extensively throughout the reviewed studies. All questionnaires included the use of pictures illustrating children engaging in a variety of activities. Pictorial prompts were used to create interaction between researcher and child as a way to engage children in the research. A researcher can work with young participants’ developing verbal abilities and shyness by giving children the opportunity to communicate through making a circle around the preferred answer or through pointing. A key strength of pictorial prompts in a questionnaire is the short amount of time required and the use of minimal or inexpensive materials. Thus, a large number of children can be assessed in field settings to address a variety of research questions (6, 36, 39).

All six studies that used questionnaires as a technique incorporated pictures to assist children’s ability to respond. However, it was evident from the reviewed studies that a number of factors need to be considered when selecting photographs to reduce bias in the measurement of preschool children’s PA knowledge and preferences. To assess appropriateness, five studies tested the questionnaires for face or content validity through expert reviews or pilot-testing (6, 16, 33, 36, 37). Validity and pilot-testing allow researchers to identify any issues with the tool, including the appropriateness of tool content, issues with delivery or how participants understand what is being asked of them. This information can assist in refining the tool before it is used for data collection. For example, to gain valid results regarding children PA knowledge and preference, the child needs to be able to understand and recognise the active and sedentary activities that are presented in pictures (48).

Familiarity is a key consideration when assessing children’s PA knowledge and their preferences. Children are less likely to select unfamiliar activities or activities that they do not have the motor skills to complete as preferred activities (36). Further, when selecting physical
activities for photographs it is important to consider the level of safety they represent. Children may be more inclined to select sedentary behaviours or the ‘safe option’ as health promoting activities, biasing their scores of PA knowledge (6). Further, when selecting photographs to assess PA knowledge and preferences, it is important to consider potential bias of the items presented to children as items may communicate which choices are healthy and thus socially desirable. This may result in children selecting the healthy option as they understand this as the ‘correct’ response. To address these issues, Bélanger and others (30) asked teachers to take photographs of extra-curricular activities occurring within the childcare centres, whereas Parrish et al. (33) observed playground activities of children prior to developing artist constructed drawings of the observed activities (33). Parrish and colleagues (33) highlighted the importance of depicting children of both genders in selected photographs, and Calfas et al. (36) identified the need to display images of children the same age as participants and from varying ethnic groups. To further assist children in making a fair comparison between paired images of ‘healthy’ or preferred activities and ‘unhealthy’ or unfavourable activities, it is important that the activities are similar in nature (both inside or outside, both solitary or group-based). Wiseman, Harris and Downes (6) also highlighted the importance of including pictures involving screen time (television viewing, computer gaming) as a sedentary option for children to select, due to the increasing usage of technology by young children.

Five of the six studies that used a questionnaire tested for at least one type of validity and reliability. However, the low values for both scales of PA knowledge and PA preferences are concerning. Calfas et al. (36) obtained non-significant results for knowledge scales by calculating the extent of improvement after a short intervention and low reliability values for knowledge and preference scales, suggesting that these scales not ready for use in other studies (36). The low reliability and validity might be a result of the instability of actual preferences in
children in this age group. For example, children’s choice of activity might be situation-dependent, which means, that choice could be influenced by what children have done immediately before the testing (36), the weather and the novelty of the activity (6). Thus, considering or at least noting these factors may help to reduce potential bias when administering scales of PA knowledge and preferences.

**Observation and activity preferences.**

Due to young children’s limited verbal and motor skills, observation can be a useful technique to gain insight into children’s preferences for PA (39, 47). Observation was used in two of the reviewed studies as a basis for preparing questions and to compared stated preferences with actual activity choices as a method for assessing the reliability of photographs as data collection tools (31, 33).

**Limitations**

This systematic review is not without limitations. The inclusion criteria required authors to sufficiently describe their data collection technique in detail, which resulted in some studies that assessed preschool children’s PA knowledge and/or preferences being excluded. In an effort to include as many relevant studies as possible, in the instances where a study did not provide sufficient detail of the technique used the authors contacted the authors of these papers for further information.

**5.7 Conclusion**

Overall, a limited but disparate range of engaging techniques have been used to assess preschool children’s PA knowledge and preferences. However, limitations to these techniques are evident, with few studies testing techniques for reliability or validity properties. The following
suggestions can be made on the basis of the reviewed articles. In general, data collection techniques used to measure PA knowledge and preferences in children should include material prompts or should incorporate structured play-based activities. This encourages children to engage in the research process. Picture sorting activities appeared to be a low cost and effective technique to measure children’s PA knowledge and preferences. However, it was evident that more work needs to be done to ensure the validity and reliability of this technique to measure PA preferences.

Further, more consideration is needed to ensure the techniques align with the characteristics of the study population. For example, when incorporating photographs or images into data collection techniques, the activity presented needs to be age-appropriate, familiar, safe and should reflect the demographic characteristics of the study population being tested. This can be assessed through pilot-testing and observing children’s activity participation as a step in tool development. If the testing is conducted in group work, research should be monitored to prevent peer influence. Considering the specifications of assessing PA knowledge, a caretaking approach might be an effective method to elicit a child’s concept of health regarding PA instead of decisions made on personal preferences. When assessing PA preference, it is important to consider what activities participants engaged in immediately before the testing as this might influence the preferred activities selected during testing.

This review has examined how existing techniques to measure preschool children’s knowledge of and preference for PA align with accepted methods for the assessment of young children. This review offers educators and public health professionals a resource that will enable them to develop, select or improve upon techniques to more effectively and consistently evaluate lifestyle interventions targeting preschool children.
5.8 References


Chapter 6: Validation of the Preschool Food and Play Questionnaire

6.1 Study 3- Validation of the Preschool Food and Play Questionnaire (Pre-FPQ) (Manuscript 3)

Reader’s Note:
The information in this section has been published as an original research paper in a peer-reviewed journal: Journal of Behavioral Nutrition and Physical Activity


Reference

The co-authors of this publication confirm that the research candidate has made the following contributions to this manuscript:

- Developed the study design;
- Completed the human research ethics application;
- Developed the questionnaire and pilot tested;
- Conducted data collection;
- Performed data analysis;
- Prepared manuscript for submission to journal.

Signed:  Date: 10/07/2018

Signed:       Date:  28/06/18
Title: Validation of an iPad activity to measure preschool children’s food and physical activity knowledge and preferences

6.2 Abstract

Background: Preschool children’s knowledge of, and preference for food and physical activity play an important role in the development of lifestyle behaviors throughout childhood. Valid and reliable instruments that are interactive and appealing to preschool children are needed, to obtain quality information in a way that actively engages children and encourages willing participation. The purpose of the current research is to assess the reliability and validity of an adapted computerized (iPad) version of the photo-pair food and exercise questionnaire (PPFEQ).

Methods: The adaptation of the PPFEQ involved generating the questionnaire as an iPad-based tool, updating the photo-pairs within the questionnaire and testing for validity and reliability. This involved four phases of investigation to assess test-retest reliability, internal consistency, sensitivity to change and percent agreement of the questionnaire.

Results: The adaption of the PPFEQ resulted in an 18-item questionnaire, titled the preschool food and play questionnaire (Pre-FPQ). The Pre-FPQ demonstrated acceptable reliability and sensitivity to change. Test-retest reliability and internal consistency improved with age, however, it was evident that the tool was not suitable for children younger than four years of age.

Conclusions: Children encounter a dynamic world that shapes their knowledge, preferences, choices and behaviors. The Pre-FPQ is an innovative tool to measure preschool children’s
knowledge of and preference for food and physical activity. The questionnaire offers the advantage of being presented in a well-received modality for preschool children as well as being easy and inexpensive to administer. This new tool is likely to be useful for the assessment of the effectiveness of healthy lifestyle programs implemented in the childcare setting. Future work is needed to refine and improve measures of physical activity preference in preschool children.

**Key Words:** Preschool children, Questionnaire, Validity, Reliability, food, physical activity, knowledge, preference, Pre-FPQ
6.3 Introduction

Diet and physical activity are important factors in the promotion and maintenance of good health throughout the entire life course. Their role as determinants of illness and chronic disease is well established and they therefore occupy a prominent position in health promotion programs [1]. Early childhood has been identified as a critical life-stage to implement lifestyle programs, as children are beginning to establish skills and behaviors related to eating and physical activity that are often continued into adolescence and adulthood [2, 3, 4]. From a socio-ecological perspective, the development of food and physical activity behaviors by preschool children is shaped by the interaction of individual, social and environmental factors [3, 5, 6]. At the individual level, both preschool children’s knowledge of, and preference for food and physical activity play important roles in the development of lifestyle behaviors throughout childhood [3]. Accordingly, there has been growing interest in the measurement of preschool children’s knowledge of and preference for food and physical activity as possible mediators of behavior [7, 8].

Food and activity knowledge

As children begin to gain independence, they operationalize the knowledge they have gained about food and exercise into what they perceive to be appropriate health behaviors [3]. In this way, a child’s knowledge and understanding of the benefits of a healthy diet and physical activity can have an important influence on a child’s lifestyle behaviors [9, 10, 11, 12]. To date, very few studies have developed or applied data collection tools to specifically investigate preschool children’s knowledge of ‘healthful’ and ‘unhealthful’ physical activity [13, 14, 15]. One European study conducted by Cammisa and colleagues (2011)[15] used a play-based drawing activity to elicit the views of preschool children on physical activity and perceived barriers to practicing it; however, this tool was not tested for validity or reliability. Although several innovative and age-appropriate techniques have been used and developed to measure
preschool children’s understanding of food and nutrition; few instruments have been tested for psychometric properties. Picture-based identification tasks and sorting activities (in which children sort food into groups based on type and nutritional quality) are most commonly used as an engaging and efficient technique to assess food knowledge in this age group [16, 17].

**Food and activity preferences**

Food and activity preferences play an integral role in shaping lifestyle behaviors in young children. It has been suggested that children’s preferences for particular foods influence consumption more than parental intake or parental attitudes to child feeding [18, 19]. Thus, food preferences are arguably the most important predictor of young children's food selection and consumption [7, 20, 21, 22]. There are a number of ways to measure children’s food preferences, the most effective method being the tasting method developed by Birch (1999), which involves presenting children with different food products and having participants taste the items [8]. However, this method is not practical for use in large studies [21], is resource intensive, expensive and has limitations being that children can only taste a limited amount of foods before getting satiated [8]. An alternate technique which has been shown to yield similar results to tasting methods is the use of food photographs [8, 21]. Several studies have applied this method and found that good quality food photographs can effectively measure children’s food preferences as this method focuses on visual appearance, and appearance is often the first sensation to arouse interest in a given food, particularly in the case of young children [8, 21, 23, 24, 25].

In regards to physical activity preference, participation in activities that are enjoyable is also essential for a physically active lifestyle [17]. Little is known about the development of activity preferences in young children [22]. As activity preferences are related to behavior and have the potential to be changed, research to improve our understanding of the development of such
preferences in children is warranted [22]. One pilot study conducted by Leary and colleagues (2008), used a picture-based selection activity to test the relationship between activity preferences of parents and young children, however psychometric testing of this tool was not reported [17]. Very few studies have examined children’s food and activity preferences simultaneously, and very rarely in preschool children [24, 26, 27, 28].

Only one tool was found to simultaneously measure preschool children’s knowledge and preference of both food and physical activity [24]. The photo pair food and activity questionnaire (PPFEQ) was designed by Calfas and colleagues in 1991 as a practical means to assess preschool children’s knowledge of and preference for physical activity and food [24]. The PPFEQ was previously validated as a paper-based picture sorting activity and has been used effectively in several studies since its development [14, 29, 30]. However, given the timeframe since the development of the PPFEQ, and the limitations identified in the initial validation of this tool, it is appropriate to update the questionnaire and determine the reliability and validity of the adapted tool.

It is increasingly recognized that instruments used to collect information from young children need to be interactive and appealing to the participant, to ensure quality information in a way that actively engages children and encourages willing participation. Computer assisted evaluation techniques are now acknowledged as being a more acceptable format for today’s children [31]. The emergence of iPad and computer assisted evaluation techniques is attractive in terms of efficiency, economy and respondent preference. The increasing use of iPads and exposure of children to iPads within the home and childcare environments make it an appealing modality for children [31]. Further, research suggests that computer-based respondents are more enthusiastic, this is important as data collected is dependent upon the respondents’
willingness to expend the effort needed to provide accurate answers [21]. The use of this format might increase motivation to proceed more carefully through the necessary cognitive processes to give an accurate answer [21, 31]. Given the advantages associated with computer-based modality of test administration, the PPFEQ was generated as an iPad application. The purpose of the current research is to assess the reliability and validity of an adapted computerized (iPad) version of the PPFEQ.

6.4 Methods

Procedure

The current research involved four phases of investigation. Interviews were conducted at the participating child care centers and took approximately 10 minutes at each time point with each child. The design of this study was guided by that used to evaluate the paper-based PPFEQ [24], as well as additional research evaluating the comparative reliability of questionnaires administered in both paper-based and computer/iPad modalities [31, 32, 33]. The adapted iPad based questionnaire is titled the Preschool Food and Play Questionnaire (Pre-FPQ). This study protocol was approved by the Griffith University HREC (MED/32/15/HREC).

Phases of Investigation

Phase 1: Adaptation of Pre-FPQ

Alterations to the photo-pairs in the Pre-FPQ were made based on the findings of a study conducted prior to the current study, which included the use of the questionnaire [34]. Three researchers reviewed the altered/additional items (photo-pairs) to determine face validity. The questionnaire was then trialed with 10 participants to determine the appropriateness of photographs included in the tool and to determine any issues with familiarity and difficulty.
Sample

Participants were recruited using convenience sampling at daycare centers located in Gold Coast, Australia. Parental consent was obtained for all children who participated in the study. To be eligible for inclusion in the study participants had to be aged between three and six years at the beginning of the study. The sample size was determined using two sample-size calculations to assess both the validity and reliability of the Pre-FPQ.

Measures

Child food and activity knowledge and preferences were assessed with the adapted, iPad version of the Pre-FPQ. The questionnaire consisted of 18 photo-pairs (10 food pairs and 8 activity pairs). Within these pairs, one picture represented a healthy food or activity, and the other represented a comparatively less healthy food or sedentary activity. Examples of the presentation of items in the Pre-FPQ are shown in appendix 2. The Pre-FPQ included four subscales; food knowledge, food preference, activity knowledge and activity preference. The food scales comprised 10 photo-pairs of photographed foods representing food items from similar food categories e.g. snack items, drinks and lunch/breakfast meals. All foods were photographed on the same white plate/bowl, in some cases the food packaging was included to clarify the food type. Activity pairs were presented with the same child (aged 6) in both photos, whether male or female.

At the beginning of the test, each child was asked to choose a small doll/bear and invited to pretend they are taking care of the doll and need to help the doll to stay healthy. The doll was used so that the child would assume a caretaking role and thus make it less likely that they make choices based on personal preferences [24]. The child was then presented with 18 pairs of photographed foods or activities in random order on the iPad. The child was asked to ‘point to the food/activity that will make the doll healthy’. In order to determine preferences, the
participant was then shown the 18 photo-pairs a second time and was asked to ‘point to the food or game that they like best’. The order of knowledge and preference testing was randomly assigned as a function of the iPad tool. The iPad also generated prompts at designated intervals throughout the test for the interviewer to remind participant whether they should select the food they preferred or considered the healthy alternative, this ensured consistency across interviews. Scale scores for each subscale were determined by the sum of healthful choices made (healthful choice =1 point, unhealthful/sedentary choice = 0 points).

Phase 2: Test Reliability

During phase two of the investigation, participants were invited to complete the Pre-FPQ iPad application through one-on-one interviews with the researcher. The participants were retested after 7 days using the same protocol to determine the test-retest reliability of the Pre-FPQ.

Phase 3: Preference validity testing

Phase three of the investigation involved the validation of the food and physical activity preference component of the questionnaire, and was conducted one week after phase one. Validity of the preference tests was determined by giving each child actual choices of the same food and activity pairs that were used in the photographs. Food pairs were presented to each child in the same way they were in the PPFEQ. Children were asked to select the food that they preferred. Similarly, for physical activity pairs, children were told that they could play a game for two minutes, and that they can choose between one or the other game of the activity pair. Actual food/activity preferences were compared to their stated preferences selected in the iPad questionnaire. Pairs were randomly selected for use in the preference validity tests, in an effort to reduce time burden on the participants. Half of the participants received the preference validity testing first, followed by the knowledge validity testing, this ordering was reversed for
the other half of participants to control for any influences the effect order may have (see figure 6.1).

**Phase 4: Knowledge Validity testing**

During the final phase of investigation, the validity of the food and activity knowledge component of the questionnaire was determined by re-administering the questionnaire after a short 10-minute education session. The education session involved the explanation of very basic dietary and activity principles related to health. The sessions were made available to all children at the participating child care centers upon permission of the center director and not limited to those who returned informed consent. The sessions involved age-appropriate activities using pictures and games and did not include the use of photographs presented in the questionnaire.
Data analysis

Statistical analyses were performed using Statistical Package for the Social Sciences (SPSS version 22.0). During the first stage of data analysis, item analysis was conducted to omit items that demonstrated poor difficulty or discriminability. Test-retest reliability of the PPFEQ was assessed using Pearson correlation tests by comparing the average score of food knowledge, food preference, physical activity knowledge, and physical activity preference scores from stage one and stage two of the investigation. Validity of the knowledge scale of the questionnaire were assessed by calculating the extent of the improvement on knowledge scores following the brief...
intervention. Paired-sampled t-tests were used to determine any significant changes in knowledge scores. A p value of <0.05 was considered statistically significant. Validity and reliability were also calculated separately for each age group (3, 4 and 5 years), due to subgroup analysis a Bonferroni correction was used and a p value less than 0.016 was considered statistically significant. The preference scales were validated by calculating the percent agreement (and its 95% confidence interval) between stated preference and actual choices of foods and activities.

6.5 Results

A total of 18 photo pairs were included in the final Pre-FPQ. Food and activities selected for the photo-pairs were drawn from the validated paper-based version of the tool; several of the items were updated after pilot testing due to low familiarity. Given the extended timeframe between the development of the PPFEQ and the current study, photo-pairs within the tool were updated to be more contemporary. For example, due to the emergence of new technologies since the questionnaire was last tested for validity and reliability, activities involving screen-time (e.g. television viewing, computer gaming) were added to the physical activity component of the questionnaire as sedentary alternatives [22]. There were four pairs retained from the original tool, eight pairs were altered and six pairs were added to the questionnaire (see table 6.1).
Table 6.1 Photo-pairs used to assess food and activity knowledge and preference

<table>
<thead>
<tr>
<th>Healthful/Active</th>
<th>Unhealthful/Sedentary</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Activities</strong></td>
<td></td>
</tr>
<tr>
<td>1. Cricket&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Reading</td>
</tr>
<tr>
<td>2. Skipping&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Watching Television</td>
</tr>
<tr>
<td>3. Soccer&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Checkers</td>
</tr>
<tr>
<td>4. Swimming&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Computer</td>
</tr>
<tr>
<td>5. Running&lt;sup&gt;b&lt;/sup&gt;</td>
<td>iPad</td>
</tr>
<tr>
<td>6. Climbing&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Xbox</td>
</tr>
<tr>
<td>7. Bike&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Legos</td>
</tr>
<tr>
<td>8. T-ball&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Coloring</td>
</tr>
<tr>
<td><strong>Food</strong></td>
<td></td>
</tr>
<tr>
<td>1. Sultanas</td>
<td>Mixed lollies</td>
</tr>
<tr>
<td>2. Rice</td>
<td>Chips</td>
</tr>
<tr>
<td>3. Yoghurt&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Doughnuts</td>
</tr>
<tr>
<td>4. Salad sandwich&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Jam sandwich</td>
</tr>
<tr>
<td>5. Water&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Juice</td>
</tr>
<tr>
<td>6. Oranges&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Cookies</td>
</tr>
<tr>
<td>7. Rice cakes</td>
<td>Crisps</td>
</tr>
<tr>
<td>8. Weetbix</td>
<td>Frootloops</td>
</tr>
<tr>
<td>7. Milk&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Cola</td>
</tr>
<tr>
<td>10. Apples&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Cake</td>
</tr>
</tbody>
</table>

<sup>a</sup>= Pair was added to Pre-FPQ  
<sup>b</sup>= Pair was altered from item in original Pre-FPQ
A total of 86 Australian preschool children (44 boys and 42 girls) participated in the study. The age of participants ranged from 37 months to 66 months (M= 51 months, SD 7.5). In the initial stage of the analysis, item analyses were conducted to identify any items that demonstrated poor discriminability or test-retest reliability. The Pre-FPQ can be broken down into the following four subscales: food knowledge (Score out of 10), physical activity knowledge (8), food preference (10) and physical activity preference (8). The mean and standard deviation of subscale scores are presented by age in table 2. Participant’s knowledge of both food and physical activity increased with age, whereas food and physical activity preference remained relatively consistent across each age group.

Table 6.2 Mean (SD) of the subscale scores of the Pre-FPQ by age group

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Total N=86</th>
<th>3 Years N=27</th>
<th>4 Years N=40</th>
<th>5 years N=19</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food knowledge score^a</td>
<td>4.56 (2.75)</td>
<td>3.33 (1.84)</td>
<td>4.67 (2.84)</td>
<td>6.38 (2.98)</td>
</tr>
<tr>
<td>Food preference score^a</td>
<td>3.97 (2.14)</td>
<td>3.52 (1.76)</td>
<td>4.43 (2.42)</td>
<td>3.56 (1.86)</td>
</tr>
<tr>
<td>Activity knowledge score^b</td>
<td>4.71 (1.82)</td>
<td>4.59 (1.76)</td>
<td>4.62 (1.71)</td>
<td>5.19 (2.28)</td>
</tr>
<tr>
<td>Activity preference score^b</td>
<td>4.34 (1.59)</td>
<td>4.56 (1.80)</td>
<td>4.17 (1.62)</td>
<td>4.31 (1.13)</td>
</tr>
</tbody>
</table>

^a score range 1-10   ^b score range 1-8

Pearson correlation tests demonstrated that the test-retest reliability for food knowledge (r =0.61, p =<0.001), food preference (r=0.61. P<0.001) and for physical activity knowledge (r =0.58, p=<0.001) was moderate and for physical activity preference (r =0.30, p =<0.01) (Figure 6.2) was poor. Developmental effects were assessed by comparing results in children aged three, four, and five. Figure 6.2 shows that the reliability of each knowledge scale improved with the age of participant. Food and activity knowledge scales and the food preference scale demonstrated higher reliability in comparison to the activity preference scale. Alpha coefficients for food knowledge (0.80) and food preference (0.65) demonstrated good and
acceptable internal consistency respectively. Alpha coefficients were low for physical activity knowledge (0.59) and preference (0.35), though this improved with the age of participants (figure 6.2). Overall, internal consistency improved with participant age for all scales with the exception of physical activity preference (figure 6.3).

Figure 6.2 Test-retest reliability of each subscale of the Pre-FPQ for 3, 4 and 5 year old participants

(n=86, 3 Years n=27, 4 Years n=40, 5 years n=19). *p<0.016 ** p<0.01 *** p<0.001
Figure 6.3 Internal consistency of each subscale scale of the Pre-FPQ for 3, 4 and 5 year old participants

The validity of the food and activity knowledge scales were tested using paired samples t-tests to determine the sensitivity of scales to change by testing for any improvements in knowledge following a short education session. Overall, the questionnaire measured significant improvements in participant’s physical activity knowledge ($t = -3.40$, $p < 0.001$) and food knowledge ($t = 4.18$, $p < 0.001$). Improvements in knowledge increased with age and demonstrated no validity in the 3-year-old children (See figure 6.4). 

(n=86, 3 Years n=27, 4 Years n=40, 5 years n=19)
The preference scales were validated by calculating the percent agreement between stated preference and actual choices of foods and activities. The percent agreement between stated food preference and actual food choices was 73%, again this improved with age with the percent agreement being 78% in 5-year-old children. Percent agreement between stated activity and physical activity preferences was 63%; however, percent agreement declined with age (See figure 6.5).
Figure 6.5 Percent agreement between stated preference and actual food and activity choice by age group

6.6 Discussion

On the whole, the reliability and sensitivity of the adapted Pre-FPQ was acceptable. Test-retest reliability and internal consistency improved with age; however, it was evident that the tool was not suitable for children younger than four years of age. Validity of the food and activity knowledge scale was indicated by significant increases in children’s knowledge scores after exposure to a healthy lifestyle education program. The percent agreement between stated food preference and choice of food was high. In contrast, the percent agreement between activity preferences and choice of physical activity was relatively low and was inconsistent across age groups. It was evident that situational factors played a role in influencing children self-reported physical activity preferences.

Food knowledge scales demonstrated high test-retest reliability and good internal consistency, comparing well with similar tools measuring food knowledge in the same population [36, 37,
The responsiveness of the questionnaire to change in knowledge was an encouraging finding, as sensitivity to change is essential if a questionnaire is to evaluate the effectiveness of an intervention [39]. The percent agreement between food preference and actual choices was high, this reinforces literature suggesting that the use of photos as a method to test children’s food preferences can be an adequate substitute to tasting methods, and offers a practical means to test large samples of participants [8,21,23,24,25]. Test-retest reliability of the food preference scales also compared well to studies that utilized the tasting technique of preference testing [8,21,23,24,25]. Test-retest reliability and internal consistency of food preference scales improved with the age of participants, demonstrating high internal consistency for 4 and 5-year-old children. This is consistent with a study conducted by Guthrie and colleagues (2000), which found a clear trend in differences in reliability by age with significantly lower reliability in 3 year olds compared with 5 year olds [23].

