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Interesting Shapes of Vegetables: Is it A Strategy to Promote Consumption Among Preschool Children?

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A thesis submitted in partial fulfillment of the requirements for the Master of Science degree in Foods and Nutrition

INTERESTING SHAPES OF VEGETABLES: IS IT A STRATEGY TO PROMOTE CONSUMPTION AMONG PRESCHOOL CHILDREN?

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ABSTRACT AND KEY WORDS

Abstract:

This study highlighted the low intake of vegetables by preschool children and determined whether changing the shape of vegetables increased their level of consumption. A new strategy of repeated exposure to interesting-shaped vegetables was a step aimed at increasing vegetable consumption by increasing the fun element in having vegetables as snacks. Vegetables are the less desirable food in comparison to more attractive unhealthy choices available to children, and discovering a strategy to promote vegetables is considered an important step in nutrition. The primary aim was to explore the effect of repeated exposure (eight times) of shaped vegetables on consumption by preschool children. The secondary aim was to determine the level of accessibility of vegetables at home and its influence on the consumption of the shaped vegetables by children. The purpose of this experiment was to compare the amount of consumption between different days and different vegetable shapes. Children (n=42) from five different childcare centres in London, Ontario as well as their parents were part of the study. Some of the data from the questionnaires came from responses of the parents (n=42), such as the demographic information and the accessibility and availability of vegetables to children at their homes. The experimental test started after the collection of some primary data from the questionnaires. In the first part of the experiment, each child was provided vegetables in their natural forms to provide an indication of the consumption of uncut vegetables as baseline data. The children were later provided with vegetables cut in different shapes (flower-shaped, star-shaped and owl-/bat-shaped). Lastly, the natural shape of vegetables was provided again to the children to determine how the different shapes of vegetables influenced their consumption of natural-shaped vegetables. The preferred dip was served with vegetables for four first days of the study; however, one childcare center had the reverse sequence. The data were analysed using analytical and descriptive statistical tests. In this study the promotion strategy of repeated exposure for 6 days to shaped vegetables increased the preschool children's consumption of natural shaped vegetables on the 8^{th} day of the experiment by 10.5%. The preschool children's consumption of shaped vegetables was significantly higher ($p<0.001$) than their consumption of natural shaped vegetables.

Keywords: Preschool children, repeated exposure, shaped vegetable, accessibility, child-oriented food

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LIST OF ABBREVIATIONS

Abbreviation	Meaning
F&V	Fruit and vegetables
CFG	Canada's Food Guide
CAB	Canadian Association of Broadcasters
CAI	Canadian Children's Food and Beverage Advertising Initiative
DALY	Disability-Adjusted Life Year
CCHS	Canadian Community Health Survey
RCT	Randomized Controlled Trial
BMI	Body Mass Index
SCT	Social Cognitive Theory
TPB	Theory of Planned Behavior
WHO	World Health Organization

CHAPTER1: INTRODUCTION

1.1 Description of the health issue:

Fruit and vegetables (F&V) are the best source of vitamins and minerals and fibre to enhance children's diet, and truly play a vital role to support their body system (Black et al 2013, Percival 2010). Evidence has been found in the literature that when consumed by children, F&V benefit their health and reduce the side effects of low consumption such as risk of cardiovascular, cancer and respiratory diseases (Antova et al 2003; Forastiere et al 2000; Hung et al 2004; Knai et al 2006; Maynard et al 2003; Ness et al 2005;WHO 2005). Approximately, 9% of all stroke deaths and 11% of all ischemic heart disease is on account of low consumption of F&V (WHO 2009). High consumption of vegetables in childhood is associated with lower risk of stroke (Ness et al 2005). Hence, a healthy dietary intake in early childhood is important for healthy growth and development. According to Canada's Food Guide (CFG), F&V are under one food group and having five servings a day is recommended for children ages four to eight years and this intake should include all F&V categories (Health Canada 2007). However, most Canadian children do not follow these guidelines. The fast growing epidemic or health problems witnessed in children today are overweight and obesity. Currently, obesity is a critical area for discussion and research since in many countries it has become a major public health concern (Garriguet 2004; Knaiet al 2006; Nicklas et al 2003; Van der Host 2006; World Health Organization [WHO] 2005). This is mainly because eating behavior during childhood is considered a predictor of long-term health problems in adulthood such as obesity and chronic health diseases (Hung et al 2004; Knai et al 2006; Maynard et al 2003; Ness et al 2005). According to nutritional surveillance in the United States, children have more unhealthy choices than healthy food, which lead to fewer intakes of F&V (Nelson et al 2006).

