

Healthy Start:
**An Evidence Based Intervention to Increase Physical Activity and Healthy Eating in Rural
Childcare Centres**

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For the Degree of Doctorate of Philosophy
In the College of Medicine
Department of Community Health & Epidemiology
University of Saskatchewan
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ABSTRACT

Research suggests that it is important to establish regular physical activity and healthy eating patterns during the early years (0-5 years). Engaging in healthy behaviours during this stage of life supports growth and development and lays the foundation for a lifetime of health and wellbeing. Despite these benefits, research indicates that children in Canada are not meeting the daily recommended physical activity guidelines for early years. Moreover, their diets are lacking in fruits and vegetables and are high in processed foods. As many early years children spend a large part of their day in childcare centres, educators can have a large influence on their physical activity and healthy eating behaviours. In the Canadian Prairie Provinces many childcare centres are located in rural communities. Previous research suggests that rural educators are influenced by unique factors associated with geographic local (e.g., access to resources to promote physical activity and year round access to variety of healthy foods) when attempting to provide healthy opportunities for children. In order to address the specific factors identified by rural educators and support healthier behaviours among rural early year's children, a multilevel physical activity and healthy eating intervention (Healthy Start) was developed using McLeroy's ecological model and a population health approach. Healthy Start was pilot tested in three rural childcare centres. **Purpose:** The primary purpose of this dissertation study was to evaluate Healthy Start, a multilevel community-based physical activity and healthy eating intervention, in rural childcare centres throughout Saskatchewan. In order to achieve this primary purpose, the specific dissertation objectives were addressed as follows.

Paper 1:

a) Determine if over the course of the intervention, Healthy Start contributed to increases in physical activity levels and improvements in motor skill development among early years children aged 3 to 5 years; b) Determine if Healthy Start supported educators in providing children with more opportunities for physical activity; c) Describe educators' experiences and perceptions of Healthy Start and its influence on physical activity within the childcare centre environment.

Paper 2:

a) Assess to what extent, Healthy Start contributed to healthier eating behaviours among early years children aged 3 to 5 years over the course of the intervention; b) Determine if Healthy Start supported childcare staff (educators and cooks) in providing children with more opportunities for healthy eating; c) Describe educators' experiences and perceptions of Healthy Start and its influence on healthy eating within the childcare centre environment.

Paper 3:

To pilot a pulse crop intervention study in *one* of the intervention childcare centres in order to:

a) Increase knowledge and awareness about the nutritional value and health benefits of pulse crops among childcare staff (educators and cooks); b) Support childcare staff in providing children with more opportunities for pulse crop consumption; c) Expand the variety of healthy foods consumed by early years children by incorporating locally grown pulse crops into the childcare centre meals.

Methods: A population health controlled intervention study using a wait-list control design (48 weeks delayed-intervention) was used to evaluate the impact of the intervention. Mixed methods were employed to determine the intervention's influence on children and educator behaviours

and on the childcare centre environment. **Results:** Overall, increases in children's physical activity levels and improvements in healthy eating behaviours were observed in the intervention group. Moreover, educators felt the intervention was effective in supporting them to increase physical activity and healthy eating opportunities provided to rural early years children. Lastly, improvements to childcare centre environments were made to promote healthy behaviours among the children. **Conclusion:** Collectively, the pilot study provided insight into the complexities and feasibility of promoting physical activity and healthy eating among early years children in childcare centres, particularly in rural communities. This was an innovative intervention which addressed critical factors at multiple levels contributing to the development of healthy behaviours among rural early years children. The lessons learned in this dissertation study can be used to improve the Healthy Start intervention so its implementation can be effectively expanded to childcare centres within and outside of Saskatchewan. Additionally, the findings can contribute to the limited body of literature on implementing and evaluating interventions aimed at increasing *both* physical activity and healthy eating in Canadian childcare centres. In turn, supporting the healthy development of early years children in the province and beyond.

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As I begin my research career I hope to emulate many of the qualities I have observed among the individuals on my advisory committee and I will do my best to provide similar support to students that I may have the opportunity to work with in the future.

I sincerely want to thank the childcare centres and the educators, for graciously allowing me into their centres. The children, educators and directors were an absolute pleasure to work with.

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- Amanda

DEDICATION

I dedicate this entire journey to the strongest and kindest women I will ever know, my Grandma Flora. She instilled in me the importance of commitment, hard work, education and staying grounded. Although, she is not here in person, I know she has been my guardian angel and given me the strength and drive to accomplish my goals. Thank you Grandma, for making me the person I am today.

-Amanda

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LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
CI	Confidence Interval
ECE	Early Childhood Educator
EPAO	Environmental and Policy Assessment Observation
GMQ	Gross Motor Quotient
HS	Healthy Start
LEAP	Literacy, Education, Activity and Play
LPA	Light Physical Activity
M	Mean
MVPA	Moderate to Vigorous Physical Activity
PLM	Program Logic Model
SD	Standard Deviation
SED	Sedentary
TGMD II	Test of Gross Motor Development II
TPA	Total Physical Activity

CHAPTER 1

Introduction and Literature Review

1.1 Introduction

It is well known that physical activity and healthy eating provide a number of health benefits for children of all ages (1). Researchers suggest that the early years (0-5 years) is a critical period to establish physical activity and healthy eating patterns, as this stage of life lays the foundation for development of lifelong healthy living patterns (2–4). Despite the benefits of engaging in these healthy behaviours, current research indicates that Canadian early years children spend a large portion of their day engaging in sedentary behaviour and they have low physical activity and dietary patterns (5–9). These unhealthy behaviours have been associated with increases in overweight and obesity during the early years. Rates of overweight and obesity continue to rise among Canadian children, including those in their early years (10). In North America, by school entry a significant number of children 2 to 5 years old children are already at risk for overweight or obesity (11). Children who are overweight during the early years have an increased risk of being overweight or obese in later childhood and are four times more likely to become obese during adulthood (12,13). This evidence suggests this early years period is the optimal time for prevention of childhood unhealthy weights (13,14). Through participation in physical activity and by consuming a healthy balanced diet which is high in fruits and vegetables and low in processed and high fat foods, children can reduce their risk of chronic diseases, including obesity (16).

Young children have little control over the physical activity and healthy eating opportunities they are provided which in turn influences their level of physical activity and their engagement in healthy eating behaviours. It is up to parents and caregivers to provide children with opportunities for engaging in healthy behaviours. As well, research shows that multiple

factors in the social and physical environments where children live and play, interact and influence parental and caregiver abilities to provide physical activity and healthy eating opportunities (14).

For the purpose of this dissertation, providing physical activity opportunities for early years children is operationally defined as creating environments which promote active play, with a particular focus on moderate to vigorous physical activity (MVPA). MVPA is defined as activities that raise one's heart rate and has been associated with specific health benefits (17–19). In addition, physical activity opportunities include activities which promote gross motor development, strength, flexibility, bone health and avoidance of extended periods of inactivity (19,20) and consider the recently developed physical activity and sedentary guidelines for early years (21,22). Providing healthy eating opportunities for early years children is operationally defined as following Canada's Food Guide recommendations for children 2 to 3 and 4 to 8 years of age and offering children a variety of healthy foods on a daily basis (23).

Although parents and the home environment have an important influence on the development of children's lifestyle patterns (24), it is important to note that over 54% of Canadian children ages six months to 5 years attend out of home care (25). In addition to parents and the home environment, early childhood educators and childcare settings are therefore another major influence on children's physical activity and healthy eating behaviours (24,26).

Licensed childcare settings can provide an effective avenue for exploring and influencing the physical activity and healthy eating behaviours of children and their educators. Experts suggest that educators and childcare centre environments can strongly influence children's physical activity and dietary patterns (27–30). Accordingly, centres have been identified as a promising setting for the delivery of interventions aimed at increasing the physical activity and

healthy eating behaviours of children (3,4,31–34). Childcare environments not only facilitate access to a large number of early years children, but also provide an ideal opportunity to introduce lessons, activities, and programming that reinforce physical activity and healthy eating (35).

In Canada, particularly in the Prairie Provinces (Manitoba, Saskatchewan and Alberta), a number of childcare centres are located in rural communities (populations less than 10,000) (36). Educators in these rural childcare centres reported being influenced by a number of unique factors when attempting to provide physical activity and healthy eating opportunities for early years children (37). For instance, access to resources that support physical activity and access to fresh produce and inexpensive healthy foods year round have been identified as barriers to promoting healthy behaviours among children in care (38). Similarly, rural parents reported facing a number of unique challenges when attempting to engage in and promote healthy behaviours among their children (38,39). Therefore, statistics suggesting that Canadian rural residents are more likely to be overweight/ obese than urban dwellers are not surprising (40).

Few interventions have been developed and evaluated to support Canadian educators in providing children attending childcare with opportunities for both physical activity and healthy eating. Additionally, to my knowledge no interventions have considered the unique factors influencing physical activity and healthy eating practices in rural childcare centres. Building on research to date, a bilingual (French and English) multilevel, community-based intervention, Healthy Start/ Départ Santé (here on referred to as Healthy Start), was developed to promote physical activity and healthy eating in childcare centres (41).

1.2 Statement of Purpose

The primary purpose of this research was to evaluate a multilevel community-based physical activity and healthy eating intervention (Healthy Start) in rural childcare centres in Saskatchewan. In order to achieve the primary purpose, the specific objectives were as follows.

Paper 1:

a) Determine if over the course of the intervention, Healthy Start contributed to increases in physical activity levels and improvements in gross motor skills among early years children aged 3 to 5 years.

b) Determine if Healthy Start supported educators in providing children with more opportunities for physical activity.

c) Describe educators' experiences and perceptions of Healthy Start and its influence on physical activity within the childcare centre environment.

Paper 2:

a) Determine if over the course of the intervention, Healthy Start contributed to healthier eating behaviours among early years children aged 3 to 5 years.

b) Determine if Healthy Start supported childcare staff (educators and cooks) in providing children with more opportunities for healthy eating.

c) Describe educators' experiences and perceptions of Healthy Start and its influence on healthy eating within the childcare centre environment.

Paper 3:

To pilot a pulse crop intervention study in *one* of the intervention childcare centres in an effort to:

- a) Increase knowledge and awareness about the nutritional value and health benefits of pulse crops among childcare staff (educators and cooks).
- b) Support childcare staff in providing children with more opportunities for pulse crop consumption.
- c) Expand the variety of healthy foods consumed by early years children by incorporating locally grown pulse crops into the childcare centre meals.

Following the statement of purpose is a review of the literature pertinent to my doctoral research. Chapter 2 discusses conceptual underpinnings and the way the ecological model and population health approach have been used to guide the development of Healthy Start. Chapter 3 is an overview of the evolution of the Healthy Start intervention, including my journey as a student researcher and a description of the intervention as implemented and evaluated in my doctoral research. Chapter 4 provides a general overview of the methods used in the evaluation on Healthy Start. Chapter 5 (paper 1), discusses the evaluation and results of the physical activity component of Healthy Start. Chapter 6 (paper 2) discusses the evaluation and results of the healthy eating component of Healthy Start. Chapter 7 (paper 3), focuses on the implementation, evaluation and results of the pulse crop pilot study. Chapter 8 is a reflection piece where I offer my reflections on the challenges, successes and lessons learned while implementing and evaluating Healthy Start in rural childcare centres. Chapter 9 finally provides a general

conclusion, highlighting the overall results of the evaluation, recommendations for future research and next steps.

1.3 Review of Literature

1.3.1 Health Benefits of Physical Activity and Healthy Eating During the Early Years

It is widely accepted that participation in regular physical activity and good nutrition promote healthy living and lower the risk of developing chronic diseases, such as obesity and diabetes, throughout all stages of life. These healthy behaviours are also key components of healthy child development, as they provide many physical and psychological health benefits (24,35,42). Evidence suggests that the health benefits of physical activity and healthy eating are most effective when these patterns are established in the early years (2). Health professionals also emphasize the importance of establishing healthy behaviours in the early years, as this is a critical time to prevent the onset of chronic diseases such as obesity and cardiovascular disease (33).

A key benefit of physical activity and active play during the early years is its link to gross motor development. Research shows that increased physical activity levels are directly associated with improvements in gross motor skills among children (24,35,43,44). Basic motor skills include both locomotor skills (e.g., running, hopping, sliding) and object control skills (e.g., kicking, throwing and catching) (45). Experts suggest that body management activities, manipulation opportunities with a variety of equipment, and both locomotor and non-locomotor activities should form the basis of a young child's motor experiences (17). Children who develop gross motor skills are also more physically literate (45). This is an important part of child development because, according to Physical Health and Education (PHE) Canada, individuals who are physically literate can move with competence and confidence in a wide variety of physical activities in multiple environments (45). Moreover, the development of both basic gross

motor skills and physical literacy provides a foundation for a lifetime of recreational and physical activities and benefits a child's overall growth development.

Dietary patterns are established during the early years, thus it is essential that children in this age group be regularly introduced to a variety of healthy foods (46). Although it is not uncommon for young children to reject new foods, it is important that parents and educators are persistent and continue to offer children healthy food choices (47). In fact, experts suggest that it takes 8-10 presentations of a new food before most children will openly accept it. Moreover, poor dietary patterns not addressed early on may negatively affect children's growth and development. They may also cause long-term unhealthy eating patterns (46).

Recent studies have shown that consuming a nutritionally balanced diet in the early years can protect against a range of health and economic consequences at both an individual and a population level (42,48). Nutrition patterns of early years children have been closely linked to physical and cognitive development. According to Ruel and Hodinott, early years children who are poorly nourished may have delayed motor and cognitive skills development (42). Arguably, a significant economic burden has been placed on Canada's health care system as a result of the resources allocated for individuals suffering from diseases related to poor nutrition (42). A number of indirect long-term costs of poor nutrition have also been identified. For example, adults who were malnourished as children have been found to be less physically and intellectually productive, and attain lower levels of education(42). As a result, these individuals are more likely to be negatively affected by other determinants of health such as socioeconomic status, poor employment and working conditions, and have limited access to necessary healthcare services. As such, they struggle to live productive, fulfilling lives and often become a burden on the healthcare system and economy (48). Thus, the establishment of healthy eating

behaviours in the early years may result in short-term and long-term health and economic benefits.

1.3.1.1 The Benefits of Promoting the Consumption of Locally Grown Foods during the Early Years

An avenue for promoting healthy eating during the early years is to expand and diversify the foods offered to children. Health professionals emphasize the importance of regularly offering young children a variety of healthy foods, as this supports children in developing a pallet for many healthy foods and ensures they are receiving the necessary vitamins, minerals and nutrients for healthy growth and development (49). Eating a wide variety of healthy foods is beneficial in promoting the establishment of healthy dietary patterns, as there has been a direct linkage in eating behaviours during the early years and in later childhood and adolescence (15,50). Additionally, meal plans that place a stronger focus on expanding dietary choices, rather than decreasing the amount of food consumed, have been shown to have greater long-term success in relation to promoting healthy weights.

Consuming locally grown foods provides a viable avenue for supporting children to develop healthy eating patterns and for increasing the variety of healthy foods offered to children (51,52). In an effort to promote the development of lifelong healthy eating habits in children, a school in California began offering a variety of locally grown foods and educating children on the source of these foods by linking the food served to local agriculture (52). Researchers found this initiative had a positive impact on children's eating behaviours and as a result children were more open to trying a variety of foods grown by local farmers.

In Canada, pulse crops are grown in all of the Prairie Provinces; Saskatchewan in particular, is one of the worldwide leading producers of pulse crops (53). Pulse crops refer to

beans, chickpeas, peas and lentils (54). Pulses are versatile and have many health benefits; they are high in fiber, vegetable protein, folate and fat free (53). Consuming diets high in fibre, protein and low in fat can lower cholesterol and protect against developing many preventable diseases such as obesity and diabetes (55). They also contain non-nutrients, such as antioxidants and phytoestrogens that may help in the prevention of hormone-related cancers, such as breast and prostate cancer (56).

In addition to the numerous health benefits, increasing pulse crop consumption can also result in economic benefits for the local community and province. For instance, the production of these crops involves the labour and resources of multiple stakeholders: farmers, input providers, processors, distributors, retailers, consumers, food preparers and restaurants in local communities (57). Such activities create jobs and circulate money within communities, improve food programs at institutions like childcare centres, schools and hospitals. Furthermore, as pulse crops are inexpensive and sold year round in Canadian grocery stores, increasing consumption of pulses can improve access to affordable nutritious food (54).

Despite the numerous health and economic benefits of consuming pulse crops, current research indicates that although pulses have been prepared and consumed as traditional foods in many cultures, and used to increase food security in developing countries, pulse crop consumption among Canadians is low relative to most parts of the world (54). When educators and cooks were asked why they did not include pulse crops in childcare centre menus, they explained their lack of knowledge on pulses and how to prepare them was a large barrier to serving them to the children (58). Similar findings were reported among parents of children 3 to 11 years of age (59). Specifically, the main barriers to pulse crop consumption identified by

parents was their lack of knowledge about how to prepare pulses and not knowing if their child would eat foods containing pulse crops (59).

It is well known that the development of children's eating preferences and patterns are influenced by foods they are offered during their early years. Given, that pulse crops are an affordable, nutritious and locally grown food, the incorporation of strategies for supporting and promoting pulse crop consumption is an avenue for increasing the variety of healthy food options offered to children in Canadian childcare centres.

1.3.2 Physical Activity and Healthy Eating During the Early Years

As highlighted above, the benefits of physical activity and healthy eating, and the significant health and economic burden of physical inactivity and unhealthy eating are well documented. However, poor physical activity and dietary patterns continue to be reported among Canadian early years children (7,8,35,60).

1.3.2.1 Physical Activity Levels Among Canadian Early Years Children

According to the Canadian Community Health Measures Survey (CCHMS) 84% of children ages 3 and 4 years are meeting the recommended physical activity guidelines of 180 minutes of daily physical activity at any intensity (9,21). However, statistics show that among Canadian early years children only 36% of 2- to 3-year-olds and 44% of 4- to 5-year-olds regularly participate in physical activity (61) and only 18% of children ages 3 and 4 years meet the Canadian Sedentary Behaviours Guidelines for the Early Years (9,22). Moreover, by age 5 there is a significant decrease in physical activity levels with only 14% of children meeting the physical activity guidelines for children and youth (60 minutes of daily MVPA) (9,62,63).

A systematic review of physical activity levels in childcare centres reported that while in care, children are engaging in low levels physical activity levels and high levels of sedentary

behaviour (Reilly, 2010). Research conducted in both Canadian and US childcare centres found that, during their day in childcare, children engaged in sedentary behaviours for 80% to 90% of the day (approximately 50 min/hr.) (5,35,64). In addition, it was reported that children engaged in significantly lower levels of physical activity and more sedentary behaviour particularly when indoors (5,35,64–66). As a result, researchers emphasized the need to engage early years children in more physical activities and focus on gross motor development (rather than only fine motor development) activities while indoors. The development of gross motor skills during the early years has been directly linked to children's physical activity participation, not only during their early years but through their entire life trajectory (24,35,43,67). Typically, educators tend to focus on fine motor development while indoors, as many centres do not have the room to accommodate large open spaces. Thus, physical activity interventions during the early years will prove to be more effective if strategies are incorporated to target gross motor development and active play not only outdoors, but also indoors where space is limited.

Another factor identified as contributing to low physical activity levels in childcare centres is the lack of physical activity policies for centres (58,68). Currently, in Canada there is no federal or provincial physical activity policy for childcare centres. Numerous studies have reported that such a policy would be helpful in ensuring that children were offered daily opportunities for physical activity while attending care (24,58,68).

Findings from recent Canadian studies suggest that early years children are insufficiently active during their time in childcare. A study conducted in London, Ontario childcare centres assessed the physical activity levels of 2372 children aged 2.5 to 5 years. Results indicated that on average children engaged in 142.7 minutes of daily low intensity play and 72.47 minutes of daily high intensity play (69). Additionally, children spent significantly more time engaging in

high-intensity indoor activity versus outdoor activity (69). It should be noted that children's physical activity levels were not directly measured in this study, rather parents (with the help of educators) were asked to complete physical activity questionnaires. Specifically, parents were asked to complete a 3-day physical activity questionnaire which contained questions about parent physical activity behaviours and opportunities they provided to their children. Although self and parent report questionnaires have been a commonly used method to indirectly measure physical activity, the direct measurement of physical activity using accelerometers has been shown to be more accurate, reliable and valid (70).

Similar findings were reported by Vanderloo and colleagues (2013), in their London, Ontario study using accelerometers to measure indoor and outdoor physical activity participation. Children were asked to wear the accelerometers for one full day during childcare hours. The children were significantly more active while playing outdoors, accumulating 14.42 minutes per hour of total physical activity (light and MVPA levels) while indoors and 31.68 minutes per hour of total physical activity while outdoors (35). However, depending on the weather children typically only spend 1 to 2 hours outdoors per day during their time in care. This study also measured children's sedentary behaviours and results indicated that while indoors, children engaged in 50.21 minutes per hour of sedentary behaviours, compared to 25.33 minutes per hour while outdoors (35). These levels of sedentary behaviour exceed the sedentary behaviour guideline for early years children, which state that children 4 years and under should not be sedentary for more than one hour at a time during the day, except while sleeping (22).

Temple and colleagues employed a cross-sectional design to examine the physical activity levels of 65 children between 3 and 5 years of age in 23 different family childcare homes in British Columbia, Canada (5). Children's physical activity levels were measured during the

summer months. Upon arrival at the family care centre, each child was fitted with an accelerometer and it was removed when the child left for the day. Physical activity levels were measured from 1 to 4 days, depending on each child's attendance. Accelerometers and direct observations were used to measure the MVPA levels of the children. During the 8 hours that the children spent in care, they engaged in an average of 1.76 minutes of MVPA per hour (5).

1.3.2.2 Dietary Patterns Among Canadian Early Years Children

In addition to engaging in low levels of physical activity, research indicates the diets of Canadian early years children are lacking in fruits and vegetables, and do not have sufficient nutritional value to support healthy development (4,7,49,71,72). Health Canada recommends that in order to promote healthy development, early years children should consume a balanced diet of fruits, vegetables, whole grains, low-fat dairy products and lean meats (23). However, Garriguet, summarized findings from the CCHMS which indicated that 70% of children (ages 4 to 8) are not meeting the recommended daily minimum number of servings of fruits and vegetables, 37% did not consume 2 milk products a day and 27% did not consume sufficient grain products in a day (7). Moreover, 26.8% of the daily calories consumed by children aged 4 to 8 were consumed between regular mealtimes and the majority of these foods were processed containing large amounts of saturated fat, sugar and sodium. In another study preschool children (n=2015) attending 12 public health units for immunization in Edmonton, Alberta were recruited for a longitudinal cohort study on determinants of childhood obesity. The children's dietary intake at baseline was assessed using parental reports. Results indicated that less than 30% of children aged 4 to 5 years met Canada's Food Guide recommendations for fruit and vegetables and less than 25% consumed the recommended daily minimum number of servings of grain products (6). Such eating patterns put children at an increased risk for becoming overweight or obese, as

research shows that children who consume fewer than 5 vegetables and fruit daily are significantly more likely to be overweight or obese (10).

In Canada, there are provincial nutrition policies for childcare centres. This is important to ensuring that children are offered daily healthy eating opportunities. For instance, in Saskatchewan the policy states that meals served in childcare centres must contain foods from all four food groups and snacks must contain food from two food groups indicated in Canada's Food Guide to Healthy Eating (73). Additionally, children must be served milk twice per day while in care. However, some research suggests that eating preferences of children and budgetary constraints make it challenging for centres to offer a variety of healthy foods to children on a daily basis (4,58,74).

Limited research has been conducted to directly measure food consumption among early years children in childcare. Rather, most studies rely on parent reported food frequency questionnaires and dietary recalls. According to a study conducted in a US childcare centre, meals and snacks offered in childcare contained an average of 13% of energy from saturated fat and sodium levels in commonly served meals and snacks were high relative to the amount of food energy they provided (75). Furthermore, a third of snacks and meals did not include any fruit or vegetable items and less than half of morning or afternoon snacks included milk.

Limited research exists about the eating behaviours of children in Canadian childcare centres (4,6,74). A study conducted among children (n=217) aged 1 to 4 years in 10 Nunavik childcare centres investigated the dietary patterns of early years children. With the help of researchers and centre educators, parents or primary caregivers were asked to complete a single 24-hour dietary recall. Results indicated that only 7.4% of the children consumed the recommended food guide servings for all four food groups and half of those children attended

childcare centres where a nutrition program had recently been implemented (11). Needham and colleagues used qualitative methods to understand specific eating practices in childcare centres(4). Educators (n=29) from three different childcare centres in Hamilton, Ontario, participated in three focus group interviews where they were asked to describe children's eating behaviours while in childcare. Researchers indicated that many early years children were not open to trying new foods and would often refuse to eat fruits and vegetables.

Needham and colleagues conducted interviews with a number of educators working in childcare centres in Ontario (4). The researchers found that outside of the care centre, children frequently ate convenience foods with little nutritional value and this made it difficult to encourage children to eat healthier foods while in care. Thus, although many care centres attempted to provide healthy meals and snacks, children often refused to eat the food served. As a result some cooks and care centre directors feel pressure to prepare less healthy foods that children are more likely to eat. Moreover, in a study conducted in Saskatchewan rural childcare centres, educators, cooks and centre directors indicated that the cost of accessing healthy fresh food made it difficult for centres to regularly incorporate a variety of healthy foods into centre meals and thus meet the provincial nutrition policy (37). Educators and centre directors explained that they would like to educate children on healthy locally grown foods; and they discussed how beneficial it would be to receive resources and ideas on incorporating affordable, healthy locally grown foods into centre menus.

1.3.3 Physical Activity and Healthy Eating in Rural Communities

Research investigating the physical activity and healthy eating behaviours in Canadian childcare centres is expanding. To date, studies have primarily been carried out in urban childcare centres. However, because rural residents, including early childhood educators report

facing unique challenges when attempting to engage in healthy behaviours, it would be beneficial to evaluate the physical activity and healthy eating behaviours of children in rural childcare centres (38–40,68). Such studies are particularly important for childcare centres located in the Prairie Provinces (Manitoba, Saskatchewan and Alberta), where a number of these centres are located in rural communities.

Differences in overweight and obesity among rural and urban residents of all ages have been attributed to lower physical activity levels and poorer dietary patterns in rural communities (38,40). It has been determined that the majority of rural school-aged children are not active enough for health benefits (39,76). For example, a cross sectional study investigated the physical activity patterns of 103 rural children ages 8 to 13 living in rural Saskatchewan (39). A two-part self-report questionnaire, which included a seven-day recall, was administered to 100 students. The results indicated that during the seven-day recall only 53% of the rural children reported being active enough for health benefits. Bilinski and colleagues suggested that three key factors impact the physical activity levels among rural children (39). The first factor was participation in physical activities in and out of school. The second factor was parental support. Children whose parents were not able or willing to drive to extracurricular physical activities were less likely to meet the guideline for physical activity. Lastly, distance from activities was suggested as the third factor which impacted the physical activity levels of rural children. It is particularly difficult for rural families to enroll their children in physical activities outside of school because most parents have to travel a minimum of 40 minutes for their children to attend the events. In addition to engaging in low levels of physical activity, research indicates that rural residents struggle to maintain healthy diets.

Differences in dietary patterns were also reported among rural and urban children and youth. Research in Saskatchewan suggested that rural children and youth consume fewer fresh fruits and vegetables than urban youth (76). In addition, a study was conducted to investigate eating habits of youth in Alberta and Ontario. The study examined associations between geographic locale (rural/urban) and dietary behaviours of the adolescents in both provinces. Youth from rural settings consumed more servings of food high in fat and sugar than their urban counterparts (77). To my knowledge there are no studies comparing rural and urban dietary patterns among Canadian early years children; although it is likely that rural early years children would display some of the same behaviours as older rural children, including consuming fewer fruits and vegetables than their urban counterparts.

As discussed above, rural educators are impacted by factors unique to rural settings. For example, some educators reported they rarely participated in physical activity because their small communities lacked the facilities for physical activity (68). Additionally, although educators tried to offer children healthy balanced meals, their small community stores carried little fresh produce, particularly in the fall and winter months (37). Lastly, educators reported that many of their coworkers lacked knowledge and understanding about the importance of physical activity and healthy eating (37). Thus, in order to support educators in providing physical activity and healthy eating opportunities for early years children, it may be beneficial to provide educators with resources to increase their own personal awareness and knowledge about the importance of physical activity and healthy eating. In turn, this would support educators to engage in and model healthy behaviours within the childcare centre.

1.3.4 Physical Activity and Healthy Eating Intervention during the Early Years

Hesketh and Campbell (2010) conducted a systematic review of literature on interventions aimed at preventing obesity in 0-5 year olds, using 10 electronic databases. Articles included in the review focused on: promoting healthy eating, promoting physical activity, and/or reducing sedentary behaviours. Inclusion criteria for journals included in the review were: peer-reviewed; English-language; published January 1995–August 2008 (regardless of when the intervention itself was conducted); reporting an intervention aiming to positively impact weight and/or behaviours that contribute to obesity; reporting child anthropometric, diet, physical activity, or sedentary behaviour outcomes; intervention targeting children aged 0–5 years of age. Exclusion criteria were: focusing on breastfeeding, eating disorders, obesity treatment, malnutrition, or elementary school-based interventions. The researchers reviewed a number of articles and a total of 23 articles met the inclusion criteria and were included in the review. Most of the studies were conducted in preschool/care centre ($n = 9$) or home settings ($n = 8$) (78). Approximately half targeted socioeconomically disadvantaged children ($n = 12$) and three quarters were published from 2003 onward ($n = 17$) (78). Over half of the studies were randomized control trials. However, the researchers did not indicate if any of the studies were conducted in rural communities.

Results indicated that although most interventions were multifaceted in their approach, there were a wide variety of interventions. It was reported that most studies described their interventions as feasible and acceptable. However, many of the studies reviewed did not report a significant impact on both physical activity and healthy eating among children (e.g., behaviours that aid in obesity prevention). Many of the studies implemented in the preschool/ childcare centre environment aimed only at increasing physical activity and there was no focus on

increasing healthy eating. Researchers reported that given the very low levels of physical activity typically observed in preschool/ childcare centre settings, there appears to be great scope for improving physical activity in these settings and further research should focus on developing interventions that are successful at increasing physical activity in these environments (78).