Although reliability and validity for the physical activity preferences scale were low, the physical activity knowledge scale demonstrated high test-retest reliability and good internal consistency for 5 year olds. Further, the questionnaire measured significant improvements in participant’s physical activity knowledge after children were exposed to a short educational intervention, which indicated the scale is sensitive to changes in physical activity knowledge. Whilst the results of this study indicate physical activity scales are less reliable than food scales, the adapted Pre-FPQ offers a proximal and direct way to measure children physical activity preferences [40, 41]. To date, no tool is available to measure self-reported physical activity preferences in preschool children thus making the Pre-FPQ a valuable addition to existing literature. This reflects emerging literature emphasizing the importance of actively engaging young children in the research process, rather than relying solely on the recounts of their caregivers [41]. Nonetheless, more work needs to be done to refine the physical activity preference component of the tool.
Interestingly, Calfas and colleagues (1991) had a similar finding in that; the percent agreement between activity preferences and choice of physical activity was relatively low in their validation of the previous PPFEQ. Although the adapted tool indicated improved percent agreement of the physical activity preference scale, low and inconsistent levels of percent agreement may reflect a lack of concrete physical activity preference in this age group [17]. Alpha coefficients for physical activity preference were low, however, they demonstrated acceptable internal consistency for children that were five years of age. Research on preschooler physical activity preferences is limited, mostly being measured through parental reporting [17, 24, 39, 40]. Thus, it is not possible to compare the reliability and validity of this component of the Pre-FPQ with existing measures.

In an effort to explain the low reliability of the physical activity preference scale in comparison to the food preference scale, Calfas and colleagues suggested that children’s choice of activity may be more situation dependent than their choice of food [24]. For example, as children’s food preferences may remain relatively stable over time, children’s physical activity preferences may be influenced by the context in which they were tested, and what they feel like doing on that occasion. Interestingly, this was observed in the current study through comments of participating children when measuring their activity preferences. Activity choices were influenced by the weather at the time of testing, the novelty of the activity (e.g. the use of iPad) and the activity being completed in the classroom prior to testing. There is a need for future research to consider how situational factors influence children self-reported physical activity preferences, and to develop a means to control for such influences.

Another key finding of this study was that the Pre-FPQ does not appear to be appropriate for the measurement of lifestyle knowledge in three-year-old participants, as no significant changes
in knowledge were observed after the intervention. Although evidence suggests that 3-year-old children have the cognitive ability to understand and retain information regarding healthy food and physical activity [3], this was not reflected by the findings of this study. This may indicate that more specific techniques are needed to measure food and activity knowledge and preferences in 3-year-old children, such as less direct, observational methods [35].

The modality of the adapted Pre-FPQ offered several advantages over the paper-based version of the questionnaire. Using pictures in a computerized iPad format facilitated a fast and reliable measurement of food and physical activity preferences and knowledge in preschool children. The tool was easy to use, inexpensive and required little time and effort from participants, which helped the researcher to work within the attention span of the target age-group. The iPad modality of the Pre-FPQ was an appealing and exciting format that enabled the researcher to engage and maintain the concentration of participants. Further, the tool was able to be applied quickly to large numbers of participants and allowed for results to be exported securely and efficiently to a data analysis program to assist with timely analysis.

The study was also subject to limitations. The sample size was not large enough to examine the interactions between age and methods rigorously, although patterns of results are consistent across the study and can be seen as a good indication of the influence of age on the tool. In addition, the sample of participants for this study was drawn from childcare centers residing in middle-to-high socioeconomic neighborhoods. These limitations restrict the generalizability of the study findings.
6.7 Conclusions

This study adds to the literature by providing a validated means to measure preschool children’s knowledge and preference for food and physical activity. The adapted Pre-FPQ is an innovative tool and demonstrated adequate reliability and validity for the assessment of food and activity knowledge and preferences in 4-5 year-old children. It was evident that the tool was not appropriate for children younger than four years of age. The Pre-FPQ offers the advantage of being presented in a well-received modality for preschool children as well as easy and inexpensive to administer. This new tool is likely to be useful for the assessment of the effectiveness of healthy lifestyle programs implemented in the childcare setting, which aim to encourage the development of health dietary and activity behavior in young children. Future work is needed to refine and improve measures of physical activity preference in preschool children.

Note: The Pre-FPQ iPad application is available through the Griffith University page on the iTunes store as a free download.
6.8 References


Chapter 7: Preschool children’s understanding of health and health behaviours

7.1 Study 4- Preschool children’s understanding of health and health behaviours
(Manuscript 4)

Reader’s Note:
The information in this section has been published as an original research paper in a peer-reviewed journal: Health Education Journal


Reference
The co-authors of this publication confirm that the research candidate has made the following contributions to this manuscript:

- Developed the study design;
- Completed the human research ethics application;
- Developed the study protocol and pilot tested;
- Conducted data collection;
- Performed data analysis;
- Prepared manuscript for submission to journal.

Signed:       Date: 06/07/2018

Signed:       Date: 28/06/18
Title: Listening to pre-school children speak about health and health promoting behaviours

7.2 Abstract

Objective: As children become increasingly exposed to health information and education, it is important to understand how these messages affect the way children speak about health and health behaviours. Children are social agents and co-constructors of their social worlds. Exploring how pre-school children speak about health and health promoting behaviours will help explain what children make of health messages in their environments, and may help to facilitate communication between children, parents, and educators.

Methods: Participants included 163 pre-school children aged three to five years old attending childcare centres in South-East Queensland, Australia. Semi-structured interviews were used to explore how pre-school children speak about health and health behaviours. Data were analysed using thematic analysis.

Results: Participant responses were structured as two categories. The first category was Meaning of healthy. This category comprised four themes of: eat your food (n=74 of 145, 51%), participating in activities (n=36, 24%), growing big and strong (n=20 13%) and not being sick (n=15, 10%). Category two, How to be healthy, comprised five themes including: eat healthy food (n=86 of 150, 57%), reduce risk (n= 31, 20%), treat illness (n=13, 8%), be well behaved (n=12, 8%) and do exercise (n=8, 5%).

Conclusion: Findings highlighted the centrality of food in how children speak about health. In comparison to discussion of food and the importance of eating healthy food, there was limited
mention of physical activity by participants as a way to be healthy. The theme reduce risk emerged from participant responses and relates to the practice of safety behaviours to prevent injury and illness. Future research needs to determine whether the emphasis children place on risk minimisation is shaping how young children speak about health and how this interaction plays out in their health behaviour.

**Key words:** Pre-school children, qualitative, health, physical activity, nutrition
7.3 Introduction

Early childhood is a life stage in which a person is gradually developing an understanding of complex concepts. The concept of health has evolved to be understood as a multi-dimensional, dynamic state of wellbeing (Bircher, 2005). How children understand and speak about health has implications for how they will act to promote health and manage risks to their health over time (Whitaker et al., 1997; Tinsley, 2003; Trudeau et al., 2004; Telama et al., 2005; Telama, 2009; Biro and Wien 2010; Craigie et al., 2011; Waters et al., 2011; Barton, 2012; Tatlow-Golden et al., 2013). Children are social agents and co-constructors of their social worlds and they offer fundamental insight into the information they receive regarding health and health behaviour (Contento, 1981; Normandeau et al., 1988; Tinsley, 2003). Listening to how children speak about health behaviours and how to maintain health may help to explain the complexity of children’s health behaviour.

Previous research has shown that young children can understand complex information if it is presented in appropriate ways, with children as young as three years demonstrating the ability to construct understandings of health (Cammisa et al., 2011). A child’s developmental acquisition of health-related understandings can be explained using an individual differences perspective (Tinsley, 2003). An individual differences perspective on children’s acquisition of health understandings suggests that personality, social and cultural variables mediate children’s understanding of health (Tinsley, 2003). Children develop their understanding of health through direct instruction, modelling and experiences within their environment. Messages about health are communicated to children both implicitly and explicitly so that they begin to learn social values around health. These understandings serve as the mental foundation to reasoning, intention and behaviour (Bartsch and Wellman, 1989; Worsley, 2002). Adults can be unaware of the ways in which children are interpreting information on health and making this
information meaningful to their lives. By listening to children’s voices it is possible to identify key values within the society of which they are a part.

Existing research presents mixed findings regarding children's understanding of health and what they consider to be health behaviours. Much of this research has focused on children’s conceptions of illness, or has targeted school age children (7 to 12 years) (Natapoff, 1982; Normandeau et al., 1998; Piko and Bak, 2006; Irwin et al., 2007). A number of studies have explored pre-school children’s knowledge and understanding of specific health behaviours, for example, food and exercise (Matheson et al., 2002; Macdonald et al., 2005; Pearce et al., 2009; Protudjer et al., 2010; Anthamattan et al., 2013; Harrison et al, 2015; Schultz and Danford, 2016). Interestingly, research that has looked broadly at this population’s understanding of health has found that children know the least about the relationship between food consumption, exercise and their health, and the most about beneficial and harmful practices in the areas of safety and hygiene (Olvera-Ezzel et al., 1994; Mobley, 1996). Pre-school children have also been found to view health as being able to participate in desired activities, being engaged and feeling good (Almqvist et al., 2006).

Much of the research investigating how children understand health and what they consider health behaviours was conducted over a decade ago (Mobley, 1996; Almqvist et al., 2006; Aggleton et al., 1998). It could be argued that how children speak about health may have shifted alongside societal changes. The field of child health has changed dramatically in recent years resulting in the adoption of new policies and interventions promoting health behaviours within childcare settings (e.g. healthy eating and active play) (Woldenden et al, 2011; Sansilios and Egberg Mikkelsen, 2011). Children are increasingly exposed to a variety of public health messages through media advertisements, education and promotion posters which collectively
shape a child’s understanding of how to be healthy (Woldenden et al, 2011; Burrows and McCormack, 2014). Exploring how pre-school children speak about health and health promoting behaviours may offer insight into how children understand health, and thus help to explain what children make of health messages in their ever-changing environments. This knowledge may help to facilitate communication between children, parents and educators. The purpose of this study was to explore how pre-school aged children speak about health and health behaviours.

7.4 Methods

Participants and procedure

Convenience sampling was used to recruit 163 pre-school children aged three to five years, from approximately 240 children attending 8 childcare centres in South East Queensland, Australia. Of the 163 participants, 87 were male (53.3%) while 76 were female (46.6%). Participants ranged in age from 3 years, 1 month (37 months) to 5 years, 1 month (61 months) (M = 48.13) (Table 7.1). More than half of the participants’ primary carers had completed higher education (bachelors or masters degree) (56.0%). Most participants had an annual household income of $145,600 or more (41.4%) or $83,200-$145,599 (31.8%). Childcare centres were selected based on their geographic proximity to the research team and willingness to participate in the study. At the participating centres, invitations asking parents to allow their child to take part in the study were distributed, which comprised information about the research and consent forms. Ethical approval for this project was obtained through Griffith University Human Research Ethics Committee HREC (MED/04/14/HREC).
Table 7.1 Demographic characteristics of participants (n=163)

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>87</td>
<td>(53.3)</td>
</tr>
<tr>
<td>Female</td>
<td>76</td>
<td>(46.6)</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>131</td>
<td>(82.9)</td>
</tr>
<tr>
<td>Non-Caucasian</td>
<td>27</td>
<td>(17.1)</td>
</tr>
<tr>
<td><strong>Annual household income</strong></td>
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<td></td>
</tr>
<tr>
<td>$145,600 or more</td>
<td>65</td>
<td>(41.4)</td>
</tr>
<tr>
<td>$83,200-$145,599</td>
<td>50</td>
<td>(31.8)</td>
</tr>
<tr>
<td>$83,199 or less</td>
<td>42</td>
<td>(26.8)</td>
</tr>
<tr>
<td><strong>Primary carer education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower secondary school</td>
<td>3</td>
<td>(1.88)</td>
</tr>
<tr>
<td>Upper secondary school</td>
<td>19</td>
<td>(12.00)</td>
</tr>
<tr>
<td>Technical and further education</td>
<td>48</td>
<td>(30.2)</td>
</tr>
<tr>
<td>Higher education (Bachelors/Masters)</td>
<td>89</td>
<td>(56.00)</td>
</tr>
<tr>
<td><strong>Child age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 years</td>
<td>61</td>
<td>(37.4)</td>
</tr>
<tr>
<td>4 years</td>
<td>89</td>
<td>(54.6)</td>
</tr>
<tr>
<td>5 years</td>
<td>13</td>
<td>(7.9%)</td>
</tr>
<tr>
<td><strong>Child age (in months)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (Min,Max)</td>
<td>48.13</td>
<td>(37, 61)</td>
</tr>
</tbody>
</table>

*Response categories were collapsed from ten to two categories of non-Caucasian and Caucasian

*Response categories were collapsed from ten categories, ranging from >145,600 to < $13,000 per annum to three categories ranging from >145,600 or more to <83,199 or less.

*Response categories were collapsed from five categories, ranging from primary school to higher education to four categories ranging from lower secondary to higher education.

This qualitative study was part of a larger intervention study conducted to evaluate the *Get Up and Grow* healthy lifestyle program for pre-school children (Wiseman, Harris and Lee, 2016). The qualitative component was conducted in March-April, 2016 prior to the intervention being implemented. It was integrated into the data collection as a means to build rapport with
participants and to orient participants’ thinking to health concepts prior to further data collection.

To gain an understanding of how pre-school children speak about health and health behaviours, semi-structured interviews were conducted with each participant individually. The interviews took approximately 10 minutes with each child and were conducted by a researcher within hearing distance of classroom educators. The researcher conducting interviews had extensive experience working with pre-school children and followed a set protocol with each participating child. Prior to commencing the interviews, each participant was asked verbally if he/she would like to participate. Interviews were structured with two open-ended questions. The questions used were drawn from a previous study conducted by Calfas and colleagues (1991). First, each child was asked ‘Can you tell me what healthy means?’ After responding, the participant was then provided with an age-appropriate explanation, ‘Being healthy means that you can play outside, you don’t get sick and you feel good’. This definition was also drawn from the study conducted by Calfas (1991), and was given to participants as a platform to allow them to tell the researcher what makes them healthy, and so that they all had the same basis to respond. The participant was then asked ‘Can you tell me some things that you might do to be healthy?’ If a child did not offer a response, he/she was offered the follow up question ‘Can you tell me what your mummy or daddy do to be healthy’. If a participant did not respond to these questions, the qualitative component of the interview ended. The qualitative component of the interview was audio recorded with parental and participant permission.

**Data analysis**

The audio-recorded participant responses were transcribed into a Microsoft Word document. Children’s responses were organised under the two categories of (1) Meaning of healthy; and
(2) How to be healthy which reflects the questions asked. Data was then analysed using a thematic analysis process. Thematic analysis is an inductive analysis strategy used to identify, organise, explain and report patterns and themes within data (Braun and Clarke, 2006). The data analyses began with the preliminary exploration of the data by reading the data and noting down initial ideas. The transcripts were reviewed and open coding used to cluster ideas under broader themes (Liamputtong, 2013). Themes were developed by segmenting and labelling text and were defined on the basis of the children’s statements (Liamputtong, 2013). The final phase of analysis involved the revision of themes, the defining and refining of themes and relating the analysis back to the research question and existing literature (Braun and Clarke, 2006). Thematic analysis was conducted and reviewed by the three authors to ensure consistency of the interpretation of data.

7.5 Results

The two categories, corresponding themes, together with representative quotes and number of responses from participants are presented below in Table 7.2 and 7.3. The themes presented are ordered by how many children gave a response relevant to that category. Responses did not vary by gender or age, however in some instances it was evident that the sophistication of child responses within themes increased with age. Of the participating children, 18 did not respond to question one and 13 did not respond to question two (non-responders varied by question). Table 7.2 presents the first category: Meaning of healthy, including the four themes of eat your food, participating in activities, growing big and strong and not being sick. Eat your food accounted for just over half (n=74, 51.03%) of all responses recorded under this category. Within this theme, a number of children stated that being healthy meant “finishing my dinner, drinking water” or to “eat your breakfast”. Other children associated health with growing big and strong and the ability to do activities such as painting and playing with toys. Children
frequently characterised health as the absence of, or resistance to illness, for example, children stated that being healthy meant to “not be sick and not have a cough”.

### Table 7.2 Meaning of healthy (n=145)

<table>
<thead>
<tr>
<th>Theme</th>
<th>Representative Quotes</th>
<th>Sex, Age</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Eat your food</strong></td>
<td><em>Eat food</em></td>
<td>male, 4 years</td>
<td>74 (51.03%)</td>
</tr>
<tr>
<td></td>
<td><em>Eat your breakfast</em></td>
<td>female, 5 years</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Finishing my dinner, drinking water</em></td>
<td>female, 3 years</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Eat some food. Eat food every day</em></td>
<td>male, 5 years</td>
<td></td>
</tr>
<tr>
<td><strong>Participating in activities</strong></td>
<td><em>You can go to school</em></td>
<td>male, 4 years</td>
<td>36 (24.8%)</td>
</tr>
<tr>
<td></td>
<td><em>You can play with cars and trucks</em></td>
<td>male, 3 years</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Painting pictures</em></td>
<td>female, 4 years</td>
<td></td>
</tr>
<tr>
<td><strong>Growing big and strong</strong></td>
<td><em>Healthy means that you are big and strong</em></td>
<td>female, 3 years</td>
<td>20 (13.79%)</td>
</tr>
<tr>
<td></td>
<td><em>I do, it means you are strong so You can swim very well</em></td>
<td>female, 5 years</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>You get big and strong</em></td>
<td>male, 4 years</td>
<td></td>
</tr>
<tr>
<td><strong>Not being sick</strong></td>
<td><em>You don’t get sick</em></td>
<td>male, 3 years</td>
<td>15 (10.34%)</td>
</tr>
<tr>
<td></td>
<td><em>Not be sick</em></td>
<td>female, 3 years</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Not be sick and not have a cough</em></td>
<td>male, 3 years</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>You keep the doctor away</em></td>
<td>female, 5 years</td>
<td></td>
</tr>
</tbody>
</table>

In regard to participants’ understanding of *How to be healthy*, five themes emerged including: Eat healthy food, reduce risk, treat illness, be well behaved and do exercise (Table 7.3). Again, the themes presented are ordered in terms of how commonly they were cited by the children. Eat healthy food emerged as the most common theme, accounting for more than half of the responses for this category (n=86, 57.33%). Children frequently indicated that the consumption
of healthy food is important to obtain good health. Children typically mentioned water, types of fruit, vegetables and meat products as food to be consumed to be healthy. The theme ‘reduce risk’ refers to the practice of safety behaviours to prevent injury and illness, for example, “If it’s cold outside in the rain and stuff you have to wear a long shirt and stuff and it’s wet, you run and you can slip”. Treating illness was the third theme, this included medical treatment of illness to restore health, for example, “I got sick so I need to drink lots of water and take my medicine”. Being well behaved was also frequently mentioned by participants, this theme refers to practices such as: obeying rules, being kind and helpful to siblings, parents and friends. The final theme which was less frequently mentioned by participants as a way to maintain health was exercise or physical activity.
Table 7.3 How to be healthy (n=150)

<table>
<thead>
<tr>
<th>Theme</th>
<th>Representative Quotes</th>
<th>Sex, Age</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eat healthy food</td>
<td><em>Eat healthy food like meat and watermelon, potato, and bread</em></td>
<td>male, 4 years</td>
<td>86 (57.33%)</td>
</tr>
<tr>
<td></td>
<td><em>Drink water, eat carrots, meat and potatoes and broccoli and food</em></td>
<td>male, 3 years</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Yes, you need to eat heaps of vegies and fruit</em></td>
<td>female, 4 years</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Eat food thats good you for but you can eat lollies every now and then</em></td>
<td>female, 4 years</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Eat not to much lollies</em></td>
<td>female, 4 years</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Eat lots of healthy food</em></td>
<td>female, 3 years</td>
<td></td>
</tr>
<tr>
<td>Reduce risk</td>
<td><em>If it’s cold outside in the rain and stuff you have to wear a long shirt and stuff and it’s wet you run and you can slip</em></td>
<td>female, 5 years</td>
<td>31 (20.66%)</td>
</tr>
<tr>
<td></td>
<td><em>Try to not get hurt, that’s all, stopping on my bike at the road</em></td>
<td>female, 3 years</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Umm mummy can put my seatbelt on when I get in the car</em></td>
<td>male, 4 years</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Strangers are not healthy and running on the concrete is not healthy, I’ll break my bones</em></td>
<td>male, 4 years</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Cover your mouth</em></td>
<td>male, 3 years</td>
<td></td>
</tr>
<tr>
<td>Treat illness</td>
<td><em>I got sick so I need to drink lots of water and take my medicine</em></td>
<td>male, 3 years</td>
<td>13 (8.66%)</td>
</tr>
<tr>
<td></td>
<td><em>When I was a baby I was sick. I went to the hospital. The doctors made me better strawberry medicine</em></td>
<td>female, 4 years</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>you get needles from the doctor and have medicine and tablets</em></td>
<td>male, 3 years</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>male, 4 years</td>
<td></td>
</tr>
<tr>
<td>Be well behaved</td>
<td><em>Clean up your toys</em></td>
<td>male, 3 years</td>
<td>12 (8.00%)</td>
</tr>
<tr>
<td></td>
<td><em>I help my mum clean the house and fix things with my dad</em></td>
<td>male, 4 years</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Be nice to my brother</em></td>
<td>male, 5 years</td>
<td></td>
</tr>
</tbody>
</table>
You be good for Mummy

Do exercise

<table>
<thead>
<tr>
<th>Activity</th>
<th>Gender</th>
<th>Age</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mummy does exercise</td>
<td>male</td>
<td>4 years</td>
<td></td>
</tr>
<tr>
<td>Playing, running, walking and basketball with Daddy</td>
<td>male</td>
<td>5 years</td>
<td>8 (5.33%)</td>
</tr>
<tr>
<td>Yes, um run and I exercise</td>
<td>female</td>
<td>5 years</td>
<td></td>
</tr>
</tbody>
</table>
7.6 Discussion

How children speak about health reflects the social and environmental context in which they live and grow (Lanigan, 2011). Children are increasingly exposed to a range of health messages formulated within public health missives, television programmes and commentaries from friends, families and teachers, which collectively shape a child’s way of understanding how a healthy person looks, behaves and talks (Burrows and McCormack, 2014).

In this study, good food choices dominated how children spoke about what it means to be healthy, contributing the most to each of the two categories and the emergence of the themes, ‘eat your food’ and ‘eat healthy food’. Research suggests that children as young as three years are knowledgeable about health in relation to eating (Schults & Danford, 2016). This may be due to a prominent educational focus on the importance of a healthy diet in the home and childcare setting (Burrows and McCormack, 2014; Freichs et al., 2016). A study conducted with school-aged children (Burrows and McCormack, 2014) found that nutritional information is readily available across young children’s private, public and institutionalised lives. These messages that children receive across contexts, often in the form of directives, may contribute to responses about food and healthy eating (Burrows and McCormack, 2014).

Participants frequently identified fruit and vegetables as examples of healthy foods, and also mentioned the need to limit unhealthy foods, for example, one participant stated “Eat food that’s good for you but you can eat lollies every now and then”. This supports other research that found pre-school children tend to view fruit and vegetables as healthy (Frerichs et al., 2016), and are able to classify foods as unhealthy or “junk” (Schultz and Danford, 2016). These views have been potentially shaped by the combination of dominant nutrition education, which use food group-based guidelines as a framework, and marketing campaigns that focus on fruit and
vegetable promotion (Frerichs et al., 2016). The extent to which eating informs how children speak about what it means to be healthy from such a young age is an important finding, as it highlights the potential benefits of persistent health messaging (Dwyer et al., 2008).

Interestingly, there was limited mention of physical activity as a health promoting behaviour by participants. This is consistent with previous work (Irwin et al., 2007; Lanigan, 2011) that found children were more adept at identifying healthy foods and explaining the benefits, than identifying physical activities that make their bodies healthy. The literature offers several possible explanations for this finding. A qualitative study conducted by Dwyer and colleagues (2008) of young children’s physical activity found that parents and educators consider children to be naturally active, requiring less physical activity promotion, which may contribute to reduced mention of physical activity as a health promoting behavior by children. Further, literature has shown that conflicting messages regarding health supporting behaviours may limit the uptake of these behaviours (Lanigan, 2011). The emphasis participants placed on the importance of minimising risk and injury prevention as a health behaviour may work to contradict the encouragement of children engaging in physical activity e.g. “Running on the concrete is not healthy, I’ll break my bones” (male, 3 years).

Responses that reflected children’s emphasis on the importance of safety to maintain health were organised under the theme labelled ‘reduce risk’, and refers to the practice of behaviours to prevent injury and illness. Children’s emphasis on safety is reflected in a number of studies that seek to explain the barriers to promoting physical activity in young children in the home and childcare settings (van Zandvoort et al., 2010; Dwyer et al., 2008; Coleman and Dyment, 2013). Given that the leading cause of child death in Australia is injury, the societal emphasis on child safety is warranted (Australian Institute of Health and Welfare, 2014). This presents a
challenge, as at a life stage in which lifestyle behaviours are developed, limiting children’s opportunities to enjoy bodily movement may constrain their long term participation in healthy physical activity. Further research is needed to determine what factors within a young child’s environment are coming together to shape how children speak about physical activity and risk.

The absence of illness was also considered a criterion of good health by participants with two themes emerging from responses including: ‘treat illness’ and ‘not being sick’. Although the definition of healthy provided to participants in this study may have influenced the emergence of this theme, this finding is consistent with existing early childhood literature. Normative health education targeting children largely individualises health, reducing health promotion to reduction of risk (of future illness, injury and the practice of unhealthful behaviours) (Burrows and McCormack, 2014). This approach shapes children’s classification of health to be two-dimensional, meaning that they view health and illness as separate concepts that cannot be present at the same time (Almqvist et al., 2006).

Personal experience with injury and illness also played a part in children’s understanding of health as the absence of illness, with participants that expressed this belief consistently referring to a past event that led them to be ‘unhealthy’ e.g. “I got sick so I need to drink lots of water and take my medicine”. This may also help to explain children’s mention of preventing illnesses such as colds and injuries (falls) as these are frequently experienced by children (Piko and Bak, 2006).