Children are considered an important target by the food industry for 'unhealthy food', i.e. low density and high-energy food (Elliott 2009; Harris et al 2009; Hastings et al 2006; McGinnis et al 2006;) and they use strategies to promote their foods through the media channels and to design attractive food products that encourage child-oriented preferences (Elliott 2009; Harris et al. 2009). The repeated exposures to well-designed strategies by food companies attract consumers in their early ages and ensure their loyalty to these food products at subsequent ages (Elliott

2009; Harris et al 2009). The Canadian Association of Broadcasters (CAB) regulates food advertising to children by following the Broadcast Code wherein their rules are regularly updated. The Canadian Code of Advertising Standards adopts public complaints and concerns about any advertisement and refers them for review (Health Canada 2006). Moreover, an example of provincial policy is Quebec's Consumer Protection Act, which bans the directed advertising to children less than 13 years (Quebec 2012). The Canadian Children's Food and Beverage Advertising Initiative (CAI) is an example of a national initiative, which is voluntarily conducted by different Canadian food and beverage companies (Advertising Standards, 2012). This initiative works to confirm the compliance of participating companies to its program, which does not allow direct advertising to children less than 12 years when it is not consistent with the CFG principles of healthy eating and nutrient content claims (Advertising Standards, 2012). The final report of CAI showed 14 % of food and beverage products are not following its rules of advertising to children (Advertising Standards, 2012). The promotion practices continue despite counteractive initiatives and policies that work to limit the exposure of this vulnerable group of children who do not have the full awareness to undertake a conscious decision towards good diet and health (Dixon et al 2014; Elliott 2009; Harris et al 2009).

On the other hand, many studies have recommended that promoting healthy diet and increasing its consumption is possible by increasing exposure/availability/accessibility to and attractiveness of presenting F&V and other healthy foods (Anzman-Frasca et al 2011; Caton et al 2012; Cooke et al 2011; Hausner et al 2012; O'Connell et al 2012; Remington et al 2012;Wolfenden et al 2012). These are the major means of promoting and increasing consumption of F&V by children in different environments (Barnes 2010; McGinnis et al 2006). However, there is limited research on promoting F&V to pre-school children (Wolfenden et al 2012).

1.1.1 Promoting fruit and vegetables in children

Research has been conducted to identify factors which influence children's F&V consumption and to define an optimum strategy to promote F&V in early ages which would subsequently improve the quality of their diet as they go through their life cycle. Research has shown that repeated exposure to vegetables among children can effectively increase their liking of vegetables and improve their intakes (Anzman-Frasca et al 2011; Caton et al 2012; Cooke et al

2011; Hausner et al 2012; Houston-Price et al 2009; O'Connell et al 2012; Remington et al 2012;Wolfenden et al 2012).

Qualitative studies indicate that the sensory aspect, convenience, availability and accessibility of food are the potential determinants of F&V consumption among children (Atik et al 2013; Dazeley et al 2012; McKinley et al 2005; Monge-Rojas et al 2005; Neumark-Sztainer et al 1999). Also, quantitative studies indicate a significant increase in children's F&V consumption with factors such an improved sensory aspect (appearance, texture and taste) and easy accessibility to eat them (Jansen et al 2010; Reverdy et al 2010).