Additionally, very few studies that focused on improving healthy eating were included in the systematic review. It is unclear if the lack of nutrition interventions were a result of limited research or if the researchers were more focused on interventions that aimed at preventing obesity through increasing physical activity and decreasing sedentary behaviours. Regardless, this is a weakness because research shows healthy eating is a key factor contributing to healthy body weights among early years children and further research is needed in this area.

Hesketh and Campbell (2010) noted that despite many studies employing a randomized control design, most failed to report their studies using the Consolidated Standards of Reporting Trials (CONSORT) guidelines. The researchers explained this made it difficult to obtain the information necessary for assessing the quality and rigor of the study design and methodologies used. It was also reported that only one study provided a discussion on continuity in research activities to build and advance the evidence base in this area (78). As such, there was no evidence of multiple separate studies conducted by the same researchers which attempt to build on lessons learnt from previous research (e.g., pilot studies). Engaging in activities that build the evidence base and enhance future research is an important component and a strength that should be included in all intervention studies. Lastly, the researchers stated that interventions which showed evidence of success were designed to positively impact not only on knowledge but also on skills and competencies suggesting effective interventions should employ a social behavioural theory and/or a model for changing behaviour.

Although this systematic review provided important information about intervention research conducted in early years care environments, a number of discrepancies and gaps exist in the review. For example, it should be noted that preschools and childcare centres were lumped together and no description was given for either of these care settings. This may be because two thirds of the studies were carried out in the United States where there is frequently no difference between preschools and childcare centres (78). However in Canada there is a large difference between the two care environments. More specifically, in Canada either children usually attend preschool for a few hours a day and they often do not consume meals while attending preschool or they typically attend childcare centres for an average of 8 hours per day and will often consume one or two meals and two snacks while in care. Furthermore, the researchers did not indicate if the studies included in the review were conducted in rural or urban environments. Given that rural-urban differences in physical activity and healthy eating behaviours have been identified and that research shows rural individuals face unique factors when attempting to engage in these behaviours, it would have been beneficial to identify the geographic locations of the interventions included in the systematic review.

1.3.4.1 Physical Activity and Healthy Eating Interventions in Childcare Centers

There has been an increase in the use of childcare centres over the last 10 years with children spending approximately 29 hours per week in care (25). In Canada, each province provides two types of regulated/ licensed childcare settings: childcare centres and family childcare homes. A family childcare home is a facility operated in a caregiver's private home (73). For instance, in Saskatchewan, legislation specifies the number of children of different ages who may be cared for and the standards that a home must meet. In comparison, childcare centres provide care for up to 90 children in a group setting; typically most centers provide services to

between 30 and 40 children (73). Children attending childcare centres can range in age from 6 weeks up to and including 12 years of age. However, on average, children in full day care are between ages 6 months to 5 years (73). Childcare workers in licenced childcare centres are referred to as early childhood educators, as the majority is required to complete some level of Early Childhood Educator (ECE) training. The ECE training program offers one, two and three year certification programs for educators. In Saskatchewan childcare centres, 30% of educators working in a centre must have a one-year ECE certificate and another 20% must have an ECE two-year diploma (79). Additionally, all educators working 65 hours/month or more must have some level of ECE certification (79).

With the increased use of licenced childcare, it has been suggested that childcare centres are an optimal environment for not only understanding, but also influencing children's physical activity and healthy eating behaviours (28). In order to understand how childcare centres can best promote physical activity and healthy eating behaviours among children in childcare, Larson and colleagues (2011) reviewed current regulations, practices, policies, and interventions in various childcare centres in a number of different countries (80). Researchers found that within childcare centres there are many opportunities for improving the nutritional quality of food offered, the number of physical activity opportunities offered to children, and educators promotion of healthy behaviors and use of health education resources (80). However, a limited number of interventions have been designed to address both physical activity and healthy eating behaviours of early years children in childcare centres; and of these interventions few reported improvements in both children's physical activity and healthy eating behaviours (32,80).

In recent years several factors have been identified as influencing physical activity, sedentary behaviours and healthy eating in childcare. They include educator's knowledge,

perceptions and attitudes, parental influence, access to resources, geographic locale and policies (institutional and governmental) (4,24,58,80–82). Researchers in North Carolina have developed tools to measure various factors influencing the physical activity and healthy eating practices in childcare centres (32,83).

Ward and colleagues conducted an intervention study aimed at improving physical activity and nutrition in childcare centres in North Carolina (83). The researchers developed a program designed to promote healthy weights of preschool children through creating an environment that promotes physical activity and healthy eating in childcare centre settings. This program is the Nutrition and Physical Activity Self-Assessment for Childcare (NAP SACC). The NAP SACC was tested in an environmental, physical activity and nutrition intervention for childcare centres (29). The purpose of the NAP SACC is to identify physical activity and nutrition factors in the childcare centre environment which encourage obesity prevention and promote physical activity and healthy eating. The effectiveness of NAP SACC was evaluated using an observation-based assessment instrument developed for childcare centres. This instrument is the Environmental and Policy Assessment Observation (EPAO) instrument. The EPAO consists of a 1-day observation and review of pertinent center documents. Ward et al (83) selected 75 items prior to evaluating the impact of the NAP SACC intervention. The 75 items responses were converted to a three point scale averaged within a given subscale and multiplied by 10, with the average of all subscale scores representing total nutrition and physical activity scores (main outcome measures). A convenience sample of 82 (56 intervention sites and 26 control sites) licensed childcare centers, with a current enrolment of 15–150 children, were recruited to participate in the Ward et al (83) study. The EPAO was administered in all centers by trained field observers before and following implementation of the NAP SACC intervention.

The research coordinator trained all observers in an intensive day-long workshop that included a review of EPAO items and criteria and a mock observation.

Ward and colleagues reported that the intervention centers showed an 11% improvement from baseline to follow-up, while no change was observed in the control centers; however, the difference did not reach significance(83). The analysis was repeated after removing childcare centers that failed to implement the intervention and this resulted in significant pre and post difference in EPAO nutrition scores between intervention and control care centers. For EPAO physical activity scores, a positive change was noted in the intervention group compared to a negative change in the control group, however this difference was not significant. Researchers reported no overall differences were found between intervention and control centers, however exploratory analyses suggested significant positive findings among the centers that implemented the program. Ward and colleagues stated it is unclear whether the overall lack of significant results occurred because of inadequate strength of the intervention, a lack of implementation fidelity, an inadequate assessment tool, or a combination of these factors. Thus, the NAP SACC intervention clearly had potential; however researchers felt the intervention should be revised, improved and repeated. This research team has since developed a battery of simpler self-assessment tools for childcare centres to evaluate their own physical activity and healthy eating practices; validation of these tools is currently underway (84).

The work by Ward and colleagues contributed a great deal to the literature, given that no similar measurement tools have been developed or tested in childcare centres. However, this evaluation lacked a clear theoretical framework or model for targeting multiple factors influencing physical activity and healthy eating behaviours among early years children in childcare centres.

CHAPTER 2

Conceptual Models and Approaches

Researchers suggest that efficacious interventions aimed at behaviour change should be guided by a framework which depicts a systematic approach to simultaneously targeting both individual level and social environmental level factors among populations (14,85–87). Evidence suggests that interventions are more likely to influence behaviour change and be sustained over time if a multilevel approach is used to address various factors across the multiple contexts (e.g., home, childcare centre, community, government) (14,86,88). According to experts, the combined strength of interventions and supportive policy change is a promising approach for positively impacting the physical activity and healthy eating behaviors of children in childcare centres (14,24,80). The ecological model is an example of a framework which assumes that behavior is influenced by factors at multiple levels (e.g., individual, interpersonal, institutional, community and public policy) (89).

2.1 Ecological Model

Ecological models have been used in intervention research to address a number of context specific factors influencing the health behaviours of a population (89). The title of the ecological model is somewhat confusing as it is actually a framework and not a model. Researchers' misuse of terminology such as framework or conceptual framework, theory and model is a common and ongoing mistake and these terms are often used interchangeably (90). However, this is not appropriate as each construct encompasses a different level of abstraction from very broad (frameworks) to more focused (models). The ecological model will represent a framework in this thesis document.

Some health promotion frameworks use a very broad approach when categorizing the various factors that influence behaviour (91). Although these frameworks acknowledge that internal factors (intrapersonal) and external factors (social environmental) influence health behaviours, they do not identify specific factors at various social environmental levels. Using this broad approach as a foundation for intervention can be problematic and ineffective in the context of childcare centres particularly because children's behaviours are influenced by external factors associated with the parental and educator behaviours, childcare centre environment, community and policy factors. A broad classification scheme would target all external categories at the same time, without knowing which of these more specific factors, if any, were most salient (91).

In order to address these deficiencies, McLeroy and colleagues (1988) developed a health promotion framework that suggests health related behaviours are determined by multiple factors at multiple levels, with some factors being more influential than others, depending on the context and the population. The ecological model uses a multilevel approach which serves to direct attention to specific factors and assumes that ecological categories are systematically connected. As such, a factor from one ecological category may influence a factor in another ecological category. This model can be useful in data collection as it allows the researcher to develop an intervention aimed at systematically addressing factors within each category of the model. Specifically, the ecological model can direct the selection of variables within each category. The model can also be used to guide data analysis and results of the variables measured can be reported in each category of the ecological model.

According to the ecological model, health related behaviours are influenced by factors in each of the following categories (intrapersonal/ individual, interpersonal, institutional,

community, and policy) (Figure 1). Additionally, intervention research focusing on behavioural change at the broader population level shows that health promoting behaviours and in turn an individual's health, is impacted by complex interactions among underlying social, economic and environmental conditions beyond individual control (e.g., population health approach) (92).



Figure 1. Ecological model adapted from McLeroy and colleagues (1988).

2.2 Population Health Approach

In order to understand health behaviours and ways to change these behaviours it is beneficial to apply a population health approach in conjunction with the ecological model. A population health approach aims to understand the individual and collective factors (e.g., determinants of health) that determine health through complex and interrelated pathways and applying this knowledge to maintain and improve health status and reduce health inequities

among population groups (93). In addition, a population health approach strives to increase health equity through the promotion of community participation and collaboration among key stakeholders such as community members, researchers, healthcare professionals and policymakers. The Public Health Agency of Canada (PHAC) has identified the population health approach as a key concept for guiding policy and program development aimed at improving the health of Canadians. Policies and programs aimed at behaviour change among a population must consider and target the specific determinants of health and interactions among determinants (e.g., child development, physical and social environments, social support networks, and biological and genetic make-up), which have been shown to have a strong influence on the health behaviour being addressed.

While the ecological model provides a framework for developing multilevel interventions which address individual and social environmental factors influencing health related behaviour, a population health approach can be added to the framework to assist in addressing underlying social, economic and environmental conditions which not only influence health, but also contribute to health disparities within a given population. Experts suggest that community-based preventative interventions should focus on both the dynamic properties and contextual factors present within the environment in which the intervention is being implemented (86,87,94). A population health perspective considers the interactions among the range of individual/behavioural and environmental determinants of health; thus assuming that health related behaviours are influenced by a complex set of factors from multiple contexts that interact with one another to influence health outcomes (94).

A number of researchers and health professionals have recommended the use of an ecological model when developing community-based population health interventions aimed at

disease prevention and health promotion among a population (89,94–96). However, the incorporation of a population health approach *with* an ecological model can provide an action plan for decreasing health risk among early years children by addressing both individual level and broader contextual factors and interrelationships among factors shown to influence physical activity and healthy eating behaviours. Such an intervention should: involve educators and parents in modeling healthy behaviours; ensure that childcare centres have the necessary resources to provide opportunities for physical activity and healthy eating; establish supports within the community that aid childcare centres in creating an environment that promotes physical activity and healthy eating; develop policies for childcare centres that support the promotion and incorporation of physical activity and healthy eating into the daily routines of children in care.

Multilevel interventions implemented in any complex community setting such as a childcare centre, should overcome barriers, reduce health inequities and lead to the evolution of new structures of interaction (95). Together, a population health approach and an ecological model can assist in developing a multilevel intervention and guide in the systematic evaluation of the intervention. Using the population health approach and the ecological model to guide the evaluation allows researchers to determine the impact of the intervention on individual behaviour change and assess such domains as interpersonal interactions and relationships, the replacement or improvement of existing activities and practices, and the redistribution and transformation of resources (87).

CHAPTER 3

Healthy Start

3.1 The Evolution of Healthy Start and My Research as a Student Scholar

Over the past six years, I had the privilege of being part of an interdisciplinary and intersectoral research team focusing on promoting the health of early years children through physical activity and healthy eating. As a member of this team, I worked as a research assistant, preparing literature reviews, developing presentations and creating posters to promote our research. I was involved in organization and participation in two early years symposiums for key stakeholders in 2007 and 2011. In 2007 this interdisciplinary team began developing a targeted physical activity and healthy eating intervention for early years children. The intervention incorporated LEAP (Literacy, Education, Activity and Play), an evidence based physical activity and healthy eating resource for early years educators (97). This resource, developed and tested at the University of Victoria, is aimed at increasing physical activity, gross motor skill development, healthy eating and literacy among early years children.

While working with the interdisciplinary team to develop the intervention I was also completing my Honour's degree. My Honour's research involved interviewing educators in urban childcare centres to understand the barriers and facilitators they perceived as influencing their ability to provide physical activity and healthy eating opportunities for children (published in the Journal of the Canadian Association for Young Children) (58). Following the completion of my Bachelor of Arts Honour's degree in Psychology, I began a Master's of Science degree in Kinesiology. During this time I expanded my research to investigate the barriers and facilitators influencing educators in the promotion of physical activity and healthy eating in rural childcare centres. While interviewing educators in the rural childcare centres I learned that their ability to

provide opportunities for physical activity and healthy eating was influenced by a number of unique factors associated with their geographic locale, such as access to resources for promoting physical activity indoors and outdoors and access to a variety of affordable fresh produce year round. The combined findings from my Honour's and Master's research assisted the interdisciplinary team in developing the physical activity and healthy eating intervention. My research contributed to augmenting the LEAP resource and adapting it to fit the needs and address the various factors identified by educators in Saskatchewan. For example, recipes and resources were added to include seasonal foods in Saskatchewan. Additionally, promotion of physical activity during the winter months is a major challenge in Saskatchewan; thus further attention was given to finding creative ways to incorporate the LEAP activities into indoor practices. The physical activity and healthy eating intervention was first piloted for 10 months in urban childcare centres in two cities in Saskatchewan. Educators participating in the urban pilot study were trained to implement the intervention in their childcare centres. As I was a certified LEAP trainer I worked with other members of the interdisciplinary team to train educators. Additionally, I was involved in data collection and data analysis for this feasibility study.

There are a number of benefits to conducting a pilot study. Specifically, a pilot study greatly reduces the number of unanticipated problems (e.g., issues with measurement tools) as it provides an opportunity to redesign parts of the study, overcoming difficulties that are revealed in pilot testing (98). Additionally, it gives the research team ideas and insights that could not be foreseen without conducting a pilot study. The information gained is then used to increase the success and feasibility of study if and when it is expanded (98).

During the urban pilot testing we observed differences in compliance to the intervention among childcare centres. Some centres engaged in all activities and implemented the

intervention as intended, while others did not. These differences seemed to be closely related to the attitudes, experiences and behaviours of childcare centre directors and staff. Although uptake was varied in terms of scope and degree of integration, many of the childcare centre directors and educators reported successes with the intervention and showed an increase in understanding and awareness about the importance of physical activity and healthy eating. Children's physical activity levels, gross motor skills and centre menus were evaluated at baseline, mid and post intervention.

To understand participants' experiences with the intervention, directors, educators and parents were asked to participate in tape recorded, semi structured interviews. Results from this pilot study indicated the intervention provided educators with support and resources for increasing physical activity and healthy eating opportunities for children. Furthermore, increases in children's physical activity levels were observed over the course of the intervention. We did not however, find significant improvements in children's gross motor development. In relation to the centre menus, some cooks began incorporating healthier foods such as using whole wheat flour and brown rice. Two centres began using recipes found in the LEAP resources on a monthly basis. Some directors, educators and cooks indicated the healthy eating resources were helpful but they would like further information on how to incorporate locally grown foods. However, two of the cooks felt that adapting their menus was too much work and they were resistant to incorporating the healthy eating resources.

The interdisciplinary team worked through other challenges that arose while piloting the intervention. For example, we determined that having only one training session at the beginning of the intervention was not sufficient for supporting the educators in the implementation of intervention. As such, we developed booster sessions to be carried out three months after the

initial training. Additionally, the nutritional component of the intervention was lacking and did not provide recipes or activities that include locally grown, cost effective, healthy foods that were readily available in Saskatchewan.

Following the urban pilot study and based on the findings from my Master's research in rural childcare centres, it was decided that the intervention would be expanded into rural communities. Collectively, members of the interdisciplinary team worked to revise the intervention using the lessons learned in the urban childcare centre and the findings from my Master's work in rural childcare centres. For instance, the training was improved and booster sessions were added midway through the intervention. In addition, I designed a more specific nutritional component focused on increasing the consumption of locally grown pulse crops. Thus, the intervention was revised and enhanced, resulting in a multilevel intervention for rural childcare centres called Healthy Start. From this point when I refer to "I" and "me" as the researcher, in many cases I was working in consultation with the interdisciplinary team of researchers. However I was the primary researcher working in the field during the implementation and evaluation of Healthy Start in rural childcare centres, as this was the specific focus of my doctoral research.

3.2 The Healthy Start Intervention

While aiming at more active 3 to 5 year olds who eat healthier, the Healthy Start intervention targeted many factors within the childcare environment (educators, affordable on-going support system, novel resources and food, training) that influence healthy behaviours. The development of this targeted multilevel intervention was guided by McLeroy's ecological (89) model and a population health approach (93). Specifically, McLeroy's ecological model was used to design an intervention aimed at instigating behaviour change among early years children

and their educators by systematically targeting factors at various levels (e.g., individual, interpersonal, institutional, community and public policy) (86,89). This involved engaging rural childcare centres, directors, educators and parent boards in delivering the multilevel intervention. Additionally, with the overarching goal of supporting healthy child development among all early years children, a population health approach was applied in conjunction with McLeroy's ecological model. This approach allowed for the development of an intervention which acknowledges that an individual's health and health related behaviours are influenced by a broad range of individual and collective factors and conditions (e.g., determinants of health) and that health is determined through interactions among these factors in complex and interrelated pathways. Specifically, this assisted in addressing key underlying determinants of health and the complex interactions among factors that have been shown to influence physical activity and healthy eating behaviours among early years children. As such, Healthy Start recognized that children's physical activity and healthy eating behaviours are impacted by multiple factors outside of an individual's environment (e.g., policy, educator and parent education level, social support networks etc.).

The Healthy Start intervention consisted of four components (41). The first component was the Healthy Start Manual (a step by step guide for promoting healthy eating and physical activity in childcare settings). Specifically, the manual was a flexible guide that provided examples and suggestions for tailoring and adapting activities and resources to fit the needs of various childcare centre environments. The second was HOP, an illustrated manual, developed for childcare environments, containing child-tested physical activity and gross motor skill development activities designed to increase physical literacy. HOP is part of the evidence based physical activity and healthy eating resource LEAP (20,41,97). Along with the HOP manual,

centres received the Healthy Start activity bags containing inexpensive materials (e.g., bean bags, ribbons, nylons etc.) used to carry out the activities described in HOP. The third component was Food Flair (also part of LEAP) a recipe book that included activities for engaging children in food preparation and encouraging healthy eating) (41,97). The fourth component of the intervention was the ongoing support and communication provided to all participants.

The implementation of the intervention involved training rural educators (in the intervention group) to use the Healthy Start Manual, HOP and Food Flair within their childcare centres. As LEAP (HOP and Food Flair) became the cornerstone of Healthy Start, and since I was a certified LEAP trainer, I along with another member of the research team trained the educators in Healthy Start.

At training, educators received the necessary equipment to implement Healthy Start in their childcare centres. Participants were asked to participate in activities in HOP and teach an activity to the group. The healthy eating component involved training rural educators (in the intervention group) to use Food Flair within their childcare centres. At this time educators received the necessary equipment to implement Healthy Start in their centres. Participants were asked to try activities in Food Flair and demonstrate the activity to the group. The training took approximately four hours (2 hours for the physical activity component and 2 hours for the healthy eating component).

Parents were invited to a Healthy Start information night where they were given an invitation letter describing the intervention activities and research procedures (Appendix A). Approximately 20 weeks into the intervention, booster training sessions were conducted to support educators in troubleshooting, overcoming any challenges that arose with implementation, and provide ongoing support. These activities were helpful in increasing fidelity to the

intervention. Additionally, the booster sessions were designed to provide training for new educators who were hired after the initial training. In the final months of implementation a Healthy Start celebration was held at each intervention childcare centre to thank childcare staff, children and parents for participating in Healthy Start. Healthy Start activities were played and snacks were provided by the research team. Healthy Start was implemented over 48 weeks in the intervention childcare centres. Educators in the comparison childcare centres continued their usual practices and were then offered the Healthy Start intervention 48 weeks after the intervention group received their training. A delayed wait-list method was used to evaluate the Healthy Start intervention.

The Healthy Start intervention is depicted in the program logic model (PLM) (Figure 2). Each component of Healthy Start is listed at the top of the model; the intervention activities with corresponding outcomes can be found in the rows below. Evaluation procedures and measurement of outcome variables are described in the chapters to follow.

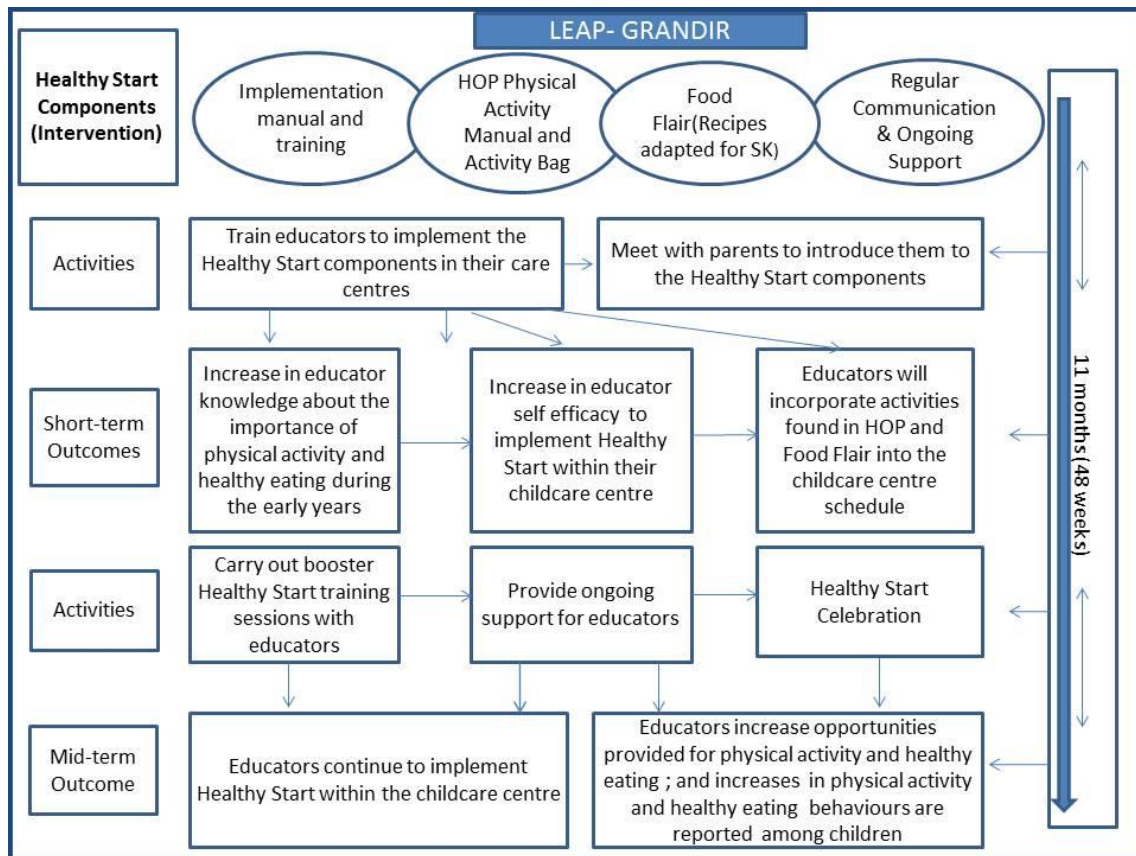


Figure 2. Healthy Start program implementation logic model.

CHAPTER 4

General Methods

4.1 Research Design

A population health wait-list comparison intervention design (48 weeks delayed-intervention) was used to evaluate the effectiveness of Healthy Start on: supporting educators in the provision of physical activity and healthy eating opportunities; and ultimately increasing physical activity levels, motor skill development and healthy eating behaviours among children aged 3 to 5 years in the participating childcare centres.

A total of six rural childcare centres participated in the study. Three centres made up the intervention group and three different centres made up the comparison group (Figure 3).

Previous community-based delayed-intervention research with children had waited up to 48 weeks to provide the intervention to the comparison group (99,100). When working in community settings there are often ethical issues related to withholding an intervention from some individuals or groups in order to evaluate a program and/or resources; thus employing a wait-list control design is a common and effective way to resolve such ethical concerns (101).

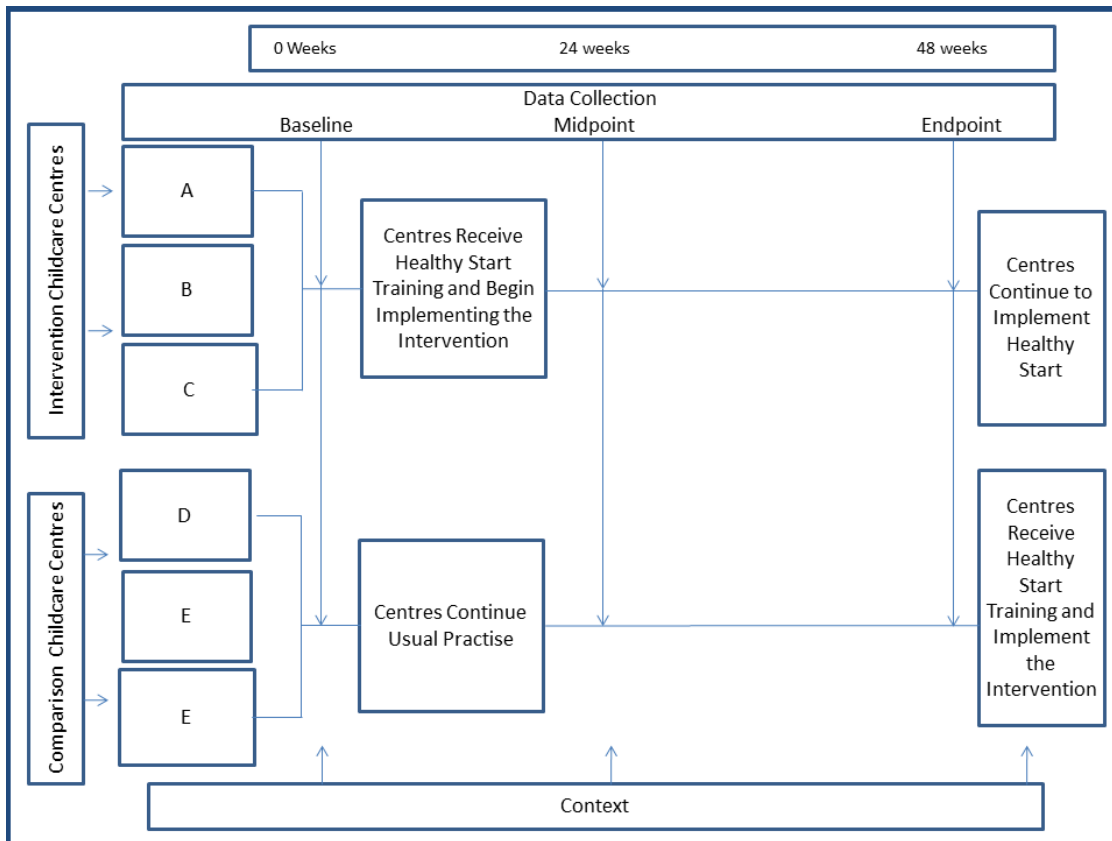


Figure 3. Study design of Healthy Start.

4.2 Settings and Participants

Licensed childcare centres were recruited through the connections I established while conducting my Master’s research in various rural communities. The six participating childcare centres (three Francophone and three Anglophone) were located in five different rural and semi-rural communities in Saskatchewan. One rural community contained both a Francophone and Anglophone childcare centre. The communities were matched as best possible on size and geographic locale. A detailed description of each childcare setting can be found in Table 1.

After receiving parental consent and losses to follow-up a total of 69 children participated in the study. Losses to follow-up were due to the fact that children had left the centre or were not in attendance during midpoint and/or baseline data collection. A total of 16 children were lost to follow-up or had missing data. Demographic information obtained revealed that the

mean age of participating children was 4 years 9 months. In the intervention group (n=42) 61% of children were male and 39% were female. In the comparison group (n=27) 67% were male and 33% were female.

Centre	Approximate # of Educators trained in Healthy Start and/ or involved in the study from 2011-2012	Number of children involved in the study over the course of 2011-2012	Capacity for children aged 2.5-4 at the centre	Total capacity of centre	Daily free play times	Educators Qualifications	Physical Activity Policy	Approximate Size of Rural Community
C_A	4	11	30	80	Changes Daily	ELCC Diploma	No	30 000
C_B	2	7	10	18	Changes Daily	ELCC Diploma	No	1500
C_C	2	9	10	15	Changes Daily	ELCC Diploma	No	700
I_E	5	8	8 (full time)	30	6:30-9 am, 2:30-5 pm	ELCC Diploma	No	2000
I_D	2	14	15	27	Changes Daily	ELCC Diploma	No	30 000
I_F	4	20	25	67	6-9 am, 3pm until pick-up	ELCC Diploma	No	800

Table 1. Description of participating childcare centres ($n=6$).