Another theme that emerged from children’s responses as a way to maintain health was the importance of being well behaved. This theme provides further evidence of the extent a child’s context and environment can shape how children speak about health and refers to practices such
as: obeying rules, being kind and helping others. Given that the definition of healthy provided to participants included the phrase ‘you feel good’, this may have contributed to the emergence of this theme. Nevertheless, the wider early childhood literature highlights the emphasis placed on children being well behaved at this age with the importance of good behaviour undoubtedly a key message reinforced across the home and childcare environments by parents and educators (Maybin and Woodhead, 2003; Larson et al., 2011; De Decker et al., 2013; Boonpleng et al., 2013; Gubbels et al., 2014). This is reflected in children’s responses, for example, “Clean up your toys”, “Be nice to my brother” or “You be good for Mummy”.

Limitations

The current study is subject to limitations. Participants resided in a medium-high socioeconomic community thus it is difficult to generalise findings to other groups. The interview method used in the present study was the best fit with the larger intervention study that it was part of. Although a substantial amount of information was obtained using the selected open-ended questions, the inclusion of other complementary age appropriate, child friendly methods would facilitate the depth of data in future studies (Mobley & Evashevski, 2000 & Olvera-Ezzel, et al., 1994). The authors acknowledge that the definition of healthy provided to participants may have influenced some responses, however, the definition served as a basis for children to tell the researcher what they do to make themselves healthy, and to ensure those who were unable to explain what health meant had the same basis to respond to following questions. Finally, the context in which the research was conducted within an educational childcare setting may have biased participant responses.
7.7 Conclusion

This study explored how pre-school aged children speak about health and health behaviours. Participant responses provided insight into how key values within the society they are a part of can shape how children speak about important issues. Findings highlighted the centrality of food in how children speak about health. In comparison to discussion of food and the importance of eating healthy food, there was limited mention of physical activity by participants as a means to be healthy. The findings raise important questions, and help to identify avenues for further research to assist with the effective promotion of health in young children. Further research should seek to quantify the impact parents’ and educators’ concern for risk may have on pre-school children’s engagement in physical activity in the Australian context.
7.8 References


Chapter 8: Preschool children’s play preferences and perceptions of facilitators and barriers

8.1 Study 5- A qualitative study using the draw-and-tell method (Manuscript 5)

Reader’s Note:
The information in this section has been published as an original research paper in a peer-reviewed journal: Health Promotion Journal of Australia

Wiseman N, Rossmann, C, Lee J, Harris N. (In press) “It’s like you are in the jungle”: Using the draw-and-tell method to explore preschool children’s play preferences and factors that shape their active play, Health Promotion Journal of Australia

Reference
The co-authors of this publication confirm that the research candidate has made the following contributions to this manuscript:

- Developed the study design;
- Completed the human research ethics application;
- Developed the questionnaire;
- Conducted data collection with CR;
- Performed data analysis with CR;
- Prepared manuscript for submission to journal

Signed: Date: 30/06/18

Signed: Date: 06/07/2018

Signed: Date: 28/06/18
Title: “It’s like you are in the jungle”: Using the draw-and-tell method to explore preschool children’s play preferences and factors that shape their active play

8.2 Abstract

Objective: A child’s preference for active or sedentary play is a key proximal indicator of a child’s physical activity behaviour. There is a need to understand children’s physical activity preferences in order to support their participation in enjoyable physical activity and encourage a more positive relationship with physical activity. To date, little research has incorporated the perspectives of young children on this topic. This study specifically examines: (1) what activities preschool children prefer; (2) what children consider to be barriers and facilitators to participating in their preferred activity.

Methods: The authors employed visual methodologies to explore the activity preferences of 29 preschool children. Children were asked to draw their preferred activities and answer a series of open- and closed-ended questions about their drawing and the barriers and facilitators to participating in this activity.

Results: Participants expressed a desire to play unstructured activities with friends or family, to engage in imaginative, challenging play, as well as the opportunity to have control over the activity they engage in. Children reported that rules at home and at preschool, the availability of toys, friends, family and having access to a natural environment served as both barriers and facilitators to participating in their favourite activity.

Conclusion: Listening to children’s voices about their play preferences and the barriers and facilitators to engaging in these activities, provides important insight into children’s play behaviour. The current findings will help to facilitate young children’s participation in enjoyable physical activity.

Keywords: physical activity, children, qualitative methods, health behaviours
8.3 Introduction:

The common perception of children being naturally active is being challenged by emerging patterns of increased sedentary behaviour and decreased physical activity in young children (1, 2). Regular physical activity is essential for a child’s growth and development and offers wide-ranging health benefits. In infants, toddlers and preschoolers, higher levels of physical activity are related to better social and motor development, improved metabolic health and decreased adiposity (3). Some researchers have identified a positive correlation between exercise and children’s academic achievement, self-esteem and self-efficacy (4). Despite the known benefits of physical activity, just over half (56%) of preschool aged children meet physical activity recommendations of three hours throughout the day (2, 5).

Early childhood is a key age in which physical activity behaviours, attitudes and motor skills develop (6). Encouraging habitual physical activity in young children is therefore crucial as physical activity behaviours tend to track from childhood through adolescence to adulthood (7-12). It is essential that children experience environments supportive of developing positive physical activity behaviours. In order to provide an environment that facilitates physical activity participation, there is a need to understand factors that may influence the current rates of physical activity in preschool children.

A young child’s preferences for active or sedentary activities is a key proximal indicator of a child’s physical activity behaviour (13). Parents’ have reported that facilitating regular physical activity is challenging with children who prefer more sedentary activities (4). Encouraging a child to favour and enjoy active play is often a key objective of physical activity interventions, as children are more likely to participate in physical activities for reasons of fun and enjoyment (7, 14). When a child participates in an activity that they enjoy, they are more likely to experience increased emotional well-being, to feel happy, and secure (15) (16). Children have their own perception of enjoyable play, which often differs from adults’ perceptions of what
enjoyable play is to children (15). Thus, there is a need to gain a child’s account of their own physical activity preferences in order to make physical play more enjoyable to them. This may support participation and encourage a positive relationship with physical activity.

Children’s voices have been underrepresented in research into children’s preferences for physical play and possible factors contributing to the decrease in physical activity in Australian children. For the most part, this body of research has relied on the perspectives of parents (17) or school-aged children (7, 18). Preschool children can be very important agents in making decisions concerning their own well-being and their perspective is essential to understanding how they and/or others make active play choices for them.

This study employs the draw-and-tell method to gain an understanding of children’s physical activity preferences and children’s perceptions of barriers/facilitators to participating in these activities, within the Australian context. The draw-and-tell method will be used as a way to engage children in the research, as opposed to simply asking them to respond to questions verbally. Drawings may also work to facilitate verbal discussion between the child and researcher, as children may be less inclined to feel as though they are being tested (6). A child’s drawing in combination with their verbal interpretation of their drawings serves as a valuable resource of their perspectives and enriches interpretation of the data (6). In the current study, children will be asked to draw themselves in their preferred way of playing and asked questions about their drawings to understand their behaviours and ideas. The key objectives of this study are to:

1. Determine preschool children’s activity preferences; and

2. Identify preschool children’s perceived barriers and facilitators to participating in their preferred activity
Gaining a child-centric view of the factors that prevent and facilitate their engagement in their preferred physical activity may help to identify plausible, context-specific behaviours and aspects of the environment that influence physical activity participation (19).

8.4 Methods:

A cross-sectional design was used for the current study. Data collection was completed over a two-week period in December, 2017. Participants were recruited using convenience sampling and included 40 children, aged 3 to 5 years, attending preschool centres located on the Gold Coast, Australia. Data collection included semi-structured interviews. Upon return of parental consent, children were asked if they would like to participate in a drawing activity, if consent to participate was given, they were asked to draw themselves engaging in their preferred activity (see a description of interview format in Cammisa et al, 2011 and appendix 4) (6). Interviews were conducted by two of the researchers (NW and CR), who were introduced to the children by the preschool educators and spent the morning with the children prior to the interviews so that children felt comfortable speaking to the researchers. Two interviews were conducted at a time, with one researcher sitting with one child each. Children and researchers sat at the same table to ensure participants had a peer nearby to help them feel comfortable, but far enough away to prevent children copying from each other. This set up was implemented due to previous research that used the same technique demonstrating that children tended to copy each other’s responses/drawings when interviewed in groups (6). The interviews were conducted at the participating preschool centres and took approximately 20-30 minutes (including the drawing task) in a quiet part of the classroom monitored by the preschool room educator. Interviews were conducted using an interview guide incorporating a list of questions. This was to ensure that the most central issues of inquiry were covered with all the children (20, 21), while keeping an open mind and appreciating the children’s own initiative for telling stories that they were eager to communicate to the researcher. The questions were asked while the child was drawing...
to ensure that the activity did not feel like an interview-testing situation. This helped to focus children at the time of data-collection and minimise distractions from other children or the environment. Researchers took general field notes at each preschool in regards to the physical activity environment of the preschool centre (22). Notes were taken regarding observed activities at the centre, available equipment (e.g. fixed, portable, electronic), the indoor and outdoor space and the social environment (e.g. rules or encouragement around physical play) (Appendix 4). This was done to understand whether any environmental variables aligned with children’s drawings.

The results, including children’s drawings and responses to questions, were analysed using inductive thematic analysis, which allowed researchers to identify, organise, explain and report patterns and themes within data (23). The audio-recorded child responses were transcribed into a word document. The transcripts were reviewed by two researchers independently and open coding was used to cluster ideas under broader themes and subthemes (24). NVivo was used to classify, sort, and arrange information and examine relationships in the data.
8.5 Results:

Participant and preschool centre characteristics

A total of three preschools participated in the study. Forty parents consented for their child to participate, with 29 of these children agreeing to participate in the study activity. Participating children were aged between 3 and 5 years (M= 4.28; SD=.71) with 15 (51.7%) female participants. The proportion of children that identified an active versus a sedentary activity as their preferred activity was almost even (sedentary: 44.8%, active: 55.2%). Females reported a preference for more active outdoor activities played at home, while male participants reported a preference for sedentary indoor activities played at home (see Table 8.1). There appeared to be no distinct difference in preferred activities between children of different ages. At preschool two, children reported a preference for sedentary and active behaviours equally, children at preschool one reported preferences for more sedentary activities (8 children sedentary, 3 children active), at preschool three, children reported preferences for more active play (7 active and 1 sedentary).
<table>
<thead>
<tr>
<th>ID</th>
<th>Age</th>
<th>Gender</th>
<th>Activity</th>
<th>Location</th>
<th>Active type</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC1_1</td>
<td>5</td>
<td>M</td>
<td>Playing Frisbee with friends</td>
<td>Home inside/outside</td>
<td>Active</td>
</tr>
<tr>
<td>CC1_2</td>
<td>3</td>
<td>F</td>
<td>Drawing</td>
<td>Home /kindergarten/inside</td>
<td>Sedentary</td>
</tr>
<tr>
<td>CC1_3</td>
<td>4</td>
<td>M</td>
<td>Watching batman on TV</td>
<td>Home /inside</td>
<td>Sedentary</td>
</tr>
<tr>
<td>CC1_4</td>
<td>5</td>
<td>M</td>
<td>iPad game (Monkey and Star Wars game)</td>
<td>Home/ inside</td>
<td>Sedentary</td>
</tr>
<tr>
<td>CC1_5</td>
<td>4</td>
<td>M</td>
<td>Playing with toy spider and ninja turtle</td>
<td>Home/inside</td>
<td>Sedentary</td>
</tr>
<tr>
<td>CC1_6</td>
<td>4</td>
<td>M</td>
<td>A block and a snake game (iPad game)</td>
<td>Home /Inside</td>
<td>Sedentary</td>
</tr>
<tr>
<td>CC1_7</td>
<td>5</td>
<td>F</td>
<td>Building blocks</td>
<td>Home/Inside</td>
<td>Sedentary</td>
</tr>
<tr>
<td>CC1_8</td>
<td>4</td>
<td>M</td>
<td>Computer game – keyboard climber</td>
<td>Home/Inside</td>
<td>Sedentary</td>
</tr>
<tr>
<td>CC1_9</td>
<td>5</td>
<td>M</td>
<td>Frisbee</td>
<td>Kindergarten/home outside</td>
<td>Active</td>
</tr>
<tr>
<td>CC1_10</td>
<td>4</td>
<td>M</td>
<td>Train tracks</td>
<td>Home/kindergarten/inside</td>
<td>Sedentary</td>
</tr>
<tr>
<td>CC1_11</td>
<td>4</td>
<td>F</td>
<td>Doggy Doggy, where’s your bone</td>
<td>Home/outside</td>
<td>Active</td>
</tr>
<tr>
<td>CC2_1</td>
<td>5</td>
<td>M</td>
<td>Monopoly</td>
<td>Home/inside</td>
<td>Sedentary</td>
</tr>
<tr>
<td>CC2_2</td>
<td>5</td>
<td>M</td>
<td>Hide and Seek</td>
<td>Home/inside</td>
<td>Active</td>
</tr>
<tr>
<td>CC2_3</td>
<td>5</td>
<td>M</td>
<td>I-spy</td>
<td>Home/inside</td>
<td>sedentary</td>
</tr>
<tr>
<td>CC2_4</td>
<td>3</td>
<td>M</td>
<td>Rollercoaster</td>
<td>Home/inside</td>
<td>Sedentary</td>
</tr>
<tr>
<td>CC2_5</td>
<td>4</td>
<td>F</td>
<td>Playing tag</td>
<td>Kindergarten/inside</td>
<td>Active</td>
</tr>
<tr>
<td>CC2_6</td>
<td>4</td>
<td>F</td>
<td>Colouring and playing with cousins</td>
<td>Home/inside</td>
<td>Sedentary/active</td>
</tr>
<tr>
<td>CC2_7</td>
<td>4</td>
<td>F</td>
<td>Hide and seek</td>
<td>Home/outside</td>
<td>Active</td>
</tr>
<tr>
<td>CC2_8</td>
<td>5</td>
<td>F</td>
<td>Duck, duck, goose</td>
<td>Kindergarten/inside</td>
<td>Active</td>
</tr>
<tr>
<td>CC2_9</td>
<td>4</td>
<td>F</td>
<td>Monkeys (computer game)</td>
<td>Home/inside</td>
<td>Sedentary</td>
</tr>
<tr>
<td>CC2_10</td>
<td>4</td>
<td>F</td>
<td>Trampoline</td>
<td>Home/outside</td>
<td>Active</td>
</tr>
<tr>
<td>CC3_1</td>
<td>3</td>
<td>F</td>
<td>Sandpit</td>
<td>Kindergarten/inside</td>
<td>Active</td>
</tr>
<tr>
<td>CC3_2</td>
<td>5</td>
<td>F</td>
<td>Run around and play</td>
<td>Kindergarten/home/outside</td>
<td>Active</td>
</tr>
<tr>
<td>CC3_3</td>
<td>3</td>
<td>M</td>
<td>Dinosaur game</td>
<td>Kindergarten/inside</td>
<td>Sedentary</td>
</tr>
<tr>
<td>CC3_4</td>
<td>4</td>
<td>F</td>
<td>Hide and Seek</td>
<td>Kindergarten/inside</td>
<td>Active</td>
</tr>
<tr>
<td>CC3_5</td>
<td>5</td>
<td>F</td>
<td>Playing sticks</td>
<td>Home/outside</td>
<td>Active</td>
</tr>
<tr>
<td>CC3_6</td>
<td>5</td>
<td>F</td>
<td>Climbing</td>
<td>Kindergarten/inside</td>
<td>Active</td>
</tr>
<tr>
<td>CC3_7</td>
<td>5</td>
<td>F</td>
<td>Doggy doggy, where’s your bone?</td>
<td>Home/outside</td>
<td>Active</td>
</tr>
<tr>
<td>CC3_8</td>
<td>4</td>
<td>M</td>
<td>Dinosaur games</td>
<td>Home/outside</td>
<td>Active</td>
</tr>
</tbody>
</table>
The play areas at all three preschools were similar in size and design. The outdoor-area of each preschool was small to medium-sized and the floor was constructed of a combination of artificial grass, concrete, wood chips and rubber. The centres were equipped with both portable and fixed equipment (e.g. sandpit, climbing equipment, slides, tricycles, trucks). All centres had some kind of organised sport available to children (yoga, soccer), which an external professional would deliver. None of the outdoor areas at the participating preschools included access to trees or grass. At all centres, children did not have access to electronic devices, such as computers, unless for learning purposes. Further, no centres permitted children to bring their own toys to the centres for play.

Themes

Table 8.2 shows the results of the thematic analysis and the six key themes that emerged from participant responses. The themes collectively depict children’s preferred activities, why they prefer these activities and what they perceive as barriers or facilitators to engaging in their favourite activities.

Unstructured play

All activities preferred by participants were unstructured activities. The authors considered unstructured play as open-ended play that has no specific learning objective (25). Although it is difficult to determine whether some activities were instructor-led (e.g. instructions from teachers or parents), all activities appeared to be an activity of the participant’s own volition, for example, ‘playing in the sandpit’ or ‘climbing’. There was no specific mention of class activities by participants, nor was this evident in participant drawings. When children were asked the reasoning behind why they enjoyed their chosen activity, a consistent response was being able to choose the activity. Some children also reported the desire to perform challenging activities, for example, jumping off something or running as fast as possible (see Table 8.2).
Figure 8.1 Participant drawings of activity preferences

Figure 8.1a Playing hide and seek with Dad (CC2_2)

Figure 8.1b Playing duck, duck, goose with friends (CC2_8)

Figure 8.1c Playing building blocks (CC1_7)

Figure 8.1d Playing Frisbee (CC1_9)

Figure 8.1e Keyboard climber (computer game) (CC1_8)

Figure 8.1f Hide and seek with Mumma and Daddy (CC2_7)
**Social connections**

Participating with others featured significantly in children’s favourite activity and acted as a key facilitator to why children participate in their preferred activity. This was also evident through the participants’ drawings, with a number of children focusing their drawing on who they were playing with, rather than the activity itself (see figure 8.1a and 8.1b). The majority of preferred activities included the participation of friends, siblings or parents, which can be seen as subthemes in Table 8.2. Although children stated that their favourite activity was a game they played with friends, for example, “Well I like playing tag with my friends”, parents were often cited as a reason for the enjoyment of the activity, for example, “[like activity because] because I get to play with Mumma and Dada” and “[like activity] because my dad plays”.

**Indoor and outdoor play**

Both outdoor and indoor play emerged as key themes and were mentioned equally by children as preferred play activities. The theme of indoor play comprises two subthemes including: screen time and indoor games. Many of the children’s preferred activities played at home were indoor activities (see figure 8.1c and 8.1e). In all cases, when children mentioned screen-based activities as a preferred game, these were played at home only, for example, “At home I only watch TV at home and sometimes I draw”. Indoor games included activities such as board games, playing with toys (blocks, racing cars) and craft activities.

The theme of outdoor play comprised three subthemes: Nature, imagination and outdoor games. All reported outdoor games were active and many were child games such as hide and seek, tag, or doggy doggy where’s your bone. Outdoor games requiring play equipment, such as a Frisbee or trampoline, were mentioned by a few participants (Figure 8.1d), but many of the outdoor activities required no play equipment. Outdoor play appeared to be connected to the subtheme ‘imagination’, with many outdoor games requiring an element of imagination. Further, children
often stated that the reason they enjoyed their preferred activity was because they had the opportunity to use their imagination. For example, “I like to play out there on the climby things… Because it’s like you are in the jungle, because I can see lots of animals and pretend”.

The subtheme ‘nature’ emerged from children’s responses as something they would like to have at their preschool e.g. “[Would like] hide and seek more and some more trees to hide with them [at kindergarten]”. This desire was apparent from both participant drawings and verbal responses. The pictures drawn by children showed flowers, trees and grassed areas, which may be relevant to their enjoyment of physical activity (see figure 8.1f).

**Rules**

Rules around physical activity arose both as a key theme and as a barrier to participating in favoured activities. Under the theme ‘rules’, two subthemes emerged including: rules at home and rules at preschool. Types of rules included no running inside or no personal toys at preschool to prevent loss of the toy. Children indicated that they were not allowed to run inside because they would knock things over or fight with siblings. Children were also unable to play their favourite games at home due to limited space, for example, “Cause my mum said I can’t get blocks at home because it’s too big for the house”. Rules at preschool were predominantly about bringing own toys to the preschool, the usage of electronic devices or the timetable and structure of the preschool, which allowed children to play certain games only in designated times. For example, “I would also like to play hide and seek [at preschool] but we can only play sometimes”.

**Availability of toys**

The availability of toys emerged as a key facilitator in instances where a toy was a prerequisite to engage in a favoured game. Many children reported the desire to bring their favourite toy from home to the preschool, for example, “I would really like to play with my toys from home
[at preschool], with my spider because it’s so cool.” Other children reported the variety of toys they have at preschool, for example, “we have toys out there [outside at preschool] and we play bikes and scooters and balls”.

<table>
<thead>
<tr>
<th>Theme</th>
<th>Subtheme and representative quotes</th>
</tr>
</thead>
</table>
| **Unstructured play** | “I like to play out there on the climby things” (CC3_6)  
“Run away as fast as you can [favourite active game]” (CC1_6)  
“[in the perfect kindergarten where you can play moving or running] um I would like to play snakes and ladders and I would also like to chases but we can only play that a little bit” (CC3_6)  
“[in the perfect kindergarten where you can play moving or running] playing outside”(CC2_7)  
“Umm [in the perfect kindergarten where you can play moving or running] there would be heaps of toys and we would play in the sand pit more and jumping off the castles that has the slides [in the play gound]”(CC1_8)  
“[why do you like this activity] Because we get to choose […] You can pick whatever you want” (CC2_3) |
| **Social connections** |Friends “Well I like playing tag with my friends” (CC2_5 )  
“I like playing with my friends in the classroom. And I like playing with my friends…”(CC1_7) |
|                | Siblings “[plays with] My sister” (CC3_2)  
“[plays with] Lennox my brother” (CC1_9) |
|                | Parents “[like activity because] Mum usually pushes us up on the trampoline” (CC2_10)  
 “[like activity because] Because I get to play with mumma and dada” (CC1_11)  
 “[like activity because] Because my dad plays” (CC2_2) |
<table>
<thead>
<tr>
<th>Screen time</th>
<th>“I just like watching TV [at home], it’s my favourite watching TV” (CC2_3)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>“At home I only watch TV at home and sometimes I draw” (CC2_3)</td>
</tr>
<tr>
<td></td>
<td>“I play Mario Kart on my iPad [at home]” (CC2_3)</td>
</tr>
<tr>
<td></td>
<td>“[at home] Mummy reads my books to me at home and I like to watch some more movies” (CC2_6)</td>
</tr>
<tr>
<td></td>
<td>“I would like to watch more movies [at kindergarten]…” (CC2_7)</td>
</tr>
<tr>
<td>Indoor games</td>
<td>“[favourite activity] Monopoly” (CC2_1)</td>
</tr>
<tr>
<td></td>
<td>“[favourite activity] building blocks” (CC1_7)</td>
</tr>
<tr>
<td></td>
<td>“[favourite activity] drawing” (CC1_2)</td>
</tr>
<tr>
<td>Outdoor play</td>
<td>Nature</td>
</tr>
<tr>
<td></td>
<td>“[Would like] Trees and everything [at kindergarten], more trees, I like to climb trees, someone cut down a tree which is sad because we loved the tree” (CC1_11)</td>
</tr>
<tr>
<td></td>
<td>“[Would like] Hide and seek more and some more trees to hide with them [at kindergarten]” (CC1_7)</td>
</tr>
<tr>
<td>Imagination</td>
<td>“I like to play out there on the climbby thingis […] Because It’s like you are in the jungle […] because I can see lots of animals and pretend, and we have lots of crocodiles and sometimes I pretend that there is a bridge that I have to climb over and there are crocodiles like peter pan” (CC3_6)*</td>
</tr>
<tr>
<td></td>
<td>“[likes activity] Because we get to pretend we are big dinosaurs and little dinosaurs and we can chase each other” (CC3_8)</td>
</tr>
<tr>
<td></td>
<td>“Pirate, Police and chasing [favourite active game]” (CC1_1)</td>
</tr>
<tr>
<td>Outdoor games</td>
<td>“[This is – referring to drawing] Playing Frisbee with friends” (CC1_1)</td>
</tr>
<tr>
<td></td>
<td>“[This is – referring to drawing] Hide and seek with mumma, daddy and me […] We are playing outside” (CC2_7)</td>
</tr>
<tr>
<td></td>
<td>“[favourite activity] Doggy doggy where’s your bone… {Likes it because} You get the bone and you have to try and find it” (CC1_11)</td>
</tr>
<tr>
<td></td>
<td>“[favourite activity] climbing” (CC3_6)</td>
</tr>
</tbody>
</table>
### Rules

**Rules at home**
- “No we can’t play those games inside [referring to playing tag with friends] we knock things over” (CC2_5)
- “We can’t play tag [...] because of pushing my brother and because we are not allowed to run inside” (CC2_6)
- “Because my mum and dad don’t let me do it because I might lose a card or so [referring to bring toys to preschool]” (CC3_2)
- “Cause my mom I said I can’t get blocks out at home because it’s too big for the house” (CC1_6)
- “It’s too small [at home to play tag]” (CC2_5)

**Rules at preschool**
- “No [cannot play at preschool], you’re not allowed to bring an iPad to day care’” (CC1_4)
- “[cannot play at preschool] Because you can’t bring the toys here” (CC2_1)
- “I would also like to play hide and seek [at preschool] but we can only play sometimes” (CC3_5)
- “[cannot play favourite activity at preschool] No we’re not allowed to touch the computers at kindergarten” (CC1_8)

### Availability of toys

- “Um I have these big blocks at my house [Would like to bring to preschool]” (CC2_7)
- “We have toys out there [outside at preschool] and we play bikes and scooters and balls…” (CC1_8)
- “I would really like to play with my toys from home [at preschool], with my spider because it’s so cool” (CC1_5)


8.6 Discussion

This study used visual methods to gain an understanding of children’s preferences for play and their perception of factors that facilitate or hinder their engagement in these activities within the Australian context. Children in the current study showed a desire to play unstructured activities with friends or family, to engage in imaginative play, to have the opportunity to control the activity they engage in, and for challenging or risky play. Children reported that rules at home and at preschool, the availability of toys, friends and family and having access to a natural environment served as both barriers and facilitators to participating in their favourite activity. These themes will be discussed in the context of existing literature to identify implications for future research and public health practice.