Population surveys of children indicate the need to increase the intake of F&V (Lock et al 2005; WHO 2005). In other words, there is a need to increase the F&V daily amount recommended to improve the diet quality that is consistent with the dietary habit of children. One study examined the U.S representative food intake surveys from 1977 to 2006 and found that snacking habits and calorie intake among children (2-18 years old) have a noticeable increase (Piernas et al 2010). Easy access to unhealthy snacks that come in small sizes such as cereals is the possible explanation for this increase in snacking habits among children (Liem et al 2009). The study showed that 27% of children's daily calories are coming from snacks, which was more than 500 calories per day in 2006. Salty snacks and candies are the snacks which increased, however, sweetened beverages and desserts are the most preferred snacks (Piernas et al 2010). The increase in snacking habit leads to a decrease in food consumption at breakfast, and lunch and dinner meals which are the main eating times for F&V in children (Garriguet 2004; Piernas et al 2010). It has also been found that there is a positive relationship between amount of snacking and overweight status (Nicklas et al 2003). Therefore, finding strategies to promote F&V and healthy snacks and to reduce unhealthy snacking is important to improve children's nutrition and diet.

An increase in consumption of unhealthy food products has been witnessed in children who are shape-oriented (Cairns et al 2009; Hastings et al 2006; McGinnis et al 2006). Most of the child–oriented food products contain high sugar, fat and sodium, and they were the most promoted food products to children (Cairns et al 2009). However, it has been found that there was almost no promotion of the F&V products in the market for children (Cairns et al 2009). A study of a

Canadian market showed that advertising of F&V to target children were less than 1%. On the other hand, food products that were in child-oriented shapes and with poor nutritional quality comprised 89% of 367 food product items in the Canadian market (Elliott 2009). Also, in the United States, $10 billion is spent annually for child-oriented food and beverage products by using effective marketing strategies to attract children as consumers (McGinnis et al 2006). In the UK, a study revealed that marketing the child oriented food products had an effect on children's preferences, purchase behaviors and consumption of food products (Hastings et al 2006).

Also, child-oriented products not only attract children, but also their parents and caretakers (Cairns et al 2009). Food companies use interesting shapes of food to attract children, and using a similar strategy to promote F&V could encourage children to consume more healthy food products and thus improve their diet quality (Boyer et al 2012). Assessing the cost effectiveness is needed to determine the benefit of promoting shaped F&V to children (Boyer et al 2012).

1.2 Rational for the Study

Promoting healthy eating in children and adolescents has become an increasingly important public health concern and thus a research priority as there is not only prevalence but growth in health problems like obesity and overweight among children and adolescents (Van der Horst et al 2007). Food companies play a major role in formulating the eating habits of people (Harris et al 2009). It does so by using its different marketing mediums and channels like in-store promotions, advertising of child-oriented products, etc (Elliott 2009; Harris et al 2009; Hastings et al 2006; McGinnis et al 2006). A significant rise has been witnessed in promotion, especially in using appealing marketing strategies designed to promote food products to children as well as adults (Elliott 2009; Harris et al 2009; Hastings et al 2006; McGinnis et al 2006). One study also revealed that it is from the 6th year onwards that a child starts to distinguish different food products and develop an understanding of different types indicating what are good for them and what are not (Strachan et al 2008). However, it has been argued that decreasing children's exposure to such food marketing strategies by devising policies to restrict food marketing is not a proper solution to deal with problems like childhood obesity. Instead, it will be more effective if

healthy foods are also rigorously promoted to compete with the unhealthy ones which strongly influence food preferences and eating habits of children (Strachan et al 2008).