4.3 Procedures

The first step of the study involved meeting with educators at the intervention and comparison childcare centres. At this time both the implementation and evaluation components of the Healthy Start intervention were described and information on the evaluation strategy was presented. Consent forms were distributed to educators (Appendix B). The childcare centre director was given information packages for parents (at both intervention and usual practice care centres) with children 3 to 5 years of age. The information package included a description of Healthy Start and consent forms. Parents who were interested in having their children participate

in the study were asked to sign the consent forms (Appendix C). A study presentation was carried out in each childcare centre to inform parents and respond to all questions. It was explained to both educators and parents that the study had been approved by the University of Saskatchewan Behavioural Research Ethics Board (Appendix D). Additionally, confidentiality of all data provided was assured and it was explained that identifying names would be separately stored, away from all interview transcripts and questionnaires. Anonymity or protecting the participants' identity was assured in the reporting and in any aspects of the study. Once consent was obtained baseline data collection began.

Below Table 2 provides a list of main outcome variables and the corresponding measures that were used in the evaluation of Healthy Start. It should be noted that although Healthy Start was conceptually a multilevel intervention, the small sample size did not allow multilevel analysis to be performed.

Main Outcome Variables	Measures
Physical Activity Levels	Accelerometers,
Gross Motor Development	Test of Gross Motor Development II
Opportunities for Physical Activity	Educator Interviews, Direct Observation
Healthy Eating Behaviours (including consuming pulse crops)	Educator Interviews, Direct Observation
Indoor and Outdoor Childcare Centre Physical Activity Environment	Environmental Scan (EPAO Tool)
Opportunities for Healthy Eating (including opportunities for pulse crop consumption)	Menu Review, Educator Interviews, Direct Observation
Opportunities for pulse crop consumption	Pre-Post Pulse Crop Questionnaire, Menu Review, Educator Interviews, Direct Observation

Table 2. Main outcome variables and corresponding measures.

Specific data collection, analysis procedures and results are described separately in papers 1, 2 and 3. In paper 1 (chapter 5), I will discuss data collection, data analysis and results associated with the physical activity component of the Healthy Start intervention. Paper 2 (chapter 6) highlights the measurement, evaluation and results of the healthy eating component of Healthy Start. In paper 3 (chapter 7), I will report on the feasibility of implementing and evaluating a pulse crop pilot study in one of the childcare centres already receiving the Healthy Start intervention. All the results are then discussed in an integrative and critical manner and lead to the last two chapters of the present dissertation.

I am the first author on all three papers and as such, I was the primary author for papers 1, 2 and 3. However, my committee has reviewed and provided feedback on each paper. Therefore, the co-authors of these papers are my supervisor, Dr. Anne Leis and my committee members: Dr. Louise Humbert, Dr. Nazeem Muhajarine and Dr. Rachel Engler-Stringer.

PRELUDE TO PAPER 1

The primary purpose of this research was to evaluate a multilevel community-based physical activity and healthy eating intervention (Healthy Start) in rural childcare centres in Saskatchewan. Paper 1, which is presented as a publishable manuscript, will discuss the results of the first thesis objective, that is the evaluation and results of implementing the physical activity component of Healthy Start. More specifically, this paper will address the following objective 1 sub-objectives:

a) Determine if over the course of the intervention, Healthy Start contributed to increases in physical activity levels and improvements in motor skill development among early years children aged 3 to 5 years.

b) Determine if Healthy Start supported educators in providing children with more opportunities for physical activity.

c) Describe educators' experiences and perceptions of Healthy Start and its influence on physical activity within the childcare centre environment.

Paper 1 will conclude with key learnings and provide recommendations for measuring and promoting physical activity in childcare centres and among early years children.

CHAPTER 5

Paper 1

The introduction and methods sections below may repeat key aspects of the review of literature or the general methods section directly pertinent to the purpose of the study.

Title: Healthy Start: An Intervention to Support Educators in Providing Physical Activity Opportunities to Children in Childcare

5.1 Introduction

The recent Canadian Community Health Measures Survey (CCHMS) indicates that 84% of children ages 3 and 4 years are meeting the recommended physical activity guidelines of 180 minutes of daily physical activity at any intensity (9). However, there is a significant decrease in physical activity levels by the time children reach the age of 5; only 14% of Canadian children 5 years of age are meeting the physical activity guidelines for children and youth (60 minutes of daily MVPA) (9). Furthermore, only 18% of children ages 3 and 4 years meet the Canadian Sedentary Behaviours Guidelines for the Early Years (9). Low levels of physical activity and long periods of sedentary behaviour have been associated with increases in overweight and obesity among early years children (0-5 years) (102). Canadian statistics show that among children ages 2 to 5 years, 15.2% are overweight and 6.3% are obese (10). Furthermore, overweight children under the age of 6 are four times more likely to become obese in later childhood and continue on this negative trajectory into adulthood (12,103).

Aspects of children's social and physical environments have been highlighted as sources of influence on young children's physical activity and sedentary behaviours (24). Over 50% of Canadian early years children spend an average of 29 hours per week in out of home childcare;

many children attend licensed childcare centres in particular (25). Childcare centres provide care for up to 90 children in a group setting. A childcare centre provides services to children ranging in age from 6 weeks up to and including 12 years of age. However, on average, children in full day care are between ages 6 months and 5 years (73). As such, childcare centres have been identified as the ideal environment to implement interventions aimed at promoting physical activity among early years children (27,67). There is evidence to suggest that childcare centres could benefit from such interventions, as a recent study conducted in the United States indicates that less than 60 minutes of licenced childcare centers offer outdoor play per day and two-thirds have insufficient indoor play spaces (104).

Intervention research aimed at promoting healthy behaviours (e.g., physical activity and/or healthy eating) and preventing obesity among early years children, has been developing and expanding in recent years. There have been a number of international intervention research studies aimed at obesity prevention among early years children through the promotion of physical activity (105–109). These interventions use multilevel approaches to target physical activity and sedentary behaviours among early years children in childcare and at the community level. Physical activity levels were evaluated indirectly through questionnaires and anthropometric measures.

In the United States there have also been a number of recently published studies documenting the impact of physical activity and/or healthy eating interventions on promoting healthy behaviours among early years children (32,33,110,111). Some of these studies have reported short-term improvements in healthy behaviours among children. Many of the interventions are carried out in childcare centres; as such evaluation tends to focus on measuring

changes in centre practices and do not include a direct evaluation of children's behaviours (e.g., physical activity and sedentary behaviours).

Children's motor skills development has been indicated as an influential factor determining children's level of physical activity participation. Basic motor skills include both locomotor skills and object control skills (45). Children who develop these basic skills are able to move with competence and confidence and are considered to be physically literate (45). Research shows that children who are physically literate have both the confidence and skills to participate in a wide range of physical activities throughout their childhood and beyond (43). Therefore, interventions aimed at increasing physical activity among early years children should also include a strategy for targeting and evaluating motor skill development.

In Canada, intervention studies aimed at increasing physical activity and motor skill development among early years children in childcare are limited. Research recently conducted in Canadian childcare settings suggests that in order to promote physical activity among early years children, it is important to motivate educators not only to provide physical activity opportunities, but also engage in these activities with the children (23, 24). As such, physical activity interventions in childcare centres should include a component targeting educators' attitudes, knowledge, confidence and intention to implement the intervention (20). Goldfield and colleagues are currently implementing a randomized control trial (RCT) testing the efficacy of an intervention designed to increase physical activity, reduce sedentary behaviour, improve motor skill development and body composition among children attending licenced urban childcare centres in Ontario (67). However, the results of this study are not yet known.

Building on research to date, a bilingual (French and English) multilevel community-based intervention, Healthy Start was developed to promote physical activity and healthy eating

in childcare centres (41). Initially Healthy Start was piloted in four urban childcare centres in Saskatchewan. However, given that in the Prairie Provinces many childcare centres are located in rural communities (populations less than 10,000) (113), the intervention was revised and expanded to six rural childcare centres throughout Saskatchewan.

5.1.1 Purpose

This article will focus on evaluating the physical activity component of Healthy Start and report on how the intervention influenced physical activity in rural childcare centres. The specific study objectives were as follows.

a) Determine if over the course of the intervention, Healthy Start contributed to increased physical activity levels among early years children aged 3 to 5 years.

b) Determine if over the course of the intervention, Healthy Start contributed to increased gross motor skill development among early years children aged 3 to 5 years.

c) Determine if over the course of the intervention, Healthy Start contributed to improvements in the childcare centre environment which promoted physical activity participation among children.

d) Determine if over the course of the intervention, Healthy Start contributed to increased support and resources for educators in providing children with more opportunities for physical activity.

e) Describe educators' experiences and perceptions of Healthy Start.

Additionally, it was hypothesized that compared to childcare centres not receiving Healthy Start, childcare centres in the intervention group would provide more opportunities for physical activity and children would engage in higher levels of physical activity and have greater improvements in motor skill development at the end of the intervention.

5.2 Healthy Start Intervention

Guided by McLeroy's ecological (89) model and grounded in a population health perspective, a multilevel intervention, Healthy Start, was developed to promote physical activity in childcare settings (41). Specifically, the physical activity aspect of the Healthy Start intervention consisted of four components. The first component was the Healthy Start Manual (a step by step guide for promoting healthy eating and physical activity in childcare settings). The second was HOP, an illustrated manual, developed for childcare environments, containing child-tested physical activity and gross motor skill development activities designed to increase physical literacy. HOP was part of an evidence based physical activity and healthy eating resource called LEAP (20,41,97). The third component was the Healthy Start activity bags, which contain inexpensive materials (e.g., bean bags, ribbons, nylons etc.) for carrying out the activities described in HOP. The fourth component of the intervention was the ongoing support and communication provided to all participants. The program logic model (PLM) provides a detailed diagram of the Healthy Start Intervention components (Figure 2).

The intervention involved training rural educators (in the intervention group) to use the Healthy Start Manual and HOP within their childcare centres. Training was carried out by two Healthy Start trainers (myself and another Healthy Start team member). The training took approximately two hours; at this time educators received the necessary equipment to implement Healthy Start in their care centres. Participants were asked to participate in activities in HOP and teach an activity to the group. As part of the intervention delivery, parents were invited to a Healthy Start information night where they were informed about the intervention activities and research procedures. Approximately 24 weeks into the intervention, booster training sessions were held. Healthy Start was implemented over 48 weeks in intervention childcare centres.

Educators in the comparison childcare centres continued their usual practices and were offered the Healthy Start training 48 weeks after the intervention group received their training.

5.3 Methods

A detailed description can be found in the general methods section (Chapter 4).

5.3.1 Design

A population health wait-list comparison intervention design (48 weeks delayed-intervention) was used to evaluate Healthy Start on supporting educators in the provision of physical activity opportunities and increasing children's physical activity levels.

5.3.2 Participants

After receiving parental consent, a total of 69 children participated in the study. Demographic information revealed that the average age of participating children was 4 years 9 months. In the intervention childcare centres (n=42) 61% of children were male and 39% were female. In the comparison childcare centres (n=27) 67 % were male and 33% were female.

5.3.3 Data collection

Data collection took place at three time points (baseline, prior to the intervention beginning, mid intervention (24 weeks into the intervention) and post intervention (immediately after the 48 week intervention). Losses to follow-up and regular attendance had a significant impact on both physical activity and gross motor development measurement. For example, some children who were present for baseline measurement had left the centre or were not present on the day I returned to conduct midpoint and/or endpoint data collection, which involved fitting children for their accelerometers and measuring gross motor development. Accelerometers were set to start measuring physical activity on a particular day and if children did not return to the centre for a few days during the week physical activity was being measured, this limited the

number of valid days of physical activity measurement for those children. Furthermore, a number of the children who participated in baseline evaluation of gross motor development were not present for endpoint evaluations. Therefore, gross motor development data were missing for a number of children and in turn this influenced the overall measurement of gross motor development and corresponding results.

Quantitative and qualitative data were collected concurrently. Quantitative measures were carried out in *both* intervention and comparison childcare centres. Every effort was made to conduct quantitative data collection during the same weeks in both intervention and comparison centres. This was to help control for the effect weather might have on children's outdoor playtime and physical activity levels. If all centres wore the accelerometers at the same time the effect of weather would be similar on all centres. Qualitative data collection was carried out in the intervention childcare centres *only*.

5.3.4 Quantitative Data Collection

Accelerometers. Physical activity levels of children were assessed with Actical accelerometers (Mini Mitter Co., Inc., Bend, OR, USA). Accelerometers provide an objective measure of habitual activity which is not dependent on self-report. Accelerometers measure the intensity of most physical activities (aside from bike riding that does not involve vertical movement of the trunk and swimming) as well as frequency.

At three time points (baseline, mid and post intervention) children were asked to wear the accelerometers. Parents were asked to put the accelerometers on when their children got up in the morning and to remove the accelerometers at night when the children went to bed. They were also advised to remove the accelerometers during any water-based activities.

In order to capture the sporadic nature of children's physical activity, accelerometers measured movement in 15 second epochs (114). Commonly used cut points for children's physical activity intensities (sedentary to vigorous activity levels) (115), were applied to produce a series of activity intensities measured in minutes, representing all activity levels [e.g., sedentary (SED), light physical activity (LPA), moderate to vigorous physical activity (MVPA), and total physical activity (LPA + MVPA= TPA)]. I chose to calculate TPA because recent physical activity guidelines state that early years children should accumulate 180 minutes of daily physical activity at *any intensity* (21). The raw data were analyzed using custom software, KineSoft version 3.3.63 (KineSoft, Loughborough, UK). Standardized quality control and data reduction procedures were carried out (116).

Test of Gross Motor Skills (TGMD) II. Is used to assess gross motor skills of children aged 3–10 years (117,118); and was used in the present study to evaluate children's motor skills. The 12 skills tested are subdivided into two skill areas: locomotor skills and object control skills. The TGMD II testing took place at baseline and post intervention in both intervention and comparison childcare centres. Data from the analyzed TGMD II provided a standard score, percentile scores and age equivalents. In order to get a combined measurement of the two subtest scores (locomotor skills and object control), standard scores are summed and then converted into a total gross motor quotient (GMQ). The GMQ is the most useful value obtained from the TGMD-2 because it reflects the basic constructs built into the test, is highly reliable and is a composite of both subtests (118). It controls for age and is therefore the best estimate of an individual's current gross motor development.

Environmental scans. Environmental scans were conducted with the environment and policy assessment and observation Tool (EPAO) (32). The EPAO is a comprehensive tool designed to

measure various aspects of the childcare centre environment that are related to the promotion of physical activity and motor skill development. The tool is divided into an observation section and a document review section. The observation section is then separated into three different segments which include eating occasions, *physical activity* and *centre environment*. The environmental scans were guided by the observation section of the EPAO tool, specifically the segment related to observing the centre environment for resources that promote physical activities. This section contains seven questions, with each question containing a number of sub-questions. The data gathered in the environmental scan were analyzed using the EPAO scoring grid created by Ward and colleagues. Environmental scans were carried out at baseline and post intervention.

5.3.5 Qualitative Data Collection

Educator interviews. One-on-one interviews are a valuable method for gaining insight into people's perceptions, understandings and experiences of a given topic, and can contribute to in-depth data collection (119). This type of interview is a commonly used data collection method in health and social research (119). One-on-one interviews were conducted with educators working with children aged 3 to 5 years, as well as centre directors to determine their experiences with implementing Healthy Start in the childcare centre. A total of 9 interviews were conducted over the course of the intervention. Educators were asked to describe their overall experience with implementing Healthy Start. Additionally, they were asked to discuss any changes in children's physical activity behaviours (ex. increases or decreases of children participating in group play and choosing to engage in Healthy Start activities in free time) over the course of the intervention.

A semi-structured interview guide containing open ended questions was used to facilitate the interviews. To ensure thoroughness and accuracy of the questions, the interview guide was pilot tested by myself and another Healthy Start team member in the previous urban pilot study.

Non-participant observations and field notes. Non-participant observation involves observing participants in their natural setting, with the researchers' presence having little to no influence on the participants' behaviour (120). I made every effort not to disrupt the children's usual routines. Thus when children were playing outside, I would observe the activities from a distance, often out of the children's sight. During these observations I kept detailed field notes documenting interactions among children and between children and staff. Observation data provided detailed information about how the intervention was being implemented, including group interactions during free play and organized physical activities. For example, I observed if all children joined in when HOP activities were taking place and if educators were joining in, not simply directing the activities. Observations were carried out at three time points (baseline, mid and post intervention).

5.3.6 Data Analysis

Descriptive statistics were computed on data from environmental scans, accelerometers and TGMD II. All statistical analyses were carried out using IBM SPSS Statistics 20 for Windows (23). Data were considered statistically significant if a 2-tailed p value of less than 0.05 was reported. Participants with missing data were not included in the data analysis.

Environmental scans. Baseline and post intervention environmental scans were scored and compared to identify changes in the centre environment related to the promotion of physical activity and motor skill development. Environmental scans were scored out of a potential 56 points. Specifically, t -tests (independent and paired) were performed to compare baseline and

post environmental scan scores between the intervention and usual practice groups and within the intervention group.

Accelerometers. Accelerometry data was entered into SPSS and comparisons were made to determine changes in physical activity levels between and within groups over the 48 week intervention. The criteria for a valid day was 8 hours of consecutive wear and 60 minutes of consecutive zeros allowing for 2 minutes of interruptions was the criteria used for non-wear. All data with at least one valid day of data was included in the analyses.

Analysis of variance (ANOVA) was used to evaluate differences within intervention group means on measures of daily: wear counts, wear minutes, sedentary minutes, light PA minutes, MVPA minutes and TPA. When appropriate, Tukey post hoc tests were performed to determine which centres were significantly different from one another (e.g., if significant differences were reported between centres). Between group (intervention and comparison) differences in wear counts, wear time and physical activity levels were evaluated using independent *t*-tests.

TGMD II. Independent *t*-tests were performed to compare baseline and post GMQ scores between intervention and comparisons groups to determine if there was changes children's gross motor skills development. Paired samples *t*-tests were also used to compare baseline and post intervention GMQ scores within the intervention group.

Educator interviews. One-on-one interviews were transcribed verbatim. Thematic analysis was used to analyze the interview transcripts (121). Each interview transcript was reviewed and divided into meaning units. These units were coded, and similar codes were grouped together to create categories (119). Categories were reviewed and linkages among categories were examined. Similar categories were merged together to create larger overarching themes. Once all

transcripts were categorized each theme was reviewed to be sure all the data were categorized appropriately. Each theme was then examined in detail to determine its fit and relevance. Once finalized, themes were defined and named to accurately represent educators' experiences and perceptions of the intervention. Themes were categorized in one of the five levels identified in the ecological model. Quotes from participants were chosen to provide an example of responses given during the interviews. Quotes were shared with educators to ensure that they accurately captured educators' views and experiences.

Field notes collected during non-participant observations. Information I gathered during non-participant observations was summarized and compared with educator feedback provided in interview transcripts. Specifically, I used my field notes to confirm and supplement data collected regarding the use of Healthy Start and educator and child interactions related to physical activity participation.

5.4 Results

5.4.1 Children's Physical Activity Levels

As the intervention was implemented in childcare centres the accelerometer data reported focuses on weekday physical activity levels. Baseline and endpoint results for average weekday wear minutes, counts per minute and minutes of activity at various levels of intensity are reported in Table 3.

Data Collection	Intervention Group	Comparison Group	<i>p</i> -value
Time point	(<i>n</i> =42)	(<i>n</i> =27)	(* = Sig)
Wear Minutes--Baseline	690.36 (103.72)	675.06 (42.77)	NS
Wear Minutes--Endpoint	680.25 (65.78)	663.73 (63.62)	<i>p</i> < 0.05*
Counts per Minute--Baseline	382.78 (140.58)	431.10 (110.53)	<i>p</i> < 0.001*
Counts per Minute--Endpoint	530.76 (163.20)	389.50 (116.40)	NS
SED--Baseline	392.83 (59.49)	369.17 (40.86)	NS
SED--Endpoint	360.00 (77.49)	386.20 (52.17)	NS
MVPA--Baseline	47.97 (19.70)	52.56 (17.70)	NS
MVPA--Endpoint	66.74 (31.01)	45.54 (21.24)	<i>p</i> < 0.05*
TPA--Baseline	284.30 (57.67)	305.87 (52.40)	NS
TPA--Endpoint	310.12 (66.93)	281.32 (41.96)	NS

Table 3. Average weekday wear minutes, counts per minute and minutes of physical activity at various levels of intensity, values reported are Mean (SD).

Increases in mean counts per minute from baseline to endpoint were observed for the intervention group only. Although not statistically significant, results also indicated that children in the intervention group (*n*=3) decreased their SED behaviours over the course of the intervention and engaged in less daily SED behaviour at endpoint than the comparison group (*n*=3). Furthermore, results from the comparison group showed increases in daily SED behaviour from baseline to endpoint.

Between group differences in MVPA levels were not significantly different at baseline or midpoint evaluation. However, endpoint measurement indicated that children in the intervention

group were engaging in significantly more MVPA than the comparison group. An obvious pattern was observed among the intervention group showing an increase in TPA levels over the course of the intervention. This increasing pattern was not reported among the comparison group; in fact a decreasing pattern was observed.

Within group differences in physical activity levels were also observed in the intervention group. Specifically, two of the centres reported significantly higher TPA and MVPA levels post intervention than the third centre. The two centres with higher post intervention physical activity levels were the most compliant centres in the intervention group. For example, educators in these centres consistently provided detailed notes of Healthy Start activities they were incorporating into their daily routine and often had suggestions of how activities could be improved or adapted. Furthermore, these centres reported the greatest improvements in environmental scan scores.

5.4.2 Children's Gross Motor Development

Between and within group differences in GMQ scores at baseline and post intervention were not significantly different. Children in both the intervention and comparison groups showed increases in GMQ scores over the course of the intervention, however a greater increase was observed among the intervention group (Figure 5). The GMQ scores among the intervention group increased from ($M = 59.63$; $SD = 23.83$) at baseline to ($M = 64.00$; $SD = 28.34$) at endpoint whereas those observed in the comparison group increased from ($M = 53.19$; $SD = 35.58$) at baseline to ($M = 56.80$; $SD = 26.55$) at endpoint.

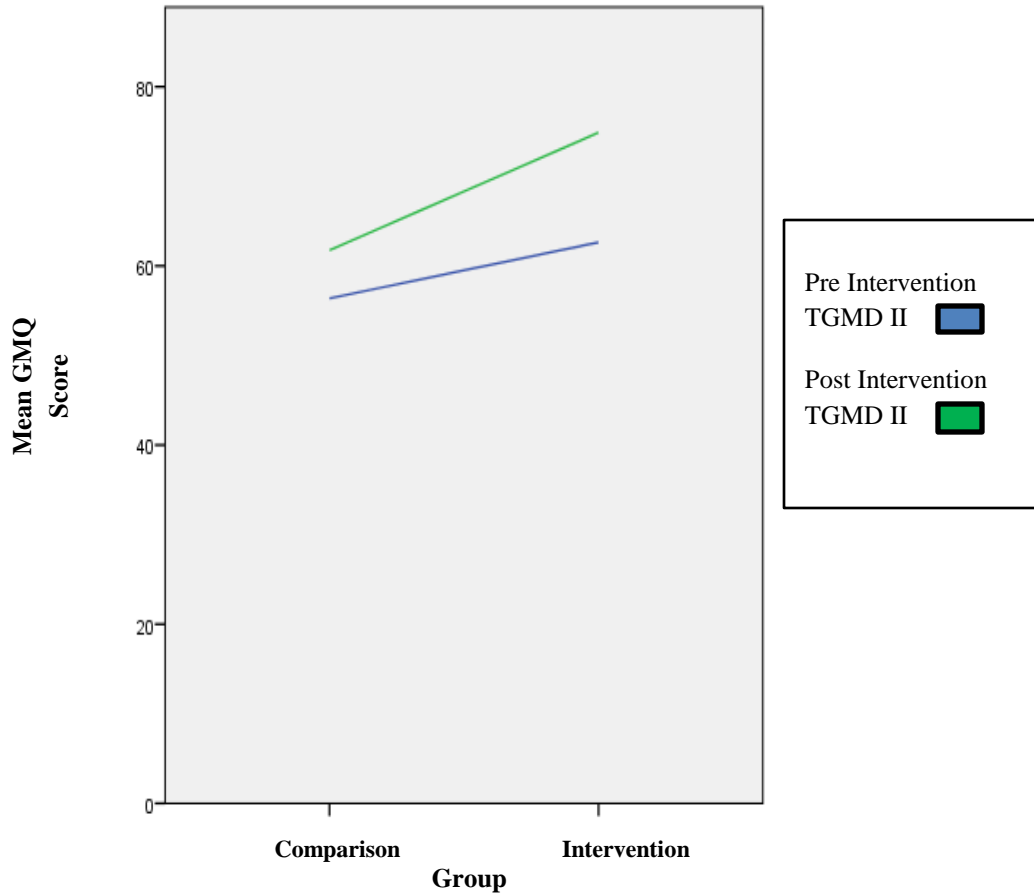


Figure 4. Baseline and post intervention GMQ mean scores.

5.4.3 Changes to the Childcare Centre Environment

Overall, between group differences for environmental scan scores at baseline and post intervention were not statistically significant; however the intervention centres did have a higher post intervention mean score ($M= 25.00$ $SD= 3.75$) than the usual practice centres ($M= 17.50$; $SD = 3.30$; $p=0.06$) (Figure 6). Again, although not statistically significant, a general increasing pattern was observed within the intervention centres, indicating improvements in the physical activity environment from baseline ($M=21.33$; $SD= 3.36$) to post intervention ($M= 25.00$; $SD= 3.30$). Moreover, this increase was not observed in the usual practice centres.

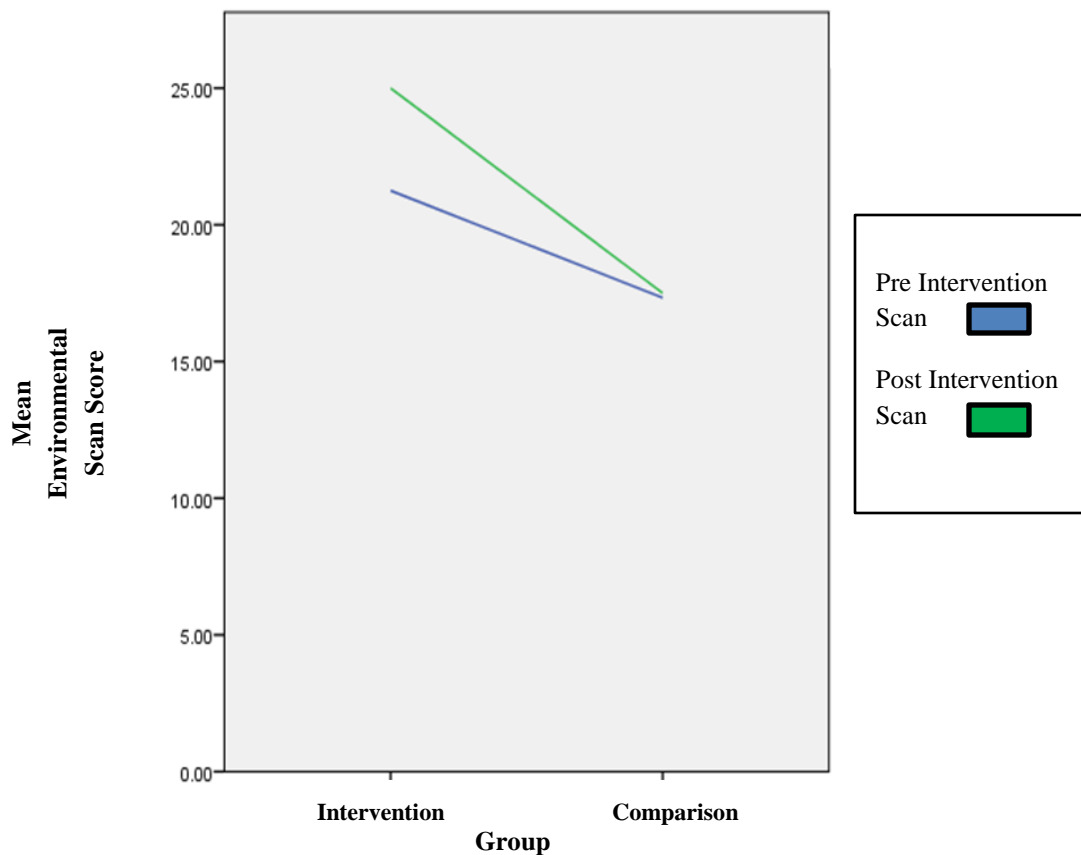


Figure 5. Baseline and post intervention environmental scan mean scores.

5.4.4 Experiences and Perceptions of Educators

One-on-one interviews were carried out with all educators in the intervention centres who received Healthy Start training ($n=11$). The interviews provided an avenue for monitoring fidelity to the intervention and for gaining insight into the educators’ perception of how the intervention influenced physical activity within the childcare centre. Overall educators felt that Healthy Start provided many new ideas for incorporating physical activity into the daily schedule. One educator stated, “It has given me so many new ideas and just made my job easier.”(F) They felt the resources were easy to use and the activities in the HOP manual were creative yet simple. Another educator remarked, “Kids loved it. As a whole it was great.”(D)

Activities in Healthy Start are designed to be adapted for various childcare environments and groups. As such some centres adapted activities to accommodate the needs of each centre. “We had to adapt some activities so all ages could participate; this took some time but once we got this sorted it out the kids enjoyed it.”(D) Educators unanimously reported that they would recommend Healthy Start to their colleagues at other childcare centres. “Yes we would recommend it (Healthy Start), in fact we already have.”(D)

A number of key themes were developed to represent educator perceptions of how Healthy Start influenced their ability to provide physical activity opportunities for children. For example, educators explained that Healthy Start was particularly suited for increasing physical activity in small indoor spaces during the winter months. This theme was supported by results obtained in the environmental scans, which indicated improvements in the intervention centre environments to promote physical activity. Additionally, many educators felt the intervention was helping not only in promoting physical activity, but also in encouraging educators to participate in physical activities with the children. For instance, during interviews, educators reported improvements in children’s physical activity participation and gross motor skills. A description of each theme and corresponding quotes representing educator perceptions of how the Healthy Start intervention influenced their ability to provide physical activity opportunities and how this in turn influenced children’s physical activity behaviours can be found in Table 4.