Children’s activity preferences

Unstructured play

Children in the current study preferred to engage in unstructured play, to have choice over the activity they engaged in, and, for some children, to engage in challenging activities. Children’s preference for unstructured play aligns with previous research (1). This preference for unstructured play may be due to limited exposure to structured or guided activities, such as yoga or soccer, at such a young age. Nonetheless, young children, particularly those who attend preschool, are increasingly offered opportunities to engage in structured play or ‘packaged play’, in which trained professionals teach students a specific exercise or sport. This was the case for each preschool involved in this study. Thus, although it would be expected that some children might prefer these activities, this was not evident in these findings.

Participants indicated a desire to have more autonomy over the activities they engage in. Despite children in this study reporting parental involvement as a facilitator of their activity participation, literature suggests that the involvement or attendance of an adult in a child’s play
is believed to lead to a reduction of a child’s choice of the activity. This appeared to be particularly relevant in this study in the preschool setting, where children were more conscious of rules and restrictions on play: “… I would also like to play hide and seek but we can only play sometimes”. It has been argued that if children do not have a choice over the activity or whether they would like to participate, they do not demonstrate behaviours associated with increased emotional well-being compared to those that do have choice (16). Giving a child autonomy and independence to engage in their preferred physical play facilitates increased confidence and self-esteem (15). However, it is noted that a child’s choice for play does not necessarily need to be completely free of adult intervention. For example, giving a child opportunities to make a choice from a variety of activities, rather than telling the child what to do, may lead the child to perceiving an increase in their level of choice (26). If a child perceives an activity as play, they are more likely to deeply engage, focus and feel more competent to try a wide range of behaviours, perceiving these behaviours as activities with minimal risk of failure (26). This may offer an opportunity to promote a preference for being physically active (16).

Participants also reported the desire to perform activities they perceive as challenging. This is consistent with current literature, as children’s active play naturally involves challenging or risky activities (27). When children are young they are naturally inclined to test their physical limits and learn to avoid or adjust to dangerous environments and activities (20). Risky play allows a child to feel pleasant emotions such as happiness, excitement, exhilaration, fun, enjoyment and thrill (29). Risky play can also fuel unpleasant emotions in children, such as feeling afraid or scared when they perceive too much danger (29). There is a constant struggle for parents and preschool educators to provide children with a stimulating environment that promotes challenging play, minimises potential for injury and allows the child to unfold creativity and test their limits (20, 29). Further, in Australia, unintentional injuries are the
leading cause of death and serious injury in young children (3). Therefore, injury prevention is considered central to promoting children’s health (31). Nevertheless, it has been suggested that too many restrictions on children’s risky outdoor play may have a negative influence on the child’s development (32). A qualitative study conducted by Little (2017) found that Australian childcare workers felt as though an over-emphasis on child safety by regulatory authority assessors restricted their ability to engage children in risk-taking or challenging play (33). Educators reported being told by assessors to remove equipment and trees, rocks and other natural elements as they were considered unsafe (33). Little (2017) also reported that educators were apprehensive about what ‘risky’ play they could and could not allow children to engage in. As preschool children’s desire for challenging play is evident in the findings of this study, future research should seek to facilitate challenging play for children and to identify potential barriers to this.

**Outdoor play**

The type of active play preferred by the children predominantly involved outdoor play. This is consistent with previous literature, as children are more likely to be active while playing outdoors (34, 35). Most of the outdoor activities mentioned by participants required no play equipment, yet most activities required an element of imagination, with imagination often mentioned as a reason for the enjoyment of the activity. This study finding may indicate that engaging children’s imagination can be one way to facilitate their engagement and enjoyment of active play. Existing literature suggests that the design of an outdoor play area has an important role in facilitating imaginative play. Zamani (2016) highlighted the importance of accessible natural elements for children to explore a complex and adaptable environment, which inspires teamwork, creativity and imagination (36).
**Indoor Play**

The home indoor area was most frequently reported by male participants when talking about their favourite game, which in all cases included sedentary activities. Once established, learned sedentary habits in children tend to shape sedentary behaviour over time, particularly in boys (37). The frequent mention of screen-based games as preferred activities supports the work of other studies in this area linking sedentary behaviour with screen-based activities (37–41).

One explanation for the high preference for screen-based activities at home might be the prohibition of screen-based activities at childcare. Rules at preschool restricted children’s participation in screen-based activities (e.g. iPad/computer), with children reporting that they were unable to bring such devices to their preschool centre as it was against the rules. A study conducted by Tucker and others (42) revealed that parents of preschoolers rely on preschool staff to ensure their child/children is/are sufficiently active. Rules around screen time at preschool may contribute to the reasoning of parents to believe that their children are adequately active at preschool and thus are more willing to permit screen time at home. Tucker van Zandvoort et al also described that preschool staff rely on parents to create an activity promoting environment. These mutual expectations and mistaken perceptions are of concern, as many studies demonstrate that preschoolers in childcare do not meet the recommended level of three hours active play per day (2).

**Barriers and facilitators**

**Rules**

Rules within the home and at preschool appeared to both hinder and facilitate participants’ active play. For example, children mentioned engaging in their preferred activity was not
possible because of rules such as “no running inside” because they were likely to “knock things over” or argue with siblings. Although beyond the scope of the current study, these responses may be partially explained by a study conducted by Pesch et al (2015), in which many mothers reported that because they themselves were tired or overwhelmed, or because their children were making a mess, they put significant effort towards reducing their children’s activity level (43). Mothers would do so by turning on the television, reading a book to the child, or setting up an activity for the child like colouring or puzzles (33). This highlights the need to understand the complex contexts shaping children’s activity preferences and behaviours, which make contemporary efforts of physical activity promotion inappropriate or difficult to implement.

**Nature**

Natural features within the outdoor environment was an expressed desire by participants and may be considered as a possible facilitator of their engagement in physical activity. The participating preschools did not provide children access to any natural features nor to a complete natural area (e.g. grass, trees, dirt, rocks). Thus, the desire expressed by participants for more trees to climb or hide behind was not surprising. Trees can create a mystical atmosphere and inspire children’s imaginative play (36). However, quantitative findings from previous literature suggest that natural features and the ground surface of preschool playgrounds, available shade and ground markings (such as a bike track) have no association with children’s physical activity (44). Nonetheless, when children come in contact with nature, they benefit not only from higher opportunity for physical activity, but also display a greater sense of responsibility, teamwork, competence and imagination (36, 45). Literature suggests that play spaces that prioritise natural elements, including trees, plants and elements and that can be manipulated by the child (e.g. water, mud, sand), allows a child to shape the play with their imagination (31, 46). Thus, it can be suggested that embedding more outdoor play and natural
elements within a child’s playground may facilitate a child to prefer and engage in physical activity by allowing play to be more complex and diverse (36).

**Social connections**

At a young age, much play is social, which was reflected in children’s responses. The majority of the activities preferred by children included friends, who play an important part in young children’s social development and learning. This is consistent with existing literature, which suggests that the involvement of siblings and peers can facilitate children’s physical activity levels (3,30). Participants also reported the participation of one or both parents as a reason why they liked their preferred activity. Parents may therefore be a key facilitator of their child’s physical activity, not only through instrumental support or encouragement, but just because children simply enjoy doing something with their parents in a social and supportive environment (47, 48). Ginsurg and others (2007) suggest that when parents join with children in child-driven play, the interactions that occur tell children that their parents are fully paying attention to them and that this helps to build enduring relationships (49). It is possible that the enjoyment that a child experiences though engaging in play with their parents contributes to their positive disposition toward active play.

**The Draw-and-Tell-Method**

The Draw-and-Tell method served as a suitable instrument to elicit children’s preferences and understanding of barriers and facilitators. The drawings served as an indirect method for facilitating the conduct and analysis of the interviews that explored the children’s explanation of their drawing. The use of drawings facilitated communication between child and researcher as it helped to overcome the brevity of their verbal responses (50). They filled important gaps in the verbal responses of the child (for example, play partners were the focal point of the
drawing rather than the activity itself). It was evident that this method is not suitable for children younger than four years. Three-year-old children’s drawings proved difficult to interpret, thus, the drawings presented in this study are those of four- and five-year-old participants. From our experience using this method, it is also recommended to let the child sit with a peer at one table to make her/him feel comfortable but far enough from each other to prevent children copying from each other.

Limitations

The limitations of the current study relate to the sample being drawn from medium-high socioeconomic status communities, thus, findings may only reflect this demographic. It was also evident that the preschool centres that participated in the study were similar in their resources and physical environment, thus the themes may not reflect the diversity of preschool children’s perspectives.

8.7 Conclusion

Listening to children’s voices about their play preferences and the barriers and facilitators to engaging in these activities provides important insight in children’s play behaviour and the promotion of active play in early childhood. The current findings highlight the importance of facilitating enjoyable, imaginative physical activity in natural environments for young children. The results of this study show that children have a desire for unstructured activities and natural features in the environment as a prerequisite to engage in imaginative and challenging active play. It became clear that children would like to play a lead role in selecting the activity they engage in and that this may facilitate their enjoyment of active play. Future research should focus on identifying ways to facilitate challenging play for young children and whether parents’ perceptions of their child’s engagement in active play at preschool is leading to their child’s increased sedentary behaviour at home.
8.8 Reference list


36. Zamani Z. ‘The woods is a more free space for children to be creative; their imagination kind of sparks out there’: exploring young children’s cognitive play opportunities in natural, manufactured and mixed outdoor preschool zones. Journal of Adventure Education and Outdoor Learning. 2016;16(2):172-89.


Chapter 9: Physical activity parenting practices and preschool children’s knowledge of and preferences for physical activity

9.1 Study 6- A quantitative study with parent-child dyads (Manuscript 6)

Reader’s Note:
The information in this section has been submitted as an original research manuscript to a peer-reviewed journal: BMC Public Health

Wiseman N, Harris N, Downes M (Under Review: Submitted May, 2018). Preschool children’s preferences for sedentary activity relates to parent’s restrictive rules around active outdoor play,
BMC Public Health

Reference
The co-authors of this publication confirm that the research candidate has made the following contributions to this manuscript:

- Developed the study design;
- Completed the human research ethics application;
- Developed and pilot tested the questionnaire;
- Conducted data collection;
- Performed data analysis;
- Prepared manuscript for submission to journal.

Signed: Date: 10/07/2018

Signed: Date: 28/06/18
Title: Preschool children’s preferences for sedentary activity relates to parent’s restrictive rules around active outdoor play

9.2 Abstract

Background: With prevalence estimates indicating that young Australian children are increasingly sedentary, it is important to identify the relevant attributes that are shaping sedentary behaviour. Literature has identified safety concerns of parents as a consistent barrier to physical activity participation of young children. Despite safety being a plausible determinant of young children's activity behaviours, the impact of restrictive parenting practices has rarely been examined through quantitative research. The current study investigates the link between controlling and supportive physical activity parenting practices and preschool children’s physical activity knowledge, preferences and behaviour.

Methods: The current cross-sectional study included 138 parent-child dyads and involved two components of data collection including a child and a parent questionnaire. Parent and child questionnaires data were matched to determine correlations between physical activity parenting practices and preschool children’s physical activity knowledge, preference and behaviour.

Results: Children’s preferences for physical activity correlated with several demographic characteristics and physical activity parenting practices, with the most influential variables being parental age, parental rules around active play outdoors and parental use of screen time to reward/control child behaviour. Children who preferred to be physically active were more likely to engage in physical activity and were less likely to engage in screen time on the weekend.

Conclusions: This study identified that parenting practices are not only associated with children’s active and sedentary behaviours, but also how children prefer to play. Future research
should seek to clarify the relationship between children’s activity preferences and parent’s use of screen time to reward and control their child’s behaviour, given the developmental and behavioural health risks associated with excessive media/screen exposure in early childhood. Further research should investigate whether competing societal values of the importance of encouraging children’s risky play and the need to prevent children from being injured, coupled with parent’s busy schedules, are contributing to parental ambivalence regarding how to promote active play for their children. Future public health practice needs to consider this confusion and find ways to assist parents to navigate the information being provided to them.

**Keywords:** Physical activity, preschool children, parenting practices, screen time
9.3 Introduction

Physical activity (PA) is essential to the physical, psychological, social, and cognitive health of children [1]. Despite the well-documented benefits of PA for young children, evidence suggests that young children are relatively inactive. In Australia, prevalence estimates suggest that preschool-aged children engage in low levels of PA and are sedentary for a large proportion of their day, with television watching (including DVDs and movies) consuming more of children’s leisure time than other identified recreational activities [2, 3]. Growing evidence indicates that once sedentary and active behaviours are established in early childhood they continue into adolescence, contributing to long term health outcomes [1, 4]. In response to this, a range of interventions have been implemented for preschool children to increase activity levels and decrease sedentary time before PA behaviours are cemented. Despite these efforts, few studies have reported having positive and lasting effects on PA levels [5]. The reported reasons for the lack of intervention success are varied; however, it has been suggested that to increase intervention success it is important to identify the relevant influences on the target behaviour [3].

Preschool children’s PA behaviours are the product of the interaction between individual characteristics and their environment [6]. At this age, preschool children are very reliant on others for many of their behavioural choices and have limited autonomy, thus, parents are critical in influencing children’s PA attitudes and behaviours [7]. Unsurprisingly, behaviours of parents to encourage or limit their child’s PA or inactivity (e.g. personal activity patterns, monitoring of child TV viewing/PA, family TV viewing) can influence children’s play behaviours [8]. One key contributing factor to children’s declining PA levels across many modern Western societies is the pervasiveness of ‘surplus safety’ [9, 10]. This has resulted in parents restricting children’s play and limiting children’s risk of engaging in dangerous behaviours.
A recent systematic review conducted by Hesketh and colleagues (2017) of factors that facilitate or hinder children’s PA identified parents’ safety concerns as a central and consistent barrier to PA participation of young children. A number of studies in the review reported that parents were worried that a physically active child could hurt themselves and may therefore be likely to limit their child's activity [5]. Further, children reported that adults' fears in relation to their safety and their health limited their activity levels [11]. Despite safety being a consistent and plausible determinant of young children's activity behaviours, the impact of restrictive parenting behaviours has rarely been explored in the quantitative literature [3].

Given that practices parents use to control PA can shape preschool children’s participation behaviours, it can be hypothesised that this parental concern for child safety may influence children’s understanding of the importance of PA and children’s activity preference. There is much qualitative research to support the idea that a child’s preference for more sedentary behaviours can have a negative impact on their participation in active play [12-15]. Further, how a child regards the importance and benefit of PA is said to play a role in determining their play choices, as they grow older and gain more autonomy over their behaviour [16]. Currently, little research has quantitatively examined the relationship between controlling and promoting parental PA behaviours and child PA knowledge and preference.

The current study seeks to address this gap in the literature by examining the link between preschool children’s knowledge and preference for PA and matching this with parental data regarding controlling and supportive PA parenting practices. Physical activity parenting practices refers to the behaviours or actions (intentional or unintentional) performed by parents for child rearing purposes that influence their children's attitudes, behaviors, or beliefs around
PA [8]. The study will also build on existing quantitative literature regarding the relationship between children’s PA knowledge and preferences and their link to children’s activity and sedentary behaviour. This understanding may lead to development of more targeted interventions to address declining PA participation in young children.

9.4 Methods:

Procedure

The current cross-sectional study involved two components of data collection. The first component included a parental questionnaire that comprised demographic questions, questions regarding their child’s PA/sedentary behaviours and PA parenting practices (Vaughn et al., 2013). Questions regarding screen time were modified to include contemporary screen-time activities such as iPad and smartphone devices. The questionnaire was validated in a study conducted by Vaughn and colleagues (2013) and measures 14 parent practices to either control (n=6) or support (n=8) children’s PA or screen time. Vaughn and others (2013) conducted an exploratory analysis and reported that the internal consistency for all factors within the tool was good, with Cronbach’s alphas ranging between 0.54-0.88. The questionnaire includes questions regarding the physical home environment, controlling parenting practices (such as rules around indoor and outdoor active play and screen time) and supportive practices including parental implicit and explicit modelling (for example, co-activity, praise and verbal encouragement, education, enjoyment and prompting).

The second component of data collection included child interviews. Upon return of parental questionnaire/consent forms, children were asked to complete the Preschool children’s Food and Play Questionnaire (Pre-FPQ). The pre-FPQ is a validated iPad activity that measures preschool children’s knowledge of and preference for PA [17]. Child interviews were 5 to 10
minutes in duration and were conducted in the free play area at participating childcare centres, which was visible to childcare educators. Parent and child questionnaire data were matched to determine any correlation between parental practices related to PA and preschool children’s knowledge and preference of PA, and PA behaviours. Children’s self-reported PA knowledge and preference was scored out of eight, with one point allocated for selecting the most active option out of two option photographs. The Griffith University Human Research Ethics Committee approved this study protocol (No: 2016/628).

**Participants**

Parent-child dyads were recruited using convenience sampling at 19 childcare centres across North Eastern New South Wales and South East Queensland, Australia. The study only included children who were between 3 and 5 years old. The required sample size of 140 was based on previous knowledge of the expected effect size of independent variables to detect an effect size ($f^2$) of 0.08 with an alpha error of .05 and a power of 80%.

**Data analysis**

Statistical analyses were performed using Statistical Package for the Social Sciences (SPSS version 23.0). Descriptive statistics were used to describe the demographic characteristics of the study participants. To determine the impact of key demographic variables on independent variables, Independent samples t-tests and ANOVAs were used. Pearson correlation tests were used to examine the relationships between parenting PA practices and children’s PA knowledge, preference and behaviours. Finally, multiple regression modeling was employed to examine the contribution of key PA parenting practices on children’s PA preferences, after controlling for key demographic variables. Preliminary analyses were conducted to ensure no violation of the assumptions of normality, linearity and homoscedasticity.
9.5 Results:

Demographic characteristics of participants

A total of 162 parent-child dyads were recruited for this study, from this sample a total of 138 parent-child dyads completed the questionnaire and were included in data analysis. Participants ranged in age from 3.1 years (37 months) to 4.9 years (59 months) \((M = 49.88\text{ months, } SD = 5.42)\). The demographic characteristics of the sample are presented in Table 9.1. Approximately half the child participants were males (66, 52%). A majority of the participating primary carers were female (122, 94.6%) and Caucasian (83%), just under two-thirds of primary carers had undergone tertiary education (64.6%), and just over half had an annual household income of $90,000 or more per annum (54.1%).

On average, children spent a total of 6.04 hours during the week engaging in screen time (total hours screen time from Monday to Friday), and a total of 4.21 hours over the weekend (total hours screen time from Saturday and Sunday). On average, children spent a total 11.9 hours participating in active outdoor play during the week (total hours active outdoor play from Monday to Friday) and 7.41 hours on the weekend (total hours active outdoor play from Saturday and Sunday). Children’s average PA knowledge and preference scores (iPad activity) were 5.39 and 3.83 respectively (out of a possible score of 8). The higher the child’s score, the more they preferred active play (PA preference), and the more they knew about the importance of activity play (PA knowledge). The average child PA preference score reported by parents was 19.6 (out of a possible score of 25). With a higher score indicating a child’s preference for PA in comparison to sedentary activities.
Table 9.1 Descriptive statistics of demographic factors and key independent variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Categorical variables</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Child gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>66 (52.0)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>61 (48.0)</td>
<td></td>
</tr>
<tr>
<td><strong>Primary carer gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>7 (5.4)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>122 (94.6)</td>
<td></td>
</tr>
<tr>
<td><strong>Primary carer age</strong>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-29</td>
<td>17 (13.2)</td>
<td></td>
</tr>
<tr>
<td>30-39</td>
<td>90 (69.0)</td>
<td></td>
</tr>
<tr>
<td>40+</td>
<td>22 (17.0)</td>
<td></td>
</tr>
<tr>
<td><strong>Ethnicity</strong>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>113 (83.0)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>20 (16.9)</td>
<td></td>
</tr>
<tr>
<td><strong>Marital status</strong>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married/defacto/living together</td>
<td>107 (82.9)</td>
<td></td>
</tr>
<tr>
<td>Single/divorced/separated</td>
<td>22 (17.1)</td>
<td></td>
</tr>
<tr>
<td><strong>Education level of primary carer</strong>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school</td>
<td>28 (22.0)</td>
<td></td>
</tr>
<tr>
<td>Technical or trade certificate/apprenticeship</td>
<td>17 (13.4)</td>
<td></td>
</tr>
<tr>
<td>Tertiary education</td>
<td>82 (64.6)</td>
<td></td>
</tr>
<tr>
<td><strong>Income per annum</strong> *</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 - $49,999</td>
<td>26 (21.3)</td>
<td></td>
</tr>
<tr>
<td>$50,000 – $89,999</td>
<td>22.1 (24.6)</td>
<td></td>
</tr>
<tr>
<td>$90,000-$129,999</td>
<td>27.9 (31.1)</td>
<td></td>
</tr>
<tr>
<td>$130,000-$150,000+</td>
<td>20.6 (23.0)</td>
<td></td>
</tr>
<tr>
<td><strong>Continuous variables</strong></td>
<td></td>
<td>Mean (SD)</td>
</tr>
<tr>
<td>Child age (months)</td>
<td>49.88 (5.42)</td>
<td></td>
</tr>
<tr>
<td>PA preference (Pre-FPQ)</td>
<td>3.83 (1.63)</td>
<td></td>
</tr>
<tr>
<td>PA knowledge (Pre-FPQ)</td>
<td>5.39 (2.03)</td>
<td></td>
</tr>
<tr>
<td>PA preference (Parent questionnaire)</td>
<td>19.6 (3.02)</td>
<td></td>
</tr>
<tr>
<td>Total hours child PA week</td>
<td>11.9 (8.1)</td>
<td></td>
</tr>
<tr>
<td>Total hours child PA weekend</td>
<td>7.4 (4.61)</td>
<td></td>
</tr>
<tr>
<td>Total hours child screen time week</td>
<td>6.1 (4.39)</td>
<td></td>
</tr>
<tr>
<td>Total hours child screen time weekend</td>
<td>4.2 (2.82)</td>
<td></td>
</tr>
</tbody>
</table>

*Categories were collapsed
Demographic characteristics and children’s PA knowledge, preferences and behaviour

No significant relationships were found between primary carer income, gender or marital status and children’s activity participation, screen time, PA knowledge or preference. Analyses indicated that Caucasian children preferred active activities ($t=1.32, p<0.05$) and spent more hours playing outside during the week ($t=3.08, p<0.001$) (Table 9.2). Child gender also appeared to be associated with activity preferences, with more males preferring PA than females. Despite this, on average, males were engaged in more weekend screen time than females ($t=2.00, p<0.01$).

Results of ANOVA tests revealed that the age and education of primary carers were related to children’s PA preference and hours spent in outdoor play (Table 9.2). Post-hoc tests indicated that children with younger primary carers (20-29 years) were more likely to prefer PA than children with older primary carers (30-39 years and 40+ years) ($F=4.93, p<0.01$). Further, children of parents who had undergone tertiary education participated in more active play on the weekend ($F=3.57, p<0.05$) and during the week ($F=4.28, p<0.01$) than children of parents who highest education achieved was a high school and technical or trade certificate (Table 9.2).

Physical activity parenting practices, child screen time and active outdoor play

Pearson correlation tests revealed that a number of controlling and supportive parenting practices were correlated with children’s PA and screen time participation (Table 9.3). A child’s exposure to television ($r=-.191, p<0.05$), explicit parental modelling and enjoyment of screen time ($r=-.345, p<0.001$), the use of screen time to reward/control child behaviour ($r=-.229, p<0.05$) and limiting outdoor play due to weather ($r=-.229, p<0.01$) were negatively associated with children’s outdoor active play during the week. Whereas, support/reinforcement from other adults for active play was positively associated with children’s total hours spent in active
outdoor play on weekends and during the week ($r=.234$, $p<0.01$). Rules around outdoor play ($r=0.195$, $r=0.12$, $p<0.05$), exposure to television, explicit modelling and enjoyment of screen time ($r=.450$, $r=.44$, $p<0.001$) were positively associated with children’s weekend and weekday hours spent engaging in screen time respectively. Support/reinforcement from other adults for active play ($r=-0.303<0.001$), parent’s perceived importance and value for PA ($r=-0.198$, $<0.01$), instrumental support for sport ($r=-0.208<0.01$) and explicit modelling and enjoyment of PA ($r=-0.342<0.001$) were negatively associated with children’s total hours of weekend screen time. Parental limiting or monitoring screen time was negatively associated with children’s weekend and weekday screen time hours ($r=-.49<0.001$) (Table 9.3).