Apart from these influential agents, children may also be attracted by the physical characteristics of food itself because of several reasons. One of the most important reasons is taste, which attracts children and develops their preference toward a particular food product (Elliott 2009; Jonsson et al 2005). Some other reasons, according to other studies, include the playful, attractive and aesthetic features of the food which are much appreciated by many children. Studies also reveal that while boys like foods which come in strange and different colors, attractive shapes, or includes interactivity, girls are more attracted by foods which have pretty and decent colors, and general aesthetic appeals (Elliott 2009). Studies conducted earlier also show that from 6 years of age, children start understanding the effect of healthy eating and also begin to care about themselves and thus eat foods that are good for their health. However, it has also been found that just because they understand what is healthy for them does not imply that they will discard eating of unhealthy food products (Atik et al 2013; Montgomery et al 2009; Von Normann 2009). F&V have many aesthetic features that can be used to promote consumption among children such as color. However, the bitter taste of vegetable makes it less preferred than fruit among children (Bergström et al 2012). Therefore, finding a strategy to promote vegetables is considered a priority.

Childhood includes the ages ranging from birth to 12 years which means there are many differences in needs and changes in physical and mental growth (Public Health Agency 2005). Preschool age is between 2 to 5 years and is a transformative period between infancy and school age, and this is also the age group that adapts food patterns that last up to adulthood (Nicklaus et al 2004). Preschool age is when children can be taught to like new foods and increase their acceptance of new foods, especially for vegetables that are less preferred by most of children (Anzman- Frasca et al 2011).

Despite knowing the benefits of vegetables on health, there is low consumption that does not meet the daily recommended amounts among children. Increasing the liking of foods in the pre-school age is important to maintain their liking at later ages. Also, there is a significant increase in the rate of childhood obesity over the past decades, which is due to the increase in intake of

low density and high-energy snacks for children. Therefore, there is a need to find new creative strategies to promote and increase likeness of vegetables among preschool children.

1.3 Study Objectives

The purpose of this study was to determine the effectiveness of repeated exposure to shaped vegetables on pre-school children's consumption and preference. Also, this study was aimed to determine the influence of accessibility of vegetables in increasing their consumption.

The specific objectives of this study were:

1. to study the influence of vegetables, cut in new shapes, on preschool children's consumption habits during a particular period (June to July) in several child-care centres in the London-Middlesex area of Ontario;
2. to study the impact of repeated exposure to interesting-shaped vegetables on preschool children's consumption habits;
3. to compare the consumption of natural-shaped and the interesting-shaped vegetables on preschool children; and
4. to determine the level of exposure/access to vegetables at home and how it is served by parents/caretaker.

The null hypotheses of this study were as follows:

1. The preschool children's consumption of interesting-shaped vegetables will not be more than natural-shaped vegetables.

2. More exposure to interesting-shaped vegetable will not increase the preschool children's consumption of natural-shaped vegetables.

3. High accessibility level of vegetables at home will not increase the preschool children's consumption.

1.4 Definition of Terms

Neophobia: According to the Oxford dictionary (2014), it is an extreme or irrational fear or dislike of anything new or unfamiliar.

Accessibility: It is the presence of F&V in such a form that it is easy for the children to obtain it. It is a concept that shows the level at which children are easily exposed to F&V in their surrounding environment (Blanchette et al 2005). In this study, accessibility levels were calculated, as indicated on pages 103-104.

Availability: It is the presence of F&V in the surrounding environment (usually the home) of the children (Blanchette et al 2005).

Child–oriented food: It is a food that is presented in an appealing way to the children.

Disability-Adjusted Life Year (DALY): It refers to quantifying the Burden of Disease from mortality and morbidity. One DALY can be thought of as one year of a healthy life lost. The sum of these DALYs across the population, or the burden of disease, can be thought of as a measurement of the gap between current health status and an ideal health situation where the entire population lives to an advanced age, which is free of disease and disability (WHO 2014).

Mere repeated exposure: It is a psychological theory that indicates more exposure to stimulus condition over time which increases familiarity and attitude of likeness towards the stimuli (Zajonc1968).