Theme (Ecological Level)	Description	Quote
Educator Participation (Individual)	Educators explained it was important for adults to participate in activities and they felt Healthy Start encouraged adult involvement	<i>“Even though the activities can be child directed the kids still want adults to be involved.”(F)</i>
Educator perceptions of parental involvement (Interpersonal)	Aware of Healthy Start, but generally not involved with it the activities. Some expressed interest in HOP activity cards that were sent home.	<i>“Parent involvement is an issue all the time, not just with LEAP.” (SB)</i> <i>“Parents put the belts on and that is about all.”(D)</i>
Educator perception of changes in children’s physical activity behaviours (interpersonal)	Many educators noticed substantial improvements in children's physical literacy (e.g., throwing and kicking a ball)	<i>“Improvements in physical literacy were obvious, especially among one child who had really struggled with activities in the past. We saw such an improvement that the mom was even on board and began using Healthy Start activities at home to help her child”.(D)</i> <i>“Since the children often choose the activities they are excited to play them.”(D)</i> <i>“They love to see the book and bag come out.”(D)</i>
Incorporation of Activities (Institutional)	Some centres added a Healthy Start section to their weekly lesson plans	<i>“We score each activity with an X or ✓, depending if the children like it.”(D)</i>
Promoted physical activity during winter months (Institutional)	Increased opportunities, particularly in the winter months	<i>“We built a big hill in the yard so the kids could run up and down it and use it for sledding in the winter.”(D)</i> <i>“We were able to do a lot of activities from Healthy Start indoors in the winter.”(F)</i>

Theme (Ecological Level)	Description	Quote
Promoted use of local facilities (Community)	Some centres began to regularly use community facilities for physical activities	<i>"We walked over to the school to use the gym, the kids really enjoyed that."(D)</i>
Support for government legislated physical activity (Policy)	Educators discussed the lack of government legislated physical activity policy and said they would advocate such a policy	<i>"I think there should be a provincially policy (for physical activity) because it would ensure all centres had to provide a certain amount of physical activity to children."(D)</i>

Table 4. Themes representing educator’s perceptions of how Healthy Start influenced physical activity in the childcare centre.

5.5 Discussion

Overall, increases in children’s MVPA levels were reported among the intervention group. Moreover, the Healthy Start intervention was effective in supporting educators to increase the physical activity opportunities they provided to rural early years children.

Previous research states that interventions aimed at behaviour change are most effective when a multilevel approach that focuses on change beyond the individual level is applied (122). Researchers investigating physical activity among early years children have identified multiple factors (both barriers and facilitators) shown to influence children’s physical activity behaviours (1,20,24,43,112). These factors include but are not limited to: children’s abilities and motor skills (individual level); parental and educator behaviours and the provision of physical activity opportunities (interpersonal level); access to space for active play, including safe neighborhoods

and communities (environmental level); and policies for physical activity in childcare settings (policy level).

There is increasingly strong evidence to suggest that opportunities for physical activity (e.g., running, leaping and hopping, and kicking, throwing and catching a ball) benefits gross motor skill development during the early years (24,44). In addition, studies show that children who develop motor skills during their early years, have increased physical activity participation and self-perceived competence related to athletics and academics during their school aged years (24,43,67,123). The Healthy Start intervention aimed to increase children's physical activity levels and improve children's motor skills through targeting interpersonal factors (educators attitudes, knowledge and behaviours related to the promotion of physical activity and motor skill development in children), institutional factors (providing solutions for barriers to physical activity caused by the physical aspects of the childcare centre environment) and community factors (identifying community facilities that could be used to provide physical activity opportunities, particularly during the winter months). Healthy Start was different from most interventions targeting physical activity in the early years because it attempted to address both physical activity and motor skill development through targeting factors beyond the individual/behavioural level and included strategies for addressing aspects of the centre environment and using resources within the rural communities.

Increases in physical activity were reported among the intervention group. Specifically, accelerometry results indicated that children in the intervention group had significantly higher MVPA levels post intervention than the comparison group. In relation to children's motor skills, significant differences were not observed between the intervention and comparison groups over the course of the intervention. There was however, an obvious pattern indicating that children in

the intervention group had greater improvements in their gross motor development than children in the comparison group.

Childcare centre environments have also been shown to have a strong influence on physical activity levels of children. For instance, in a study by Temple and colleagues (2010) caregivers reported that rules for play indoors, the size of indoor spaces for play and safe outdoor place spaces were all factors influencing the promotion of physical activity opportunities for children (30). Similarly, Bower and colleagues found that aspects of the centres physical environment such as, large outdoor play spaces, portable play equipment and fixed play equipment related to physical activity behaviors among children (31). As such, Healthy Start targeted aspects of the childcare centre environment including resources and ideas on how to use small spaces inside the centre to promote active play and motor skill development. Furthermore, educators were encouraged to use their outdoor space, including natural features present in the outdoor area such as, hills and open areas to play with the children. The environmental scan scores did not show statistically significant improvements in the environmental scans from baseline to post intervention for either group. However, unlike the comparison group, the intervention group reported improvements in environmental scan scores from baseline to post intervention. Thus, suggesting that Healthy Start did help the childcare centres to create environments that promote physical activity and motor skill development among the children.

Educators perceptions captured in the one-on-one interviews indicated that Healthy Start was able to increase educator's confidence and personal behaviours associated with the provision of physical activity opportunities and participation in physical activity with the children. This is important because research shows that young children are more likely engage in a particular behaviour if an adult (parent, educator etc.) is modeling the same behaviour(38,39). During the

one-on-one interviews educators also stated that prior to Healthy Start training, they lacked knowledge and confidence in providing physical activity opportunities and engaging in these activities with the children. However, following the intervention educators felt more equipped and confident in providing and engaging in physical activity opportunities. Educators felt this in turn had a positive impact on children's physical activity levels.

Healthy Start also addressed institutional factors associated with influencing children's physical activity behaviours. Specifically, using lessons learned in Healthy Start training, educators were able to increase physical activity opportunities provided inside the childcare centre and during the winter months. For example, educators began incorporating small bursts of physical activity into routine activities (e.g., educators had children hop like bunnies while going to wash their hands for lunch). Other centres created Healthy Start stations in their centre where children could engage in small games encouraging active play. Increasing physical activity opportunities was also linked to the use of local community facilities as some centres used the school gym or the community centre as a space for physical activity during the winter months.

In addition to targeting specific factors related to educators, children and childcare centres the intervention also attempted to impact broader determinants of physical activity such as lack of a physical activity policy in childcare centres. To date no attempts have been made by the provincial government to implement a provincial physical activity policy, and educators reported they would advocate for such a policy and consider implementing their own policies at the institutional level. Moreover, results from this study provide evidence that children are exceeding the recommended minutes of daily sedentary behaviour (22) and engaging in fewer than recommended minutes of daily of MVPA (21). Of course, the lack of a provincial physical activity policy for childcare centres is not the only factor contributing to low physical activity

levels and high levels of sedentary behaviour among Canadian early years children. However, childcare centres could benefit from such policies as they would specify amount and intensity of daily physical activity. The development and implementation of provincially legislated physical activity policies have been recommended in previous studies by both educators and researchers (67,68).

Study Strengths and Limitations

Among the strengths of this study was the fact that a wait-list comparison design was employed to evaluate the Healthy Start intervention. The use of a comparison group allowed me to conclude with more certainty that changes associated with physical activity in the intervention group could be attributed to the Healthy Start intervention. Additionally, a wait-list ensured that the centres in the comparison group were also provided the opportunity to implement and benefit from Healthy Start; thus, limiting the ethical challenge that arises when only offering a program to the intervention group. A second strength was the intersection of the ecological model and a population health approach assisted in not only targeting specific factors while designing and implementing the intervention, but it also guided the evaluation. Specifically, I was able to identify how the intervention successfully influenced or failed to address specific factors (influencing physical activity) in each ecological category and interactions between categories.

As with any research, there were limitations to this study. The most obvious limitation was the small sample size, which, although not an issue in qualitative research, proves to be problematic when employing quantitative methods. For instance, the small number of participants likely contributed to the overall lack of non-significant results, even when differences appeared to be large. The findings are limited to the sample population and the childcare centres that participated in the study.

Another main challenge related to analysis is the assessment of valid days and wear time with young children. Experts suggest that data analysis should include 80% of the sample with valid data (125,126). In order to achieve this, the criterion for a valid file was set at 8 hours of wear for one valid day per week. Ideally, we would have wanted a valid file to represent three 8 hour days per week. However, when working with young children in real life environments it can be challenging to encourage the children to wear the belts each day and all day. This challenge was increased by the fact the children in the intervention centre participated in four data collection time points (baseline, midpoint 1, midpoint 2 and endpoint). However, because compliance was low, little valid data was obtained from the second midpoint data collection and thus results from this data collection were eliminated it all together from analysis. In the future researchers must consider the added challenges which arise when working with young children. As such, they need to weigh the pros and cons of multiple data collection time points. Finally, parental engagement was also a challenge. Although efforts were made to encourage parental participation, they were largely unsuccessful. As such, future work associated with the promotion of healthy behaviours among early years children should focus on parent engagement and participation. Such as, inviting parents to participate in the Healthy Start training and providing more resources for promotion of physical activity at home.

Lastly, I had initially intended to carry out one-on-one interviews with educators in both intervention and comparison childcare centres and the use of mixed methods was intended as a strength of the intervention. However, due to a number of logistical challenges (person power, time, and childcare centre schedules) I was only able to carry out one-on-one interviews in the intervention centres. As a result, direct observation was the only qualitative method employed in both the intervention and comparison centres and this method did not provide sufficient

information to be a standalone result. Thus, as previously discussed, the educator interviews were only carried out in the intervention centres to determine fidelity and educators' experiences and perceptions of Healthy Start. In addition, direct observations were used to supplement the interviews.

5.6 Conclusion

Overall results indicate that when implemented as intended, Healthy Start can effectively support educators in providing children with more opportunities for physical activity.

Additionally, although not all quantitative results were statically significant, increases were observed in children's physical activity levels and motor skills. This is one of few intervention studies in childcare centres which used accelerometers to directly measure children's physical activity levels.

The findings from this study should be used to influence practice among educators in childcare environments. Specifically, resources and supports should be developed to increase educators' confidence and self-efficacy in modeling motor skills and engaging in physical activities with the children. In addition, the results contribute to and provide support for the growing body of research around the importance and necessity of a physical activity policy for childcare settings. Furthermore, the lessons learned in this study will be used to improve the Healthy Start intervention so its implementation can be effectively expanded to childcare centres in both rural and urban communities.

PRELUDE TO PAPER 2

The primary purpose of this research was to evaluate a multilevel community-based physical activity and healthy eating intervention (Healthy Start) in rural childcare centres in Saskatchewan. Paper 2, which is presented as a publishable manuscript, will discuss the results of the second thesis objective, that is the evaluation and results of implementing the healthy eating component of Healthy Start. More specifically, the following chapter will address the objective 2 sub-objectives:

a) Determine if over the course of the intervention, Healthy Start contributed to healthier eating behaviours among early years children aged 3 to 5 years.

b) Determine if Healthy Start supported childcare staff (educators and cooks) in providing children with more opportunities for healthy eating.

c) Describe educators' experiences and perceptions of Healthy Start and its influence on healthy eating within the childcare centre environment.

Paper 2 will conclude with key learnings and provide recommendations for measuring and promoting healthy eating in childcare centres and among early years children.

CHAPTER 6

Paper 2

The introduction and methods sections below may repeat key aspects of the review of literature or the general methods section directly pertinent to the purpose of the study.

Title: **Healthy Start: An Intervention to Support Educators in Providing Healthy Eating Opportunities to Children in Childcare**

6.1 Introduction

Research suggests that it is important to establish healthy eating patterns during the early years (0-5 years); as healthy behaviours during this stage of life should support growth and development, laying the foundation for lifelong healthy living patterns (1,2). Despite the benefits of healthy eating, diets of many Canadian early years children are lacking in fruits, vegetables and grain products, and are high in fat and sugar (4,6,7). These unhealthy dietary patterns have been associated with increases in overweight and obesity during the early years. Canadian statistics show that among children aged 2 to 5 years 15.2% are overweight and 6.3% are obese (10). Furthermore, children who are overweight during the early years significantly increase their risk of being overweight or obese in adolescence and adulthood (103,127).

Parents and caregivers are essentially gatekeepers, as they provide not only opportunities for healthy eating, but also influence the social environment during mealtime (128). Although parents have a large influence on the development of children's lifestyle patterns, over 54% of Canadian children ages six months to 5 years receive non-parental care; with 30% of these children attending licensed childcare centres (25). Past research has shown that young children are very imitative, copying dietary patterns and food preferences of adults (7). Experts have

emphasized that childcare centres are ideal environments for understanding, exploring and influencing health promoting behaviours of children and their educators (74,128)

Researchers in Canada have investigated dietary practices in childcare centres and food consumption patterns of children ages 3 to 5 years (4,6,37,74). Results indicate that centres faced many financial constraints which centre directors and cooks identified as a barrier to accessing and serving a variety of fresh fruits and vegetables (4,37). Moreover, educators explained that outside of the centre, children frequently ate convenience foods with little nutritional value and this made it difficult to encourage children to eat healthier foods while in care (4). Until recently, little research existed about the specific dietary patterns of Canadian children younger than 6 years of age (6). However, a study conducted in Alberta (n=2015) indicated that less than 30% of children aged 4 to 5 years met Canada's Food Guide recommendations for fruit and vegetables and less than 25% consumed the recommended daily minimum number of servings of grain products (6). Additionally, research among early years children aged 1 to 4 years in Nunavik (n=217) indicated that only 7.4% of the children consumed the recommended food guide servings for all four food groups and half of those children attended childcare centres where a nutrition program had recently been implemented (74).

In Canada, particularly in the Prairie Provinces, many childcare centres are located in rural areas and small towns (populations less than 10,000) (36). Numerous studies have reported that rural residents have poorer dietary practices than their urban counterparts, due in part to the fact that rural communities struggle to access a variety of affordable fresh fruits and vegetables all year round (12,14,15). Therefore, based on research to date a bilingual (French and English) community-based intervention (Healthy Start) was developed to increase healthy eating and physical activity behaviours among early years children in Saskatchewan. Specifically, Healthy

Start is a multilevel, intervention designed to support educators in promoting physical activity and healthy eating in childcare settings.(41) Healthy eating refers to following the recommendations in Canada's Food Guide, which emphasizes the importance of eating a variety of foods from the four food groups (23). Initially Healthy Start was piloted in four urban childcare centres in Saskatchewan. However, Healthy Start was expanded to rural childcare centres throughout Saskatchewan. To my knowledge this is the first multilevel intervention to be implemented in rural childcare centres in Saskatchewan. This article will focus on the evaluation of the healthy eating component of Healthy Start.

6.1.1 Purpose

This article will focus on evaluating the healthy eating component of Healthy Start. In order to achieve the primary purpose the study objectives were to:

- a) Determine if over the course of the intervention, Healthy Start contributed to healthier eating behaviours among early years children aged 3 to 5 years.
- b) Determine if Healthy Start supported childcare staff (educators and cooks) in providing children with more opportunities for healthy eating.
- c) Describe the educators' experiences and perceptions of Healthy Start.

Additionally, it was hypothesized that compared to childcare centres not receiving Healthy Start, centres in the intervention group would provide more opportunities for healthy eating and children would engage in healthier eating behaviours at the end of the intervention.

6.2 Healthy Start Intervention

Guided by McLeroy's ecological (89) model and grounded in a population health perspective, a multicomponent intervention, Healthy Start, was developed to promote healthy eating in childcare settings (41). The healthy eating segment of the Healthy Start intervention consisted of the Healthy Start Manual (a step by step guide for promoting healthy eating and physical activity in childcare settings) and Food Flair (a recipe book that includes activities for engaging children in food preparation and encouraging healthy eating). Food Flair is part of an evidence based physical activity and healthy eating resource called LEAP (41,97). The third component of the intervention was the ongoing support and communication provided to all participants. For example, centre directors were contacted monthly via phone to check-in and discuss any challenges that arose. Additionally, centres were provided with new recipes via email on a monthly basis.

The healthy eating component involved training rural educators (in the intervention group) to use the Healthy Start Implementation Manual and Food Flair within their childcare centres. Training was carried out by Healthy Start trainers who were also certified LEAP trainers. The training took approximately two hours; at this time educators received the necessary equipment to implement Healthy Start in their childcare centres. Participants were asked to try activities in Food Flair and demonstrate the activity to the group. Booster training sessions were held approximately 24 weeks after the initial training.

Healthy Start was implemented over 48 weeks in intervention childcare centres. Educators in the comparison childcare centres continued their usual practices and were offered the Healthy Start training 48 weeks after the intervention group received their training.

6.3 Methods

A detailed description can be found in the general methods section (Chapter 4).

6.3.1 Design

A population health wait-list comparison intervention design (48 weeks delayed-intervention) was used to evaluate Healthy Start on supporting educators in the provision of healthy eating opportunities and improving children's dietary behaviours.

6.3.2 Participants

After receiving parental consent a total of 69 children participated in the study. Demographic information obtained revealed that the mean age of participating children was 4 years 9 months. In the intervention childcare centers (n=42) 61% of children were male and 39% were female. In the comparison centres (n=27) 67 % were male and 33% were female.

6.3.3 Data Collection

Data collection took place at three time points (baseline, prior to the intervention beginning; mid intervention, 24 weeks into the intervention and post intervention, immediately after the 48-week intervention). Quantitative and qualitative data were collected concurrently. Quantitative measures were carried out in both intervention and comparison childcare centres. Additionally, every effort was made to conduct quantitative data collection during the same weeks in both intervention and comparison centres. Qualitative data collection was carried out in the intervention childcare centres only.

6.3.4 Quantitative Data Collection

Menu Review. The menus were collected and reviewed at three time points (pre, mid and post intervention) to determine to what extent childcare centres were meeting the guidelines outlined in the provincial nutrition policy (73). This policy is based on Canada's Food Guide (CFG)

recommended daily servings for children 2 to 5 years of age (23). The guidelines state that snacks served in childcare centres must contain two food groups, one of which must be from the fruits and vegetables group. In addition, if breakfast is served it must contain three food groups and all other meals served must contain food from each food group. Regarding beverages, milk must be served twice a day and if juice is offered it must be 100% unsweetened fruit juice and cannot be served more than 3 times per week (73).

6.3.5 Qualitative Data Collection

Educator Interviews. One-on-one interviews are a valuable method for gaining insight into people's perceptions, understandings and experiences of a given topic, and can contribute to in-depth data collection (119). This type of interview is a commonly used data collection method in health and social research (119). One-on-one interviews were conducted with the educators to determine their experiences with implementing Healthy Start in the intervention childcare centres. Educators were asked to describe their perceptions of the intervention's influence on their ability to provide opportunities for healthy eating. Additionally, educators were asked if they observed changes in children's eating behaviours over the course of the intervention.

A semi-structured interview guide containing open ended questions was used to facilitate the interviews. To ensure thoroughness and understandability of the questions, the interview guide was pilot tested.

Non-participant observations and field notes. Non-participant observation involves observing participants in their natural setting, with the researchers' presence having little to no influence on the participants' behaviour (120). During these observations I kept detailed field notes documenting interactions among children and between children and staff. Observation data provided detailed information about the social environment and group interactions during

mealtime between educators and children and among children. For example, mealtime activities were observed to assess whether children were served food or if they chose their own serving sizes. Additionally, aspects of the physical environment were also reviewed, such as if there were posters or pictures promoting healthy eating. Observations were carried out at three time points (baseline, mid and post intervention).

6.3.6 Data Analysis

Menu Review. Menus were reviewed and scored based on the number of days per week that the centre meals and snacks met the guidelines described in the provincial nutrition policy. Specifically, daily menus were reviewed and if the meal contained all four food groups they were given a score of 4. Snacks were also reviewed and if the snack contained 2 food groups and one being fruit and vegetable each snack was given a score of 1. Lastly, if milk was served twice per day the menus received a score of 2. In addition, *t*-tests (independent and paired) were performed to make comparisons between the intervention and comparison groups and within the intervention group, to determine if there were changes in relation to menus meeting the provincial nutrition policy.

Educator interviews. One-on-one interviews were transcribed verbatim. Each interview transcript was reviewed and divided into meaning units. These units were coded, and similar codes were grouped together to create categories (119). Categories were reviewed and linkages among categories. Similar categories were merged together to create larger overarching themes. Once all transcripts were categorized each theme was reviewed to be sure all the data was categorized appropriately. Each theme was then examined in detail to determine its fit and relevance. Once finalized, themes were defined and named to accurately represent educators' experiences and perceptions of the intervention. Themes were categorized in one of the five

levels identified in the ecological model. Quotes from participants were chosen to provide an example of responses given during the interviews. Themes were shared with educators to ensure that they accurately captured educators' views and experiences.

Field notes collected during non-participant observations. Information gathered during non-participant observations was summarized and compared with educator feedback provided in interview transcripts. Specifically, field notes were used to confirm and supplement data collected regarding the use of Healthy Start and educator and child interactions related to healthy eating behaviours.

6.4 Results

6.4.1 Changes in Childcare Centre Menus

Based on the weekly menus reviewed at baseline, midpoint and post intervention, neither group (intervention or comparison) met all policy guidelines 5 days a week (e.g., 100% of the time). Overall no significant differences were reported between the intervention and comparison groups or within each group. However, analysis of baseline data indicated that the comparison group was meeting the nutrition policy guidelines more often. Although the comparison group met the nutrition policy guidelines more often, the percentage of time this group met the guidelines decreased from baseline (94%) to post intervention (92%). Conversely, childcare centres in the intervention met the nutrition guideline more often post intervention (83%), compared to baseline (78%). Furthermore, during the course of the intervention, the centres receiving the intervention steadily increased how often they followed all aspects of the nutrition policy.

6.4.2 Educators' Experiences and Perceptions of Healthy Start

One-on-one interviews were carried out with all educators in the intervention centres who received Healthy Start training ($n=11$). The interviews provided an avenue for monitoring fidelity to the intervention and for gaining insight into the educators' perception of how the intervention influenced healthy eating within the childcare centre. Themes were developed in relation to levels within the ecological model.

6.4.3 Individual Factors

Supported Educators in the provision of healthy eating opportunities. Overall educators felt the intervention supported them in increasing healthy eating opportunities. "We have been able to offer more healthy food choices."(D) Centres began to purchase more whole grain and whole wheat ingredients. "We have been using whole wheat flour."(F) Educators unanimously reported that Healthy Start improved their ability to promote healthy eating through fun and creative activities. "It (Food Flair) is great! We have incorporated all the recipes into our menu." (D). Staff indicated that Healthy Start provided many creative ways to involve children in food preparation. "We have cooked with the kids more now, they really enjoy it."(F) Some staff explained that they began cooking with children on a regular basis. This involved having children help prepare meals and snacks. "Because the kids can pick recipes out themselves, they are excited to try the new foods."

6.4.4 Interpersonal Factors

Children's eating behaviours. Educators described their perceptions of how Healthy Start influenced children's healthy eating behaviours. For instance, they explained that Healthy Start provided creative ideas for incorporating a variety of fresh produce into children diets; as a result one childcare centre started their own garden. Children were able to watch the vegetables grow

and pick them when the food was ready to harvest. In turn, children were more likely to eat the foods they helped to prepare. Furthermore some educators indicated that children were more open to trying a variety of new foods. “We have gotten the children to help us prepare the food, they really like this and they (children) are more open to try new foods when they help prepare the snack or meal.”(D)

Challenges for cooks. Although childcare staff were generally pleased with the results of intervention, some educators reported that cooks needed further support and education as they resisted incorporating the Healthy Start recipes into the centre menus. “The cook has used Food Flair a handful of times, but I think she needs more training on healthy cooking and how to easily incorporate the recipes into our menu.”(F) Additionally, one cook suggested that Healthy Start recipes should be revised to include larger serving sizes because currently most recipes only provide 4 to 8 servings. “Recipes were good but had to be adapted for larger groups and this took some time.”(F)

In the rural communities, not all centres had cooks; rather the educators took turns preparing meals. It was in these centres that Healthy Start had the largest impact and recipes were regularly incorporated into the weekly menus. This suggests that although the Healthy Start training was effective in supporting and motivating educators, implementation activities need to be revised and expanded to include a component focused specifically on supporting cooks to incorporate the Healthy Start resources and recipes into their daily routines.

Another challenge related to childcare centre menus was that some centres used a rotating menu that had been developed and approved by centre directors, prior to the intervention implementation. Therefore the cooks in the intervention centres were resistant to making large menu revisions to incorporate recipes and suggestions provided in the Healthy Start resources.

6.4.5 Institutional Factors

Improvements made to the social and physical centre environment. Educators indicated that Healthy Start supported them in enhancing the centre environment to promote healthy eating. Educators explained that because they began engaging the children in food preparation, staff also started to talk with the children about what healthy food choices look like (ex. using whole wheat flour instead of white flour) and where many foods came from. Specifically, educators in the centre with the garden commented that children were very interested in learning how the vegetables grew in the garden.

6.4.6 Community Factors

Access to fresh produce year round. Although Healthy Start provided information about affordable seasonal fruits and vegetables, educators commented that small rural grocery stores had limited fresh produce particularly in the winter months. This made it challenging for childcare staff to incorporate all the foods suggested in Healthy Start. As discussed above one centre started a garden, but the produce from the garden did not last into the winter months.

6.4.7 Policy Factors

Adhering to provincial nutrition policy. Educators discussed that prior to implementing Healthy Start; they often struggled to follow the provincial legislated nutrition policy. However, they explained that Healthy Start supported their centres in adhering to the provincial nutrition policy more often. The recipes suggested in the intervention made it easier for staff to regularly incorporate healthy foods into the menu and thus follow the guidelines. “It (Healthy Start) was very helpful in following nutrition guidelines.”(D) This result was also reflected in the menu reviews, where intervention centres showed an increase from baseline to post intervention in the

number of days per week they met nutrition guidelines (although this was not statistically significant).

6.5 Discussion

Although, menu review results were not significantly different from baseline to endpoint childcare centres receiving the Healthy Start intervention did increase the number of healthy eating opportunities provided to children. Moreover, educators reported observing increases in children's healthy eating behaviours. Educators indicated that children enjoyed the activities associated with Healthy Start and they felt that children were more open to eating a variety of healthy foods.

Past research shows that when children are involved in food preparation they are more likely to consume the food (131). This finding was supported in the Healthy Start intervention. For example, over the course of the intervention some centres began cooking with children on a regular basis. This involved having children choose snacks, help prepare meals and snacks and at one centre children harvested food from the childcare centre garden. When children participated in these activities they were not only excited to eat the food that was prepared, they began trying new foods.

Previous recommendations state that interventions aimed at influencing health related behaviours among children are most effective when a systems approach is employed to address various factors in environments where children live and play (106,132). The use of a systems approach allows for the development of interventions that explicitly focus on the interconnections between different aspects of the environment and between individuals in the environment, while also identifying and addressing between level interactions (e.g., individual, interpersonal/ family, institutional, community and policy) among various factors (14,87).

Although, Healthy Start is a multilevel, multicomponent intervention that systematically targets both individual level and environmental level factors influencing health related behaviours among early years children, it primarily focuses on the childcare centre environment and not on the home environment. Thus, because eating patterns at home influence children's eating behaviours in childcare (15), the Healthy Start intervention could have a larger impact if it targeted parents and educators simultaneously to ensure that both groups are consistently modeling and promoting healthy eating.

Provincial legislated nutrition policies are designed to provide guidelines for childcare centre menus and ensure that children are served nutritious meals. As described previously, menu reviews were based on these provincial nutrition guidelines. However, these guidelines are quite broad and the nutrient quality of food served is not emphasized. For example, some comparison group centres served hot dogs, hot dog buns, French fries, carrot sticks and juice for lunch; and this meal was scored as meeting the nutrition guidelines because it contained all four food groups. Therefore, provincial nutrition policy should be improved to contain more specific information about the nutritional value of foods. For instance, research conducted by the American Dietetic Association suggests that menus in childcare centres should adhere to the specific nutrient needs listed in Recommended Dietary Assessment (RDAs) and Dietary Reference Intakes (DRIs) for children (133). Furthermore, it is recommended that all meals and snacks served in childcare centres limit added sugar, fat, cholesterol, and sodium, nor should fried foods be served. In order to ensure that more specific nutrition guidelines are implemented in Saskatchewan childcare centres, changes will need to be made to the current policies. In addition, educators and cooks would have to be well educated on how to implement and adhere to these provisions.

Study Strengths and Limitations

Among the strengths of this study was the fact that a wait-list comparison designed was employed to evaluate the Healthy Start intervention. The use of a comparison group allowed me to conclude with more certainty that changes associated with healthy eating among the intervention group was likely attributed to the Healthy Start intervention. Additionally, a wait-list ensured that the centres in the comparison group were also provided the opportunity to implement Healthy Start if they wished to receive the initiative.

Research shows that rural residents, including childcare centres face unique challenges when attempting to access a variety of affordable fresh produce year round. Moreover, childcare centres often have financial constraints which influence their ability to offer a variety of healthy foods to the children. A second strength of Healthy Start was that it was innovative in incorporating strategies to help educators in overcoming challenges associated with healthy eating in rural communities. To our knowledge no other interventions have been implemented to address the unique challenges and increase healthy eating in Canadian rural childcare centres.

As with any research, there were limitations to this study. The most obvious limitation was the small sample size, although less of an issue in qualitative research, this proves to be problematic when employing quantitative methods. For instance, the small number of participants likely contributed to the overall lack of significant results. Even when differences appeared to be large, the *p*-values indicated that differences were not significant. Furthermore because convenience sampling was used the findings are limited to the sample population and the childcare centres that participated in the study.

In some centres engaging cooks was a challenge. For instance, some centres used a rotating menu that had been developed and approved by centre directors, prior to the intervention

implementation. Cooks and centre directors explained that they followed the menus very closely. Therefore the cooks in the intervention centres were resistant to making large menu revisions to incorporate recipes and suggestions provided in the Healthy Start resources. As such, menu reviews may not have accurately portrayed the potential effectiveness of Healthy Start on supporting educators and cooks to regularly provide a variety of healthy foods to children. Parental engagement was also a challenge. Although efforts were made to encourage parental participation, they were largely unsuccessful. As such, future work associated with the promotion of healthy behaviours should focus on cook and parent engagement and participation.