**Physical activity parenting practices and children’s PA knowledge, preference and behaviour**

Pearson correlation tests indicated that children’s knowledge of PA was not correlated with any PA parenting practices (presented in Table 9.3). Children’s PA preference (Pre-FPQ) was found to be negatively correlated with parental rules around active play outdoors ($r=-0.179$, $p<0.05$) and positively correlated with the total hours children spent engaged in outdoor play on the weekend ($r=.240$, $p<0.01$). Child PA preference (parent questionnaire) was found to be negatively correlated with children’s weekend screen time ($r=-.214$, $p<0.01$), parental rules around active play outdoors ($r=-0.287$, $p<0.001$) and parental use of screen time to reward/control child behaviour ($r=-0.06$, $p<0.05$). Child PA preference (parent questionnaire) was also found to be positively correlated with parent’s instrumental for active play ($r=.211$, $p<0.01$), parent’s perceived importance and value for PA ($r=.301$, $p<0.001$), support/reinforcement from other adults ($r=.233$, $p<0.001$) and children’s total hours spent engaged in outdoor play ($r=.180$, $<0.01$).
Multiple regression modeling was used to examine the contribution of key PA parenting practices on children’s PA preferences (Table 9.4). Key socio-demographic variables entered at step 1 explained 7.9% of the total variance in children’s PA preference scores ($R^2 = 0.079$) (step 1). Overall, parental age was the only demographic factor that made a significant contribution in explaining children’s PA preference scores ($p=0.05$). All controlling and supportive parental PA practices that significantly correlated with children’s PA preferences were added at step 2, explaining an additional 15.7% of the variance in children's PA preference scores, after controlling for demographic factors ($R^2$ change =.157, $p=0.01$). Only rules around active play outdoors ($p<0.01$) and the use of screen time to reward/control child behaviour ($p<0.05$) made significant contributions children’s PA preferences, thus making the largest contribution to children’s PA preferences. The overall model contributed 23.6% ($R^2 = 0.236$) of the variance in children’s PA preferences.
Table 9.2: Children’s PA preference, knowledge, screen time and outdoor play by demographic factors

<table>
<thead>
<tr>
<th>Variable</th>
<th>Ethnicity</th>
<th>Child Gender</th>
<th>Age of Primary carer</th>
<th>Primary carer education</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Caucasian</td>
<td>Male</td>
<td>Female</td>
<td>20-29 years</td>
</tr>
<tr>
<td></td>
<td></td>
<td>n=109</td>
<td>n=62</td>
<td>n=60</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td></td>
<td>n=20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weekend outdoor play</td>
<td>7.65 (4.1)</td>
<td>7.60 (4.6)</td>
<td>.379 .71</td>
<td>7.46 (3.66)</td>
</tr>
<tr>
<td>weekday outdoor play</td>
<td>12.68 (8.0)</td>
<td>12.1 (4.7)</td>
<td>.31 .97</td>
<td>12.9 (8.26)</td>
</tr>
<tr>
<td>Weekend screen time</td>
<td>6.22 (4.5)</td>
<td>4.74 (3.2)</td>
<td>.20 0.04*</td>
<td>3.53 (1.97)</td>
</tr>
<tr>
<td>Weekday screen time</td>
<td>4.10 (2.6)</td>
<td>6.3 (4.9)</td>
<td>0.443 .658</td>
<td>6.59 (5.38)</td>
</tr>
<tr>
<td>PA preference score (Pre-FPQ)</td>
<td>3.92 (1.6)</td>
<td>4.12 (1.6)</td>
<td>2.59 0.01*</td>
<td>4.57 (1.28)</td>
</tr>
<tr>
<td>PA knowledge (Pre-FPQ)</td>
<td>5.42 (2.0)</td>
<td>5.18 (2.0)</td>
<td>-.907 .367</td>
<td>5.00 (2.07)</td>
</tr>
<tr>
<td>PA preference (Parent questionnaire)</td>
<td>19.64 (3.06)</td>
<td>19.7 (3.20)</td>
<td>0.318 .75</td>
<td>21.6 (2.52)</td>
</tr>
</tbody>
</table>

*p<0.05 **p<0.01 ***p<0.001
Table 9.3 Correlations between PA parenting practices and children’s PA preference, knowledge, screen time and outdoor play

<table>
<thead>
<tr>
<th>Variable</th>
<th>Child iPad activity</th>
<th>Parental report</th>
<th>Parental report hours outside play</th>
<th>Parental report hours screen time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Child PA preference (Pre-FPQ)</td>
<td>Child PA knowledge (Pre-FPQ)</td>
<td>Child PA preference (Parent questionnaire)</td>
<td>last 5 weekday</td>
</tr>
<tr>
<td>Controlling factors</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rules around active play indoors</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rules around active play outdoors</td>
<td>-0.092</td>
<td>-0.123</td>
<td>-0.020</td>
<td>-0.020</td>
</tr>
<tr>
<td>Use of PA to reward/control behaviour</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limiting or monitoring screen time</td>
<td>-0.078</td>
<td>0.058</td>
<td>0.021</td>
<td>-0.125</td>
</tr>
<tr>
<td>Limiting outdoor play due to weather</td>
<td>-0.026</td>
<td>-0.050</td>
<td>-0.060</td>
<td>-0.229**</td>
</tr>
<tr>
<td>Use of screen time to reward/control child behaviour</td>
<td>-0.026</td>
<td>-0.050</td>
<td>-0.060*</td>
<td>-0.229*</td>
</tr>
<tr>
<td>Promoting factors</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Explicit modelling and enjoyment of PA</td>
<td>-0.077</td>
<td>0.050</td>
<td>0.228**</td>
<td>0.165</td>
</tr>
<tr>
<td>Verbal Encouragement</td>
<td>0.020</td>
<td>0.096</td>
<td>0.074</td>
<td>0.124</td>
</tr>
<tr>
<td>Instrumental support for sport</td>
<td>-0.070</td>
<td>0.057</td>
<td>0.119</td>
<td>0.093</td>
</tr>
<tr>
<td>Instrumental support for active play</td>
<td>-0.068</td>
<td>-0.007</td>
<td>0.211**</td>
<td>0.24**</td>
</tr>
<tr>
<td>Importance and value PA</td>
<td>-0.052</td>
<td>0.021</td>
<td>0.301***</td>
<td>-0.041</td>
</tr>
<tr>
<td>Support/reinforcement from other adults</td>
<td>0.020</td>
<td>0.064</td>
<td>0.233***</td>
<td>0.234**</td>
</tr>
<tr>
<td>Exposure to TV</td>
<td>0.035</td>
<td>-0.155</td>
<td>-0.027</td>
<td>-0.191*</td>
</tr>
<tr>
<td>Explicit modelling and enjoyment of screen time</td>
<td>-0.389</td>
<td>-0.041</td>
<td>-0.170</td>
<td>-0.345***</td>
</tr>
<tr>
<td>Dependent variables</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Child PA preference (Pre-FPQ)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child PA knowledge (Pre-FPQ)</td>
<td>0.096</td>
<td>-</td>
<td></td>
<td>0.101</td>
</tr>
<tr>
<td>Child PA preference (Parent questionnaire)</td>
<td>0.029</td>
<td>0.097</td>
<td>-0.174</td>
<td>0.117</td>
</tr>
</tbody>
</table>

*p<0.05  ** p<0.01  *** p<0.00
Table 9.4 Hierarchical Multiple Regression: Factors relating to children’s PA preferences

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>B</th>
<th>SE</th>
<th>Beta</th>
<th>t</th>
<th>p</th>
<th>R²</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>0.079</td>
<td></td>
</tr>
<tr>
<td>Child gender</td>
<td>-.159</td>
<td>.549</td>
<td>-.026</td>
<td>-.290</td>
<td>.773</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td>-1.04</td>
<td>.877</td>
<td>-.108</td>
<td>-1.19</td>
<td>.235</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parent age</td>
<td>-1.48</td>
<td>.512</td>
<td>-.260</td>
<td>-2.89</td>
<td>.005</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Household income</td>
<td>-.221</td>
<td>.277</td>
<td>-.077</td>
<td>-.796</td>
<td>.428</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.236</td>
<td>.157***</td>
</tr>
<tr>
<td>Rules around active play outdoors</td>
<td>-.220</td>
<td>.083</td>
<td>-.248</td>
<td>-2.64</td>
<td>.009**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of screen time to reward/control child behaviour</td>
<td>.353</td>
<td>.168</td>
<td>.198</td>
<td>2.098</td>
<td>.038*</td>
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<td></td>
</tr>
<tr>
<td>Explicit modelling and enjoyment of PA</td>
<td>.046</td>
<td>.045</td>
<td>.099</td>
<td>1.024</td>
<td>.308</td>
<td></td>
<td></td>
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<tr>
<td>Instrumental support for active play</td>
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<td>.070</td>
<td>.162</td>
<td>1.80</td>
<td>0.075</td>
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<tr>
<td>Support/reinforcement from other adults</td>
<td>.183</td>
<td>.143</td>
<td>.121</td>
<td>1.28</td>
<td>.203</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instrumental support for sport</td>
<td>.112</td>
<td>.109</td>
<td>.093</td>
<td>1.03</td>
<td>.305</td>
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*p<0.05 ** p<0.01 *** p<0.001
9.6 Discussion

The purpose of this study was to examine the relationship between PA parenting practices and preschool children’s PA knowledge, preferences and behaviours. Rather unexpectedly, children’s PA knowledge was not correlated with PA parenting practices or children’s activity behaviours. On the other hand, children’s preferences for PA appeared to be correlated with a number of demographic characteristics and PA parenting practices, with the most influential being parental rules around active play outdoors and parental use of screen time to reward/control child behaviour. Findings will be discussed in the context of existing literature.

Demographic characteristics and children’s PA knowledge and preferences

The demographic factors of child gender, ethnicity and parental age were correlated with children’s PA preferences and/or PA and sedentary behaviours. Children of older parents were more likely to prefer sedentary activities. Literature has presented mixed findings regarding this link [6]; nonetheless, a study conducted by Zecevic and others (2010) reported parental age as a negative correlate of children’s PA [18]. Follow up analyses in the current study revealed that parents between the ages of 30 to 39 years participated in significantly less activity than those of 20 to 29 years and 40 to 49 years. As 30- to 39-year-old parents represented 65% of the study population, it could be suggested that the reduced activity levels of this age group may contribute to children’s preference for more sedentary activities. Future research should seek to determine why parents within this age group engage in lower levels of activity, and how underlying factors influence children’s activity preferences.

Boys were more likely to prefer being physically active than girls. This aligns with existing research conducted with primary school children [19], which found that boys had a significantly higher preference for cycling, playing sport at a club and playing outside. Caucasian children
and children of parents with a higher level of education were found to prefer more active activities and engaged in more outdoor play during the week. The strength of the associations and the presence of an association between ethnicity and preschool children’s PA has varied between studies and remains inconclusive [6, 20]. Ethnic differences in PA preference and participation may be explained by differences in socioeconomic status by ethnic group or the questionnaire may have not been appropriate for differing ethnicities [20, 21]. Further, literature indicates that this may be due to that fact that ethnic minorities are underrepresented in mainstream culture, resulting in children of ethnic minorities being more likely to be guided by familial role models [21]. Future studies should seek to determine the mechanisms related to ethnicity that underpin differences in PA preferences, for example, whether differences in PA habits by ethnicity could be attributable to socioeconomic status [21].

There is conflicting literature that both supports and disproves the relationship between parental education and children’s PA levels [6, 20]. In the current study, children of parents with a higher level of education engaged in more active outdoor play. Although parental education is difficult to alter, and generally beyond the possible scope of a public health intervention, this finding may help to identify sub-populations that may benefit from interventions to support their child’s engagement in PA [18, 21]. As the association between parental education and child activity preference was independent of household income in the current study, more research needs to be done to determine how parental education relates to child activity preferences and behaviours. For example, is the link between child PA and parental education related to the type of jobs undertaken by those with differing levels of education? Are parents who work more labor-intensive jobs or longer hours less inclined to engage in PA promoting behaviours? More broadly, does increased level of education influence parental knowledge of the importance of PA or how they can use their own behaviour to encourage PA? Despite this
lack of clarity, a large number of interventional studies have targeted parental knowledge as a means to increase children’s activity levels, with the studies overall showing no or indeterminate effects [5]. It may therefore be important to revisit parental education as a determinant of child PA to explore other mechanisms that contribute to this relationship.

**Physical activity knowledge, preference and activity behaviours**

In the current study, children’s knowledge of PA was not correlated with children’s active and sedentary behaviour or any demographic factors. This may be due to high levels of PA knowledge in study participants due to participants being drawn from the educational setting of the childcare centre. Nonetheless this contradicts existing literature that suggests children with increased knowledge of the importance of PA are more likely to engage in active play [22]. Children who preferred to be physically active were more likely to engage in PA on the weekend and were less likely to engage in screen time on the weekend. Although existing literature highlights the importance of preschool children’s preference for PA as a predictor of activity behaviour, this has been based predominantly on the findings of qualitative literature [5]. The current study adds to existing literature by quantitatively supporting the link between child PA preferences and activity behaviours. The reason for the lack of correlation between children’s activity preferences and weekday activity may be due to the fact that children are at childcare during the week, and thus, have limited control over the activities they engage in [9, 10]. Parents may be unaware of the exact activity behaviours children engage in during the day while they are at childcare. Further, a lack of correlation may be explained by the situational nature and/or influence of the child’s environment on their activity preferences [16].
Physical activity parenting practices and children’s PA preferences

There were a number of controlling and promoting PA parenting practices that correlated with preschool children’s activity preferences. After controlling for key demographic factors and parental PA practices, only rules around active play outdoors and the use of screen time to reward/control child behaviour made significant contributions to children’s PA preferences. The PA parenting practice of ‘rules around active play outdoors’ included questions such as ‘do you ask your child not to run outside?’ and ‘do you ask your child to calm down his/her outdoor play?’.

Existing literature supports the link that parent’s attitudes about risky play influence children’s engagement in PA, but the current study demonstrates how restrictive rules around outdoor play at home can also influence children’s activity preferences [9, 23, 24].

Most young children seek out and enjoy challenging play [24]. There is much argument that challenging play affords children a number of benefits including providing them the opportunity to test their limits, explore boundaries and learn to make decisions about injury and risk [9]. Parental rules around outdoor play are arguably fueled by safety concerns and the increasingly regulated and controlled tendencies of western society [11, 14, 24]. Niehues and colleagues (2015) stated that at the root of parenting rules is parental concern of being labelled as ‘incompetent parents’ or having their parenting skills questioned. There are contradictory discourses emerging in literature which suggest that parents understand the importance of encouraging and facilitating their child’s risky play [9] and value their own childhood experiences of engaging in unstructured, unsupervised play [24]. Yet, at the same time, parents consider themselves to be ‘socially assigned’ to make their child’s safety their primary concern and to prevent their child from being injured [23, 24]. Managing these competing societal values along with the staggering amount of information about ideal parenting, makes it understandably difficult for parents to know how to approach this issue. Nevertheless, parents
have reported that safety often prevails as a priority over offering children the adventure of age-appropriate risk taking activities [23].

This is further complicated by parents’ increasingly busy schedules and dual-working households. Busy parents report that it takes time and additional effort to support autonomy, and that is often easier to take the safer option and say ‘no’ to riskier activities [25]. This may contribute to children engaging in more screen time, which parents may consider as low risk. This theory is supported by the current study as findings indicate that the more parents employ restrictive rules around outdoor play, the less likely their children was to prefer active outdoor play and the more likely they were to engage in screen time.

The second most influential contributor to children’s activity preferences was parents use of screen time to reward and control their child’s behaviour. This PA parenting practice included questions such as, ‘Do you offer screen time as a reward for good behaviours?’ and ‘Do you take away screen time as a punishment for bad behaviour?’. Qualitative literature suggests that screen devices are being more commonly used as a reward or punishment or for conflict reduction [26]. In the current study, parent use of screen time to reward/control child behaviour led to children preferring more sedentary activities and was also negatively correlated with children’s active outdoor play. This is consistent with existing literature which suggests that this parenting practice to manage children’s behaviour leads to an increase in children’s screen time [8, 27].

There is limited research that explains the correlation between children activity preferences and parents’ use of screen time to reward and control their child’s behaviour. However, it has been suggested that rewarding or encouraging behaviours with screen time further elevates the status
of screen time by using it as a tool to drive and shape behaviour. Choudhury and McKinney (2013) go on to note that screen time and media use is already an inherently rewarding activity for most children, due to the euphoria and pleasure associated with media use and the resulting release of the neurotransmitter dopamine [27-29]. It can also be hypothesised that using screen time as a reward or punishment encourages children to think of screens as a recreational, exciting activity as opposed to a functional tool. This may result in children establishing unhealthy relationships with technology seeing them as entertainment rather than as device that can be used for specific functions. Nevertheless, several studies have contradicted this finding, and suggest that adult rules on screen use can effectively deter children from participating in excessive television viewing and computer use, if supported concurrently with adult modelling of low screen use [30]. The current study did not find that parental explicit modelling and enjoyment of screen time was correlated with children’s activity preferences. Finally, as the regression model accounted for 23.6% of the variance in children’s activity preferences, further research is needed to explore contributing variables that were not accounted for in the current research.

Limitations

This study is subject to limitations. Firstly, due to the difficulty in gaining access to the target population, the researchers recruited participants from early childcare educational settings. This limits the generalisability of findings, as children attending childcare may be more educated regarding the importance of PA. Further, children attending these centres, particularly in metropolitan areas, can often be of a higher sociodemographic background, exemplified by the median income in the survey being AUD$90,000 while the median income in Australia was AUD$75,000 at the time of analysis [31]. The reliance on parental report to measure children’s activity and screen time behaviours could have been confounded by some social desirability bias [29]. Finally, given that the data was collected at a single point in time at one location,
using one method of measurement, correlations between parent reported parenting PA practices and other variables may be subject to mono-method bias.

9.7 Conclusions

This study identified that parenting practices are not only shaping children’s active and sedentary behaviours, but also how children prefer to play. Children’s activity preferences for PA was found to correlate with parental rules around active play outdoors and parental use of screen time to reward/control child behaviour. Given the link between children’s activity preferences and behaviours in early childhood, contextual factors shaping these parenting practices warrant consideration.

Competing societal values of the importance of encouraging children’s risky play and the need to prevent children from being injured, coupled with parents’ busy schedules and the abundance of parenting advice they receive, may be leading to parents feeling ambivalent about how to promote active play for their children. Future public health practice needs to consider this confusion and find ways to assist parents to navigate the information being provided to them. Future research should seek to clarify the relationship between children’s activity preferences and parent’s use of screen time to reward and control their child’s behaviour, given the developmental and behavioural health risks associated with excessive media/screen exposure in early childhood. Finally, given the inconsistencies in the literature regarding the relationships between the demographic factors of parental age, education, child gender, ethnicity and children’s activity preferences, future research should consider what could be underpinning these relationships in different contexts. This may help to identify those that could benefit from assistance with encouraging their child’s active play or could inform interventions with broader benefits.
9.8 Reference list


Chapter 10: Discussion and Conclusions

10.1 Introduction

The overall aim of this program of research was to examine the individual and contextual factors shaping preschool children’s knowledge of and preferences for healthy lifestyle behaviours. This research incorporated nine research questions, which were developed to meet the overall aim of the thesis. Six studies were conducted to answer these research questions. Collectively, this research contributes an enhanced insight into how children understand and prefer (or not prefer) healthy lifestyle behaviours. This included the systematic review of methods currently being used to measure preschool children’s knowledge of food and knowledge of and preference for physical activity and, the validation of an iPad activity to measure these variables. The body of research also incorporated contemporary, visual methodologies to explore preschool children’s perceived barriers and enablers to their participation in their favourite physical activity. This final chapter starts with the candidate’s reflections on the research process, followed by an overview of the key research findings. Drawing upon this overview, implications of the findings and recommendations for future research and practice are presented. Last, the overall conclusions of the program of research are presented.

10.2 Reflections on Research Process

Conducting this program of research has offered me a number of insights into the research process. It became clear very early on in the research that the childcare setting presented a gateway to invite 3- to 5-year-old children to participate in the research. Educators at the childcare centres were keen to be involved in the research, which was encouraging and facilitated the research process. All educators involved were very supportive of the research and assisted with encouraging children to be involved in the research, particularly if children
were nervous about participating or meeting the researcher. This highlighted the importance of conducting data collection in close proximity to the participant’s educator and classmates. One challenge that arose consistently throughout the research process was the difficulty facilitating parent involvement, at least in part, due to their busy schedules. Working with young children requires parental consent for child participation. Parental consent was very difficult to obtain in many cases, which often meant parents needed to be approached to fill out consent forms in person rather than sending consent forms home to parents. This also made the survey-based research conducted in study 6 very challenging, as the survey was quite long and could not be completed by parents on the spot when they picked their children up from childcare. Although incentives were offered to parents for their completion of the questionnaire, data collection was anticipated to take 2 to 3 months. In total, it took nearly 18 months to obtain an acceptable sample size.

Another key learning was the benefits associated with beginning the research by conducting systematic reviews. Commencing the research program with these systematic reviews of the literature allowed me to gain knowledge and familiarise myself with the techniques available to measure these variables and the strengths and weaknesses of these techniques. By becoming familiar with the range of techniques that have been used to collect data with preschool children, I was able to select the data collection tools that aligned with my program of research and anticipate any methodological issues commonly associated with the used of these tools. Further, as it was identified that there were no valid and reliable measures of children’s food and physical activity knowledge and preferences, Study 3 involved the validation of the Preschool food and Play Questionnaire (Pre-FPQ). In this way, findings of the systematic reviews informed the methods that were used and developed throughout this program of research.
Using age-appropriate visual methods to engage children in the research represented a steep learning curve in terms of the issues that can arise when working with children. For me, this process highlighted the importance of having practical, field experience, as although my literature review helped me to anticipate issues that may arise when working with children, there were certainly a number of unexpected challenges that I encountered. For example, issues with keeping children engaged arose if the data collection task was too easy or if there were distractions that were more exciting than the research activity. These issues highlighted the importance of the data collection being age-appropriate including being engaging for the participant as well as having a quiet space to conduct data collection activities free from distractions. Finally, I underestimated how much insight children, particularly as young as 3 years of age, were able to provide into how various factors can shape their health understandings. These insights came about not only from children’s responses to direct questions, but in passing comments to their peers, in justifying their responses, or through their responses when they are shown prompts or pictures or through their drawings. To me, this confirmed the importance of including children in the research process and the opportunities and information that can arise from doing so.

Validating the Pre-FPQ unexpectedly provided insight into the confounding contextual factors that were shaping preschool children’s answers in regard to their physical activity knowledge and preferences. It was evident that children placed considerable emphasis on safety as a health promoting behaviour and that this had a confounding effect on children’s answers in regard to their preference and understanding of physical activity. This finding led to further analyses presented in the studies that followed and shaped the overall direction of the program of research. For example, Study 5 aimed to gain a more detailed insight into activities preschool children prefer and what they consider to be barriers and facilitators to participating in their preferred activities. Study 6 built on this by quantitatively examining the relationship between
demographic factors, physical activity parenting practices and children’s physical activity knowledge, preferences and subsequent sedentary and active behaviour.

Collectively, this program of research presents a compelling picture of how children understand health and health behaviours through allowing the children themselves to share their own perspectives and experiences. This allowed me to identify individual and contextual factors that may shape children’s knowledge of and preference for healthy lifestyle behaviours as well as the activities that preschool children prefer to play and what they consider to be barriers and facilitators to them participating in activities. Finally, the research highlighted the benefits of using age-appropriate techniques to involve children in the research process and how the involvement of young children can offer unique child-centred insight into the factors that drive children’s behaviours.

10.3 Overview of Key Research Findings

The main findings of each study are outlined in Table 10.1. The key findings of the included studies are discussed below and align with three main areas:

1. Working with children and measuring children’s knowledge of and preference for physical activity and nutrition
2. Preschool children’s understanding of health and health behaviours
3. Preschool children’s physical activity preferences and behaviours
Table 10.1 Overview of study findings

<table>
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<tr>
<th>Study</th>
<th>Objectives</th>
<th>RQ</th>
<th>Main findings</th>
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| 1     | 1. To identify and review data collection techniques used effectively to measure preschool children's knowledge of food and nutrition | 1 | 1. Twenty studies were eligible for inclusion in the review. The studies reported the use of a range of innovative, age-appropriate techniques to assess children’s knowledge of food and nutrition.  
2. Data collection techniques were grouped under 3 broad approaches: (1) interviews, (2) use of stimulus material and prompts, and (3) structured play-based activities.  
3. Only 3 of the reviewed studies tested for both reliability (test-retest and internal consistency) and face and content validity. Only 9 of the reviewed studies reported pilot-testing their instruments before use.  
4. Picture-based multiple choice or sorting activities can be reliable data collection techniques and may be highly beneficial in research projects with time and resource constraints.  
5. If using photo-pairs to measure nutrition knowledge, tools should include food items of varying degrees of difficulty and discriminability, that is, including simple pairs such as a junk food item versus a piece of fruit, together with more difficult pairs, such as, refined orange juice and milk.  
6. Further research to develop more valid and reliable measures to assess preschool children’s knowledge of food and nutrition is required. Assessment tools need to be pilot-tested, refined, and adapted to suit both the specific audience and the components of nutrition knowledge being targeted by an intervention before implementing a nutrition education program. |
| 2     | 2. To identify and review data collection techniques used to effectively measure preschool | 2 | 1. Fourteen studies were eligible for inclusion in the review. The identified studies employed a limited but disparate range of techniques to assess children's physical activity knowledge and preferences.  
2. Four techniques were consistently used across the reviewed studies, including; interviews, structured play-based activities, questionnaires and observation. |
3. Of the existing techniques, more consideration needs to be given to ensure that the techniques used align with the characteristics of the study population. For example, when incorporating photographs/images into data collection techniques, these images need to be age-appropriate, familiar, safe and reflective of the demographic characteristics of the study population being tested. This can be ensured through pilot-testing and observing children’s activity participation prior to tool development.

4. When assessing physical activity preference, it is important to consider what activities participants engaged in immediately before the testing, as this might influence the preferences reported during testing.

5. A caretaking approach might be an effective method to measure physical activity knowledge by providing a context where physical activity decisions are linked with health rather than personal preferences.

6. There is a need for validated and reliable measures to assess children's knowledge of and preference for physical activity.

3. To assess the reliability and validity of an adapted computerised (iPad) version of the photo-pair food and exercise questionnaire (Pre-FPQ).

1. The adapted Pre-FPQ is an innovative tool and demonstrates adequate reliability and validity for the assessment of food and activity knowledge and preferences in 4- to 5-year-old children.