Body Mass Index (BMI): Index is calculated by dividing the body weight in kilograms by the height (in meters) squared

CHAPTER 2: LITERATURE REVIEW

This chapter results from reviewing 78 publications from 1968 to 2014 including journal articles, research reviews and organizational reports from the following publications: Journal of Consumer Studies, Journal of Foodservice Business Research, Journal of Human Nutrition and Dietetics, International Journal of Behavioural Nutrition and Physical Activity, Journal of the American College of Nutrition, British Journal of Nutrition, Journal of Epidemiology and Community Health, Journal of the American Dietetic Association, Canadian Journal of Communication, Journal of Public Health, Journal of Health Education, European Journal of Clinical Nutrition, American Journal of Preventive Medicine, American Journal of Clinical Nutrition, Journal of Personality and Social Psychology, Acta Paediatrica and Cochrane Collaboration. In this chapter, the topics are varied in its content to cover the problem of children having low vegetable consumption and possible reasons for the problem. The current and different interventions and strategies addressed by different researchers to promote F&V to children are also presented.

2.1 Statistics of Vegetable Consumption

According to the findings from Statistics Canada, one third of children aged 5-17 years were categorized as overweight or obese in the Canadian Health Survey of 2009 to 2011 (Roberts et al 2012). Also, the Canadian Community Health Survey (CCHS) for childhood obesity in 2004, 26% of Canadian children and adolescents aged 2 to 17 were overweight or obese; 8% were obese (Shields 2005). Child and youth obesity and overweight rates between the years 2007 and 2009 were almost double that in 1981(Knaiet al 2006). Obesity and its determinants such as insufficient physical activity and unhealthy diet are major risk factors for many chronic diseases, which are the leading causes of disability and death worldwide (Maynard et al 2003). The low consumption of F&V is considered an important determinant of obesity and is also represented in the same survey. It had also been revealed that 59% of the Canadian children consumed less than 5 servings of vegetable per day, which is considered a requisite amongst children in the surveyed age-group.

Low consumption of F&V has evolved as a public health issue in children (Shields 2005). According to the CCHS, 59% of Canadian children between the age of 2 to 17 years have

inadequate intakes of F&V in their daily diet, and they were more likely to be overweight and obese (Shields 2005). Moreover, according to the nutritional surveillance in the United States, children consume less F&V as they have more unhealthy choices such as chips, pretzels, candies and cookies (Nelson et al 2006). Strong and overwhelming evidence about the benefits of consumption of F&V is found in the literature such as reduced risk of stroke, cardiovascular disease, non-traumatic death, cancer and type II diabetes (Barclay et al 2007; Hung et al 2004; Knai et al 2006; Maynard et al 2003).

According to the World Health Organization (WHO), low consumption of F&V in the diet is one of the top ten risk factors that contribute to global mortality and a large number of children did not meet the minimum intake of 400g of vegetables daily as per the WHO recommendations (Guenther et al 2006). According to worldwide statistics, inadequate consumption of F&V is the reason for 2.9% of deaths and 1.1% of disability-adjusted life years (DALYs) disability illness each year (WHO 2005). Therefore, there is a need to formulate a strategy to prepare the new generation of children to consume F&V to protect them from long term health problems.

2.2 Benefits of Vegetables on Health

In childhood, adequate consumption of F&V can increase key nutrients that boost immune system capacity such as iron, zinc and copper which enhance the productivity of the immune system cells and vitamins which work as antioxidants (Black et al 2013, Percival 2010). It also decreases the consumption of food and beverages that are high in calorie and low in nutrients, both of which are associated with several negative impacts on health such as obesity which in turn increases the risk of cardiovascular diseases and type II diabetes mellitus (Dubois et al 2007, Pereira 2013). Moreover, healthy snacks of F&V instead of high density calorie snacks could improve the mood and mental health of children (Hung et al 2004). The proportionate dietary intake in early childhood is important for the growth and development and health of these children. According to the CFG (2007), the amount of F&V for children from four to eight years should be five servings each day, which is often not followed by most Canadian children (Shields 2005).