In relation to measurement, there was no direct measure of children's eating behaviours; rather, I relied on educator observations. Although measures were taken to minimize this limitation (e.g., direct observation) more accurate and rigorous measures of children's eating behaviours would have been beneficial. For example, a plate waste study at various time points throughout the intervention would have provided detailed information about exactly what and how much children were eating while in childcare (134). In turn, this would provide more accurate results about the effectiveness of Healthy Start on children's eating behaviours.

Lastly, I had initially intended to carry out one-on-one interviews with educators in both intervention and comparison childcare centres and the use of mixed methods was intended as a strength of the intervention. However, due to a number of logistical challenges (person power, time, and childcare centre schedules) I was only able to carry out one-on-one interviews in the intervention centres. As a result, direct observation was the only qualitative method employed in both the intervention and comparison centres and this method did not provide sufficient information to be a standalone result. Thus, as previously discussed, the educator interviews were only carried out in the intervention centres to determine fidelity and educators' experiences

and perceptions of Healthy Start. In addition, direct observations were used to supplement the interviews.

6.6 Conclusion

According to educators, Healthy Start was a creative and influential intervention that supported the provision of healthy eating opportunities for early years children. Moreover, all participants indicated they would recommend Healthy Start to other childcare centres. Although results from the quantitative analysis were non-significant, there was an obvious trend indicating that centres in the intervention group increased healthy eating opportunities offered to early years children.

This study is important because it indicates that a multilevel intervention can effectively be implemented within childcare centres in rural communities. Although previous interventions have been carried out in Canadian childcare centres, to our knowledge this is the first study to use a wait-list comparison design to conduct a 48 week evaluation of an intervention targeting healthy eating among rural early years behaviours children (74,135). The lessons learned in this study can be used to improve the Healthy Start intervention so its implementation can effectively be expanded to childcare centres within and outside of Saskatchewan, in turn, supporting the healthy development of early years children in the province and beyond.

PRELUE TO PAPER 3

The primary purpose of this research was to evaluate a multilevel community-based physical activity and healthy eating intervention (Healthy Start) in rural childcare centres in Saskatchewan. Paper 3, which is presented as a publishable manuscript, will discuss the results of the third thesis objective that is the implementation, evaluation and results of piloting a pulse crop intervention in one of the childcare centres receiving the Healthy Start intervention. The pulse crop pilot was a sub-study within the Healthy Start intervention. This paper will address the following objective 3 sub-objectives:

- a) Increase knowledge and awareness about the nutritional value and health benefits of pulse crops among childcare staff (educators and cooks).
- b) Support childcare staff in providing children with more opportunities for pulse crop consumption.
- c) Expand the variety of healthy foods consumed by early years children by incorporating locally grown pulse crops into the childcare centre meals.

Paper 3 will report on the feasibility of implementing a pulse crop intervention in rural childcare centres and discuss the influence of the pulse crop pilot on enhancing the healthy eating component of Healthy Start. This paper will conclude with key learnings and provide recommendations for incorporating locally grown foods as an avenue for promoting healthy eating in childcare centres and among early years children.

CHAPTER 7

Paper 3

The introduction and methods sections below may repeat key aspects of the review of literature or the general methods section directly pertinent to the purpose of the study.

Title: Supporting Healthy Eating Among Early Years Children: A Pulse Crop Pilot

Intervention Study

7.1 Introduction

Current statistics indicate that 15.2% of Canadian children ages 2 to 5 years are overweight and 6.3% are obese (10) Young children who are overweight have an increased risk of being overweight or obese in later childhood and may follow a trajectory of life-long of unhealthy weight, in turn resulting in ill health (12). Dietary patterns have been identified as a proximal determinant of an individual's weight. Current research indicates that diets of Canadian early years children are low in fibre, high in fat, lacking in fruits and vegetables, and are excessively high in processed foods that have little nutritional value (7)

In Canada many young children attend childcare centres. Experts have identified childcare centres as the ideal environments for examining and influencing behaviours (e.g., dietary patterns) of children and their educators (136). Childcare staff often struggle to regularly meet the government legislated nutrition policies (58). For example, some educators and cooks indicate that they lack knowledge and ideas for preparing healthy meals and snacks, and that the cost of fresh and non-processed food makes it difficult to incorporate healthy foods into

childcare centre meals. Thus, it would be useful to provide educators with tools and suggestions for cost effective ways to provide healthy options to children.

Research suggests that consuming locally grown foods can have health and economic benefits (51). Canada (particularly Saskatchewan) is a worldwide leader in pulse crop production (53). Pulse crops refer to beans, chickpeas, peas and lentils (7) and they are a versatile food that contributes to a nutritious and balanced diet (51). For example, pulse crops contain a wide range of important nutrients, including dietary fibre, vegetable protein, unsaturated fat, vitamins and minerals such as folate, vitamin B and folic acid (53,56). In addition, they also contain potentially beneficial non-nutrients, such as antioxidants and phytoestrogens that may help in the prevention of hormone-related cancers, such as breast and prostate cancer (4). Consuming diets high in fibre, protein and low in fat contributes to a balanced diet and protects against developing many chronic diseases such as obesity and diabetes (55). In addition to the health benefits of consuming pulse crops, economic benefits have also been identified. Specifically the production of locally grown crops employs local farmers, processors, distributors, grocery retailers, and in turn provides inexpensive and readily available healthy food for consumers and institutions in local communities (3,8).

Experts suggest that meal plans which place a stronger focus on expanding healthy dietary choices, rather than controlling the amount of food served, will have greater long-term success in promoting healthy weights (137). Incorporating pulse crops into the menus at childcare centres would be an avenue for expanding the variety of healthy foods offered to children. A pulse crop intervention was developed and piloted tested in a rural childcare centre.

7.1.1 Purpose

The purpose of this pilot study was to evaluate a pulse crop pilot intervention developed to expand the variety of healthy dietary options provided to early years children in childcare centres. In order to achieve the primary purpose the study objectives were to determine if the intervention:

a) Increased knowledge and awareness about the nutritional value and health benefits of pulse crops among childcare staff (educators and cooks).

b) Supported childcare staff in providing children with more opportunities for pulse crop consumption.

c) Expanded the variety of healthy foods consumed by early years children by incorporating locally grown pulse crops into the childcare centre meals.

7.2 Pulse Crop Intervention

The pulse crop intervention was carried out for 28 weeks. The intervention involved providing the educators with information about where pulse crops are grown, the nutrient quality of pulses and the numerous health benefits of consuming pulse crops. Educators were also trained in how to cook and bake with pulse crops. They received a book containing quick, simple and healthy pulse crop recipes and instructions for cooking and baking with pulses. Educators were provided with a supply of pulse crops and asked to incorporate pulse crops into their weekly menus. Additionally, educators were given ideas for fun activities that teach children about pulse crops such as, where pulses are grown and why pulse crops are a healthy food. Over the course of the intervention I was in regular contact with the educators and as an incentive to keep educators engaged, I sent new pulse crop recipes each month. During visits to the childcare centre, I also brought homemade pulse crop granola bars for children and staff.

7.3 Methods

7.3.1 Design

A pre and post 28 week intervention design was used to evaluate the pulse crop intervention on increasing childcare staff knowledge and awareness about pulse crops, supporting staff in incorporating pulse crops into centre menus and increasing pulse crop consumption among children. This was a sub-study of the larger intervention (Healthy Start) aimed at increasing physical activity and healthy eating opportunities provided to early years in rural childcare centres. The healthy eating component of Healthy Start was not focused on increasing pulse crop consumption. The larger study used a wait-list comparison design (48 weeks delayed-intervention) to implement the intervention in 6 childcare centres. Three childcare centres made up the intervention group and three different centres made up the comparison (e.g., wait-list) group. One of the intervention centres received the pulse crop intervention in addition to their participation in the larger study.

7.3.2 Settings and Participants

A licensed childcare centre was identified through connections established in previous work with this centre. The childcare centre was located in a rural community (approximate population 1500) in the province of Saskatchewan. The participants included full-time female educators (n=4) aged 35 to 50 years old. The educators had received their diplomas in Early Learning and Childcare (level 3) and had worked at this centre between 5 and 20 years. One of the educators included was the centre director, who started the childcare centre. At this particular centre the educators also did the cooking (e.g., there was not a centre cook). This centre was licenced for 30 children, however only about 25 children between the ages of 2 and 5 years were exposed to the pulse crops intervention.

7.3.3 Data Collection

Both quantitative and qualitative approaches (e.g., mixed methods) were used to evaluate the impact of the pulse crop intervention and address the study objectives. Quantitative and qualitative data were collected concurrently.

7.3.4 Pulse Crop Questionnaire

Pulse crop questionnaires were completed in order to determine educators' knowledge and awareness about pulse crops and their use of pulse crops, both in their personal lives and at the childcare centre (e.g., Are pulse crops high in fibre and a good source of plant based protein? Do you incorporate pulse crops into meals at your childcare centre or at home?). The questionnaire also contained questions that pertain to pulse crop consumption among early years children in their care centre. Educators took approximately 10 minutes to complete the questionnaires which were administered pre and post intervention. This questionnaire was adapted from the D.A.I.L.Y. Project, a study aimed at increasing pulse crop consumption among youth in Saskatchewan (59).

7.3.5 Menu Review

The menus were collected and reviewed at three time points (pre, mid and post intervention) to confirm information gathered in the questionnaire about educators' use of pulse crops in the centre. Essentially, by reviewing the menus this allowed me to determine, to what extent the childcare centre was incorporating pulse crops over the course of the intervention.

7.3.6 Educator Interviews

One-on-one interviews were conducted with the childcare centre staff to determine awareness and knowledge about pulse crops and the importance of healthy eating, particularly during the early years. Additionally, participants were asked to describe their experiences with

implementing the pulse crop intervention in their childcare centre and incorporating pulse crops into meals. Lastly, educators were asked if they observed changes in children's eating behaviours over the course of the intervention. A semi-structured interview guide containing open ended questions was used to guide interviews.

7.3.7 Data Analysis

Pre and post intervention pulse crop questionnaires were scored and compared to identify changes in educator's knowledge, awareness and use of pulse crops in the childcare centre. Questionnaires were scored out of 186 potential points. A paired samples *t*-test was performed to compare pre and post intervention scores. All statistical analyses were carried out using IBM SPSS Statistics 20 for Windows (138). Data were considered statistically significant if a 2-tailed *p* value of less than 0.05 was reported.

Menus were reviewed pre, mid and post intervention to determine if staff increased opportunities for children to consume pulse crops over the course of the intervention. Lastly, one-on-one educator interviews were transcribed verbatim. Interview transcripts were reviewed to determine educator's experiences with the pulse crop intervention and to determine children's acceptance and consumption of pulse crops. Quotes from participants were chosen to provide an example of responses given during the interviews.

7.4 Results

7.4.1 Pulse Crop Questionnaire

There was a significant improvement in the educators' (*n*=4) pulse crop questionnaire scores from pre intervention $t(3) = -6.67, p < 0.05$ ($M = 99.63; SD = 9.38$) to post intervention ($M = 128.36; SD = 17.99$) (Figure 7). This indicates increases in educator knowledge and awareness about pulse crops including how to cook them and their health benefits. This also

suggests that educators began incorporating pulse crops into their diets and meals served at the childcare centre.

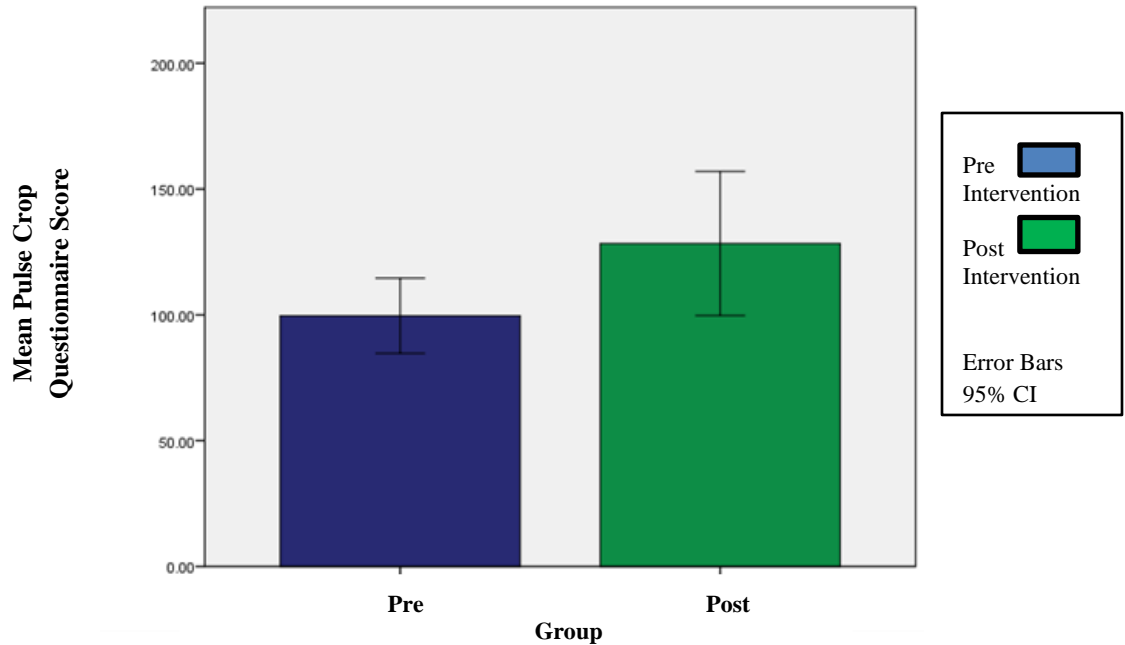


Figure 6. Pre and post intervention Pulse Crop Questionnaire mean scores.

7.4.2 Menu Review

Results from the pulse crop questionnaires were also reflected in the menu reviews. Specifically, menu review results indicated that over the course of the intervention, childcare staff went from (pre intervention) never serving pulse crops to serving pulses on a weekly basis (post intervention).

7.4.3 Educator Interviews

One-on-one interviews were carried out with all educators in the intervention centres who received pulse crop cooking training (n=4). The interviews provided an avenue for understanding

educator's perceptions of how the pulse intervention influenced their ability to provide opportunities for consuming pulse crops.

Educators stated that pulse crop recipes were easy to follow and helpful in increasing the incorporation of pulse crops into childcare centre menus. They explained that the variety of recipes encouraged staff to provide pulse based meals. "We incorporate pulse crops into the centre menu at least once a week now."(S1) A number of childcare staff also indicated they began using pulses in meals they prepare for their families. "I always liked beans and lentils, but my children and husband never really ate them before, but now they will eat them."(S2) Educators were very engaged in the intervention and felt that the pulse crop recipes provided a variety of cost effective and creative healthy options. In fact staff began collecting pulse recipes on their own and had compiled a large selection of recipes by the end of the intervention. According to staff almost all children were willing to try the new pulse crop recipes and most children stated that they liked the new foods being served. "The children really like the pulse baking."(S2) Educators were particularly pleased with lentils and pulse crop granola bars that I brought to the centre. Staff explained that at first they were not sure pulse crop baking would taste good, but they were impressed when they tried the granola bars. This encouraged educators to begin baking pulse based snacks regularly. Furthermore, they began engaging the children in baking with pulse crops. "As we are baking with the children we have talked to them about what pulse crops are, where the crops are grown and why pulses are so healthy."(S3)

7.5 Discussion

Overall, the pulse crop intervention was effective in: increasing educator knowledge and awareness about the nutrient content and health benefits of pulse crops; supporting educators to

increase opportunities for pulse crop consumption in the childcare centre; and promoting pulse crop consumption among early years children in childcare.

Results indicate that prior to the pulse crop intervention childcare staff knew very little about the nutrient value of pulse crops and they did not feel comfortable cooking or baking pulses. Some educators indicated they rarely (less than once a month) used pulse crops in meals they ate at home and they never incorporated pulse crops into meals at the centre. However, following the 28 week intervention results from the pulse crop questionnaire, menu reviews and interviews clearly indicated that childcare staff had increased their knowledge and use of pulse crops. Educators felt that the use of pulses in baking was a great way to not only expand the variety of food served to children, but also reduce fat and increase the nutritional value of many snack foods served to the children. Research suggests that children develop many of their eating patterns and food preferences during their early years (46). As such, if young children become accustomed to eating nutritious foods they will likely continue to engage in healthy dietary patterns later in life. Furthermore, if young children develop a palate for pulses they will likely ask their parents to cook pulse based meals. In turn, families may begin consuming pulse crops, thus increasing the demand on the local pulse market.

Although children's eating patterns were not directly measured, childcare staff indicated that most children really enjoyed the pulse-based foods. Educators explained that a number of the children's parents were grain producers. Thus they explained to children that the pulses they were eating may have been grown at their family farm and in the fields surrounding their house and community. Children were very interested in this link and educators felt that it encouraged the children to try the foods containing pulse crops. Overall, results suggest that the pulse crop intervention supported educators in incorporating pulse crops into meals served to children, in

turn improving healthy eating behaviours among children by introducing them to a variety of healthy pulse based foods.

Study Strengths and Limitations

Among the strengths of this study was the use of mixed methods, as this design allowed for a comprehensive evaluation of the pulse crop intervention. Specifically, the quantitative methods allowed me to objectively measure the changes in educator knowledge, awareness, consumption and use of pulse crops over the course of the intervention. The qualitative methods assisted me in gathering rich, in-depth and contextualized information about educator perceptions and experiences with the intervention and its effectiveness. Combined, this provided a more complete picture of the intervention's impact. Another strength of this intervention is its low cost and simplicity. For example, educators indicated that the implementation was straightforward and uncomplicated and the corresponding resources (including the pulse crops) are relatively inexpensive. Therefore, if implemented as intended this intervention can provide an avenue for young children, their educators and families to access affordable, locally grown healthy food year round.

As with any study there are limitations to this research. The most obvious limitation is the small unrepresentative sample size of this pilot project. As such, the results of this study cannot be generalized to the larger population. However, because the intervention was being implemented for the first time it was beneficial to conduct a pilot study with a small sample. A pilot study is typically part of any good research and it tests the logistics, feasibility and gathers information prior to a larger study (139). This in turn allows researchers to improve quality and efficiency of the intervention. A pilot study can also reveal deficiencies in the design and as such, these can then be addressed before time and resources are expended on large-scale studies

(15). A second limitation was the lack of direct measure of children's pulse crop consumption. Rather, data collection relied on educator observations and feedback. More accurate and rigorous measures of children's eating behaviours would have been beneficial as it would have allowed me to directly measure how often and how much pulse crops children were consuming.

7.6 Conclusion

In conclusion this study shows that a pulse crop intervention in childcare centres is feasible and can have an impact on increasing educators' knowledge and awareness of pulse crops, and in supporting educators to providing children with opportunities for pulse crop consumption. This research is important and innovative because, to my knowledge, no studies have focused specifically on increasing the consumption of locally grown pulse crops among early years children in Canada. The information gathered can be used to further develop the intervention so that it can be effectively implemented on a larger scale in many childcare centres, in turn supporting the development of lifelong healthy eating patterns among early years children in Saskatchewan and beyond.

CHAPTER 8

Reflections

In this chapter I offer my reflections on the challenges, successes and lessons learned while implementing and evaluating Healthy Start and the Pulse Crop Intervention in rural childcare centres.

For as long as I can remember, I have had a passion for promoting the health of early years children. I am particularly interested in understanding how physical activity and healthy eating can be used to facilitate healthy growth and development. I also grew up in a rural community, and know firsthand that individuals in rural communities face a number of unique challenges when attempting to engage in healthy behaviours.

As previously discussed, this research journey began while completing my Honour's undergraduate degree. I investigated barriers and facilitators influencing urban educators in the provision of physical activity and healthy eating opportunities for early years children. I expanded this study into rural childcare centres during my Master's research. This research helped me to identify specific factors that should be addressed when developing strategies aimed at supporting rural educators in promoting and engaging in health promoting behaviours with children in their care. Following my Master's and Honour's work, where I observed the critical role that educators can play in the lives of early years children, I had a strong desire to pursue doctoral research aimed at supporting educators to promote healthy behaviours and in turn support growth and development of early years children.

Initially, I turned to the literature to identify already existing interventions; lessons learned by previous researchers and determine key elements and effective strategies that should be considered when implementing interventions within a childcare centre. It was obvious that

understanding and promoting physical activity, healthy eating and healthy weights during the early years constitute a growing body of research, as a number of Canadian studies have recently been published or are currently underway in urban childcare settings (35,43,67,74,112,140).

Researchers state that effective interventions aimed at promoting the health of early years children would do well to target both physical activity and healthy eating (49), as these behaviours have been identified as proximal determinants of obesity among children, youth and adults. In addition, experts suggest that in order for interventions to influence behaviour change and be sustained over time, they should include strategies for targeting both individual level (e.g., children, educator and parental behaviours) and broader contextual factors (e.g., economic factors influencing accesses to resources and public policies to promote behaviours) (86,88).

Another common element which I identified in the literature was that community-based interventions should be conducted in partnership with participants including practitioners, educators and policy-makers (86,141). However, limited research discussed and reflected upon the lessons learned and the various challenges that can arise when attempting to engage in partnership and specifically while working with early years children, their families and educators.

This chapter provides an opportunity for me to summarize my reflections throughout my research journey. It may also be helpful for those embarking on similar journeys as I discuss a number of underlying challenges and lessons that are rarely reported in academic writing. Thus, from the viewpoint of a community-engaged student scholar, the goal of this self-reflection is to return to some of the key challenges and successes, and elaborate on the thought processes and decisions that I had to work through while completing my doctoral research.

8.1 Challenges and Successes during the Implementation and Evaluation of Healthy Start

After reviewing the data collected during the evaluation (e.g., my field notes and participant interview transcripts, environmental scans, accelerometer files, TGMD II scores and menu reviews), I identified common themes to represent challenges, successes and key learnings that arose during the research process.

8.1.1 Individual and Interpersonal Factors

Engaging educators. Childcare educators play an integral role in the development of early years children. Often educators feel pressure to spend a significant portion of their time with children preparing them for elementary school by devoting a large part of the day to activities such as reading and writing. In some centres it was difficult to encourage educators to commit to focusing on promoting physical activity and healthy eating through the implementation of Healthy Start. Moreover, if childcare centre directors were not committed and engaged in the intervention, it was also difficult to elicit educator participation.

When Healthy Start was first implemented, educators explained that although they knew physical activity was important for promoting healthy lifestyles, they simply did not feel comfortable engaging in physical activities with the children. Some educators explained that they were not physically active in their personal lives, or they had never learned basic skills such as how to properly throw or kick a ball. Booster sessions were incorporated midway through the intervention implementation, and this seemed to be helpful in encouraging a number of educators to begin engaging in physical activities with the children.

In relation to healthy eating, educators felt that it was important to introduce children to a variety of foods at a young age. However in some centres, educators felt they had little impact on the children's eating behaviours because they were not involved in the food preparation as this

was the cook and director's role. During the Healthy Start training, I attempted to help educators feel empowered in their abilities to educate the children about healthy foods, even if they were not directly involved in food preparation. For instance, during the training educators were provided with information and resources about the nutritional benefits of a variety of foods suggested in Canada's Food Guide. Additionally, they were given recipes for preparing a wide variety of healthy foods and ideas for including the children in the preparation process. Using these resources as a template, I worked with educators to help them come up with their own ideas of how to incorporate specific food items from Canada's Food Guide into not only meals, but also fun activities for the children. Specifically, educators were asked to complete an activity where they had to develop a lesson plan that focused on teaching children about one food in particular, including where the food came from, why it was a healthy choice and how to prepare the food. In doing these activities my main goal was to help educators see that they were really the experts in caring for early years children, not me. As such, by engaging in these activities and coming up with their own ideas, educators were able to increase their confidence and feel empowered. Following the training and midway through the intervention, some educators told me they made more of an effort to model healthy eating behaviours and began eating lunch with the children rather than bringing their own lunch.

Although increases in physical activity and healthy eating opportunities were reported by the educators post intervention, further attention needs to be given to building relationships with educators and directors, and empowering them to feel comfortable engaging in and promoting physical activity and healthy eating among the children.

Working with early years children. Although a number of studies have reported on the complexities of working in schools and measuring physical activity levels and dietary patterns

among school aged children, limited information exists about working with children under the age of 6. While attempting to evaluate the impact of the intervention on children's behaviours, I was faced with challenges that were unique to working with early years children. For instance, parents and educators found difficult to encourage the children to wear the accelerometers by the final data collection. Parents explained that children were "tired of wearing the belts" and they did not have time to reason with their children in the morning to convince them to wear the accelerometer. Thus, as a consequence during the final data collection I did not get physical activity measures for a number of the children.

Measuring dietary intake among early years children is significantly more complicated than measuring such behaviours in older children. This is due in part to the fact that young children are unable to complete commonly used self-report questionnaires and dietary recalls. Thus, in order to get a direct measure of what children in childcare are consuming, I would have needed to use costly and time consuming methods such as food waste plate weighing measurement(134,142). Unfortunately, this was a pilot study and limited funding and research staff restricted the use of such methods. Therefore I was only able to indirectly evaluate healthy eating behaviours of children through menu reviews, educator interviews and direct observation. Essentially, I assessed what was offered, but I was unable to determine what or how much was actually consumed by the children. As such, it was challenging to obtain an accurate evaluation of the impact of Healthy Start on children's healthy eating behaviours. However, I was able to spend time in the childcare centres where I observed foods that were served and the children's behaviours and interactions with their peers and educators during mealtime. Additionally, I had a number of informal, but informative conversations with educators about eating practises and behaviours in the childcare centres.

8.1.2 Institutional Factors

Childcare centre practises and lesson planning. All childcare centres in Saskatchewan are expected to follow provincial guidelines and a program called *Play and Exploration*, which is a philosophy for practises focusing on child directed learning within childcare centres (143).

However, the extent to which individual centres follow these guidelines and practises varies. For example, some centres have educators fill detailed daily lessons plans, documenting all activities. Conversely, in other centres educators are only required to provide a general weekly overview. In order to address these differences among centres and gather the necessary information for evaluation, a simple template for lesson planning that included a section for HOP activities was developed in consultation with the educators. This was a way to collaborate with the centres and ensure that both the educators and I could easily accomplish and benefit from evaluation activities.

Another difference among childcare centres was that some had cooks and in other centres the educators took turns preparing meals. Currently, the healthy eating component of the intervention is tailored for supporting educators to promote healthy eating. Results indicated that Healthy Start was effective in increasing healthy eating opportunities particularly when it was implemented in centres where educators prepared meals. For example, the menu reviews conducted following the Healthy Start training indicated that recipes found in Food Flair were incorporated into the weekly menus. Additionally, one centre began collecting healthy recipes that incorporated fruits and vegetables into meals.

This trend was not observed in centres where cooks prepared the meals. When educators did the cooking, they explained that they had a lot of flexibility in meal preparation and accessing the kitchen, making it easy to involve the children in preparing various foods. As such,

the educators reported using a number of the Food Flair activities which focused on including the children in meal preparation. Conversely, educators in centres with cooks stated that it was difficult to involve children in food preparation because the cook had a limited amount of time to get the meals prepared for the children. Moreover, some cooks were not open to having the children help in preparation as they felt it caused too much chaos in the kitchen and slowed down their productivity. Thus, they were not interested in using the resources that considered and encouraged involvement of children in food preparation. As a result fewer improvements were observed in meals served in childcare centre menus and cooks in these centres reported that they rarely incorporated the Healthy Start recipes into meals served in their centres.

Although the Healthy Start intervention effectively engaged and supported educators in promoting healthy eating, it did not employ the appropriate strategies for working in centres with cooks. It was apparent that childcare centres with cooks had different practises and schedules which did not fit well with a number of the intervention methods for increasing healthy eating opportunities. In the future we need to work more closely with childcare centre cooks and centre directors to revise the implementation procedures of Healthy Start and obtain their assistance in developing strategies that consider the differing routines and challenges arising in centres where cooks (not educators) prepare the food served.

Access to a variety of affordable foods. Providing healthy meal options for children typically involves incorporating a variety of healthy fresh foods into the childcare centre menu. However, access to a variety of fresh produce was a common issue reported by childcare staff and this is often a challenge for individuals living in rural communities (133,144,145). Moreover, the available fresh foods can be very costly, particularly in the winter and spring seasons. Thus, before expanding Healthy Start into rural communities, the healthy eating component was

revised and tailored to address the unique needs of rural childcare centres. Specifically, recipes were added to Food Flair that incorporate in-season fresh produce and nutritious locally grown foods such as lentils and chick peas. Additionally, centres were encouraged to start a garden. One childcare centre did start a garden and educators explained that children enjoyed picking the fresh produce from the garden. Educators at another centre began bringing vegetables from their home gardens, and the children participated in preparing meals with the fresh produce.

Overall, educators felt these strategies were helpful in increasing the healthy eating opportunities provided to early years children and although not statistically significant, obvious improvements in menus were observed from baseline to endpoint among the intervention centres. I believe a greater impact could be made on improving the menus in childcare centres by focusing on developing strategies and recipes for incorporating the foods which are accessible year round in rural communities. For example, a number of different recipes could be provided that incorporate pulse crops and specific fruits and vegetables which are commonly found in rural grocery stores (apples, oranges, carrots, potatoes), and a variety of frozen fruits and vegetables.

Flexibility, fidelity and rigorous evaluation in childcare centres. When carrying out any community-based research the realities of everyday life and working in an uncontrolled environment must always be considered. I quickly learned that as a researcher going into others environments, I had to be somewhat flexible when implementing an intervention and planning data collection. However, I also had to remember that in intervention research following standardized procedures is important when ensuring fidelity to the intervention and necessary when evaluating the intervention's impact on behaviour change. I did my best to manage the constant balancing act between accommodating specific needs of participants and following

standardized procedures across various settings with differing contextual factors. Even so, all challenges related to implementation and evaluation procedures could not be avoided.