2. The tool is not appropriate for children younger than 4 years of age.

3. The iPad modality of the Pre-FPQ was an appealing and age-appropriate format that enabled the researcher to engage and maintain the concentration of participants. The Pre-FPQ offers the advantage of being presented in a well-received modality for preschool children as well as being easy, quick and inexpensive to administer. This helped the researcher work within the attention span of the target age-group.
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<td>4.</td>
<td>The tool was able to be applied efficiently to large numbers of participants and allowed for results to be exported securely and efficiently to a data analysis program to assist with timely analysis.</td>
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<td>5.</td>
<td>The percent agreement between activity preferences and choice of physical activity was relatively low and was inconsistent across age groups, this may have been influenced by the weather at the time of testing, the novelty of the activity (e.g. the use of iPad) and the activity being completed in the classroom prior to testing.</td>
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<td>6.</td>
<td>This new tool is likely to be useful to assess the effectiveness of healthy lifestyle programs implemented in the childcare setting, which aim to encourage the development of health dietary and activity behaviour in preschool children. Future work is needed to refine and improve measures of physical activity preference in preschool children.</td>
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<td>4.</td>
<td>To explore how preschool aged children speak about health and health behaviours.</td>
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<td>5.</td>
<td>To examine the influence of age and gender on preschool aged children’s self-reported understanding of health and health behaviours.</td>
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<tr>
<td>1.</td>
<td>Healthy food choices dominated how children spoke about what it means to be healthy.</td>
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<td>2.</td>
<td>Interestingly, participants offered limited mention of physical activity as a health promoting behaviour.</td>
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<td>3.</td>
<td>The emphasis participants placed on the importance of minimising risk and injury prevention as health behaviours may undermine efforts to encourage their engagement in physical activity. Future research needs to determine whether the emphasis children place on risk minimisation is shaping how they speak about health and how this interaction plays out in their behaviour.</td>
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<td>4.</td>
<td>Another theme that emerged from children’s responses as a way to maintain health was the importance of being well-behaved. This theme provides further evidence of the extent a child’s context and environment can shape how children speak about health and refers to practices such as: obeying rules, being kind and helping others.</td>
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5. The absence of illness was also considered a criterion of good health by participants with two themes emerging from responses including: ‘treat illness’ and ‘not being sick’. This may reflect normative health education targeting children, which largely individualises health, reducing health promotion to reduction of risk.

6. Children’s understanding of health did not appear to vary by gender or age; however in some instances it was evident that the sophistication of child responses within themes increased with age.

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<th>6. To explore preschool children’s activity preferences and identify what children consider to be barriers or facilitators to participating in their preferred activity</th>
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<td>5</td>
<td>6. Participants expressed a desire to play unstructured activities with friends or family, to engage in imaginative, challenging play, as well as the opportunity to have control over the activity they engage in.</td>
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<td>2. Children reported that rules at home and at childcare, the availability of toys, friends, family and having access to a natural environment served as both barriers and facilitators to their participation in their favourite activity.</td>
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<td></td>
<td>3. More research needs to be conducted to determine a balance between safe play and creating a challenging environment for children.</td>
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<td>4. Listening to children’s voices about their play preferences and the barriers and facilitators to engaging in these activities, provides important insight into children’s play behaviour. The findings will help facilitate young children’s participation in enjoyable physical activity.</td>
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6. To examine the influence of demographic factors and parental physical activity behaviours on children’s physical activity knowledge and preferences

<table>
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<tr>
<th></th>
<th>1. Children who preferred to be physically active were more likely to engage in physical activity on the weekend and were less likely to engage in screen time on the weekend.</th>
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<td></td>
<td>2. This study identified that parenting practices are not only shaping children’s active and sedentary behaviours, but also how children prefer to play.</td>
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<td>8. To examine the influence of preschool children’s knowledge of and preference for physical activity on their participation in physical activity and sedentary behaviours</td>
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<td>3. Children’s physical activity knowledge was not found to be correlated with physical activity parenting practices or children’s activity behaviours.</td>
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<td>4. Children’s preferences for physical activity appeared to correlate with child gender, ethnicity and parental age and physical activity parenting practices, with the most influential variables being parental rules around active play outdoors and parental use of screen time to reward/control child behaviour.</td>
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<td>5. Future research should seek to clarify the relationship between children’s activity preferences and parents’ use of screen time to reward and control their child’s behaviour, given the developmental and behavioural health risks associated with excessive media/screen exposure in early childhood.</td>
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<td>6. Competing societal values of the importance of encouraging children’s risky play and the need to prevent children from being injured, coupled with parents' busy schedules, may be contributing to parental ambivalence regarding how to promote active play for their children. Future public health practice needs to consider this confusion and find ways to assist parents to navigate the information available to them.</td>
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<tr>
<td>7. Finally, given the inconsistencies in the literature regarding the relationships between the demographic factors of parental age, education, child gender, ethnicity and children’s activity preferences, future research should consider what could be underpinning these relationships in different contexts. This may help to identify parents who could benefit from assistance regarding how to encourage their child’s active play or, assist in developing interventions with broader benefits.</td>
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Working with children and measuring children’s knowledge of and preference for physical activity and nutrition.

The purpose of this program of research was to gain insight into children’s self-reported understanding of and preference for healthy lifestyle behaviours. Very little research has been conducted to gain preschool children’s own perspectives of health or factors driving their healthy lifestyle behaviours. The emergence of participatory age-appropriate research techniques has now allowed for a shift in how health behavioural research is conducted with young children, with researchers recognising the importance of conducting “research with children, rather than, on children” (Roberts, 2017). As evidenced by the current research, participatory research allows us to understand children’s health-related behaviours, behavioural preferences and factors that enable or act as barriers with respect to these behaviours - from their perspective (Anthamatten et al., 2012). Collectively, the current research highlighted the benefit of using age-appropriate, visual methodologies to engage preschool children in the research process, including methods such as the draw-and-tell method and an interactive iPad activity. The use of these methods also provided valuable insight into the benefits and challenges associated with these techniques, which will be discussed in the following paragraphs along with key findings.

Study 1 and 2 contributed to existing literature by systematically reviewing the literature to identify data collection techniques that have been used to effectively measure preschool children's knowledge of food and nutrition (Study 1), and knowledge and preference for physical activity (Study 2). Overall, findings identified that while a number of diverse tools have been used to measure preschool children’s nutrition knowledge, a limited yet disparate range of engaging techniques have been used to assess preschool children’s physical activity knowledge and physical activity preferences. This may be due to several factors, such as the common belief that children are naturally active, despite emerging patterns of increased
sedentary behaviour and decreased physical activity in young children (Noonan et al., 2016). Alternatively, this may be a result of the effectiveness of physical activity interventions being evaluated through anthropometric measures including: weight, BMI, BMI z-scores and waist circumference, rather than through proximal measures of physical activity knowledge and preferences (Ling, Robbins & Wen 2016).

Study 1 and Study 2 acknowledged that picture-based multiple choice or sorting activities can be reliable data collection techniques when working with preschool children and may be highly beneficial in research projects with time and resource constraints. Further, the reviews highlighted the need for assessment tools to be pilot-tested and adapted to suit both the variables being measured and the specific characteristics of the study population. For example, when assessing physical activity preference in children, it is important to consider what activities participants engaged in immediately before the testing as it might influence reported activity preferences at the moment of testing. When incorporating photographs/images into data collection techniques, there is a need to ensure the activity presented is age-appropriate, familiar and safe for participants. Similarly, several factors need to be considered a priority when using photos or images to measure nutrition knowledge. For example, researchers should collect relevant information before using photographs/images, such as food allergy and intolerance information and home exposure to food items (frequency, types, and forms of food consumed) to ensure children are able to make genuine choices in research activities. Further, findings indicated a need for more valid and reliable measures to assess children's knowledge of nutrition and knowledge of and preference for physical activity. This finding shaped the basis of Study 3, which aimed to adapt and validate an iPad activity to effectively measure these variables.

Study 3 included the adaption and validation of the Preschool-Food and Play Questionnaire (Pre-FPQ). The Pre-FPQ is a picture-based questionnaire administered by iPad
and was found to demonstrate adequate reliability and validity for the assessment of food and activity knowledge and preferences in 4- to 5-year-old children. Although test-retest reliability and internal consistency improved with age, it was evident that the tool was not suitable for children younger than 4 years of age. This was because most children below this age were less likely to understand the rules of the activity, and reported selecting pictures based on factors such as colour or at random. The iPad modality of the Pre-FPQ was an appealing and age-appropriate format that enabled the researcher to engage and maintain the concentration of participants. This was important, as it is increasingly recognised that instruments used to collect information from young children need to be interactive and appealing to encourage willing participation that produces quality data (Noonan et al., 2016). Further, the Pre-FPQ offers the advantage of being presented in a well-received modality for preschool children as well as being easy, quick and inexpensive to administer. This helped the researcher to work within the attention span of the target age-group. This was a particularly important advantage of the tool, as it became evident that, although the activity was interactive and engaging, the novelty of the iPad was not sufficient to maintain participants’ focus for much longer than the 10 minutes required to complete the activity.

Participatory visual methods, such as the draw-and-tell method used in the current research, are highly efficient and ethically appropriate research methods that are particularly suited for research with children for reasons of inclusivity and interactivity (Noonan et al., 2016). The draw-and-tell method employed in Study 5 is popular in child-focused health research and has been used to explore children’s physical activity beliefs and playground experiences in school aged children (Noonan et al., 2016; Cammisa et al., 2011). Drawing provides children greater control over their expression, allowing them to reflect and articulate what is important to them, and the drawings are rich visual illustrations that directly represent
children’s perspectives. Many insights into the benefits and challenges associated with this technique emerged throughout the application of this technique in Study 5.

In the current research, the use of drawings facilitated communication between child and researcher as it helped to overcome the brevity of their verbal responses. The drawings filled important gaps in children’s verbal responses. It was also evident that this method is not suitable for children younger than 4 years of age, with drawings of 3-year-old children proving difficult to interpret. From the candidate’s experience, when using this method it is recommended to let the child sit with a peer at one table to make her/him feel comfortable but far enough from each other to prevent children copying from each other. Following this approach allowed children to stay focused at the time of data-collection because they were less likely to be distracted by other children or events in the environment. Lastly, the traditional approach of reviewing the finished drawing with the child by asking several questions often led to participants becoming quiet and possibly self-conscious. After this became evident, the candidate began asking questions while the child was drawing, this ensured that the activity did not feel like an interview/test situation and more like a conversation, this often facilitated more in-depth responses from participants.

**Preschool children’s understanding of health and health behaviours**

The current research contributes knowledge to existing literature on how children make sense of health and healthy lifestyle behaviours. Such understanding is an important precursor to developing policy and educational programs that reflect young people’s lives and dispositions (Burrows & Wright, 2004). The findings of this research suggest that Australian children as young as 3 years are able to articulate, with some clarity, the dominant, health-related messages surrounding them. As such, it is possible that children’s understandings of health and health promoting behaviours are being shaped by the social and environmental
context in which they live and grow. This reflects a socio-ecological perspective, which informed the current research. It is evident that not only are health behaviours and status framed and influenced by various factors and environments identified in the framework, but also how children come to understand health (Bronfenbrenner, 1979, 1989). In the first five years of life, children are increasingly exposed to a range of lifestyle messages formulated within public health missives, television programs, and commentaries from friends, family and teachers, all of which may be shaping a child’s way of understanding how a healthy person looks, behaves and talks (Burrows & McCormack, 2014).

Participant responses in the current research demonstrated the extent to which a child’s context and environment can shape how children speak about health. For example, children mentioned ‘being well-behaved’ by obeying rules, being kind and helping others as a way to be healthy. These beliefs are likely instilled by directives delivered by different caretakers relevant to the child. Thus, by listening to children’s voices it was possible to identify key values within the society of which they are a part. Being well-behaved is a social expectation that allows them to fit in and to please those around them, thus from their perspective, contributes to their overall health and happiness (Burrows & McCormack, 2014). This aligns with the meso environment of the socio-ecological perspective as it reflects the interaction of the two micro systems of the home and childcare environment, and highlights that consistent directives given to children across contexts are able to influence children’s concept of health (Bronfenbrenner, 1979, 1989). At the individual level of the socio-ecological perspective, personal experience with injury and illnesses also played a part in children’s understanding of health. There were no noted differences found in health understandings between gender and age of preschool children, however, it was evident that in some instances, the sophistication of responses within themes increased with age.
The absence of illness or ‘not being sick’ was also considered a criterion of good health by participating children. This may reflect normative health education targeting children within the childcare setting, or information being passed on to children by family and other social environments, which largely individualises health, reducing health promotion to reduction of risk through specific actions. This emphasises the importance and influence of formal and informal education on how children conceptualise health (Bhagat & Howard, 2018). Normative health information has a tendency to individualise health, reducing health promotion to the reduction of risks, for example of future illness or injury, and the practice of unhealthful behaviours (Burrows & McCormack, 2014). This approach has the potential to shape children’s classification of health into a two-dimensional model, meaning that they view health and illness as separate concepts that cannot be present at the same time (Almqvist et al., 2006). This style of education can have a negative effect on children’s health as they may not align themselves with the socially accepted version of health that is presented to them, this can lead to feelings of inadequacy, stigmatisation, and maladaptive behaviours (Alexander et al., 2014). Further, this may lead to the classification of children as healthy/unhealthy, construct them as good/bad citizens, or construe them as at-risk and thus in need of intervention (Burrows & McCormack, 2014). The findings from this program of research suggest the development of health recommendations, policies, and curricula that promote health and health practices in a broader, more holistic way, are needed. Having a better understanding of how children conceptualise health as well as the factors that shape these conceptualisations can provide a starting point for these efforts. Public health practitioners should acknowledge that children are inevitably influenced by various discourses regarding health and should recognise this as a key opportunity to have a positive influence on these developing understandings (Bhagat & Howard, 2018).
Another key finding reflected throughout this program of research was that, although participants’ explanations of what it means to be healthy were dominated by an emphasis on food choices, they rarely featured reference to physical activity as a health promoting behaviour. Studies 3, 4 and 5 highlighted the emphasis participants placed on the importance of minimising risk and injury prevention as a health promoting behaviour. For example, in Study 3, when children were asked to select a health activity for a doll with the option to select an active or more sedentary activity, children often selected the sedentary activity, as this was what they stated was the ‘safer option’. This emphasis on safety as a criterion for health may work to contradict the encouragement of children to engage in physical activity. Although it has been hypothesised by existing literature that restrictive parenting practices may be leading to children being less confident in their motor skills and their ability to make judgement about risk (Little, 2016), the current study demonstrated how this concern is shaping how children understand health and healthy lifestyle behaviours. This finding, has not been discussed in existing literature, indicating much potential for future research to understand how this plays out as children mature. Further to this, study 5 and study 6 demonstrated how restrictive rules used by parents/carers to regulate their child’s outdoor play are correlated with children’s increased preference for and engagement in sedentary play.

**Preschool children’s physical activity preferences and behaviours.**

Findings from early studies conducted within this program of research revealed a gap in the literature exploring preschool children’s self-reported activity preferences and factors that shape their ability to engage in their preferred activities. Study 6 identified a significant relationship between preschool children’s activity preferences and their behaviours, with a lower preference for active play being correlated with more sedentary behaviours. This finding highlighted the importance of exploring children’s activity preferences and the factors shaping
these preferences, which have the potential to shape behaviours. Several of the studies included in this program of research provide insight into the factors that are shaping preschool children’s activity preferences from children’s perspectives and through quantitatively measuring demographic and carer/parenting practices related to physical activity. In Study 5, children reported that rules at home and at childcare, the availability of toys, friends, family and having access to a natural environments served as both barriers and facilitators to participating in their favourite activity. Further, children’s preferences for physical activity appeared to correlate with child gender, ethnicity and parental age and physical activity parenting practices, with the most influential variables being parental rules around active play outdoors and parental use of screen time to reward/control child behaviour.

Caretaker concern for safety and risk and the relationship with preschool children’s physical activity knowledge, preferences and behaviours was a reoccurring theme throughout the current program of research, reinforcing the emphasis placed on safety throughout children’s social environment. Study 6 revealed that parental rules around outdoor play was correlated to children’s preference for more sedentary activities and increased screen time hours. This suggests that concern for children’s safety is resulting in parents/carers restricting children’s play to limit the risk of engaging in dangerous behaviours. Such rules are arguably fueled by safety concerns and the increasingly regulated and controlled nature of western society (Noonan et al., 2016, Tovar et al., 2015; McFarland et al., 2017). This demonstrates how the interaction between the various levels of the socio-ecological model can shape children’s physical activity knowledge, preferences and behaviours, as it is evident that there may be an interplay between the macro-system (attitudes and ideologies of the culture), the exo-system (for example, the media highlighting risks to children’s health) and the meso-system (parents’ and carers’ concern for safety) (Doherty & Hughes, 2009).
In studies 3, 4 and 5, children themselves identified being safe as a key way to be healthy and reported that rules at home and at preschool were barriers to them engaging in their preferred activity. Thus, overall, this research provides evidence of the way such concern for child safety is shaping children’s understanding of health and preferences for play. Further to this, the current research identified that parents’ use of screen time to reward and control their child’s behaviour is correlated with children preferring more sedentary activities and was also negatively correlated with children’s active outdoor play. This finding may be explained by existing literature, which states that busy parents report that it takes time and additional effort to support autonomy in children’s play, and despite being aware of the benefits of their child engaging in challenging play, it is often easier to take the safer option and say ‘no’ to riskier activities (Grolnick & Kathy, 2008). This orientation to the safe options may contribute to children engaging in more screen time, which parents may consider as low risk. Further research should explore this link between screen time, demographic characteristics and physical activity parenting practices.

Parents' perceptions of risk and danger are malleable, they change over time and vary across cultures according to worldviews (Little, 2016). In western society, risk is typically viewed as a danger or threat; something against which people can protect themselves and others to avoid being blamed for uncertain consequences of their actions. In a ‘risk society’, parents often frame risk narrowly, in terms of their own daily worries and concerns. This is accentuated by societal pressures placed on parents, as at the root of parenting rules is parental concern of having their parenting skills questioned or being labelled as an ‘incompetent parent’ (Little, 2016). Nevertheless, accidents are the leading cause of injury in Australian children (Active Healthy Kids Australia [AHKA], 2016). This may be because in the highly industrialised societies we have minimised many of the other risks to child health through technological and health care advances, leaving accidents to overshadow other health issues due to our inability
to prevent all accidents from happening. Nevertheless, accidents are also an inevitable aspect of childhood and play an important role in children learning their physical limits and boundaries. Thus, future research should look further into the nature of accidents that cause injury to children and whether they do in fact have a relationship with riskier physical activity.

Allowing children to engage in play behaviours with a higher level of risk, or play that has the potential to result in minor injury, may be connected to a range of outcomes in later life, including resilience, confidence, creativity, motor skills and learning to assess and make judgement about risk (Little, 2016). As parents’ perceptions of risk change over time, it is important to understand where parents are receiving or sourcing information and how this is shaping their anxieties. Future research should explore factors that contribute to parents increased concern for risk and how this is shaping children’s active play. This is important, as it is unknown how western societies’ preoccupation with risk will shape the activity behaviours of the current generation of children as they move into later childhood and adolescence.

Another interesting finding revealed in Study 6 was that children were more likely to prefer engaging in sedentary, screen-based activities (for example, iPad, television) at home rather than at childcare. Based on children’s responses, it was evident that this was at least partially due to rules at childcare that restricted children’s engagement in screen time. However, a study conducted by Tucker et al. (2011) revealed that parents of preschoolers rely on preschool staff to ensure their children are sufficiently active. Rules around screen time at preschool may contribute to the reasoning of parents to believe that their children are adequately active at preschool; and thus, are more willing to permit their children to engage in screen time at home. Tucker van Zandvoort and others described that preschool staff rely on parents to create an activity promoting environment. These mutual expectations and mistaken perceptions are of concern, as many studies demonstrate that preschoolers in childcare do not meet the recommended level of 3 hours active play per day (AHKA, 2016). Future research should
explore whether there is in fact, a disconnect between childcare workers and parents regarding their children’s physical activity level at childcare and whether this results in parents allowing their children to watch more screen time at home.

Collectively, the current program of research has added to the literature regarding children’s physical activity by representing children’s self-reported activity preferences using visual methods. Children expressed a desire to play unstructured activities with friends or family, to engage in imaginative, challenging play, to interact with nature, and to have control over the activity they engage in. Studies have shown that the endless stimuli and abundance of loose parts in natural environments afford children boundless opportunities for exercise, exploration, experimentation, and imaginative play (Dowdell et al., 2011). Although research has demonstrated the benefits of engaging with nature for children, this research highlights that young children are actively expressing the desire to engage with nature. Embedding more outdoor play and natural elements within a child’s playground may therefore facilitate a child to prefer and engage in physical activity by allowing play to be more complex and diverse. It is important to note that, of the childcare centres included in Study 5, none allowed children access to outdoor play areas. As literature has established the importance of incorporating outdoor elements within childcare facilities to facilitate children’s play, this may suggest that this is not being prioritised within the childcare context (Zamani, 2016). Nonetheless, it is difficult to draw these conclusions from such a small sample size included in Study 5. As the current research has highlighted children’s desire for outdoor play, this should have implications for the structure and design of childcare centres. Overall, the research demonstrated that listening to children’s voices about their play preferences and the barriers and facilitators to engaging in these activities provides important insight into children’s play behaviour. These findings could inform the development of interventions to facilitate young children’s participation in enjoyable physical activity.
Finally, despite previous literature linking children’s knowledge of healthy lifestyle behaviours with actual behaviours (Lanigan, 2011), when assessed quantitatively the current research did not support the literature linking preschool children’s knowledge of physical activity and their sedentary or active behaviours. This may be due to the multitude of individual and contextual factors that are evidently shaping children’s understandings of physical activity. Alternatively, this may be due to the age of participants and their limited autonomy over their play behaviours, the link between children’s knowledge of physical activity and activity behaviours may become more evident as children gain more autonomy. Nonetheless, this finding highlights the need to move beyond the notion that knowledge alone will lead to action so that research can continue to identify and understand contextual and personal factors shaping children’s lifestyle behaviours.

To conclude, in line with the socio-ecological perspective that guided this program of research, a number of individual, demographic and contextual factors were found to shape children’s health understandings, knowledge and preferences for active play. Thus, collectively, this research contributed an enhanced understanding of how children understand and prefer healthy lifestyle behaviours within a socio-ecological framework. Although children have not always been seen as active constructors of social meaning, the current research adds to existing literature to highlight the importance of seeking children’s viewpoints to understand the ways they interpret and internalise health and lifestyle information.

10.4 Implications of Findings and Recommendations for Research and Practice

The key findings from this program of research can be used to inform future research and practice. As a result of the research within this thesis, eight implications and
recommendations for further research have been made. The rationale for each recommendation is also described below:

Implications and recommendations for practice.

1. The findings of this research suggest that Australian children as young as 3 years of age are able to articulate, with some clarity, the dominant health-related messages surrounding them. Thus, children’s understandings and knowledge of health and healthy lifestyle behaviours is being shaped by the personal experiences and the social and environmental context in which they live and grow. The current research adds to contemporary literature to demonstrate the importance of seeking children’s viewpoints to understand the ways they interpret and internalise health information given to them as directives or through their own observations and environment. A better understanding of how children understand health and health behaviours as well as the factors that shape these conceptualisations provides a starting point for the development of more holistic and appropriate health promoting programs. Given the limited research in the field engaging children in research, it is recommended that public health practitioners should not only acknowledge that children are inevitably influenced by various discourses regarding health but should seize the opportunity to positively influence their developing understandings.

2. The research highlighted the benefits of using age-appropriate techniques to involve children in the research process, and how, when used appropriately, young children can offer insight into their world including how factors within their world shape their behaviours. The research identified some challenges and solutions to using age-appropriate techniques to explore children’s knowledge and preferences for health behaviours. From these findings, recommendations can be made regarding how these techniques can be better implemented in future:
• In the current research, the use of drawings facilitated communication between child participants and the researcher as it helped to fill important gaps in their brief verbal responses.

• While conducting the drawing activity, it was found that asking children questions as they were drawing was more effective than asking them to explain their drawing afterwards.

• To encourage children to feel comfortable and willing to participate, the candidate identified that allowing a child to be close to peers/friends/teachers when participating in the research, yet, far enough away to not be distracted by other children, was an effective strategy. Further, while conducting research in the childcare setting, it is important to assure children that there is no right or wrong answer, in addition to providing continuous positive feedback on their work and responses.

3. The Preschool Food and Play Questionnaire (Pre-FPQ) validated in the current research was found to demonstrate adequate reliability and validity for the assessment of food and activity knowledge and preferences in 4- to 5-year-old children. This is an important addition to research and practice, as Study 1 and 2 identified that very few tools measuring these variables had been pilot tested or tested for validity and reliability. The iPad modality of the Pre-FPQ was an appealing format that enabled the researcher to engage and maintain the attention of participants. The Pre-FPQ offers the advantage of being presented in a well-received modality for preschool children as well as being easy, quick and inexpensive to administer. Although the test-retest reliability and internal consistency of the Pre-FPQ improved with age, it was evident that the tool was not suitable for children younger than 4 years of age. Despite this, the Pre-FPQ adds to practice and provides a means to measure food and activity knowledge and preferences in 4- to 5-year-
old children and is publicly available to researchers and practitioners as an effective way to evaluate healthy lifestyle interventions.

4. This research identified ways in which active play can be made more enjoyable for preschool children. Educators, parents and public health practitioners should use this information provided by children to facilitate children’s active play, which may allow children to develop a more positive relationship with physical activity. From the current findings it can be suggested that if possible, practitioners, parents and educators should provide more opportunities for children to engage in unstructured activities with friends or family, to engage in imaginative, challenging play, as well as opportunities to interact with nature and have control over the activity they engage in. For example, childcare centres and public health professionals may seek to support parents and carers to implement and prioritise challenging play, and to recognise the difference between a hazardous activity and a challenging activity. Further, as children actively expressed the desire to engage with nature, facilitating outdoor play should be considered as a facilitator of their engagement in physical activity and the inclusion of natural play areas should be included in the design of childcare facilities.