Many studies discussed the health impact of adequate intake of F&V in childhood (Lien et al 2001; Maynard et al 2003; Mikkilä et al 2004; Ness et al 2005). The Boyd Orr cohort study done

by Maynard and colleagues found that adequate intake of F&V consumption impacts on future health quality in adulthood and plays a protective role against cancer (Maynard et al 2003). Longitudinal studies suggest that eating habits developed in childhood are likely to persist in adulthood (Lien et al 2001; Mikkilä et al 2004). Therefore, promoting a strategy of healthy food habits is important to focus on early childhood, and finding an effective strategy would be beneficial. For instance, 37-year follow-up data from the Boyd Orr cohort study of British children found lower rates of cardiovascular mortality among children with greater intake of vegetables in childhood (Ness et al 2005). There is an ongoing investigation to find the best strategies to promote F&V to better the health of children (Knai et al 2006). Encouraging healthy eating behaviors among children will help in increasing the consumption of F&V. Therefore, there is a need to address the factors that impact children's F&V consumption to design effective strategies.

2.3 Factors Affecting Vegetable Consumption

To understand the reasons and causes behind the low consumption of vegetables among children, there is a need to find the interrelationship between the possible causal factors. There are many factors that can be deduced from qualitative and quantitative research about determinants of children's F&V consumption carried out across different regions of the world. These are presented in the following sections.

2.3.1 Fruit and vegetable characteristics

Some studies highlight that the sensory characteristics are main drivers to F&V liking (Eertmans et al 2000). Taste is a major contributor to liking and disliking F&V and it changes according to age (Eertmans et al 2000). Good taste of F&V is determined according to familiarity, i.e., if the families nurture the habit of eating more F&V then it is embedded in the children's food habits. The way of preparing food is a determining factor for the liking of vegetables. For example, children like fresh, crunchy, crispy and juicy F&V, whereas they do not like it when it's cooked (Caporale et al 2009). The appearance of the food on the plate (color and shape) is the sensational property that integrates to give us a perception of the flavour of food (Eertmans et al 2000). The smell of F&V is a factor that affects children's choices (Atik et al 2013; Eeetmans

2000). Other studies show that children do not choose fresh and healthy F&V because they do not give the feeling of satiety as compared to unhealthy choices (Monge-Rojas et al 2005).

Convenience and time to access F&V are considered barriers that restrict the acceptance and eating of F&V (Monge-Rojas et al 2005). When choices of buying snack foods were observed, it was found that children had a preference for pre-packaged foods that are easy to obtain, carry and require no preparation, examples of which are salty snacks, sweets, fast food, and soft drinks (Monge-Rojas et al 2005). F&V were, in general, perceived as inconvenient as they were not instantly available and had to be washed, dried, peeled or cooked before consumption. They were not in accessible form which decreases the convenience of access (Monge-Rojas et al 2005). Also it is inconvenient to eat and transport F&V compared to packaged snacks, because of the preparation time and the quality is affected with time (Krølner et al 2011).

In some studies, dinner is presented as the most usual time of having and eating vegetables (Krølner et al 2011). Skipping this meal then meant that not enough vegetable servings for a day were consumed. Many children did not like having F&V as healthy snacks while watching TV, whereas having vegetable snacks along with a friend is considered as appropriate (Krølner et al 2011).

All these children's perceptions could lead to reducing the availability of F&V at home. Many studies revealed that children did not have enough F&V because of lack of availability of F&V at home especially among families with low economic status (Christian et al 2013; Cullen et al 2003; Koui et al 2008; Van Ansem et al 2012).