A main issue that arose was centre variations in compliance to the intervention. For example, some centres were very compliant and followed all implementation procedures. Conversely, other centres struggled to comply with the intervention guidelines because of issues such as staff turnover. For instance, in some cases those who participated in the Healthy Start training at the onset of the intervention had left the centres midway through the study, and thus the new educators hired were not familiar with Healthy Start. Although booster sessions were carried out to help address this issue, in some cases the new staff arrived after the booster session was held or they simply needed more comprehensive training than was provided in the booster session.

Another reason that centres struggled to comply with the intervention may be related to the fact that childcare staff were not invited to play a participatory role in the development of Healthy Start procedures and resources. Although educators and centre directors were consulted during the development phase, they were not invited to be actively involved until the implementation of Healthy Start. Educators and directors could have been given an opportunity to actively participate in the development of Healthy Start. For example, childcare staff could have participated in working groups that designed specific aspects of the intervention or at least provided feedback on various components of Healthy Start as they were being developed.

In terms of evaluation, it was difficult to evaluate the impact of Healthy Start on children's gross motor development. One of the main challenges that arose during the TGMD II testing was following the specific protocol for a number of skills because a number of the children simply couldn't complete the skill (e.g., dribbling and batting a ball) or they did not

have the patience to participate in the various skills. Another issue was that a number of children were away or had left the centre and were not present on the day I had scheduled post intervention testing, and other children simply did not want to participate. As a result I was only able to gather pre and post intervention TGMD II scores for a small number of the children. Thus, TGMD II results may not have been a good representation of changes in children's motor skills over the course of the intervention. Currently, TGMD II is a commonly used measure of gross motor skills and is recommended by those working with children, including early years (43,67). To my knowledge there is limited research on the few tools that have been or are being developed to measure gross motor skills specifically among early years children. Thus, for individuals using TGMD II among early years children, I would suggest testing a selected number of the skills and focus on the skills most early years children are able to complete. According to the tool's creator (Dr. Ulrich), this is a viable option when working with early years children as long as the same skills are tested each time and one provides a rationale for selecting specific skills. Doing so would also address the second challenge I identified, as it would shorten the testing time and children may be more likely to stay focused and participate.

A second barrier related to evaluation was trying to schedule concurrent data collection at both intervention and comparison centres. For example, data collection time points were initially planned for the same weeks in both groups; however some centres rescheduled at the last minute due to absence of staff or scheduling conflicts. It was important that I was flexible and worked with the childcare centres to accommodate their schedules, while also keeping in mind that all centres needed to engage in the same standardized evaluation procedures.

I found that a key to keeping this equilibrium between flexibility and standardized procedures was developing strong partnerships and building trust with the participating childcare

centres. Additionally, during the baseline data collection and during the early stages of implementation I began working with educators to problem solve and find solutions to issues that arose among the centers throughout the research process. In many cases educators took the lead on suggesting solutions. I was able to learn from their ideas and then reuse and adapt these strategies to address similar challenges that arose in other centres as the study was rolled out.

8.1.3 Community Factors

Parent engagement. During the intervention, I learned that developing partnerships with parents is equally as important as engaging educators. Early on in the intervention it became obvious that a main shortcoming of Healthy Start was that it lacked a specific strategy for engaging parents and ensuring their active participation in the intervention. I primarily attempted to interact with parents at the end of the day when they were picking up their children, and this was not a good time as parents were hurrying to get home or to extracurricular activities. Although parents indicated that they felt Healthy Start was a good initiative, they were not fully able to participate because they were very busy with work and extracurricular activities. As such, parents felt they did not have the time or energy to familiarize themselves with the intervention activities. As a result, parents were less engaged than I had hoped and this made building capacity to expand Healthy Start beyond childcare centres into the home environment particularly challenging. Moving forward, researchers need to work more closely with educators and particularly parents to develop appropriate and effective methods for expanding Healthy Start from the childcare centre to the home.

Some unique aspects of rural communities could be used to facilitate researcher and parent partnerships. For example, parents typically interact with educators outside of the childcare centre at community activities (e.g., sporting events and community clubs). As such,

parents typically trust and respect educators' opinions on issues related to their child's behaviours and preferences. These relationships could be beneficial in bringing researchers, educators and parents together to determine how Healthy Start can effectively be used by parents to promote physical activity and healthy eating in the home environment.

Connections among educators in neighbouring communities. Childcare centres in neighbouring rural communities often have regular communication. Centres in the same region typically meet on a monthly basis and have a strong support network. These meetings involve sharing information among educators such as new programs, activities and recipes. This common practice should be built upon because community connections will be instrumental in expanding Healthy Start to other rural childcare centres across the province. In fact, participants already using Healthy Start have recommended it to their colleagues in neighbouring communities.

8.1.4 Policy Factors

Influencing policy. As with any effective intervention aimed at behaviour change, one of the main goals may be to influence policy at some level (local, provincial or federal). However, this is a complex and challenging undertaking that often takes years of research and negotiation with government.

In the province of Saskatchewan, there is a government legislated nutrition policy for childcare centres. However, no physical activity policies currently exist in Saskatchewan for childcare centres. The recommendations in Healthy Start do, however, support the new physical activity and sedentary behaviour guidelines for early years children developed by the Canadian Society for Exercise Physiology (CSEP) (26,27). Educators from all centres agreed that provincially legislated guidelines for physical activity should be implemented in childcare centres. Given that Healthy Start had a positive impact on both opportunities for physical activity

and physical activity levels among children, this should provide evidence to support the development of a policy for physical activity in childcare. For example, educators reported that HOP not only gave them ideas for physical activities, but it also supported their participation in the activities with the children. Furthermore, accelerometry data reflected an increase in physical activity levels among children in the intervention group over the course of the intervention. Thus, although a provincial policy on physical activity has not yet been developed, Healthy Start has taken a very important first step by getting the educators on board to advocate for such a policy. Moving forward, researchers should partner with provincial policymakers and attempt to mobilize government in developing a policy for physical activity and sedentary behaviour in childcare centres.

Training of educators. In the early childhood educator (ECE) training program there is limited instruction on including lessons about the importance of physical activity during the early years. This could be directly linked to the fact that there are no provincial physical activity policies for licenced childcare and thus program developers do not feel focusing on physical activity is necessary.

When I asked educators about the focus of the ECE curriculum, they explained that a great deal of instruction is given on how to teach children their numbers, letters, writing, colouring and cutting; with limited attention given to the promotion of gross motor development and physical activity. Educators felt it would be helpful to learn how to properly engage in various fundamental motor skills themselves and how to improve motor skills among early years children. A number of educators told me that they know motor skill development is important for promoting physical activity; however educators were not familiar with all the motor skills and did not feel comfortable modelling them to children. Thus, there should be policies developed to

ensure that provincial ECE training programs include a component that focuses on preparing educators to model and promote physical activity.

8.2 Key Elements to Consider when Implementing and Evaluating Interventions in Childcare Centres

In addition to the themes discussed above, I identified three key lessons I learned while developing, implementing and evaluating this community-based intervention.

8.2.1 Individual and Broader Contextual Factors at Multiple Levels

The use of the ecological model was beneficial as it allowed for both individual level and social environmental factors influencing physical activity and healthy eating behaviours of early years children to be considered during both the implementation and evaluation of the intervention. Results indicated that Healthy Start was particularly influential in addressing individual and interpersonal factors (e.g., educators' ability to provide opportunities for physical activity and healthy eating) and institutional level factors (e.g., supported childcare centres in meeting nutrition policies and provided ideas for using small areas in the centre environment to promote physical activity). Furthermore, Healthy Start attempted to address underlying social environmental factors (e.g., education of childcare staff on the importance of engaging in health promoting behaviours with the children, ideas of way to increase access to fresh produce and how to incorporate pulse crops, which are affordable and available year round) through applying principles of population health. Specifically, Healthy Start focused on the following principles: providing equal opportunity for individuals to develop and maintain their health; empowering individuals (e.g., children and educators), institutions (e.g., childcare centres) and communities (e.g., participating rural communities) to establish and engage in behaviours that promote their

own health; and promoting participation (by childcare centres) in the development, implementation and evaluation of this initiative (92,141,146,147).

During the evaluation, the ecological model served as a guiding tool in identifying how Healthy Start impacted or did not address factors at each ecological level, from the individual to the governmental level. For example, results indicated that Healthy Start was influential in supporting educators to develop skills and abilities related to physical movement and increase their confidence in providing physical activity opportunities for children. Educators explained to me that they felt empowered in not only taking charge of their own physical activity behaviours, but also in implementing Healthy Start, and thus, modelling and promoting healthy behaviours in their centres. Specifically, during the first interviews many educators stated that because of the lack of a provincial physical activity policy for childcare centres, they were unsure of how much (if any) daily physical activity opportunities they should provide to children. In an effort to help educators understand the importance of daily physical activity, I spoke to educators about the physical activity guidelines for early years, which were released while the study was underway. I also encouraged staff to develop centre level policies for physical activity if they had not already done so.

Although the ecological model was useful in a number of aspects related to both the development and evaluation of this multilevel intervention, there were limitations to its utility. The main limitations were that the ecological model did not consider broader contextual factors. I found the categorization of certain determinants of health and identifying complex interactions between factors at various levels, particularly challenging. For instance, the education of educators was a factor that seemed to influence educator engagement in the intervention. In some centres, none of the educators had completed any level of post-secondary ECE training; whereas

in other centres, all of the educators had some level of training. The educators with ECE level training seemed to have a greater awareness of the provincial nutrition guidelines and understanding of gross motor development during the early years. Thus it was difficult to categorize the factor of education in only one of the ecological levels, as it interacted with other interpersonal (educator behaviours), institutional (centre practises and adherence to policies) and policy level factors (local and provincial).

Finances were another factor influencing the ability of childcare centres to provide healthy opportunities for children. The centres located in the more remote rural communities seemed to have increased financial constraints and limited access to a variety of healthy foods. In addition, fresh produce sold at the community grocery stores was more expensive than the produce sold in the larger rural communities or communities located near a larger urban centre. Thus, this factor was related to institutional, community and policy levels, and it was challenging to know how to categorize, and in turn, how to target and evaluate financial constraints within the Healthy Start intervention.

The incorporation of the population health approach with the ecological model drew attention to broader determinants of health, particularly education and economics, which indirectly influence health related behaviours. The use of the population health approach also assisted in identifying interactions among behavioural and contextual factors at different levels of the ecological model. For example, educator behaviours association with the promotion of physical activity and modeling of motor skills were dependent on the interaction of various factors (e.g., self-efficacy, previous education levels, co-worker and director behaviours and space for active play in the childcare centre).

In order to implement interventions which create environments that support the health of everyone, researchers must develop a good understanding of the broader contextual factors, such as how policies can influence the behaviours of the entire population. (146). The population health approach directs attention to the broader policy level factors that are often difficult to address and emphasizes the role of policy in shifting national or provincial values to support the health of entire populations (146). Experts suggest the design of population health interventions which includes strategies for policy development and change require the co-ordinated action of many sectors working together to improve health and well-being of a population (144). Thus, researchers, policy makers and communities must collaborate to develop effective strategies and policies aimed at supporting behaviour change (86,89,144). This is a long-term goal and a complex process which involves strong and sustained partnerships among communities, researchers, healthcare professionals and government (municipal, provincial and federal).

As Healthy Start was a pilot study, the main goal was not to address broader policy level factors. However, employing a population health approach in evaluating the intervention was a good starting point and a necessary building block on the long road to influencing policy. Specifically, as previously discussed, the findings of my doctoral research highlighted the lack of a government legislated physical activity policy in regulated childcare settings. This emphasized the need for educators, childcare centre directors, parents, researchers, healthcare professionals and policy makers to work collaboratively to not only develop an appropriate physical activity policy for childcare centres, but also strategies for effectively implementing such a policy. An inter-disciplinary partnership would help to ensure that realistic guidelines are established for promoting physical activity in childcare settings and that physical activity recommendations are adequate to support growth and development of early years children.

Many educators explained that it would be beneficial if the ECE diploma program included lessons (based on Healthy Start training) that focused on teaching all new educators the importance of engaging in healthy behaviours, with a particular focus on how to model gross motor skills and engage in physical activities with the children. It became obvious to me that the lack of provincial physical activity policy, which may have been linked to the limited training educators received about *how* to be active with children, made it very challenging for educators to promote and model active play in the childcare centre. To move forward, Healthy Start should also develop a strategy for targeting educational factors influencing educators' knowledge and ability to engage in and confidently promote healthy behaviours. Specifically, based on the feedback from educators in the field, the ECE program needs to be enhanced to ensure that all educators have equal opportunity to receive the training and skills necessary for promoting their own health and the health of children in their care. A training component aimed at educating ECE students on how to promote and model healthy behaviours among early years children would be an ideal avenue for empowering educators, increasing self-efficacy and, in turn, eliciting behaviour change among educators. Currently, Healthy Start does have the support of the ECE program instructors in Saskatchewan, however closer partnerships need to be developed to determine how to best incorporate Healthy Start into ECE training.

Given that Healthy Start was implemented in rural areas, it was important to develop an intervention that considered the various contextual factors associated with rural environments. Each type of community provides a slightly different context, and thus factors influencing behaviours such as economic barriers and access to resources differ depending on the community size. For example, all centres in the intervention were expected to follow the government legislated nutrition policy for childcare centres. However, many centres, particularly those in

small rural communities (less than 10 000) struggled to meet nutritional guidelines on a regular basis because the fresh produce was too expensive and the community grocery store carried very few fruits and vegetables, particularly during the winter and spring months.

Again, given that this was a pilot study, the main goal was not to address broader economic barriers (improving access to fresh affordable produce year round) by making changes to the cost of produce, or the types of fresh foods offered in local rural grocery stores. However, the intervention did educate childcare centre staff on healthy affordable foods including how to incorporate locally grown pulse crops in centre menus. In addition, Healthy Start provided information on seasonal fruits and vegetables and suggested that educators start their own gardens and freeze produce so that centres could offer a variety of vegetables year round. As such, individual and institutional level factors were targeted in an effort to address this barrier to healthy eating in rural childcare centres and communities.

Moving forward the knowledge gained in this study can be used to draw attention to the broader economic factors influencing residents' access to healthy foods year round. I hope to return to the communities and share this information with community members. These discussions may empower and mobilize residents to work with their local municipalities to problem solve and come up with strategies to promote healthy eating year round.

8.2.2 Community Engagement and Participation

When developing, implementing and evaluating any community-based initiative, it is essential that prior to implementation a partnership is established between the researcher(s) and participants (i.e. community members). During this research process I learned many valuable lessons about engaging in partnership with participants. It is a challenging but rewarding - and I believe necessary - process of community-based research. Through getting to know each centre I

gained unique insights into the local context such as information about local policies and practises at the centre level and in some cases at the community level. I also learned about some of the unspoken interactions and relationships that go on between various institutions and groups (childcare centres and schools) within small rural communities.

In the future I will work to develop close partnerships earlier on in the research process. For example, if childcare staff had been invited to play a more participatory role in the development of Healthy Start, this may have increased compliance and fidelity during the implementation phase. Research shows that when participants take a participatory role in developing an intervention they feel a form of ownership over the project and thus are motivated to ensure it is effectively implemented and evaluated (144,145).

The commitment and combined efforts and expertise of all the partners involved can increase the efficacy of community-based research approaches (148); in turn, contributing to program sustainability and promoting healthy behaviour changes among all involved (e.g., institutions, communities and society as a whole). When I contacted the centres post intervention, most educators indicated that they were continuing to use Healthy Start (i.e. program sustainability) and they appreciated the ongoing support and contact. The initiative is garnering interest among many more centres in the province of Saskatchewan and other childcare centres want to implement Healthy Start. I believe this is due in part to the fact that Healthy Start developed good relationships with the participating centres; and in turn, these centres shared their positive experiences with their colleagues.

Building relationships among potential participants would also be beneficial in addressing challenges with obtaining consent that arose during the evaluation of Healthy Start. For example, having parents sign and return the consent forms was difficult, not necessarily

because parents did not want to give consent, but because they often forgot or misplaced the consent forms. Educators and parents also had trouble deciphering how the implementation differed from the evaluation and why aspects of the research protocol, such as obtaining consent, was necessary for the centres to receive the intervention. In order to increase parental participation, including receiving consent, I believe we will need to develop a strategy for helping parents and educators better understand the differences between implementation and evaluation and the necessity of the ethical procedures associated with participating in intervention research.

Participant fatigue, particularly among children and their parents, was another challenge faced during the evaluation of Healthy Start. Although every attempt was made to limit the burden on educators, I did need them to complete some tasks at various points over the 48-week intervention. I found that by the end of evaluation, educators were saying they did not have time to record how often they were incorporating the Healthy Start activities into their daily routines. Also, some centre cooks stated that it was too much effort to try and remember to use the new recipes provided by Healthy Start; rather it was easier to stick to the old recipes with which they were familiar. Lastly, by the end of the study children were tired of wearing the accelerometers and parents did not feel like arguing with the children to wear the belts. In the future, methods for avoiding participant fatigue should be incorporated into the evaluation component of Healthy Start. For example, researchers could work with cooks to develop recipes, rather than simply providing recipes to cooks. Thus, cooks may take some ownership over the initiative and be motivated to use the recipes. Additionally, researchers could work with educators and parents to determine a reasonable number of evaluation time points for measuring children's physical activity levels. Educators and parents could be asked to suggest rewards that researchers could

provide to encourage the children to wear the accelerometers. I would also suggest future work considers the use of technology, such as online newsletters, a Facebook page or development of an application to encourage and increase participant engagement and interaction.

8.2.3 The Value of Reflection

So often the only focus of population health research papers is to report on the outcome and impact of the intervention. Of course this is an important aspect of research and results should be disseminated, however it is also beneficial to share findings related to process and lessons learned throughout the entire research process (92,141,145,148). For instance, reflections may include assessment of how interventions can be expanded and identify challenges and successes in altering interventions for different contexts. It has been suggested that this process of reflection and sharing will assist in embedding interventions in institutions and communities, ultimately increasing their long-term sustainability (92). Such information is valuable as it may educate others engaging in similar studies; particularly, in new up-and-coming areas of research. If previous research with early years children had discussed some of the unique challenges that may arise when working with this age group, I could have accounted for these issues during the implementation of Healthy Start. By including this reflection piece in my dissertation I hope to make a meaningful contribution to this growing area of research.

8.3 Continuing the Journey

I hope the reflections I offered will provide context for those engaging in similar work and raise awareness about the complexities, challenges and rewards that come with working in childcare centres and with early years children, their families and educators. For me, the process of documenting my reflections provided an opportunity to consider how many unspoken, yet influential factors were at play during this entire research process. I became acutely aware of the

constant balancing act between having power over the study and giving power to the participants. Perhaps the most important things I learned were that building trust and partnerships among participants is key to this power balance and ensuring success of an intervention implemented within a community. There is no doubt I learned a lot and answered a number of questions; however I feel that more questions arose than were answered during the research process. As such, by no means was my doctoral research the end of my journey as a community engaged scholar, rather it is just the beginning. Moving forward in my research career, this reflection piece will influence and strengthen my future work as a researcher and enhance partnerships I strive to develop in future community-based studies.

CHAPTER 9

General Conclusions and Next Steps

9.1 General Conclusions

The purpose of my doctoral research was to evaluate Healthy Start, a multilevel physical activity *and* healthy eating intervention guided by McLeroy's ecological model and grounded in a population health approach. The specific study objectives were addressed in three papers.

The first objective, as discussed in paper 1, explored the influence of Healthy Start on physical activity levels and motor skill development among early years children aged 3 to 5 years in participating childcare centres. Results indicated that Healthy Start contributed to increases in MVPA among children in the intervention centres. Additionally, interviews with educators revealed that educators felt Healthy Start supported them in providing children with more opportunities for physical activity. Furthermore, key aspects of the childcare centre environments that influence physical activity promotion and participation were identified through environmental scans.

The results emphasized the importance of participant engagement as participation and involvement of educators and directors were strong indicators of the intervention's success and effectiveness. Study findings also indicated that Healthy Start provided educators with support and resources for promoting physical activity as shown by increases in children's MVPA levels at intervention childcare centres. Improvements in TGMD II were observed from pre to post intervention, however these changes were not statistically significant. A factor that may have contributed to this non-significant result is that pre and post intervention measures were only collected on a small number of children. Additionally, there were some skills that most of the children could not complete during pre and post intervention and this influenced their TGMD II

scores. The inability for children to complete certain skills pre or post intervention emphasized the need for individuals delivering the intervention (e.g., educators) to not only be trained to promote active play, but also to be confident in their ability to engage in and demonstrate basic gross motor development skills (which are directly related to physical activity participation).

The second objective (paper 2) explored the influence of Healthy Start on children's healthy eating behaviours and investigated the intervention's role in supporting educators in providing children with opportunities for healthy eating. Menu review results indicated that among the intervention group, healthy eating opportunities (meals served that met the provincial nutrition policy) increased over the course of the intervention. Educator interviews were used to better understand how childcare staff were influenced by Healthy Start and if it supported them in offering children with more healthy eating opportunities. However, because children's eating behaviours were not directly measured it was difficult to conclude that children were actually consuming healthier foods. Thus, I believe my dissertation highlighted a gap in the literature and the need for future research focusing on direct measurement of food intake among early years children. Currently, interventions aimed at increasing healthy eating in Canadian childcare centres have measured children's food intake using observation and parent and/or educator questionnaires. Directly assessing children's food intake, through for example plate weighing measures, would provide a more reliable and specific assessment; and in turn a more accurate measure of an intervention's effectiveness (142).

The largest increases in the provision of healthy eating opportunities were observed in centres where there were no cooks and educators did the cooking. As discussed in relation to implementation of the physical activity component of Healthy Start, this result highlighted the necessity of focusing on the training of childcare centre cooks. Although cooks were trained in

the healthy eating component of the intervention, Healthy Start was primarily developed for educators who worked directly with the children. During the intervention, it was apparent that childcare centre cooks have a variety of experiences from diverse cooking backgrounds. Moreover, centre cooks are not required to complete ECE training, nor do they need previous education or experience in meal preparation. The only common knowledge shared among all cooks was their awareness of the provincial nutrition guidelines. This finding emphasized the need for strategies aimed at connecting with the cooks and providing resources for creative ways to meet the childcare nutrition policy. Additionally, a component focusing on educating cooks about the eating behaviours of early years children would be beneficial, as many cooks do not have previous experience in childcare settings. Such strategies should be developed in consultation with childcare cooks and educators.

The third objective of my doctoral research (paper 3) was to increase healthy eating opportunities offered to children through piloting a pulse crop intervention in one of the intervention childcare centres. The results of this pilot study indicated that the pulse crop intervention diversified children's diets by expanding the variety of healthy foods provided to early years children through incorporating pulse crops into the centre menu. In addition, the intervention increased educator knowledge and awareness about the nutritional and health benefits of pulse crops. This pilot study was both unique and innovative, as no interventions have developed strategies for promoting the consumption of locally grown pulse crops in an effort to increase the variety of healthy foods offered to Canadian early years children in childcare. The findings provide evidence to suggest that promoting the consumption of locally grown food can be an effective method for increasing the variety of healthy foods offered to children.

Educators reported that following the intervention they spent time teaching children about different ways to eat pulse crops and where pulse crops are grown. Given that the centre was located in a rural community and a number of the children's parents were grain producers, children took a keen interest in learning that pulse crops they were eating, may have come from their family's field. Educators reported that this unique connection was very helpful in encouraging children to eat pulse based foods, thus suggesting that interventions aimed at increasing the variety of healthy foods offered to children should consider choosing a food produced in the local environment. Educators could make personal and visual links between the food children are eating and where it is produced. Field trips could be arranged around the production of the chosen food, such as taking the children to a local farm.

9.2 Next Steps

As discussed previously, intervention research aimed at increasing physical activity and healthy eating among Canadian early years children is a growing field of study with studies such as those by Goldfield and colleagues and Timmons and colleagues currently underway (22,67). However, a number of gaps in the literature continue to exist. Below I discuss specific areas related to research, policy and practice, where further work is needed.

9.2.1 Recommendations for Research

Currently the majority of intervention studies have been carried out with relatively small sample sizes, in a limited number of childcare centres. As such, although challenging both financially and in person power, it would be advisable that researchers focus on expanding physical activity and healthy eating interventions on a larger scale and include multiple childcare centres and a diverse population of early years children. In the expanded intervention children's food intake should be directly measured using a plate waste study. Furthermore, a framework

similar to McLeroy's model should be employed in the development and evaluation of the intervention. However, rather than combining multiple frameworks, researchers should consider using a more complex and comprehensive framework which already includes conceptual underpinnings of a population health approach.

Nader and colleagues have developed a framework for guiding the implementation of an intervention using a systems approach to target health promotion and obesity prevention during the early years(14). This framework illustrates how policy and practice at the local, state/provincial, and national levels directly and indirectly affect community-level physical and social environments, the economic environment, healthcare systems, and family and individual health behaviors (14). The systems approach considers that health behaviours among children, their families and caregivers/educators are influenced by interactions among factors in various systems including: family settings, community institutions (e.g., childcare centres for children, work site and neighbourhoods for adults, and healthcare systems for both children and adults). Nader et al (14) states that the systems approach framework identifies interaction pathways, which in turn provide a template for designing interventions that create and enhance pathways to promote healthy behaviors and disrupt pathways that increase the risk of overweight and obesity. A key underpinning of this framework is its focus on building strong partnerships among participants, communities, healthcare professionals and policy makers. Such partnerships are necessary when attempting to use research findings to influence and inform policy.

9.2.2 Recommendations for Policy

The expansion of physical activity and healthy eating interventions in multiple childcare centres and among diverse communities and populations in Canada is also related to policy development. For instance, if such interventions were reproducible on a large scale and effective

in increasing physical activity and healthy eating among early years children, this would allow researchers to generalize the results to most childcare settings in Canada. In turn, the intervention results could be used to inform the development of regulations and policies aimed at promoting healthy behaviours in childcare centres. Although engaging governments and policy-makers is a challenge and often a long-term goal that is not always achieved, obtaining government support is essential when attempting to influence policy and impact behaviour on a population level.

In relation to the promotion of healthy behaviours among early years children in childcare, I believe the most pressing policy issue is the lack of a provincial level physical activity policy for childcare centres. Moving forward, efforts should be made to engage governments, researchers and educators to collaborate in developing a physical activity policy for childcare centres in Saskatchewan. The recently released physical activity and sedentary behaviour guidelines for the early years (21,22) could be used as a guide for developing such a policy. In my opinion, the implementation of a provincial physical activity policy for childcare centres is a necessary step in promoting healthy behaviours among early years children.

9.2.3 Recommendations for Practice

Three main recommendations for practices within childcare centres can be provided. The first is the importance of the education of educators. I believe the ECE training program should be revised to incorporate a component focused on teaching educators about the importance of movement. There is a particular need to teach gross motor skills and ways to promote the development of these skills among early years children. Another goal of this training would be ensuring that educators are confident in their abilities to engage in and model such skills. Once educators have the self-efficacy to model and promote gross motor skills they will be more likely to engage in various physical activities with the children.

The second practice related recommendation is that, until a provincially legislated physical activity policy is developed for childcare centres, directors and educators should be encouraged to develop a physical activity policy for their individual centres. Although regulation of a centre level policy would differ for each childcare centre, it is another avenue for ensuring that children are offered daily physical activity opportunities. Such a policy would also assist educators in knowing how often they should provide opportunities for the children to be active. In turn, this may mobilize those educators who do not feel motivated to promote active play on a daily basis.

The third recommendation for childcare centres is related to healthy eating practices. Resources should be developed to include creative recipes that specifically incorporate healthy affordable foods that centres have access to year round. These resources and recipes would vary depending on the centre demographics and the geographic locale of the communities in which the centres are located. Although this does not influence the underlying and more complex economic and policy factors associated with access and availability of healthy foods; I believe this could be a feasible strategy for supporting childcare centres in offering healthy foods year round, particularly for those centres located in rural communities.

9.3 Concluding Thoughts

This was a pilot intervention study that aimed to support rural educators in providing opportunities for physical activity and healthy eating, with the primary goal of increasing physical activity and healthy eating behaviours among early years children in childcare centres. Collectively, the objectives addressed in each paper provide insight into the complexities and feasibility of promoting physical activity and healthy eating among early years children, particularly in rural communities. Healthy Start was an innovative intervention which addressed

critical factors contributing to the development of healthy behaviours in rural early years children. The intervention was feasible and it drew a lot of interest among key stakeholder (e.g., educators, ECE instructors, the Saskatchewan Early Childhood Association and the Early Childhood Education branch of the Saskatchewan government) in the province. Additionally, the findings from my dissertation can be used to expand the limited body of literature on implementing and evaluating interventions aimed at increasing *both* physical activity and healthy eating in Canadian childcare centres.

The recommendations for areas of future work provide a template for next steps that I believe should be taken to fill the knowledge gaps in this area of study. Addressing these gaps is essential in moving towards interventions which are sustainable and effective in promoting the healthy development of all early years children.