5. This research identified a significant relationship between preschool children’s activity preferences and their behaviours, with a lower preference for active play leading to more sedentary behaviours. Children who preferred to be physically active were more likely to engage in physical activity on the weekend and were less likely to engage in screen time on the weekend (Study 6). Although existing literature highlights the importance of preschool children’s preference for physical activity as a predictor of activity behaviour, this has been based predominantly on the findings of qualitative research. The current study adds to existing literature by quantitatively supporting the link between physical activity child preferences and activity behaviours. This finding highlights the importance
of exploring children’s activity preferences and factors shaping these preferences, as once established, these preferences have the potential to shape behaviours. For practitioners, this presents an important additional target for interventions that seek to promote sustainable activity behaviours in children. Interventions should target physical activity behaviours, children’s knowledge of the importance of physical activity alongside encouraging children’s preference for more active play by making children’s play more enjoyable for them.

6. Parental and educator concern for safety and injury prevention appeared to influence how children understood health and the importance of physical activity to maintain health, and children’s activity preferences and behaviours. Parental concern for safety and risk reduction and the relationship with preschool children’s activity knowledge, preferences and behaviours was a consistent theme throughout the current program of research. Existing literature suggests that restrictive parenting practices may be leading to children being less confident in their motor skills and their ability to make judgement about risk (Little, 2016). The current research demonstrates how this concern is shaping children’s understanding of health and their activity preferences and behaviours. Study 6 revealed that parents’ restrictive rules around outdoor play was positively correlated with children’s preference for more sedentary activities and hours spent in screen time. Competing societal values around the importance of encouraging children’s risky play and the need to prevent children from being injured, coupled with parents’ busy schedules and the amount of information about parenting practices they receive, may make it difficult for parents to know how to approach this issue. Future public health practice needs to consider this confusion and find ways to assist parents to navigate the information being provided to them.
7. The current research identified some key challenges with measuring preschool children’s self-reported activity preferences. The process of validating the Pre-FPQ revealed a low level of agreement between activity preferences and choice of physical activity, and that this was inconsistent across age groups. This suggests that physical activity preferences may be situational and/or easily influenced by the child’s environment. The current research has identified several factors that need to be considered when measuring physical activity preferences, such as, the weather at the time of testing, the novelty of the activity (for example, using an iPad), participants’ activities immediately prior to testing and whether the child has the motor skills to perform the activity demonstrated/presented to them.

8. In Study 5, children reported the desire to perform activities they perceive as challenging. When children are young, they are naturally inclined to test their physical limits and learn to avoid or adjust to dangerous environments and activities (Sandseter, 2012). Risky play allows a child to feel pleasant emotions such as happiness, excitement, exhilaration, fun, enjoyment and thrill, yet can also fuel unpleasant emotions, such as feeling frightened or anxious, when they perceive too much danger (Sandseter, 2012). There is a constant struggle for parents and preschool educators to provide children with a stimulating environment that promotes challenging play, minimises potential for actual injury and allows the child to unfold creativity and test their limits (Little, 2017). As preschool children indicated a clear desire for challenging play in Study 5, future research should seek to determine whether parents and educators need support to create challenging play situations for children and to identify potential barriers to this.
Recommendations for further research

Future research opportunities have arisen throughout this research, some due to limitations of the current research, and others as a result of the findings of the six studies.

It is recommended that future research endeavors to:

1. *Examine how preschool children’s understanding and perception of health persists through the life course.*

   Findings of studies three, four, five and six identified the way a variety of individual and contextual factors collectively shape preschool children’s understanding and knowledge of health and health behaviours. Future research should seek to examine how these early understandings persist into later childhood and adolescence. This knowledge will help researchers determine how malleable these understandings are and how they can be supported to ensure children have a holistic understanding of health and healthy lifestyle behavior. This improved understanding may, in turn, shape lifestyle behaviours later in life.

2. *Determine whether preschool children’s knowledge and understandings of health and health behaviours differ according to attendance at an early education centre*

   Due to the difficulty in gaining access to the target population, the candidate recruited participants from early childcare educational settings in studies 3, 4, 5 and 6. The reliance on childcare centres for recruitment limits the generalisability of the findings, as children attending childcare may be more educated regarding healthy lifestyle behaviours due to healthy eating and activity education they receive at the centre. Further, children attending these centres, particularly in metropolitan areas, can often be from a higher sociodemographic background, as demonstrated by the median household income of participants surveyed in study 6 being AUD$90,000, which compares favourably to the median Australian income of AUD$75,000. Further, conducting research in the
educational childcare setting may have biased participant responses. Given the educational setting, children may have been inclined to give the ‘correct’ response as opposed to their own preferences. Future research should determine whether preschool children’s knowledge and understandings of health and health behaviours differ from children who experience a range of care settings, including family daycare and full time parental care.

3. **Further research is needed to determine the stability of preschool children’s preferences for physical activity in order to develop more reliable measures**

Despite being a key indicator of children’s activity behaviours, the current research identified difficulties with measuring preschool children’s self-reported activity preferences. Findings identified through the validation of the Pre-FPQ was that the percent agreement between activity preferences and choice of physical activity was relatively low and was inconsistent across age groups. Future research should consider the situational and contextual influences of children’s physical activity preferences in order to determine the stability of children’s activity preferences. Ongoing research should seek to further refine and validate measures of children’s activity preference given that this can be used as a key indicator of preschool children’s likelihood to engage in active play, which could be used as a low-cost, efficient way to evaluate physical activity programs.

4. **Explore factors that may be contributing to parents’ increased concern for risk and how this is shaping active play in Australian preschool children.**

As parents’ perceptions of risk change over time, it is important to understand where parents are sourcing information and how this is contributing to shaping their views and anxieties. Future research should explore factors that contribute to parents’ increased concern for risk and how this is shaping children’s active play. There are contradictory
discourses emerging in the literature that suggests that parents understand the importance of encouraging and facilitating their child’s risky play (McFarland et al., 2017), and value their own childhood experiences of engaging in unstructured, unsupervised play (Niehues et al., 2013; McFarland et al., 2017). Yet, at the same time, parents consider themselves to be ‘socially obligated’ to make their child’s safety their primary concern and to prevent their child from being injured (Niehues et al., 2013; McFarland et al., 2017). Managing these competing values along with the staggering amount of information about ideal parenting, makes it understandably difficult for parents to know how to approach this issue. Future research needs to test this hypothesis to establish how parents experience this conflict and find appropriate ways to assist parents to navigate the information. Further to this, accidents are an inevitable aspect of childhood and play an important role in children learning their physical limits and boundaries. Thus, future research should look further into the nature of accidents that cause injury to children and whether they do in fact have a relationship with risky play or not.

5. **Examine the relationship between children’s activity preferences and parents’ use of screen time to reward and control their child’s behaviour,**

The research identified that parental use of screen time to reward/control child behaviour is associated with children preferring more sedentary activities and was also negatively correlated with children’s active outdoor play. Literature has presented mixed findings regarding this relationship, with several studies contradicting this finding, suggesting that adult rules on screen use can effectively deter children from participating in excessive television viewing and computer use, if supported concurrently with adult modelling of low screen use (Schoeppe et al., 2016). Nonetheless, there is a body of existing literature that argues that rewarding or encouraging behaviours with screen time further elevates the status of screen time by using it as a tool to drive and shape their
behaviour (Choudhury & McKinney; 2013). Given the developmental and behavioural health risks associated with excessive media/screen exposure in early childhood, future research should seek to clarify the relationship between children’s activity preferences and parents’ use of screen time to reward and control their child’s behaviour,

6. **Explore whether there is a disconnect between childcare workers and parents in regard to children’s physical activity level at childcare and whether this results in parents allowing their children to watch more screen time at home.**

Study 5 revealed that children were more likely to prefer engaging in sedentary, screen-based activities (for example, iPad or television) at home rather than at childcare. Based on children’s responses, it was evident that this was at least partially due to restrictive screen time rules at childcare. Rules around screen time at preschool may contribute to the reasoning of parents to believe that their children are adequately active at preschool (Tucker et al., 2011) and thus, are more willing to permit their children to engage in screen time at home. Tucker and others also described that preschool staff rely on parents to create an activity promoting environment. These mutual expectations and mistaken perceptions are of concern, as many studies demonstrate that preschoolers in childcare do not meet the recommended level of 3 hours active play per day (AHKA, 2016). Future research should explore whether there is in fact, a disconnect between childcare workers and parents in regard to their children’s physical activity level at childcare and whether this results in parents allowing their children to watch more screen time at home.

7. **Examine how demographic characteristics (including parental age, education, child gender and ethnicity) shape preschool children’s activity preferences.**

Given the inconsistencies between the existing literature and the current research findings identified in Study 6, as well as the inconsistencies across existing literature regarding the relationship between the demographic factors of parental age, education,
child gender, ethnicity and children’s activity preferences, future research should consider how these relationships function in different contexts. This may help to identify parents who could benefit from assistance with encouraging their child’s active play or, assist in developing interventions with broader benefits.

10.5 Conclusion

This thesis examined the individual and the mesosystem level contextual factors shaping Australian preschool children’s knowledge of and preference for lifestyle behaviours. The findings of this research demonstrate how personal experiences and the social and environmental context in which children live and grow shape their understanding of health and their knowledge of and preference for healthy lifestyle behaviours. The research reviewed current data collection techniques to measure preschool children’s knowledge of food and nutrition and knowledge and preferences for physical activity and went on to validate a new interactive tool to measure these variables. Findings highlighted the benefits of using age-appropriate techniques to involve children in the research process, and how the involvement of young children can offer insight to their world. This research identified ways in which active play can be made more enjoyable to preschool children, which if addressed, may allow children to develop a more positive relationship with physical activity. Finally, this research identified the relationship between demographic factors and physical activity parenting practices and children’s activity preferences and behaviours. The findings from this research can inform public health professionals, educators and researchers of the importance of considering contextual factors that shape children’s knowledge of and preference for healthy lifestyle behaviours and provides recommendations for further action and research.

This research contributes to the growing body of knowledge that seeks to understand how children develop lifestyle behaviours. Early childhood is undeniably a crucial life stage that shapes health outcomes throughout the life course. How we act to promote health during
this time may therefore hold the potential to dictate the health challenges of our future society.

The use of engaging methods allows the researcher to look at issues through the eyes of a child, rather than the eyes of parents or researchers. In the current research, this has allowed the candidate to understand how children view health and what factors enable or prevent their engagement in health promoting behaviours. This understanding may assist public health practitioners, parents and educators to support children to develop the skills to make discerning choices to achieve a lifestyle that aligns with their understanding of health.
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Appendix 1. Information sheet and consent for parents to ask for permission for their child to participate in study 3

Participant Information Sheet

Validation of an iPad activity to assess preschool children’s knowledge and preference of food and physical activity

Who is conducting the research:

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What is the purpose of this research?
The purpose of the current research is to assess the reliability and validity of a computerised (iPad) version of the photo-pair food and exercise questionnaire. The questionnaire was designed as a practical and innovative means to assess preschool children’s knowledge of and preference for physical activity and food. The validation of this tool will assist with development and evaluation of nutrition and physical activity programs for preschool aged children, aimed at building healthy lifestyle habits and improving health.

What does the participant have to do?
To be involved in this research, all children are required to be 3-5 years old at the beginning of the study.
This activity should take no more than 10 minutes at each time point. As part of the research your child is requested to:

a. Participate in a picture sorting iPad activity in which your child will be asked to sort pictures of food and physical activity into healthy and unhealthy groups.

b. Complete the same iPad activity a second time after one week.

c. Select preferred food and physical activity options from pairs provided.

d. Participate in a 10-minute education session on health eating and physical activity.

**What are the possible benefits of taking part?**

It is expected that this research will:

- Build on current knowledge of how to effectively measure the understanding of healthy eating and physical activity benefits by children between 3-5 years of age.

Your child’s participation is voluntary

Participation in any research project is voluntary. If you do not wish for your child to take part, they do not have to. If you decide that they can take part and later change your mind, you are free to withdraw them from the project at any stage. Please notify a staff member at the day care centre if you would like to withdraw your child. If you choose for your child not to participate it will not affect you or your standing within the childcare centre in any way and there will be no penalties or impacts.

**What are the possible risks and disadvantages of taking part?**

This research poses no foreseeable risk to participants. All information will be de-identified at completion of data collection and individual participants will not be identifiable in the data set.

**What will happen to information about the participant?**

For this research all information will be de-identified and each child’s identity will not be revealed to other parties. Individual identifiers will be removed and replaced by a code in order to match results across the four stages of the study. No identification of individuals will be published. Consent forms will be kept securely at Griffith University for five years and then destroyed. It is anticipated that the results of this research project will be published. In any publication and/or presentation, information will be provided in such a way that the participants cannot be identified.
Further information and who to contact
If you have any questions or comments related to this project at any point in time, please contact a member of the research team. You can email either n.harris@griffith.edu.au, or nicola.wiseman@griffith.edu.au.

Feedback to you
At the completion of the study, a summary of the findings will be made available to the childcare centre director for distribution.

The ethical conduct of this research
The Human Research Ethics Committee of Griffith University has approved the ethical aspects of this research project. Griffith University conducts research in accordance with the National Statement on Ethical Conduct in Human Research. If potential participants have any concerns or complaints about the ethical conduct of the research project they should contact the Manager, Research Ethics on (07) 3735 4375 or research-ethics@griffith.edu.au.

Legal Privacy Statement
The conduct of this research involves the collection, access and/ or use of your identified personal information. The information collected is confidential and will not be disclosed to third parties without your consent, except to meet government, legal or other regulatory authority requirements. A de-identified copy of this data may be used for other research purposes. However your anonymity will at all times be safeguarded. For further information consult the University’s privacy plan at http://www.griffith.edu.au/about-griffith/plans-publications/ Griffith-university-privacy-plan or telephone (07) 3735 4375.

If you would like your child to participate in this study, please fill out a consent form provided at reception and place in provided ballot box.
Consent Form – Parent/Guardian

Title                  Validation of interactive iPad game to assess preschool children’s knowledge and preference of food and physical activity

Coordinating Principal A/Prof Neil Harris
Investigator

Principal Investigator(s) Nicola Wiseman
                      A/Prof Martin Downes

Declaration by Parent/Guardian

• I have read the Participant Information Sheet or someone has read it to me in a language that I understand.

• I understand the purposes, procedures and risks of the research described in the project.

• I have had an opportunity to ask questions and I am satisfied with the answers I have received.

• I understand that my child's consent will be verbally confirmed upon commencement of the activities and that my child is not obligated to participate if he/she does not wish to

• I freely agree to my child participating in this research project as described and understand that I am free to withdraw my child at any time during the project without consequence.

<table>
<thead>
<tr>
<th>Name of Child</th>
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<tbody>
<tr>
<td>(oldest child attending the centre)</td>
</tr>
<tr>
<td>Child Date of Birth</td>
</tr>
<tr>
<td>Name of parent/Guardian</td>
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</tbody>
</table>
| Signature of parent/Guardian | Date:  

288
Appendix 2. Description and screenshot examples of Pre-FPQ

Description of PRE-FPQ
A computerized version (iPad) of the photo-pair food and exercise questionnaire will assess children’s knowledge and preferences of food and physical play.

1. Each child will be asked to choose a small doll/bear and invited to ‘pretend they are taking care of the doll and need to help the doll to stay healthy’ (Calfas et al, 1991). A variety of dolls will be provided to ensure children had adequate choice (e.g. boy, girl, gender neutral). The doll will be used so that the child would assume a caretaking role and thus make it less likely that they make choices purely based on personal preferences (Calfas et al, 1991).

2. The child will then be presented with 15 pairs of photographed foods or activities in random order. Within these pairs, one picture will represent a healthy food or activity, and the other represented an unhealthy food or a sedentary activity (e.g. lollies versus nuts and swimming versus rolling toy truck). The child will then be asked to ‘point to the food/activity that will make the doll healthy and grow big and strong’. In order to determine preferences, the participant will then be shown the 15 photo- pairs a second time, and was asked to “point to the food or game that they like best”. The order of knowledge and preference testing was randomly assigned using a computerised program.
Appendix 3. Information sheet and consent for parents to ask for permission for their child to participate in Study 5

Participant Information Sheet

Title: An exploration of children’s preferences for physical activity

What is the purpose of this research?
Physical activity is essential for optimal growth and development, therefore there is a need to understand factors which may influence physical activity in preschool children. The aim of this study is to gain an understanding of children’s physical activity preference.

Who is conducting the research?
- Nicola Wiseman, PhD Candidate, School of Medicine, Griffith University, Ph: (07) 5552 7872 e: nicola.wiseman@griffith.edu.au
- Neil Harris, PhD, School of Medicine, Griffith University, Ph: (07) 5552 7879, e: n.harris@griffith.edu.au
- Jessica Lee, PhD, School of Medicine, Griffith University, Ph: (07) 5552 7873, e: Jessica.lee@griffith.edu.au
- Christin Rossmann, School of Medicine, Griffith University, c.rossmann@griffith.edu.au

What does the participant have to do?
To be involved in this research, your child is required to be between 4-6 years old.
- You are asked to complete this consent form
- Your child is requested to participate in a drawing activity. This will include your child drawing his/her favourite activity. He/she will then be asked questions about the drawing for example, ‘why do you like it?’/where to you play it? The drawing activity and questions asked will take approximately 20-30 minutes.

What are the possible benefits of taking part?
The anticipated project outcome is an improved understanding of factors that may influence preschool children’s preferences of physical activity.
Your own and your child’s participation is voluntary: Participation in any research project is voluntary. If you do not wish for you or your child to take part, you do not have to. If you do not wish to participate it will not affect you or your standing within the childcare center in any way and there will be no penalties or impacts. You are entirely free to discontinue your participation at any time without penalty, or to decline to answer any question/s.

What are the possible risks and disadvantages of taking part?
This research poses no foreseeable risk to participants.

Your confidentiality: To ensure your own and your child’s confidentiality, the research team will manage the data collected throughout the research. All data collected will be de-identified and kept by researchers in a secure room at Griffith University for 5 years and then destroyed as confidential waste. The computerised information will be protected by password. Participant drawings will be de-identified and collected by the researchers for analysis and publication purposes. Research results will be reported in an academic thesis, and may also be disseminated via journal articles and/or conference presentations. You child’s identity will not be identifiable in any publication or reporting resulting from this research.

Further information and who to contact: If you have any questions or comments related to this project at any point in time, please contact a member of the research team. You can email nicola.wiseman@griffith.edu.au. The conduct of this research involves the collection, access and/or use of your/ your child’s identified personal information. The information collected is confidential and will not be disclosed to third parties without your consent, except to meet government, legal or other regulatory authority requirements. A de-identified copy of this data may be used for other research purposes. However, your anonymity will at all times be safeguarded. For further information consult the University’s Privacy Plan at http://www.griffith.edu.au/about-griffith/plans-publications/griffith-university-privacy-plan or phone (07) 3735 4375

Feedback to you: At the completion of the study, a summary of the findings will be made available to the childcare center director for distribution.

The ethical conduct of this research: Griffith University conducts research in accordance with the National Statement on Ethical Conduct in Human Research. If you have any concerns or complaints about the ethical conduct of the research project you should contact the Manager, Research Ethics on 3735 4375 or research-ethics@griffith.edu.au (GU ref no: 2017/944).
Consent Form – Parent/Guardian

Title: An exploration of children’s preferences for physical activity

Declaration by Parent/Guardian

- I have read the Participant Information Sheet or someone has read it to me in a language that I understand.
- I understand the purposes, procedures and risks of the research described in the project.
- I have had an opportunity to ask questions and I am satisfied with the answers I have received.
- I understand that my child's consent will be verbally confirmed upon commencement of the activities and that my child is not obligated to participate if he/she does not wish to.
- I freely agree to myself and my child participating in this research project as described and understand that I am free to withdraw at any time during the project without consequence.

Griffith University project reference no: 2017/944

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<th>Signature of parent/Guardian</th>
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<th>Name of child care</th>
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Appendix 4. Protocol for Study 5 drawing activity and field notes template

The two researchers will be introduced to the class by the childcare room educators so that children can familiarize with the ‘new’ adults, using only first names to minimize formality. The researchers will sit with a small group of four children at a table within the class room, in sight of the educators but out of the way of potential distractions. The researcher will ask children to draw themselves in a preferred way of play as if it were a normal activity to perform within school time. While they are drawing, the researcher will observe the children and give more information, should it be needed, and to avoid that children being influenced by others.

As soon as the child is finished his/her drawing (i.e. while he/she is colouring it the researcher will move with the child into a more private part of the class room complimenting him/her for the nice drawing. The researcher will then ask the child questions (listed below) in a low voice so that other children cannot hear the questions in advance.
1. Would you like to participate in this research/drawing activity? (y/n) *if yes continue – if no activity will discontinue.*

2. Draw yourself while you are playing your favourite game

*While children are drawing, the researchers will observe children to give them more information, should it be needed, and to avoid children being influenced by others. As soon as child is about to finish drawing (i.e. when he/she is colouring it) the educator will move with the child into a more private part of the classroom complimenting him/her for the nice drawing.*

3. Do you mind if I record us speaking? *If yes, voice recording will start*

4. What have you drawn?

5. Why do you like it?

6. Where do you play it?

7. Can you or can’t you play it at your kindergarten/home?

8. Prompt if necessary, Why?

-----------------------------------

1. What game do you like the most being sitting/moving?*

2. Why do you like it?

3. Where do you play it?

4. Can you or can’t you play it at you kindergarten/home?

5. Why?

6. You have always spoken about indoor/outdoor games, why?**

7. How do you imagine the perfect kindergarten where you can play moving or running?

*The question will be asked according to the answers previously given by the child (i.e. if the child has drawn a sedentary game, then the researcher will ask about a movement game, or the opposite).

**This question is given for children who will give only one kind of answers in order to understand specific reasoning.
General Field Notes

Childcare code number:
Date/day:
Time:
Weather:

**Observed activities/comments:**
*Activities observed during visit e.g. structured/unstructured/Indoor/outdoor play/ quite/screen time*

\[\text{Observed activities/comments}^{**}\]

\[\text{Physical environment}^{**}\]
Fixed play equipment:
Portable play equipment:
Electronic media available:
Outdoor running space used/available:
Indoor play space available (quiet play/limited movement/some active play/all activities)
Posters of PA in observation room (y/n)
Extra-curricular PA programs provided to children on a fee basis:
Other:

\[\text{Social environment}^{**}\]
Notes regarding the encouragement of pa e.g. can you jump higher? Or restricting e.g. slow down

Dowda, Brown, McIver, Pfeiffer, O’Neil, Addy, Pate, 2009 - Based on EPAO observation
Appendix 5. Information sheet, questionnaire and informed consent for parents to ask for permission for their child to participate in study 6

Participant Information Sheet

Title: Factors influencing preschool children’s physical activity knowledge, preference and behaviours

Who is conducting the research?

Nicola Wiseman  
PhD Candidate  
School of Medicine  
Griffith University  
Ph: (07) 5552 7872  
Email: nicola.wiseman@griffith.edu.au

Neil Harris, PhD  
Martin Downes, PhD  
Jessica Lee, PhD

School of Medicine  
Griffith University  
Ph: (07) 5552 7879  
Email: n.harris@griffith.edu.au

What is the purpose of this research?

Physical activity is essential for optimal growth and development, therefore there is a need to understand factors which may influence physical activity in preschool children. Very little research has been conducted to examine the influence of parental factors and the home environment on preschool children’s physical activity knowledge, preference and behaviour. The aim of the proposed study is to examine the association of parental factors with children’s physical activity knowledge, preferences and behaviour.

What does the participant have to do?

To be involved in this research, your child is required to be between 4-6 years old.

g. You are asked to complete the attached survey which will take approximately 20-30 minutes. Alternatively there is a link provided on the first page of the survey to the questionnaire if you would like to complete the survey online.

h. Your child is requested to participate in a picture sorting iPad activity in which (s)he will be asked to sort pictures of lifestyle behaviours into healthy and unhealthy groups. This task takes about 10 minutes to complete. The iPad activity will be done at your child's daycare center and a member of the daycare staff will be present.

What are the possible benefits of taking part?

The anticipated project outcome is an improved understanding of factors that may influence preschool children’s physical activity knowledge, and behaviours.

Your own and your child’s participation is voluntary

Participation in any research project is voluntary. If you do not wish for you or your child to take part, you do not have to. If you do not wish to participate it will not affect you or your standing within the childcare center in any way and there will be no penalties or impacts. As a token of our appreciation for your participation, you are invited to enter into a prize draw for the chance to win a $200 Coles Myer voucher. In addition, a $10 incentive, (payable to the centre to max $100) will also be offered to the childcare centre your child is enrolled in for each survey received. You are entirely free to discontinue your participation at any time without penalty, or to decline to answer any question/s. If you would like to enter the draw please provide your contact details at the bottom of consent form (page 3).

What are the possible risks and disadvantages of taking part?

This research poses no foreseeable risk to participants.

Your confidentiality
To ensure your own and your child’s confidentiality, the research team will manage the data collected throughout the research. All data collected will be de-identified and kept by researchers in a secure room at Griffith University for 5 years and then destroyed as confidential waste. The computerised information will be protected by password. Your identity will not be identifiable in any publication or reporting resulting from this research.