REFERENCES

1. Zecevic C a, Tremblay L, Lovsin T, Michel L. Parental Influence on Young Children's Physical Activity. *Int J Pediatr* [Internet]. 2010 Jan [cited 2012 Nov 8];2010:468526. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2909717&tool=pmcentrez&rendertype=abstract>
2. Keon WJ. Focusing on Childhood Obesity. *Conduit* [Internet]. 2009;3:4–6. Available from: <http://www.docstoc.com/docs/9150211/Conduit-Magazine-Summer-09>
3. Ward DS. Physical activity in young children: the role of child care. *Med Sci Sports Exerc* [Internet]. 2010 Mar [cited 2013 Sep 26];42(3):499–501. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/20068500>
4. Needham L, Dwyer JJM, Randall-Simpson J, Heeney ES. Supporting healthy eating among preschoolers: challenges for child care staff. *Can J Diet Pract Res* [Internet]. 2007 Jan;68(2):107–10. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/17553198>
5. Temple V a, Naylor P-J, Rhodes RE, Higgins JW. Physical activity of children in family child care. *Appl Physiol Nutr Metab* [Internet]. 2009 Aug [cited 2012 Nov 6];34(4):794–8. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/19767816>
6. Pabayo R, Spence JC, Casey L, Storey K. Food Consumption Patterns in Preschool Children. *Can J Diet Pract Res* [Internet]. 2012 Jun 1 [cited 2013 Jun 3];73(2):66–71. Available from: <http://www.dcjournals.ca/openurl.asp?genre=article&id=doi:10.3148/73.2.2012.66>
7. Garriguet D, Vanier T. More fruit less fat: Canadians' eating habits. 2008;4–6.
8. Timmons BW, Leblanc AG, Carson V, Gorber SC, Dillman C, Janssen I, et al. Systematic review of physical activity and health in the early years (aged 0 – 4 years). 2012;792:773–92.
9. Colley RC, Garriguet D, Adamo KB, Carson V, Janssen I, Timmons BW, et al. Physical activity and sedentary behavior during the early years in Canada: a cross-sectional study. *Int J Behav Nutr Phys Act* [Internet]. 2013 Jan;10:54. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3655822&tool=pmcentrez&rendertype=abstract>
10. Shields M. Overweight and obesity among children and youth. *Health Rep*. 2006;1–27.
11. Stice E, Shaw H, Marti CN. A meta-analytic review of obesity prevention programs for children and adolescents: the skinny on interventions that work. *Psychol Bull* [Internet]. 2006 Sep [cited 2013 Oct 13];132(5):667–91. Available from:

<http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1876697&tool=pmcentrez&rendertype=abstract>

12. Quattrin T, Liu E, Shaw N, Shine B, Chiang E. Obese Children Who Are Referred to the Pediatric Endocrinologist : Characteristics and Outcome. *Pediatrics*,. 2005;115:348–51.
13. Freedman DS, Khan LK, Serdula MK, Dietz WH, Srinivasan SR, Berenson GS. The relation of childhood BMI to adult adiposity: the Bogalusa Heart Study. *Pediatrics* [Internet]. 2005 Jan 1 [cited 2012 Oct 29];115(1):22–7. Available from: <http://pediatrics.aappublications.org.cyber.usask.ca/content/115/1/22>
14. Nader PR, Huang TT-K, Gahagan S, Kumanyika S, Hammond R a, Christoffel KK. Next steps in obesity prevention: altering early life systems to support healthy parents, infants, and toddlers. *Child Obes* [Internet]. 2012 Jun [cited 2013 Apr 10];8(3):195–204. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22799545>
15. Anzman SL, Rollins BY, Birch LL. Parental influence on children’s early eating environments and obesity risk: implications for prevention. *Int J Obes* [Internet]. Nature Publishing Group; 2010 Jul [cited 2013 Aug 13];34(7):1116–24. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/20195285>
16. Guinhouya BC, Samouda H, Zitouni D, Vilhelm C, Hubert H. Evidence of the influence of physical activity on the metabolic syndrome and/or on insulin resistance in pediatric populations: a systematic review. *Int J Pediatr Obes* [Internet]. 2011 Oct [cited 2013 Oct 15];6(5-6):361–88. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/21851163>
17. O’Connor, J. P, Temple, V. A. Constraints and facilitators for physical activity in family day care. *Aust J Early Child*. 2005;30(1-9).
18. Colley RC, Garriguet D, Janssen I, Craig CL, Clarke J, Tremblay MS. Physical activity of Canadian children and youth: accelerometer results from the 2007 to 2009 Canadian Health Measures Survey. *Health Rep* [Internet]. 2011 Mar;22(1):15–23. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/21510586>
19. Sallis JF, Prochaska JJ, Taylor WC. A review of correlates of physical activity. *Med Sci Sport Exerc*. 2000;32(5):963–75.
20. Naylor P-J, Temple V a. Enhancing the capacity to facilitate physical activity in home-based child care settings. *Health Promot Pract* [Internet]. 2013 Jan [cited 2013 Oct 16];14(1):30–7. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22146905>
21. Tremblay MS, Leblanc AG, Carson V, Choquette L, Gorber SC, Dillman C, et al. Canadian Physical Activity Guidelines for the Early Years (aged 0 – 4 years). 2012;356:345–56.

22. Tremblay MS, Leblanc AG, Carson V, Choquette L, Gorber SC, Dillman C, et al. Canadian Sedentary Behaviour Guidelines for the Early Years (aged 0 – 4 years). 2012;380:370–80.
23. Canada H. Eating well with Canada's Food Guide [Internet]. 2011. Available from: <http://www.hc-sc.gc.ca/fn-an/food-guide-aliment/index-eng.php>
24. Tremblay L, Boudreau-larivière C, Cimon-lambert K. Promoting Physical Activity in Preschoolers : A Review of the Guidelines , Barriers , and Facilitators for Implementation of Policies and Practices. 2012;53(4):280–90.
25. Bushnik T. Child Care in Canada [Internet]. 2006 p. 1–99. Available from: <http://publications.gc.ca/Collection/Statcan/89-599-MIE/89-599-MIE2006003.pdf>
26. Briley M, McAllaster M. Nutrition and the child-care setting. J Am Diet Assoc [Internet]. Elsevier Inc.; 2011 Sep [cited 2013 Oct 17];111(9):1298–300. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/21872691>
27. Finch M, Wolfenden L, Falkiner M, Edenden D, Pond N, Hardy LL, et al. Impact of a population based intervention to increase the adoption of multiple physical activity practices in centre based childcare services: a quasi experimental, effectiveness study. Int J Behav Nutr Phys Act [Internet]. International Journal of Behavioral Nutrition and Physical Activity; 2012 Jan [cited 2013 Jun 1];9(1):101. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3494551&tool=pmcentrez&rendertype=abstract>
28. Kaphingst KM, Story M. Child care as an untapped setting for obesity prevention: state child care licensing regulations related to nutrition, physical activity, and media use for preschool-aged children in the United States. Prev Chronic Dis [Internet]. 2009 Jan;6(1):A11. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2644584&tool=pmcentrez&rendertype=abstract>
29. Gunter KB, Rice KR, Ward DS, Trost SG. Factors associated with physical activity in children attending family child care homes. Prev Med (Baltim) [Internet]. Elsevier Inc.; 2012 Feb [cited 2013 Oct 16];54(2):131–3. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22178820>
30. Temple VA, Naylor P-J. Exploring Family Child Care as a Context For Physical Activity. PHENex J. 2010;2(2):1–16.
31. Bower JK, Hales DP, Tate DF, Rubin D a, Benjamin SE, Ward DS. The childcare environment and children's physical activity. Am J Prev Med [Internet]. 2008 Jan [cited 2012 Nov 6];34(1):23–9. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/18083447>

32. Ward DS, Benjamin SE, Ammerman AS, Ball SC, Neelon BH, Bangdiwala SI. Nutrition and physical activity in child care: results from an environmental intervention. *Am J Prev Med* [Internet]. 2008 Oct [cited 2012 Nov 2];35(4):352–6. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/18701236>
33. Ammerman AS, Ward DS, Benjamin SE, Ball SC, Sommers JK, Molloy M, et al. An intervention to promote healthy weight: Nutrition and Physical Activity Self-Assessment for Child Care (NAP SACC) theory and design. *Prev Chronic Dis* [Internet]. 2007 Jul;4(3):A67. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1955393&tool=pmcentrez&rendertype=abstract>
34. Gagné D, Blanchet R, Vaissière É, Lauzière J, Vézina C, Al. E. Impact of a Childcare Centre Nutrition Program: On Nutrient Intakes in Nunavik Inuit Children. *Can J Diet Pract Res* [Internet]. 2013 [cited 2013 May 31];74:311–7. Available from: <http://search.proquest.com.cyber.usask.ca/docview/1324977082/fulltextPDF/13E606EC0F8531C580E/1?accountid=14739>
35. Vanderloo LM, Tucker P, Johnson AM, Holmes JD. Physical activity among preschoolers during indoor and outdoor. *Appl Physiol Nutr Metab*. 2013;1175(April):1173–5.
36. Beshiri R, Bollman RD. Definitions of “ Rural .”2002;(21):1–43.
37. Froehlich Chow A, Humbert ML. Supporting the Healthy Development of Rural Children: An Ecologically Based Investigation of Barriers and Facilitators Identified by Early Years Caregivers in the Promotion of Physical Activity and Healthy Eating. 2010. p. 1–111.
38. Bruner MW, Lawson J, Pickett W, Boyce W, Janssen I. Rural Canadian adolescents are more likely to be obese compared with urban adolescents. *Int J Pediatr Obes* [Internet]. 2008 Jan [cited 2012 Nov 6];3(4):205–11. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/18608637>
39. Bilinski H, Chad K, Semchuk KM. Understanding physical activity patterns of rural Canadian children. *Online J Rural Nurs Heal Care*. 2005;5(2):73–81.
40. Shields M, Tjepkema M. Regional differences in obesity. *Health Rep* [Internet]. 2006 Aug;17(3):61–7. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/16981487>
41. Healthy Start-Départ Santé [Internet]. 2013. Available from: www.healthystartkids.ca
42. Ruel M, Hoddinott J. Investing in Early Childhood Nutrition. 2008;(November). Available from: <http://www.ifpri.org/sites/default/files/publications/bp008.pdf>
43. LeGear M, Greyling L, Sloan E, Bell RI, Williams B-L, Naylor P-J, et al. A window of opportunity? Motor skills and perceptions of competence of children in kindergarten. *Int J Behav Nutr Phys Act* [Internet]. BioMed Central Ltd; 2012 Jan [cited 2013 Sep

- 26];9(1):29. Available from:
<http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3330012&tool=pmcentrez&rendertype=abstract>
44. Williams HG, Pfeiffer KA, O'Neill JR, Dowda M, McIver KL, Brown WH, et al. Motor skill performance and physical activity in preschool children. *Obesity (Silver Spring)* [Internet]. Nature Publishing Group; 2008 Jun 3 [cited 2012 Nov 1];16(6):1421–6. Available from:
<http://www.nature.com.cyber.usask.ca/oby/journal/v16/n6/full/oby2008214a.html>
 45. Physical Health & Education (PHE) Canada [Internet]. 2013 [cited 2013 Jul 4]. Available from: <http://www.phecanada.ca/programs/physical-literacy>
 46. Black MM, Hurley KM. Helping Children Develop Healthy Eating Habits [Internet]. *Encyclopedia on Early Childhood Development*. Montreal, Quebec: Centre of Excellence for Early Childhood Development; 2007. p. 1–10. Available from: http://www.child-encyclopedia.com/documents/Black-HurleyANGxp_rev-Eating.pdf.
 47. Dietitians of Canada. How to deal with common toddler preschool feeding issues.pdf [Internet]. 2010. p. 1–2. Available from: <http://www.cheo.on.ca/uploads/How to deal with common toddler preschool feeding issues.pdf>
 48. Link BG, Phelan JC. Review :Why are some People Healthy and Others Not? The Determinants of Health of Populations. *Am J Public Health* [Internet]. 1996 Apr;86(4):598–9. Available from:
<http://ajph.aphapublications.org/doi/abs/10.2105/AJPH.86.4.598>
 49. Savage JS, Fisher JO, Birch LL. Parental influence on eating behavior: conception to adolescence. *J Law Med Ethics* [Internet]. 2007 Jan;35(1):22–34. Available from:
<http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2531152&tool=pmcentrez&rendertype=abstract>
 50. Evans Morris S. EXPANDING CHILDREN ' S DIETS [Internet]. 1999. p. 1–4. Available from: <http://www.new-vis.com/fym/pdf/papers/feeding.13.pdf>
 51. Jilcott S, Keyserling T, Crawford T, McGuirt J, Ammerman A. Examining associations among obesity and per capita farmers' markets, grocery stores/supermarkets, and supercenters in US counties. *J Am Diet Assoc*. 2008;111:567–72.
 52. Graham H, Feenstra G, Evans AM, Zidenberg-Cherr S. Davis school program supports life-long healthy eating habits in children. *Calif Agric* [Internet]. 2004;58(4). Available from: <http://ucce.ucdavis.edu/files/repositoryfiles/ca5804p200-69155.pdf>
 53. Growers SP. Pulses and Healthy Living. [Internet]. 2013. Available from:
<http://saskpulse.com/recipes-nutrition/health-benefits>.

54. Faye S. Pulse Consumption in Canada [Internet]. 2010 p. 1–4. Available from: [http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/sis13124/\\$file/pulses_June2.pdf?OpenElement](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/sis13124/$file/pulses_June2.pdf?OpenElement)
55. Slavin J. Dietary fibre and body. *Nutrition*. 2005;21:411–5.
56. Bulletin AP. Health Benefits of Pulse Crop [Internet]. 2008 p. 1–5. Available from: [http://www.pulseaus.com.au/pdf/Health Benefits of Pulses.pdf](http://www.pulseaus.com.au/pdf/Health%20Benefits%20of%20Pulses.pdf)
57. Government of Alberta. Local Food – A Rural Opportunity [Internet]. 2010 p. 1–31. Available from: [http://www1.agric.gov.ab.ca/\\$Department/deptdocs.nsf/all/csi13484/\\$FILE/Local-Food-A-Rural-Opp.pdf](http://www1.agric.gov.ab.ca/$Department/deptdocs.nsf/all/csi13484/$FILE/Local-Food-A-Rural-Opp.pdf)
58. Froehlich Chow AL, & Humbert ML. Barriers and Facilitators For Physical Activity and Nutrition In Early Years Care Centres. *J Can Assoc Young Child*. 2011;36:26–30.
59. Phillips T. DIET APPROACHES TO INCREASE LENTIL CONSUMPTION IN YOUTH The D.A.I.L.Y. Project [Internet]. University of Saskatchewan; 2011. p. 1–101. Available from: <http://ecommons.usask.ca/bitstream/handle/10388/ETD-2011-09-108/PHILLIPS-THESIS.pdf?sequence=7>
60. Card AHKC. Driving Our Kids Unhealthy Habits ? Report Card on Physical Activity for Children and Youth THE 2013 ACTIVE HEALTHY KIDS ON PHYSICAL ACTIVITY FOR. 2013 p. 1–109.
61. Government of Canada SC. National Longitudinal Survey of Children and Youth Survey Overview [Internet]. Ottawa, Ontario Canada; 2007 p. 1–44. Available from: <http://abacus.library.ubc.ca/bitstream/10573/41398/15/nlscy-cycle7-overview-eng.pdf>
62. Janssen I. [Guidelines for physical activity in children and young people]. *Appl Physiol Nutr Metab* [Internet]. 2007 Jan [cited 2012 Nov 1];32 Suppl 2:S122–35. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/19377536>
63. Tremblay MS, Warburton DER, Janssen I, Paterson DH, Latimer AE, Rhodes RE, et al. New Canadian physical activity guidelines. *Appl Physiol Nutr Metab* [Internet]. 2011 Feb [cited 2012 Nov 3];36(1):36–46; 47–58. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/21326376>
64. Raustorp A, Pagels P, Boldemann C, Cosco N, Söderström M, Mårtensson F. Accelerometer measured level of physical activity indoors and outdoors during preschool time in Sweden and the United States. *J Phys Act Health* [Internet]. 2012 Aug;9(6):801–8. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/21952100>
65. Brown WH, Pfeiffer K a, McIver KL, Dowda M, Addy CL, Pate RR. Social and environmental factors associated with preschoolers’ nonsedentary physical activity. *Child*

- Dev [Internet]. 2009;80(1):45–58. Available from:
<http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2648129&tool=pmcentrez&rendertype=abstract>
66. Alhassan S, Nwaokelemeh O, Mendoza A, Shitole S, Whitt-Glover MC, Yancey AK. Design and baseline characteristics of the Short bouTs of Exercise for Preschoolers (STEP) study. BMC Public Health [Internet]. ???; 2012 Jan [cited 2013 Oct 17];12(1):582. Available from:
<http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3418210&tool=pmcentrez&rendertype=abstract>
 67. Goldfield GS, Harvey A, Grattan K, Adamo KB. Physical activity promotion in the preschool years: a critical period to intervene. Int J Environ Res Public Health [Internet]. 2012 Apr [cited 2012 Nov 1];9(4):1326–42. Available from:
<http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3366614&tool=pmcentrez&rendertype=abstract>
 68. Froehlich Chow A, Humbert ML. Perceptions of Early Childhood Educators: Factors Influencing the Promotion of Physical Activity Opportunities in Canadian Rural Care Centers. Child Indic Res [Internet]. 2013 May 22 [cited 2014 Feb 8];7(1):57–73. Available from: <http://link.springer.com/10.1007/s12187-013-9202-x>
 69. Tucker P, Irwin JD. Physical Activity Behaviors During the Preschool Years. Child Heal Educ. 2010;2(1):60–70.
 70. Prince S a, Adamo KB, Hamel ME, Hardt J, Connor Gorber S, Tremblay M. A comparison of direct versus self-report measures for assessing physical activity in adults: a systematic review. Int J Behav Nutr Phys Act [Internet]. 2008 Jan [cited 2014 Jan 28];5:56. Available from:
<http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2588639&tool=pmcentrez&rendertype=abstract>
 71. Jensen RE, Bute JJ. Fertility-related perceptions and behaviors among low-income women: injunctive norms, sanctions, and the assumption of choice. Qual Health Res [Internet]. 2010 Nov [cited 2012 Nov 8];20(11):1573–84. Available from:
<http://www.ncbi.nlm.nih.gov/pubmed/20663935>
 72. Dwyer J, Needham L, Simpson JR, Heeney ES. Parents report intrapersonal, interpersonal, and environmental barriers to supporting healthy eating and physical activity among their preschoolers. Appl Physiol Nutr Metab [Internet]. 2008 Apr [cited 2012 Nov 4];33(2):338–46. Available from:
<http://www.ncbi.nlm.nih.gov/pubmed/18347689>
 73. Saskatchewan G of. The Childcare Act [Internet]. 2012 p. 1–14. Available from:
<http://www.qp.gov.sk.ca/documents/English/Statutes/Statutes/C7-3.pdf>

74. Gagné D, Blanchet R, Vaissière É, Lauzière J, Vézina C, Vinet-Lanouette C, et al. Impact of a Childcare Centre Nutrition Program on Nutrient Intakes in Nunavik Inuit Children. *Can J Diet Pract Res* [Internet]. 2013 Apr 1 [cited 2013 Jun 1];74(1):e311–e317. Available from: <http://www.dcjournals.ca/openurl.asp?genre=article&id=doi:10.3148/74.1.2013.e311>
75. Story M. Promoting Good Nutrition and Physical Activity in Child-Care Settings. Found settings a Res brief Princet NJ Robert Wood Johnson [Internet]. 2007;(May). Available from: [http://www.healthyeatingresearch.org/images/stories/her_research_briefs/her child care setting research brief.pdf](http://www.healthyeatingresearch.org/images/stories/her_research_briefs/her_child_care_setting_research_brief.pdf)
76. Marko J. Health Status of Rural Residents in the Saskatoon Health Region. Presented at Public Health Seminar, RUH Saskatoon, Sk.; 2008.
77. Leia M, Mccargar L, Lambraki I, Jessup L. Status and Geographic Locale is Associated with Food Behaviour of Ontario and Alberta. 2006;57(November 2002):357–61.
78. Hesketh KD, Campbell KJ. Interventions to Prevent Obesity in 0–5 Year Olds: An Updated Systematic Review of the Literature. *Obesity* [Internet]. Nature Publishing Group; 2010 Feb [cited 2012 Oct 25];18(n1s):S27–S35. Available from: <http://www.nature.com/doifinder/10.1038/oby.2009.429>
79. Council CHRS. Pathways to Early Childhood Education Credentialing in Canada [Internet]. Ottawa; 2009 p. 1–104. Available from: http://www.ccsc-cssge.ca/sites/default/files/uploads/Projects-Pubs-Docs/2.1PathwaysCred_MainEN.pdf
80. Larson N, Ward DS, Neelon SB, Story M. What role can child-care settings play in obesity prevention? A review of the evidence and call for research efforts. *J Am Diet Assoc* [Internet]. Elsevier Inc.; 2011 Sep [cited 2013 Sep 22];111(9):1343–62. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/21872698>
81. Hinkley T, Crawford D, Salmon J, Okely AD, Hesketh K. Preschool children and physical activity: a review of correlates. *Am J Prev Med* [Internet]. 2008 May [cited 2012 Nov 6];34(5):435–41. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/18407012>
82. Copeland KA, Kendeigh CA, Saelens BE, Kalkwarf HJ, Sherman SN. Physical activity in child-care centers: do teachers hold the key to the playground? *Health Educ Res* [Internet]. 2012 Feb [cited 2013 May 20];27(1):81–100. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3258280&tool=pmcentrez&rendertype=abstract>
83. Ward D, Hales D, Haverly K, Marks J, Benjamin S, Ball S, et al. An instrument to assess the obesogenic environment of child care centers. *Am J Health Behav* [Internet]. 2008;32(4):380–6. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/18092898>

84. Ward D, Morris E, McWilliams C, Vaughn A, Erinosh T, Mazzuca S, et al. Go NAP SACC: Nutrition and Physical Activity Self-Assessment for Child Care, 2nd edition. [Internet]. Chapel Hill, United States; 2013. Available from: <http://gonapsacc.org/resources/nap-sacc-materials>
85. Davison KK, Lawson CT. Do attributes in the physical environment influence children ' s physical activity ? A review of the literature. 2006;17.
86. Raine KD, Plotnikoff R, Nykiforuk C, Deegan H, Hemphill E, Storey K, et al. Reflections on community-based population health intervention and evaluation for obesity and chronic disease prevention: the Healthy Alberta Communities project. *Int J Public Health* [Internet]. 2010 Dec [cited 2013 Jun 7];55(6):679–86. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/20814715>
87. Hawe P, Shiell A, Riley T. Theorising interventions as events in systems. *Am J Community Psychol* [Internet]. 2009 Jun [cited 2012 Nov 6];43(3-4):267–76. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/19390961>
88. Glasgow RE, Klesges LM, Dzewaltowski D a, Estabrooks P a, Vogt TM. Evaluating the impact of health promotion programs: using the RE-AIM framework to form summary measures for decision making involving complex issues. *Health Educ Res* [Internet]. 2006 Oct [cited 2012 Nov 6];21(5):688–94. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/16945984>
89. McLeroy KR, Bibeau D, Steckler A, Glanz K. An Ecological Perspective on Health Promotion Programs. *Heal Educ Behav* [Internet]. 1988 Jan 1 [cited 2012 Oct 29];15(4):351–77. Available from: <http://heb.sagepub.com.cyber.usask.ca/content/15/4/351>
90. Carpiano RM, Daley DM. A guide and glossary on post-positivist theory building for population health. *J Epidemiol Community Health* [Internet]. 2006 Jul [cited 2012 Nov 2];60(7):564–70. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2566228&tool=pmcentrez&rendertype=abstract>
91. Gyurcsik NC, Spink KS, Bray SR, Chad K, Kwan M. An ecologically based examination of barriers to physical activity in students from grade seven through first-year university. *J Adolesc Health* [Internet]. 2006 Jun [cited 2012 Nov 8];38(6):704–11. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/16730599>
92. Hawe P, Potvin L. What is population health intervention research? *Can J public Heal Rev Can santé publique* [Internet]. 2009;100(1):Suppl I8–14. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/19263977>

93. Public Health Agency of Canada. What is the Population Health Approach? - Population Health Approach. 2001 Nov 25 [cited 2012 Nov 29]; Available from: <http://www.phac-aspc.gc.ca/ph-sp/approach-approche/appr-eng.php>
94. Raine K. Overweight and Obesity in Canada: A Population Health Perspective [Internet]. Available from: https://secure.cihi.ca/free_products/CPHIOverweightandObesityAugust2004_e.pdf
95. Hawe P, Riley T. Ecological theory in practice: illustrations from a community-based intervention to promote the health of recent mothers. *Prev Sci* [Internet]. 2005 Sep [cited 2012 Nov 6];6(3):227–36. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/16044208>
96. Birch LL, Ventura a K. Preventing childhood obesity: what works? *Int J Obes (Lond)* [Internet]. Nature Publishing Group; 2009 Apr [cited 2013 Sep 16];33 Suppl 1(S1):S74–81. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/19363514>
97. Temple V, Preece A, Naylor, P. &, McFadyen P. LEAP BC: Legacies Now. 2007.
98. Lancaster G a, Dodd S, Williamson PR. Design and analysis of pilot studies: recommendations for good practice. *J Eval Clin Pract* [Internet]. 2004 May;10(2):307–12. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/15189396>
99. Janicke DM, Sallinen BJ, Perri MG, Lutes LD. Comparison of Parent-Only vs Family-Based Interventions for Overweight Children in Underserved Rural Settings. 2008;162(12):1119–25.
100. Sacher PM, Kolotourou M, Chadwick PM, Cole TJ, Lawson MS, Lucas A, et al. Randomized controlled trial of the MEND program: a family-based community intervention for childhood obesity. *Obesity (Silver Spring)* [Internet]. Nature Publishing Group; 2010 Feb [cited 2012 Oct 29];18 Suppl 1(n1s):S62–8. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/20107463>
101. Adamchak S. A Guide to Monitoring and Evaluating Adolescent Reproductive FOCUS on Young Adults. 2000;(June).
102. Street M, Wt L, Taylor W, Mcauley KA, Williams SM, Barbezat W, et al. Reducing weight gain in children through enhancing physical activity and nutrition: the APPLE project. *Int J Pediatr Obes* [Internet]. 2006 Jan [cited 2012 Nov 6];1(3):146–52. Available from: <http://informahealthcare.com/doi/abs/10.1080/17477160600881247>
103. Freedman DS, Khan LK, Serdula MK, Dietz WH, Srinivasan SR, Berenson GS. The relation of childhood BMI to adult adiposity: the Bogalusa Heart Study. *Pediatrics* [Internet]. 2005 Jan [cited 2012 Oct 29];115(1):22–7. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/15629977>

104. Tandon PS, Garrison MM, Christakis D a. Physical activity and beverages in home- and center-based child care programs. *J Nutr Educ Behav* [Internet]. Elsevier Inc.; 2012 [cited 2013 Oct 12];44(4):355–9. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22564855>
105. De Silva-Sanigorski AM, Bolton K, Haby M, Kremer P, Gibbs L, Waters E, et al. Scaling up community-based obesity prevention in Australia: background and evaluation design of the Health Promoting Communities: Being Active Eating Well initiative. *BMC Public Health* [Internet]. 2010 Jan;10:65. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2836295&tool=pmcentrez&rendertype=abstract>
106. De Silva-Sanigorski AM, Bell AC, Kremer P, Park J, Demajo L, Smith M, et al. Process and impact evaluation of the Romp & Chomp obesity prevention intervention in early childhood settings: lessons learned from implementation in preschools and long day care settings. *Child Obes* [Internet]. 2012 Jun [cited 2013 Mar 17];8(3):205–15. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22799546>
107. Zask A, Adams JK, Brooks LO, Hughes DF. Tooty Fruity Vegie: an obesity prevention intervention evaluation in Australian preschools. *Heal Promot J Aust* [Internet]. CSIRO PUBLISHING; [cited 2013 May 7];23(1):10–5. Available from: http://www.publish.csiro.au/view/journals/dsp_journal_fulltext.cfm?nid=292&f=HE12010
108. Skouteris H, McCabe M, Swinbur B, Newgree V, Sacher P, Chadwic P. Systematic, Parental influence and obesity prevention in pre-schoolers: a review of interventions. *Obes Rev*. 2011;12(5):315–328.
109. Marks J, Barnett LM, Foulkes C, Hawe P, Allender S. Using Social Network Analysis to Identify Key Child Care Center Staff for Obesity Prevention Interventions: A Pilot Study. *J Obes* [Internet]. 2013;2013:1–9. Available from: <http://www.hindawi.com/journals/jobes/2013/919287/>
110. Trost SG, Messner L, Fitzgerald K, Roths B. A nutrition and physical activity intervention for family child care homes. *Am J Prev Med* [Internet]. Elsevier; 2011 Oct 1 [cited 2013 May 7];41(4):392–8. Available from: [http://www.ajpmonline.org/article/S0749-3797\(11\)00447-8/abstract](http://www.ajpmonline.org/article/S0749-3797(11)00447-8/abstract)
111. Natale R, Scott SH, Messiah SE, Schrack MM, Uhlhorn SB, Delamater A. Design and methods for evaluating an early childhood obesity prevention program in the childcare center setting. *BMC Public Health* [Internet]. BMC Public Health; 2013;13(1):1. Available from: BMC Public Health
112. Gagné C, Harnois I. The contribution of psychosocial variables in explaining preschoolers' physical activity. *Health Psychol* [Internet]. 2013 Jun;32(6):657–65. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/23566181>

113. Plessis V du, Beshiri R, Bollman, Ray D. &, Clemenson H. Definitions of rural. 2001;3(3):1–17.
114. Van Cauwenberghe E, Labarque V, Trost SG, de Bourdeaudhuij I, Cardon G. Calibration and comparison of accelerometer cut points in preschool children. *Int J Pediatr Obes* [Internet]. 2011 Jun [cited 2013 Jul 2];6(2-2):e582–9. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/21121867>
115. Puyau M, Adolph A, Vohra F, Issa Z. &, Butte N. Prediction of Activity Energy Expenditure Using Accelerometers in Children. *Med Sci Sport Exerc* [Internet]. 2004 Sep [cited 2013 May 28];36(9):1514–21. Available from: <http://content.wkhealth.com/linkback/openurl?sid=WKPTLP:landingpage&an=00005768-200409000-00009>
116. Colley R, Gorber SC, Tremblay MS. Quality control and data reduction procedures for accelerometer-derived measures of physical activity [Internet]. 2010 p. 1–8. Available from: <http://www.statcan.gc.ca/pub/82-003-x/2010001/article/11066-eng.pdf>
117. Houwen S, Hartman E, Jonker L, Visscher C. Reliability and validity of the TGMD-2 in primary-school-age children with visual impairments. *Adapt Phys Activ Q* [Internet]. 2010 Apr;27(2):143–59. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/20440025>
118. Ulrich DA. *Test of Gross Motor Development*. Austin, TX: Pro-Ed.; Second, 2000.
119. Ryan F, Coughlan M, & Cronin P. Interviewing in qualitative research: The one-on-one interview. *Int J Ther Rehabil*. 2009;16(6):306–17.
120. Trochim WMK. *Quasi-Experimental Design* [Internet]. 2006 [cited 2012 Nov 16]. Available from: <http://socialresearchmethods.net/kb/quasiexp.php>
121. Ryan GW, Bernard HR. Techniques to Identify Themes. *Field methods* [Internet]. 2003 Feb 1 [cited 2013 Nov 11];15(1):85–109. Available from: <http://fm.sagepub.com/cgi/doi/10.1177/1525822X02239569>
122. Chappell N. Multilevel community health promotion: How can we make it work? *Community Dev J* [Internet]. 2006 Apr 25 [cited 2012 Nov 6];41(3):352–66. Available from: <http://cdj.oxfordjournals.org.cyber.usask.ca/content/41/3/352>
123. Emck C, Bosscher R, Beek P, Doreleijers T. Gross motor performance and self-perceived motor competence in children with emotional, behavioural, and pervasive developmental disorders: a review. *Dev Med Child Neurol* [Internet]. 2009 Jul [cited 2013 Oct 13];51(7):501–17. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/19538424>
124. Bandura a. Social cognitive theory: an agentic perspective. *Annu Rev Psychol* [Internet]. 2001 Jan;52:1–26. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/11148297>

125. Sherar LB, Griew P, Esliger DW, Cooper AR, Ekelund U, Judge K, et al. International children's accelerometry database (ICAD): design and methods. *BMC Public Health* [Internet]. BioMed Central Ltd; 2011 Jan [cited 2013 May 27];11(1):485. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3146860&tool=pmcentrez&rendertype=abstract>
126. Ward DS, Evenson KR, Vaughn A, Rodgers AB, Troiano RP. Accelerometer Use in Physical Activity: Best Practices and Research Recommendations. *Med Sci Sport Exerc* [Internet]. 2005 Nov [cited 2013 May 23];37(Supplement):S582–S588. Available from: <http://content.wkhealth.com/linkback/openurl?sid=WKPTLP:landingpage&an=00005768-200511001-00011>
127. Natale R, Scott SH, Messiah SE, Schrack MM, Uhlhorn SB, Delamater A. Design and methods for evaluating an early childhood obesity prevention program in the childcare center setting. *BMC Public Health* [Internet]. 2013 Jan [cited 2013 May 24];13(1):78. Available from: <http://www.biomedcentral.com/1471-2458/13/78>
128. Dennison B, Faith M. Dennison BA, Faith MS: Prevention of Childhood Obesity in Childcare Settings. *Handbook Childhood Adolescent Obes 2009*,. *Handbook of Childhood and Adolescent Obesity*. New York: Springer; 2009. p. 313–330.
129. Government of Canada SC. Canadian Community Health Survey (Cycle 4.1). [Internet]. 2007. Available from: <http://www.statcan.gc.ca/tables-tableaux/sum-som/101/cst01/health84a-eng.htm>
130. DesMeules M, Pong R. “How healthy are rural Canadians? An assessment of their health status and health determinants, a component of the initiative, Canada's rural communities: Understanding rural health and its determinants.”2006.
131. Hadjiyannakis S. Health Bits: Weighing in on a healthy lifestyle [Internet]. 2013 [cited 2013 Jun 12]. Available from: <http://www.cheo.on.ca/en/obesity1>
132. Silva-sanigorski AM De, Bell AC, Kremer P, Nichols M, Crellin M, Smith M, et al. Reducing obesity in early childhood : results from Romp & Chomp , an Australian community-wide intervention program 1 – 3. *Am J Clin Nutr* [Internet]. 2010;831–40. Available from: <http://ajcn.nutrition.org.cyber.usask.ca/content/91/4/831.full.pdf+html>
133. Briley ME, Roberts-Gray C. Position of The American Dietetic Association: Nutrition standards for child-care programs Source: American Dietetic Association. *Am Diet Assoc J* [Internet]. 1999;99(8):981–9. Available from: <http://www.healthyweightforkids.org/read/position.htm>
134. Nicklas T, Liu Y, Stuff J, Fisher J, Mendoza J, O'Neil C. Characterizing lunch meals served and consumed by pre-school children in Head Start. *Public Health Nutr*. 2013;16(12):2169–77.