Terms and Conditions of Prize Draw Entry

1. The prize draw is being run by Griffith University researchers to encourage participation in a questionnaire on factors influencing preschool children’s physical activity knowledge, preference and behaviours.
2. By electing to participate, you accept these terms and conditions as governing the prize draw. To enter the prize draw please provide your details on the next page. Any personal information you provide to us in the course of entering the prize draw will be dealt with by us in accordance with our privacy policy (published at: http://www.griffith.edu.au/about-griffith/governance/plans-publications/griffith-university-privacy-plan).
3. One $200 dollar Coles Myer voucher will be awarded in the prize draw. Should the advertised prize become unavailable as a result of circumstances beyond our control, we are free (at our sole discretion) to substitute a cash prize equivalent to the value of the prize advertised.
4. There is no cost to you for entry into the competition. Entry is free and is open between 1st, September 2016 and 30th, November 2016. Entries received after the closing date will not be accepted.
5. To enter the prize draw you must:
   (a) Return a completed questionnaire to the researcher or childcare center, together with consent for your child to participate in the study.
6. You may not enter the prize draw if you are an employee of Griffith University or an immediate family member of an employee of ours or otherwise associated with the competition.
7. You may only submit one entry in the prize draw.
8. All survey and other materials provided by you become our property. No responsibility is taken for late, lost or misdirected surveys or entries.
9. Following the closing date, the prize winner will be selected randomly from valid entries received. Each entry can only be drawn once.
10. Subject to system malfunction, the draw will occur on December 1st. If the systems supporting the draw are not functioning as they should when the draw is due, the draw will be held as soon as possible once the systems become functional again. Prize winners do not need to be present at the time of the draw.
11. Prize winner names will not be published.
12. The prize will be sent to the prize winner at the email address captured within the survey instrument. If an address has not been supplied, the entry will be treated in accordance with clause 14. The prize will be emailed within two weeks of the draw.
13. The right to a prize is not transferable or assignable to another person.
14. If any prize winner cannot be contacted within three (3) months of the draw, then that person’s right to the prize is forfeited and the prize will be treated as an unclaimed prize.
15. Only one redraw of the unclaimed prize will take place. The redraw prize winner will be randomly selected from remaining valid entries and notified within two (2) weeks of the redraw. If the redraw prize winner(s) cannot be contacted within three (3) months of the redraw, then we may determine that the relevant prize(s) will not be awarded.
16. Prizes cannot be substituted for another prize at the election of the prize-winner.
17. We are not liable for any loss, expense, damage or injury sustained by any entrant in connection with this prize draw, the prize or redemption of the prize, except for any liability which cannot be excluded by law (in which case, that liability is limited to the minimum allowable by law).
18. We may suspend the promotion if we determine that the integrity or administration of the promotion has been adversely affected due to circumstances beyond its control. We may disqualify any individual who tampers with the entry process.

Further information and who to contact: If you have any questions or comments related to this project at any point in time, please contact a member of the research team. You can email nicola.wiseman@griffith.edu.au. The conduct of this research involves the collection, access and/or use of your/ your child’s identified personal information. The information collected is confidential and will not be disclosed to third parties without your consent, except to meet government, legal or other regulatory authority requirements. A de-identified copy of this data may be used for other research purposes. However, your anonymity will at all times be safeguarded. For further information consult the University’s Privacy Plan at http://www.griffith.edu.au/about-griffith/plans-publications/griffith-university-privacy-plan or phone (07) 3735 4375.

Feedback to you: At the completion of the study, a summary of the findings will be made available to the childcare center director for distribution.

The ethical conduct of this research: Griffith University conducts research in accordance with the National Statement on Ethical Conduct in Human Research. If you have any concerns or complaints about the ethical
conduct of the research project you should contact the Manager, Research Ethics on 3735 4375 or research-
ethics@griffith.edu.au (GU ref no: 2016/628).

If you would like your child to participate in this study, please fill out the consent form provided on the
next page, place the survey and consent form in the envelope provided and return to childcare
centre.

Consent to participate in the survey is indicated by return of the completed questionnaire.

PLEASE TEAR OFF AND RETAIN THIS INFORMATION SHEET
Consent Form – Parent/Guardian

Title: Factors influencing preschool children’s physical activity knowledge, preference and behaviours

Declaration by Parent/Guardian

I have read the Participant Information Sheet or someone has read it to me in a language that I understand.

I understand the purposes, procedures and risks of the research described in the project.

I have had an opportunity to ask questions and I am satisfied with the answers I have received.

I understand that my child’s consent will be verbally confirmed upon commencement of the activities and that my child is not obligated to participate if he/she does not wish to.

I freely agree to myself and my child participating in this research project as described and understand that I am free to withdraw at any time during the project without consequence.

Griffith University project reference no: 2016/628

Name of Child
(oldest child attending the center)

Name of parent/Guardian

Signature of parent/Guardian

Date:

Please complete if you would like to enter the prize draw for the chance to win a $200 Coles Myer Voucher

Contact details

Email: __________________________
and/or
Phone number : _________________________
HOW TO COMPLETE THIS SURVEY

The survey consists of a number of sections where you will be asked about your own and your child’s physical activity behaviours and associated factors. Please fill out the survey for your eldest child between the ages of 4 and 6 years attending the day care center.

Please complete this survey carefully and be as honest as possible: there are no right or wrong answers.

The survey includes six sections:

Section A – General Information
Section B – Your home and physical activity
Section C – Rules around your house
Section D – Physical activity behaviours
Section E – Things that you and your child do in a typical week
Section F – Your neighbourhood

Most questions only require you to answer by marking the appropriate box with a cross or a tick like these:

[ ] [ ]

Please do not mark any areas outside the box.

Some questions will require a numeric answer and can be filled like this: 1 hour 30 Minutes

Other questions will have a scale where you will be asked to tick the one response option with which you most agree. For example:

<table>
<thead>
<tr>
<th>Never</th>
<th>Rarely</th>
<th>occasionally</th>
<th>frequently</th>
<th>All the time</th>
</tr>
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<tbody>
<tr>
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<td>[ ]</td>
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</table>

If you make a mistake, completely shade out the box and cross the appropriate one

[ ] [ ]

This survey will take you between 20 to 30 minutes – thank you for your time and patience!
## SECTION A – GENERAL INFORMATION

**A1.** What is the name of your child?  
(This is to match the results of your child’s iPad activity, participants will be coded and unidentifiable in the data set)  
________________________                       ____________________  
(First name)                                                 (Surname)

**A2.** What is your child’s date of birth?  
_____________________ (Day/Month/Year)

**A3.** What relationship are you to the child in this study?  
□ Mother  
□ Grandparent  
□ other (please state)  
□ Father  
□ Guardian

**A4.** Do you identify as:  
□ Caucasian  
□ Asian  
□ Middle Eastern  
□ African  
□ Hispanic  
□ Pacific Islander  
□ Aboriginal  
□ Torres Strait Islander  
□ Both Aboriginal & Torres Strait Islander  
□ Other (please specify) _____________

**A5.** How old are you?  
□ Less than 20 years  
□ 20-29 years  
□ 30-39 years  
□ 40-49 years  
□ 50-59 years  
□ 60-69 years  
□ 70 years or older  
□ 60-69 years

**A6.** Which one of the following best describes your marital/relationship status?  
□ Married  
□ De facto/living together  
□ Single  
□ Divorced/separated  
□ Widowed  
□ Other (please specify) _____________

**A7.** What is your highest level of education? (tick one box)  
□ Less than year 10 high school  
□ Completed year 10 high school  
□ Finished year 12 high school  
□ Technical or trade school certificate/apprenticeship  
□ University or tertiary education  
□ Other (please specify) _____________

**A8.** What is your partner’s highest level of education? (tick one box)  
□ Less than year 10 high school  
□ Completed year 10 high school  
□ Finished year 12 high school  
□ Technical or trade school certificate/apprenticeship  
□ University or tertiary education  
□ Other (please specify) _____________
A9. Which one of the following groups would represent your annual household income, before tax, from all sources? (Including yourself and your partner)

- Up to $29,999
- Between $30,000 - $49,999
- Between $50,000 - $69,999
- Between $70,000 - $89,999
- Between $90,000 - $109,999
- Between $110,000 - $129,999
- Between $130,000 - $149,999
- $150,000 or more
- Prefer not to say

A10. Excluding this child, how many other children (siblings, step siblings, foster children etc) aged under 18 years currently live in your house? _______

A11. What are their ages and gender?

<table>
<thead>
<tr>
<th>Age</th>
<th>Gender</th>
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</table>

SECTION B – YOUR HOME AND PHYSICAL ACTIVITY

The next questions are going to ask you about some of the things you may have around your house and how much you use them. Please think about items both inside and outside your house. Read each item and select the best answer for you. We are interested in what you do, what you have, and how you feel. Please take your time and answer as accurately as possible.

B1. How many working televisions are in your house? (If Zero skip to B7)

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- more

B2. Does your child have a TV in their bed room?

- Yes
- No

B3. Do you have a TV in your Bedroom?

- Yes
- No

B4. Do you have a TV in your Kitchen?

- Yes
- No

B5. On an average day, how many hours do you spend watching TV, movies or videos?

- 0.0 to 0.9
- 1.0 to 1.9
- 2.0 to 2.9
- 3.0 to 3.9
- 4.0 to 4.9
- 5.0 to 5.9
- 6.0 or more

B6. How often is the TV in your house on when people are at home?

- Very rarely
- Rarely
- Sometimes
- Often
- Very often
- Always
B7. How many video game systems (Xbox, PlayStation, Nintendo DS, Wii) are in your house? This does not include computers] (If Zero skip to B10)

☐ 0  ☐ 1  ☐ 2  ☐ 3  ☐ 4  ☐ 5  ☐ 6  ☐ 7  ☐ other ________

B8. Does your child have a video game system in their bedroom?

☐ Yes  ☐ No

B9. On an average day, how many hours do you or another adult in your house spend playing video games?

☐ ☐ .☐ hours

B10. How many computers(laptop or desktop) are in your house?

☐ 0  ☐ 1  ☐ 2  ☐ 3  ☐ 4  ☐ 5  ☐ 6  ☐ 7  ☐ other

B11. Does your family have a dog? (if no skip to B13)

☐ Yes  ☐ No

B12. How often does your child play with your dog outside?

☐ never  ☐ Very rarely  ☐ rarely  ☐ sometimes  ☐ Often  ☐ Very often

B13. Please tick the square that best represents how often you use the item while at home. If you do not have an item at home, please mark “do not have”.

<table>
<thead>
<tr>
<th>Item</th>
<th>Never</th>
<th>Very rarely</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
<th>Very often</th>
<th>Do not have</th>
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<tbody>
<tr>
<td>a. Stationary exercise equipment (e.g. bike,treadmill)</td>
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<td>b. Weight lifting/resistance training equipment</td>
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<td>c. Workout DVDs/Videos</td>
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<tr>
<td>d. Shoes for running/walking</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>e. Exercise/yoga mat</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>f. Adult bike</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>g. Bicycle trailer (for hauling kids or groceries)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>h. Jogging stroller</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>i. Canoe/kayak</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>j. Skis (water or snow)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
B14. Please tick the square that represents how often your child uses each item while at home. If you do not have an item at home please mark “do not have”.

<table>
<thead>
<tr>
<th>Item</th>
<th>Never</th>
<th>Very rarely</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
<th>Very often</th>
<th>Do not have</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Basketball hoop</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Climbing structure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Balancing surface (balance beams)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Playhouse/cubby house</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Sandbox</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. Slide</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. Swing (swing/rope)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>h. Pool</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. Trampoline</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>j. Balls (soccer, basketball)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>k. Cricket/t-ball equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>l. Hockey sticks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>m. Racquets (tennis, badminton)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n. Soccer/hockey goal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>o. Yard games (horse shoes, croquet)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>p. Skates (roller, incline/ice)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>q. Push/pull toys (wagon/wheel barrow, dump-truck)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>r. Jumping play equipment (jump ropes/hula hoops, mini trampoline)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>s. Twirling play equipment (ribbons, scarves)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>t. Tumble mats</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>u. Buckets or shovels</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>v. Frisbee or activity disk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>w. Sand/water table</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>x. Slip 'n' slide or outdoor water activities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SECTION C – RULES AROUND YOUR HOUSE
The next few questions are about the rules around your house. Please read each item and select the best answer for you. Take your time and answer as accurately as possible. Your responses are important to us.

C1. Tick the square that describes how often your child is allowed to do each of the following activities while playing inside the house. (For example, we don’t have a swing or rope in the house and we don’t want the kids swinging on anything else, so they are not allowed to swing on anything while playing in the house).

a. Hopping, skipping or galloping   ❑ anytime ❑ sometimes ❑ never
b. Running around   ❑ anytime ❑ sometimes ❑ never
c. Chasing   ❑ anytime ❑ sometimes ❑ never
d. Rough housing or wrestling   ❑ anytime ❑ sometimes ❑ never
e. Jumping from a height   ❑ anytime ❑ sometimes ❑ never
f. Flipping (somersault) or tumbling   ❑ anytime ❑ sometimes ❑ never
g. Climbing   ❑ anytime ❑ sometimes ❑ never
h. Swinging or hanging   ❑ anytime ❑ sometimes ❑ never
i. Balancing   ❑ anytime ❑ sometimes ❑ never
j. Piling up pillows and jumping on them   ❑ anytime ❑ sometimes ❑ never
k. Throwing, kicking or bouncing a ball   ❑ anytime ❑ sometimes ❑ never

C2. Please read each of the following statements and then tick the box that best describes how much you agree or disagree with that statement:

a. When my child is inside the house his/her play should be quiet and calm. ❑ Strongly Disagree ❑ Disagree ❑ Neither agree nor disagree ❑ Agree ❑ Strongly Agree
b. When inside the house, my child can use toys and equipment for physically active play (e.g. running, jumping and hopping). ❑ Strongly Disagree ❑ Disagree ❑ Neither agree nor disagree ❑ Agree ❑ Strongly Agree

C3. How often do you ask your child to calm down his/her indoor play?
❑ Never ❑ Very rarely ❑ Rarely ❑ Sometimes ❑ Often ❑ Very often

C4. Please tick the box that best describes how often you do each of the following things related to your child’s outdoor play.

How often do you...

a. Ask your child not to run when (s)he is playing outside? ❑ Never ❑ Very rarely ❑ rarely ❑ sometimes ❑ Often ❑ Very often
b. Ask your child to try and stay clean when playing outside? ❑ Never ❑ Very rarely ❑ rarely ❑ sometimes ❑ Often ❑ Very often
c. Let your child play outside on hot days? ❑ Never ❑ Very rarely ❑ rarely ❑ sometimes ❑ Often ❑ Very often
d. Let your child play outside on cold days? ❑ Never ❑ Very rarely ❑ rarely ❑ sometimes ❑ Often ❑ Very often
e. Ask your child to calm down his/her outdoor play?

f. Ask your child not to get his/her clothes dirty while (s)he is playing outside?

g. Ask your child not to play in puddles when (s)he is playing outside?

C5. Do you limit the time your child watches TV, videos, or movies _during the week_? (Monday to Friday) (if no skip to C7) □ Yes □ No

C6. About how much time is (s)he allowed to watch _each weekday_? (please report total hours) □□□ hours

C7. Do you limit the time your child watches TV, videos, or movies on the _weekend_? (Saturday-Sunday) (if no skip to C9) □ Yes □ No

C8. About how much time is (s)he allowed to watch _each weekend day_? (please report total hours) □□□ hours

C9. Do you limit the amount of time your child plays video games _during the week_? (Monday to Friday) (if no, skip to C11) □ Yes □ No

C10. About how much time is (s)he allowed to play video games _each weekday_? (please report total hours) □□□ hours

C11. Do you limit the time your child plays video games on the _weekend_? (Saturday-Sunday) (if no skip to C13) □ Yes □ No

C12. About how much time is (s)he allowed to play video games _each weekend day_? □□□ hours

C13. Please tick the box that best describes how often _you_ do each of the following things:

<table>
<thead>
<tr>
<th>How often do you...</th>
<th>Never</th>
<th>Very rarely</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
<th>Very often</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Offer TV, video or movie time to your child as a reward for good behaviour.</td>
<td>□</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Take away TV, video, or movie time as a punishment for bad behaviour.</td>
<td>□</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Offer sports or physical activities to your child as a reward for good behaviour. (e.g. “we can go to the park once you have put away your toys”.)</td>
<td>□</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
d. Use sports or physical activities to get your child to do something (e.g. "you can’t go outside to play until you eat your peas.")

C14. Please read each of the following statements and then tick the box that best describes how much you agree or disagree with that statement:

I tightly monitor the time my child...

<table>
<thead>
<tr>
<th></th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neither agree nor disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Watches TV or videos during the week</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>b. Watches TV or videos on the weekend</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>c. Plays video games during the week</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>d. Plays video games on the weekend</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

C15. How many days per week does your family have the television on during breakfast?

☐ 0  ☐ 1  ☐ 2  ☐ 3  ☐ 4  ☐ 5  ☐ 6  ☐ 7

C16. How many days per week does your family have the television on during an evening meal?

☐ 0  ☐ 1  ☐ 2  ☐ 3  ☐ 4  ☐ 5  ☐ 6  ☐ 7

C17. How often ...

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Very rarely</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
<th>Very often</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Does your child get extra TV, video, or movie time as a reward?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>b. Does your child get extra outside time as a reward?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>c. Do you use TV time to control your child’s behaviour? (e.g. &quot;If you don’t stop that you will not be able to watch TV today.&quot;)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>d. Do you use sports or physical activities to control your child’s behaviour? (e.g. &quot;If you don’t stop that you will not be able to go to karate tonight.&quot;)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>e. Do you take outside time away from your child for bad behaviour? (e.g. &quot;if you keep hitting we will not go to the swings.&quot;)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
**SECTION D – PHYSICAL ACTIVITY BEHAVIOURS**

**D1.** For the following items, please read each statement and tick the square that best describes **how much you agree or disagree** with that statement:

<table>
<thead>
<tr>
<th></th>
<th>strongly disagree</th>
<th>disagree</th>
<th>Neither agree nor disagree</th>
<th>agree</th>
<th>strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. My child needs my help getting out the toys or equipment (s)he likes to play with outside.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>b. My child enjoys being physically active.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>c. I have control over how much TV my child watches.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>d. Other adults in my child’s life make it hard to get my child to be physically active.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>e. My child would rather play inside than outside</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>f. My family is physically active.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>g. I enjoy watching TV/movies with my child.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

**Each week how often (on average) do you participate in moderate to vigorous physical activities or sports?**
Moderate or vigorous activities get you breathing harder and your heart beating faster. Examples include: walking briskly, jogging, dancing, yard work etc.

**D2.** How often do you participate in moderate or vigorous physical activity? ☐ ☐ times per week

**D3.** About how many minutes each time?

**D4.** How much do **you** enjoy physical activities or sports?

☐ Don’t enjoy ☐ Sort of enjoy ☐ Really enjoy ☐ Thoroughly enjoy

**D5.** How much do **you** enjoy watching TV or movies during your free time?

☐ Don’t enjoy ☐ Sort of enjoy ☐ Really enjoy ☐ Thoroughly enjoy

**D6.** How often does your family use physical activities or sports as a form of family recreation? (e.g. going for bike rides)

☐ Rarely ☐ Once in a while ☐ Relatively often ☐ Frequently
D7. How often do you go to your child’s sporting events, lessons, or other organised physical activities with them? (for example, watch your child perform in swim practice)

☐ Rarely  ☐ Sometimes  ☐ Usually  ☐ Almost always

D8. How valuable is it to you that your child be physically active?

☐ Not valuable  ☐ Of little value  ☐ Moderately valuable  ☐ Valuable  ☐ Very valuable

D9. During the past year has an adult in your family paid fees so your child could take lessons, classes, or play sports involving moderate or vigorous physical activity? (e.g. dance, soccer) if not, skip to D12

☐ Yes  ☐ No

D10. For how many of these activities have you or other adults paid fees?

☐

D11. How much do you use your own behaviour to encourage your child to be physically active?

☐ I don’t use my own behaviour to encourage my child to be active.
☐ I rarely use my own behaviour to encourage my child to be active.
☐ I often use my own behaviour to encourage my child to be active.
☐ I constantly use my own behaviour to encourage my child to be active.

D12. How important is it to you to be actively involved in your child’s sporting events?

☐ It is not particularly important to me to be involved.
☐ It is sort of important to me to be involved.
☐ It is important to be involved.
☐ It is extremely important to be involved.

D13. How active are you in enrolling your child in sports?

☐ I rarely enroll my child in sports.
☐ I enroll my child once in a while.
☐ I frequently enroll my child in sports.
☐ I go out of my way to enroll my child in sports.

D14. During the last month, how many times have you taken your child to play at the park?

☐

D15. Please read each of the following statements and then tick the box that best describes how much you agree or disagree with that statement:

<table>
<thead>
<tr>
<th>strongly disagree</th>
<th>disagree</th>
<th>Neither agree nor disagree</th>
<th>agree</th>
<th>strongly agree</th>
</tr>
</thead>
</table>

a. My child does not like being physically active  ☐  ☐  ☐  ☐  ☐  ☐
b. I am in charge of how much TV my child watches during his/her free time.

c. **When inside**, my child can easily get toys that are used for physically active play.

d. **When outside**, my child can get toys or equipment without help from an adult.

e. My child would rather watch TV than play a sport or active game.

f. I can get my child to be physically active at home.

g. **Other adults** in my child’s life make it hard to enforce household rules about TV viewing.

h. I like being physically active with my child.

---

SECTION E – THINGS THAT YOU AND YOUR CHILD DO IN A TYPICAL WEEK

During the past 7 days, about how many hours did **your child** spend **watching TV, videos or movies**? (Please report separately for week days and weekend days. Estimate to the nearest .5 hour)

**E1. Total hours for last 5 weekdays (Mon-Fri)**

**E2. Total hours for last 2 weekend days (Sat and Sun)**

**E3.** On the scale provided, tick the box that best describes how often **you** do each of the following on a typical week

**During a typical week, how often…**

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Very rarely</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
<th>Very Often</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Do you tell your child how sedentary habits can be unhealthy?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>b. Do you watch TV or videos with your child?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>c. Do you send your child outside to play so you can get things done around the house?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>d. Do you take your child to the park to play?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

During the past 7 days, about how many hours did **your child** spend **playing outside**? (Please report separately for week days and weekend days. Estimate to the nearest .5 hour)

**E4. Total hours for last 5 weekdays (Mon-Fri)**

**E5. Total hours for last 2 weekend days (Sat and Sun)**
E6. During the past 7 days, about how many hours did your child spend doing an organized sport, class or lessons that included vigorous physical activity?

E7. Please tick the box that represents how often each of the following things happen during a typical week.

<table>
<thead>
<tr>
<th>During a typical week, how often...</th>
<th>Never</th>
<th>Very rarely</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
<th>Very Often</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Do you tell your child that physical activity is good for health?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>b. Does your behaviour encourage your child to be sedentary?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>c. Do you praise your child for participating in sports or physical activities?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>d. Do you turn on TV, a video, or movie for your child when the weather is bad (e.g. too cold, too hot, raining)?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>e. Do you say things to encourage your child to do physical activities or play sports?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

E8. How do you rate your child’s level of physical activity, compared to others the same age and sex?

☐ Much less than others
☐ Somewhat less than others
☐ About the same as others
☐ Somewhat more than others
☐ Much more than others

E9. Please tick the box that represents how often each of the following things happen during a typical week.

<table>
<thead>
<tr>
<th>During a typical week, how often...</th>
<th>Never</th>
<th>Very rarely</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
<th>Very often</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Does your child hear you say that you were too tired to be active?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>b. Does your child see you watching TV or Movies?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>c. Do you play sports, active games, or do other physical activities with your child?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>d. Do you try to get your child to play outside when the weather is nice?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>e. Do you transport your child to a place where (s)he can be physically active or play sports?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
E10. What does your child usually do when (s)he has a choice about how to spend free time?

☐ Almost always chooses activities like TV, reading, listening to music, computers or iPad games.
☐ Usually chooses activities like TV, reading, listening to music, computers or iPad games.
☐ Just as likely to choose TV and reading as active games and sports.
☐ Usually chooses activities like bicycling, dancing outdoor games or active sports.
☐ Almost always chooses activities like bicycling, dancing outdoor games or active sports.

E11. Please tick the box that represents how often each of the following things happen during a typical week.

<table>
<thead>
<tr>
<th>During a typical week, how often...</th>
<th>Never</th>
<th>Very rarely</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
<th>Very often</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Does your child hear you talk about participating in a sport or being physically active?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>b. Does your child see you doing, or going to do, something that is physically active? (e.g. walking, biking)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>c. Do you turn on a TV, a Video, or movie for your child so you can get things done around the house?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>d. Do you try to get your child to be physically active instead of watching TV?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>e. Do you say things to encourage your child to spend less time being sedentary?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

E12. Please tick the box that best represents how important each of the following this is to you:

<table>
<thead>
<tr>
<th>How important is it for your child...</th>
<th>Unimportant</th>
<th>Of little importance</th>
<th>Moderately important</th>
<th>Important</th>
<th>Very important</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. To participate in sports?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>b. To be physically active when (s)he grows up?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

SECTION F – YOUR NEIGHBOURHOOD

F1. Does your local neighborhood have the following places or facilities where your child can play and be physically active (tick as many as you like)

- Open areas such as beaches, rivers, natural reserves
- Public park or oval
- Playground
- Public swimming pool

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>Not sure</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
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<tr>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
Gym that offers programs for young children *(e.g. kindergym)*

Club that offers activities/sports for young children *(e.g. soccer, dance etc.)*

---

**F2. How much do you agree with the following statements?**

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. It is safe for my child to play outdoors in my neighbourhood <em>(if supervised)</em>.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>b. There are usable footpaths on most of the streets in my local area.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. There are major barriers or dangers to walking with my child in my neighbourhood that make it hard to get from place to place <em>(for example, major roads, railway lines, storm water drains or rivers)</em>.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. There is so much traffic along the streets that it makes it difficult or dangerous to walk with my child in my neighbourhood.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. There are sufficient traffic lights or pedestrian crossings to make it safe to walk with my child during the day.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. The local shop(s) are within easy walking distance of my home.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. There are dangers <em>(e.g. dogs, undesirable people)</em> in the local park(s) so I avoid taking my child there.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

END OF QUESTIONNAIRE!

Thank you very much for your time and patience