135. Urden T, Sheeshka J, Edley G, Lero D, Marsh S. Development , Implementation , and Evaluation of a Nutrition Education Program for Informal (Unlicensed) Child Caregivers. *J Nutr Educ.* 2000;34(2):104–10.
136. Card AHKCR. *Healthy Habits Start Earlier Than You Think: Canada’s Report Card on Physical Activity for Children and Youth.* Toronto; 2010.
137. Winett R a. *Reviews : Robert G. Evans, Morris L. Barer, & Theodore R. Marmor, Why are Some People Healthy and Others not? The Determinants of Health of Populations* New York: Aldine de Gruyther, 1994, 378 pp. US\$54.95 (hbk); ISBN 0-202-30489-2. US\$24.95 (pbk); ISBN 0-. *J Health Psychol [Internet].* 1997 Jul 1 [cited 2012 Nov 8];2(3):427–8. Available from: <http://hpq.sagepub.com/cgi/doi/10.1177/135910539700200310>
138. IBM SPSS Statistics 20 [Internet]. 2012. Available from: <http://www-01.ibm.com/software/analytics/spss/products/statistics/>
139. Altman D. Why do a pilot study ? [Internet]. 2006 p. 1–2. Available from: <http://www.nc3rs.org.uk/downloaddoc.asp?id=400>
140. Timmons BW, Proudfoot N a, MacDonald MJ, Bray SR, Cairney J. The health outcomes and physical activity in preschoolers (HOPP) study: rationale and design. *BMC Public Health [Internet].* 2012 Jan;12:284. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3372448&tool=pmcentrez&rendertype=abstract>
141. Potvin L, Cargo M, McComber AM, Delormier T, Macaulay AC. Implementing participatory intervention and research in communities: lessons from the Kahnawake Schools Diabetes Prevention Project in Canada. *Soc Sci Med [Internet].* 2003 Mar;56(6):1295–305. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/12600366>
142. Nicklas T a, O’Neil CE, Stuff J, Goodell LS, Liu Y, Martin CK. Validity and feasibility of a digital diet estimation method for use with preschool children: a pilot study. *J Nutr Educ Behav [Internet].* Elsevier Inc.; 2012 [cited 2013 Dec 14];44(6):618–23. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3764479&tool=pmcentrez&rendertype=abstract>
143. Education SM of. *Play and Exploration for Infants and Toddlers [Internet].* 2010 p. 1–35. Available from: <http://www.education.gov.sk.ca/elcc/infant-and-toddler>
144. Bogart LM, Uyeda K. Community-based participatory research: partnering with communities for effective and sustainable behavioral health interventions. *Health Psychol [Internet].* 2009 Jul [cited 2013 Sep 14];28(4):391–3. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2854509&tool=pmcentrez&rendertype=abstract>

145. Israel B a., Parker E a., Rowe Z, Salvatore A, Minkler M, López J, et al. Community-Based Participatory Research: Lessons Learned from the Centers for Children’s Environmental Health and Disease Prevention Research. *Environ Health Perspect* [Internet]. 2005 Jun 24 [cited 2013 Jun 5];113(10):1463–71. Available from: <http://www.ehponline.org/ambra-doi-resolver/10.1289/ehp.7675>
146. Government of Saskatchewan. A Population Health Promotion Framework For Saskatchewan Regional Health Authorities [Internet]. Regina, SK; 2002 p. 1–40. Available from: <http://www.health.gov.sk.ca/health-promotion-framework>
147. Labonte R, Polanyi M, Muhajarine N, McIntosh T, Williams A. Beyond the divides: Towards critical population health research. *Crit Public Health* [Internet]. 2005 Mar [cited 2012 Nov 7];15(1):5–17. Available from: <http://www.tandfonline.com/doi/abs/10.1080/09581590500048192>
148. Israel B a, Schulz a J, Parker E a, Becker a B. Review of community-based research: assessing partnership approaches to improve public health. *Annu Rev Public Health* [Internet]. 1998 Jan;19:173–202. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/9611617>

APPENDIX A



INVITATION TO PARENTS

The *name of care centre* will be taking part in a pilot program to increase healthy eating and physical activity levels among children in their early years. The project is a collaboration with the Healthy Start Team; a group that includes members from the Department of Community Health and the College of Kinesiology at the University of Saskatchewan, Canada *in motion*, the Saskatchewan Network for Health Services in French, and others.

The Healthy Start initiative is guided by a resource called LEAP (literacy, education, activity, play) that includes innovative and easy to use activities for childcare workers and parents. LEAP was developed at the University of Victoria and is considered the best resources of its kind in Canada.

Staff at the care center will be trained in Healthy Start and will animate activities with children on a daily basis, giving them the chance to gain many health and developmental benefits, all by doing what young children love to do best—play!

In addition, we would like to evaluate the pilot program by looking at how the resources effect physical activity levels among children aged 3-4 at the childcare centre. We would like to invite you and your child to be part of this research. We will be available to meet with you to discuss the research project in more detail at a time convenient for you. We will be in touch with the care center director to establish a day that works for parents, and you will be notified ahead of time.

You will find background information on the pilot project in this package; however we look forward to the opportunity to meet with you to talk about the project in person.

Sincerely,

Amanda Froehlich Chow
Research Coordinator
a.froehlichchow@usask.ca
306-370-9391

Allysha Larsen
Program Coordinator
allysha.rsfs@shaw.ca
306-2912650

APPENDIX B



CONSENT LETTER (Educator)

Project Title: Starting Young: The implementation and evaluation of Healthy Start

Principal Investigators:

Dr. Louise Humbert
College of Kinesiology,
University of Saskatchewan
966 – 1070
louise.humbert@usask.ca

Dr. Anne Leis
Dept. of Community Health and Epidemiology
University of Saskatchewan
966 - 7878
anne.leis@usask.ca

INVITATION

We would like to ask for your assistance with a study that is being carried out by the College of Kinesiology and the department of Community Health & Epidemiology, College of Medicine at the University of Saskatchewan in partnership with the Roseau santé en français de la Saskatchewan. The purpose of this pilot study seeks to determine the impact of Healthy Start, a physical activity and healthy eating initiative designed to increase physical activity and healthy eating among 3 and 4 years old children. This project also aims at increasing the capacity of childcare educators and families to offer and promote children opportunities to engage in physically activity and healthy eating. The project will evaluate the feasibility of the implementation of Healthy Start. We anticipate that this evidence based information could be used to assist in the development of a sustainable early year's physical activity strategy for young children in Saskatchewan.

WHAT'S INVOLVED

As a participant, you will be trained to deliver Healthy Start and you will be asked to develop plans that will create an environment that will support the activities outlined in the Healthy Start resource within your childcare setting. When you have completed this first step, you will be asked to record one week of physical activity opportunities provided for the children and a

week's menu in each of the months, from September 2010-June 2011. In addition, you will be asked to share your experiences with Healthy Start (February and June 2011) in a short interview that will be audio recorded with your permission.

POTENTIAL BENEFITS AND RISKS

There are no known or anticipated risks associated with participation in this study. You will be trained with the LEAP resource and be able to implement this resource with your 3 and 4 year old group during the year.

Environmental Scan: There is no risk in determining if the environment at the care center promotes physical activity. The information gathered will be used to assist you in creating an environment that promotes physical activity.

Recording activity and menu for one week: There is no risk in recording activity and submitting a menu. The information gathered will help the research team better understand the data collected from the accelerometers and determine ways in which the menu for the children can be enhanced.

CONFIDENTIALITY

The interviews will be recorded and transcribed. Only a study number and not your name will be associated with your interview. Raw material such as notes and tapes, collected during this study will be destroyed once the transcriptions have been made. Access to this data will be restricted to the Principal researchers, Dr. Louise Humbert, Dr. Anne Leis and the research assistant.

All information you provide will be considered confidential and grouped with responses from other participants. Given the format of the meetings, we ask you to respect your fellow participants by keeping all information that identifies or could potentially identify a participant and/or his/her comments confidential. Your name will not appear in any thesis or report resulting from this study; however, with your permission, anonymous quotations may be used.

Shortly after the interview has been completed, you will receive a copy of the transcript to give you an opportunity to confirm the accuracy of the conversation and to add or clarify any points that you wish.

VOLUNTARY PARTICIPATION

Participation in this study is voluntary. If you wish, you may decline to answer any questions or participate in any component of the study. Further, you may decide to withdraw from this study at any time and may do so without any penalty. If you decide to withdraw the information you have shared with us will be withdrawn from the data collected. Your right to withdraw from the

study will apply until the data has been disseminated. After this it is possible that some form of research dissemination will have already occurred and it may not be possible to withdraw your data.

PUBLICATION OF RESULTS

The aggregate results from this project will be made available to the researchers, childcare directors, participants such as parents and childcare workers, as well as childcare centers involved in the study. In addition, the data collected will be used in presentations in the College of Kinesiology at the University of Saskatchewan and in the francophone community; we also plan to present the findings of our project at conferences such as the Saskatchewan Early Years conference, the Canadian Association for Young Children conference, and the Western and Territorial Francophone Early Years conference. The grouped results may also appear in printed or published reports such as journal articles. The findings as well as our final report of the project will be accessible on ours and our partner's websites (Réseau santé en français de la Saskatchewan, Association des parents Fransaskois; Saskatoon *in motion*; Saskatchewan *in motion*).

CONTACT INFORMATION AND ETHICS CLEARANCE

If you have any questions about this study or require further information, please contact one of the principal investigators, Dr. Louise Humbert or Dr. Anne Leis using the contact information provided above. This study has been reviewed and received ethics approval through the **Research Ethics Office at the University of Saskatchewan (966 – 2084)**.

If you have any comments or concerns about your rights as a research participant, please contact the Research Ethics Office.

Thank you for your assistance in this project. Please keep a copy of this form for your records.

Consent to Participate

I have read and understand the description of the research study provided above. I have been provided with an opportunity to ask questions and my questions have been answered satisfactorily. I agree to participate in the study described above, understanding that I may withdraw my consent prior to the dissemination of the results. A copy of this consent form has been given to me for my records.

(Signature of Participant)

(Date)

(Signature of Researcher)

APPENDIX C



CONSENT LETTER (Parent/Guardian)

Project Title: Starting Young: The implementation and evaluation of Healthy Start

Principal Investigators:

Dr. Louise Humbert
College of Kinesiology
University of Saskatchewan
966 – 1070
louise.humbert@usask.ca

Dr. Anne Leis
Dept. of Community Health and Epidemiology
University of Saskatchewan
966 - 7878
anne.leis@usask.ca

INVITATION

We would like to ask for your assistance with a study that is being carried out by the College of Kinesiology and the department of Community Health and Epidemiology, College of Medicine at the University of Saskatchewan in partnership with the Réseau santé en français de la Saskatchewan. The purpose of this pilot study seeks to determine the impact of Healthy Start, a physical activity and healthy eating initiative. This initiative is designed to increase physical activity and healthy eating among 3 and 4 years old children in childcare settings. Healthy Start also aims to increase the capacity of childcare educators and families to offer children opportunities to engage in physically activity and healthy eating. The project will include an evaluation of the feasibility of the implementation process. We anticipate that this evidence based information could be used to assist in the development of a sustainable early year's physical activity strategy for young children in Saskatchewan.

WHAT'S INVOLVED

As a participant, your child will be asked to wear a physical activity monitor (Accelerometer) for one week in each of the months from May/June 2011, October 2011, February 2012 and May/June 2012 and in order for us to get a direct measure of your child's physical activity. Your child will also be asked to participate in a measurement of gross motor skills (e.g., jumping,

hopping, throwing and catching) once in May 2011 and once in May/June 2012. With your permission the assessment will be video recorded. The purpose of the video recording is to help the research team to assess the gross motor skills. Children of this age often move very quickly and thus a video recording will help us to be more accurate in our assessment. The children will be assessed in a private space at the childcare center. As a parent/guardian you are welcome to attend this session.

As a parent/guardian of a child participating in the project you will be asked to attend an information session and you may be invited to participate in two 20 minutes individual interviews, one at mid-course of the study and one at the end. The purpose of this interview will be to gain a greater understanding of the Healthy Start initiative. The interviews can occur at either the care center, your home or at an agreed upon location. With your permission the interview will be audio recorded.

POTENTIAL BENEFITS AND RISKS

Measuring activity levels of children using Accelerometers: There is no risk in wearing this device. The information collected will permit the research team to determine the activity levels of the children so that we can work together to maintain or increase the activity levels of their children.

Assessment of gross motor skills: There is no risk in assessing gross motor skills in children. The skills we will focus on are activities that the children do every day. The information collected will permit the research team to determine ways to help children become more skilled movers, to help them to become active for a lifetime.

CONFIDENTIALITY

The interviews will be recorded and transcribed. Only a study number and not your name nor your child's name will be associated with your interview. Raw material such as notes and tapes, collected during this study will be destroyed once the transcriptions have been made. Access to this data will be restricted to the Principal researchers, Dr. Louise Humbert, Dr. Anne Leis and the research assistant.

All information you provide will be considered confidential and grouped with responses from other participants. Given the format of the meetings, we ask you to respect your fellow participants by keeping all information that identifies or could potentially identify a participant and/or his/her comments confidential. Your name will not appear in any thesis or report resulting from this study; however, with your permission, anonymous quotations may be used.

Shortly after the interview has been completed, you will receive a copy of the transcript to give you an opportunity to confirm the accuracy of the conversation and to add or clarify any points that you wish.

VOLUNTARY PARTICIPATION

Your participation and your child's participation in this study are voluntary. If you wish, you may decline to participate in any component of the study, you will be given a timeline indicating when each phase of the study will occur and you can withdraw from any component of the study. Further, you may decide to withdraw your child from this study at any time and may do so without any penalty. If you decide to withdraw the information you have shared with us will be withdrawn from the data collected. Your right to withdraw from the study will apply until the data has been disseminated. After this it is possible that some form of research dissemination will have already occurred and it may not be possible to withdraw your data.

PUBLICATION OF RESULTS

The aggregate results from this project will be made available to the researchers, childcare directors, parents, childcare workers, and childcare centers involved in the study. In addition, the data collected will be used in presentations in the College of Kinesiology at the University of Saskatchewan and in the College of Medicine as well we plan to present the findings of our project at conferences such as the Saskatchewan Early Years conference, the Canadian Association for Young Children conference, and the Western and Territorial Francophone Early Years conference. The grouped results may also appear in printed or published reports such as journal articles. The findings as well as our final report of the project will be accessible on ours and our partner's websites (Réseau santé en français de la Saskatchewan, Association des parents Fransaskois; Saskatoon *in motion*; Saskatchewan *in motion*).

CONTACT INFORMATION AND ETHICS CLEARANCE

If you have any questions about this study or require further information, please contact one of the principal investigators, Dr. Louise Humbert or Dr. Anne Leis using the contact information provided above. This study has been reviewed and received ethics clearance through the **Research Ethics Office at the University of Saskatchewan (966 – 2084)**.

If you have any comments or concerns about your child's rights as a research participant, please contact the Research Ethics Office.

Thank you for your assistance in this project. Please keep a copy of this form for your records.

Consent to Participate

I have read and understand the description of the research study provided above. I have been provided with an opportunity to ask questions and my questions have been answered satisfactorily. I have been given a timeline of the study, indicating when each phase of the study will begin. I agree to have my child _____ and myself participate in the study described above, with the understanding that I may withdraw my consent to have my child or I participate at any time. I understand that I can withdraw from this study until the results have been disseminated. A copy of this consent form has been given to me for my records.

I, _____ give permission to allow _____

To participate in the study conducted by the College of Kinesiology and the College of Medicine: Dept. of Community Health and Epidemiology.

(Signature of Parent/Guardian)

(Date)

(Parent/Guardian Contact Information)

(Signature of Researcher)

APPENDIX D



UNIVERSITY OF
SASKATCHEWAN

Behavioural Research Ethics Board (Beh-REB)

Certificate of Re-Approval

PRINCIPAL INVESTIGATOR	DEPARTMENT	Beh #
Louise Humbert	Kinesiology	09-217
INSTITUTION (S) WHERE RESEARCH WILL BE CARRIED OUT		
University of Saskatchewan Saskatoon SK		
STUDENT RESEARCHER(S)		
Amanda Froehlich		
FUNDER(S)		
PUBLIC HEALTH AND THE AGRICULTURAL RURAL ECOSYSTEM (PHARE)		
TITLE:		
Early Years Healthy Weight Strategy		
RE-APPROVED ON	EXPIRY DATE	
12-Mar-2013	11-Mar-2014	

Full Board Meeting

Delegated Review

CERTIFICATION

The University of Saskatchewan Behavioural Research Ethics Board has reviewed the above-named research project. The proposal was found to be acceptable on ethical grounds. The principal investigator has the responsibility for any other administrative or regulatory approvals that may pertain to this research project, and for ensuring that the authorized research is carried out according to the conditions outlined in the original protocol submitted for ethics review. This Certificate of Approval is valid for the above time period provided there is no change in experimental protocol or consent process or documents.

Any significant changes to your proposed method, or your consent and recruitment procedures should be reported to the Chair for Research Ethics Board consideration in advance of its implementation.

ONGOING REVIEW REQUIREMENTS

In order to receive annual renewal, a status report must be submitted to the REB Chair for Board consideration within one month of the current expiry date each year the study remains open, and upon study completion. Please refer to the following website for further instructions: http://www.usask.ca/research/ethics_review/

Beth Bilson

Beth Bilson, Chair
University of Saskatchewan
Behavioural Research Ethics Board

Please send all correspondence to:

Research Ethics Office
University of Saskatchewan
Box 5000 RPO University, 1607 – 110 Gymnasium Place
Saskatoon, SK S7N 4J8
Phone: (306) 966-2975 Fax: (306) 966-2069

APPENDIX E



Accelerometers (The Actical)

The Actical is a uniaxial accelerometer that detects vertical acceleration. The Actical (size and dimensions of a small pager) is worn by the participants on a belt worn around the waist with the accelerometer situated at the hip. The children and their parents would be instructed both verbally and in written form on how to attach the accelerometer. The child will be asked to wear the monitor at all times while awake. Exceptions would include water activities like bathing and swimming, or when it is deemed inappropriate by the participant. The parents will be asked to record the time the monitor was attached and removed for the purpose of calculating activity time and sleeping time. The data are electronically downloaded into a data file which contains minute-by-minute movement counts for each child. The total amount of physical activity from the Actical is expressed as the average movement counts per minute and the number of minutes beyond certain activity thresholds.

APPENDIX F



Test of Gross Motor Development-II (TGMD-II)

The Test of Gross Motor Development (TGMD-2) was developed by Ulrich (1985) as a means of assessing selected motor skills in children 3-10 years of age. This 12-item test consists of selected locomotor and manipulative skills. Locomotor skills include running, galloping, hopping, leaping, horizontal jumping, skipping, and sliding. Manipulative skills include 2-hand striking, stationary ball bouncing, catching, kicking, and overhead throwing. The administration of the TGMD takes approximately 15 minutes per child.

APPENDIX G



Environment and Policy Assessment Observation Tool (EPAO- Tool)

The purpose of the EPAO is to objectively and effectively describe the nutrition and physical activity environment and practices of childcare facilities. The tool is divided into an observation section and a document review section. The observation section is then separated into three different segments which include eating occasions, physical activity and centre environment. The document review section is also divided into separate segments, including menu review, care centre physical activity and nutrition policies and staff training and curriculum use. For the proposed study we will use certain segments of the EPAO tool. Specifically, we will use the centre environment section to conduct the environmental scan. This section contains seven questions, with each question containing a number of sub-questions.

The EPAO tool will also be used to conduct the Menu reviews. The segment on menu review is found in the document review section of the EPAO tool. The menu review also contains a section focused on recording detailed information of food served at mealtime. To ensure that the menu reviews are completed correctly the menu review protocol will be used to guide the review process.

APPENDIX H



Educator Interview Guide

Interview #1

- What words would you use to describe your experiences with the Healthy Start resources to date?
- Do you feel that your work is increasing the physical activity opportunities for the children in your care?
- Do you think you are offering healthier food choices?
- Do you feel that the gross motor skills of the children have improved?
- What particular challenges have you faced in your work with these resources?
- What successes have you had using these resources?
- Do you feel the parents are participating in the project?
- What have you learned that will influence your work in the future?

Interview #2

- Now that our work together is coming to an end, how would you describe your experiences this past year?
- When you think of the challenges you faced this past year, what strategies did you use to overcome any challenges?
- When you think of your successes, what strategies did you use to bring about success?
- Do you feel that your work is increasing the physical activity opportunities for the children in your care?
- Do you think you are offering healthier food choices?
- Do you feel that the gross motor skills of children have improved?
- Would you recommend the use of this resource in other care centers in the province?

APPENDIX I



Pulse Crop Questionnaire

(For Educators)

For you Information

The term **pulse crop** refers to:

- Beans (e.g., kidney beans, black beans, navy beans)
- Chickpeas
- Peas (e.g., split peas)
- Lentils (e.g., red, yellow and green)

Please answer the following questions. It should take you approximately 10 minutes to complete.

Thank you very much!

Amanda Froehlich Chow

Leap Research Coordinator

alf263@mail.usask.ca

- A. Please choose one response for each question in regards to pulse crop consumption among you and your family.

	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
1. I need more information about how to cook pulse crops.					
2. I do not know how to prepare pulse crops.					
3. I am busy and it takes too long to prepare pulse crop based meals.					
4. I believe it would be too expensive to eat pulse crops.					
5. It is too difficult to find pulse crops in my local grocery store.					
6. Pulse crops upset my stomach so I choose not to eat them.					
7. I do not like the taste of pulse crops.					
8. I never think of using pulse crops when I am cooking meals.					
9. I do not cook pulse crops because my family does not like them.					
10. I tried cooking pulse crops but my family did not eat them, so I quite serving pulse crops.					

B. Please choose one response for each question in regards to pulse crop consumption among you and your family.

	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
1. I know how to cook pulse crops.					
2. I believe pulse crops are a healthy food choice.					
3. Pulse crops are locally grown in Saskatchewan.					
4. I believe pulse crops are inexpensive.					
5. I am able to find pulse crops in my local grocery store.					
6. I am motivated to eat pulse crops.					
7. I believe pulse crop based meals will help my family save money.					
8. My family is willing to try pulse crops.					
9. Pulse crops can be part of a healthy diet.					
10. My family likes to eat pulse crops.					

C. Please choose one response for each question in regards to pulse crop consumption among children at your care centre.

	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
1. I believe that it is important for children to consume pulse crop based meals					
2. I believe pulse crops are a healthy food choice for young children					
3. I believe the children would eat pulse crops if we served them.					
4. I believe the children would be more likely to eat pulse crops if we, as educators, were eating them too.					
5. I believe that it is important that children learn that pulse crops are grown in Saskatchewan.					

D. Please choose one response for each question in regards to pulse crop consumption among children at your care centre.

	Yes	No
1. We have not offered pulse crops in meals at the care centre.		
2. If the children would eat pulse crops, we would serve them at the care centre.		
3. We have tried serving pulse crops at the care centre.		
4. We often incorporate pulse crops into meals served at the care centre.		
5. We discuss pulse crops with the children at the care centre		

E. How often do you eat pulse crops? (please check one)

Never or rarely	
1-3 times per month	
1-2 times per week	
3-4 times per week	
5-6 times per week	
Once a day	
Two or more times a day	

F. Circle the type(s) of pulses that you eat most often. (If you answered never or rarely on question E move on to question G.

Split peas

Beans

Chickpeas

Lentils

G. How often do you eat each of the following foods?

Food Choices	Never/ rarely	1-3 per month	1-2 per month	3-4 per month	5-6 per month	1 per day	2+ per day
Baked beans							
Soup with beans, peas or lentils							
Chili with beans, peas or lentils							
Dips or spreads made with beans, peas or lentils (hummus, bean dip, etc.)							
Salad with beans, peas or lentils							
Missed dishes with beans, peas or lentil (curries, stew, taco etc.)							

H. Please choose what you believe is the best answer.

1. According to Canada's Food Guide lentils, chickpeas and beans are an example of a food in the (please circle one):

Vegetable and Fruit Group

Grain Products Group

Milk and Alternatives Group

Meat and Alternatives Group

2. Eating a diet high in fibre and protein and low in fat will help reduce your risk of certain types of diseases:

True

False

3. According to Canada's Food Guide one serving of cooked lentils equals (please circle one):

$\frac{1}{4}$ cup

$\frac{1}{2}$ cup

$\frac{3}{4}$ cup

1 cup

4. Pulse crops are good source of protein:

True

False

5. Pulse crops are a good source of fibre:

True

False

6. Pulse crops are a poor source of Iron:

True

False

7. Pulse crops have too much saturated fat:

True

False

8. Which of the following does not belong to the Meat and Alternatives Group in Canada's Food Guide (please circle one):

Eggs

Kidney Beans

Tofu

Peanut Butter

Cottage Cheese

9. Saskatchewan is a leading producer of pulse crops:

True

False

10. Pulse crops can be used in baking:

True

False

APPENDIX J



Parent/Guardian Interview Guide

Interview #1

- What words would you use to describe your experiences with the Healthy Start resources to date?
- Do you feel that your participation in this program has influenced the physical activity opportunities you offer to your family or that you participate in as a family?
- Do you think you are offering healthier food choices?
- Do you feel that your children move in a more confident and competent manner?
- What particular challenges have you faced in your work with these resources?
- What successes have you had using these resources?
- What have you learned from your participation in this project?
- What other supports do you need so that you can offer your children opportunities to be active and healthy food choices?

Interview #2

- Now that our work together is coming to an end, how would you describe your experiences this past year?
- When you think of the challenges you faced this past year, what strategies did you use to overcome any challenges?
- When you think of your successes, what strategies did you use to bring about success?
- Do you feel that your participation in this program has influenced the physical activity opportunities you offer to your family or that you participate in as a family?
- Do you think you are offering healthier food choices?
- Do you feel that your children move in a more confident and competent manner?
- What particular challenges have you faced as part of this project?
- Would you recommend the use of this resource in other care centers in the province?

APPENDIX K



TRANSCRIPT RELEASE FORM

I, _____, have reviewed the complete transcript of my personal information that was given during the interview session in this study, and have been provided with the opportunity to add, alter, and delete information from the transcript as appropriate. I acknowledge that the transcript accurately reflects what I said in the interview with the researcher. I hereby authorize the release of this transcript the named researchers to be used in the manner described in the consent form. I have received a copy of this Transcript Release Form for my own records.

(Participant signature)

(Date)

(Researcher signature)

(Date)