2.3.2 Age of preschool children

Many studies prove that liking of vegetables helps in the prediction of vegetable consumption, and it can be learned by taking different strategies into account (Jacka et al 2011). The preschool age 2 to 4 years or between infancy and school age, is a critical period to learn about food and to adapt a food pattern that lasts for the rest of their life (Mannino et al 2004; Nicklaus et al 2004). They begin expressing what they have learned from their experiences and the environment, and establish concepts about food that will be hard to change in later ages. Thus, the appetite level at these ages is decreased dramatically when compared to other ages (Cashdan 1994). The sensory

characteristics of vegetables which include bitter and sour tastes are not preferred by children (Bergström et al 2012). Therefore, it has been suggested that flavour learning associated with F&V (in the form of a dip), which can be a preferably healthy product, will enhance and increase the F&V intake in children (Anzman-Frasca et al 2011).

2.3.3 Awareness about fruit and vegetables

Preschool childhood is the age for choosy eating habits, trying new food and distrust for unfamiliar food which is called neophobia (Bergström et al 2012). This is a natural mechanism and found to be a protective process against harmful substances (Bergström et al 2012). Making children familiar with a new food is a step to make them learn new flavours and liking of food by reducing the fear element (Anzman-Frasca et al 2011). Many studies suggest that increasing the experience of children in having with F&V will increase their consumption (Bergström et al 2012; Cashdan 1994; Jacka et al 2011; Knai et al 2006). Also the positive feelings towards F&V in preschool children are directly correlated to F&V consumption (Cooke et al 2004).

2.3.4 Accessibility/Availability of fruit and vegetables

Preference is the leading motivational factor for eating F&V in children. However, 13% of children's F&V consumption depend on their availability and accessibility (Hearn et al 1998). The definitions of availability and accessibility of F&V are different. Availability is the presence of vegetables in the surrounding environment of children, whereas, accessibility is the presence of F&V in a form that is easy to obtain by the children, which is a concept that reveals the level of exposure of children to F&V in their surrounding environment (Blanchette et al 2005). The U.S. Task Force on Childhood Obesity (Barnes 2010) discussed the importance of easy accessibility and attractive presentation of F&V that encourage children to consume them because of the fact that children's choice of food selection depends on what is available and easy to eat (Barnes 2010).

Many studies on children's intake with large sample sizes across the continent revealed a positive relationship between the environmental factor of availability and accessibility of F&V at home (Bere et al 2007; Christian et al 2013; Cullen et al 2003; Koui et al 2008; Van Ansem et al

2012). Also, other studies discussed the factors that impact F&V availability and accessibility such as socioeconomic factor, ethnicity, F&V prices, and others (Nelson et al 2006).

One of the earlier studies tested the impact of different levels of availability and accessibility of food on two groups of school children where one group had the packaged meal and other had unpackaged meal from the school foodservice bar. There was a significant improvement observed in F&V consumption by the group provided with the packaged lunch meal (Cullen et al 2000). It is an indication of the importance of F&V availability and accessibility to improve children's F&V consumption. On other hand, providing financial support did not improve the F&V consumption for parents and children (Odoms-Young et al 2013). The study also stated that the improvement in consumption of F&V by parents correlated with the improvement in consumption of F&V by their children (Odoms-Young et al 2013).

2.3.5 Predicting fruit and vegetable consumption

Predicting preschool children's F&V consumption is related to demographic factors, parental feeding practices and feeling towards F&V. Demographic factors associated with preschool children's F&V consumption were parents' education, children's age, ethnicity and gender (Cooke et al 2004). There is a positive association between parental education and their children's vegetable consumption (Fernández-Alvira et al 2013). Parental feeding practices such as parental food intake and style, breast-feeding and early introduction of F&V to children were taken into account (Cooke et al 2004).

Parents were considered a factor that had direct and great impact on preschool children's F&V preference (Spurrier et al 2008). Considering parents as the controller of F&V availability and accessibility at home, they were treated as role models with their food parenting style (Branen et al 1999). Studies have found that there was a strong positive relationship between children's F&V consumption and availability and accessibility, and these factors were considered as significant predictors of high consumption of F&V in children (Bere et al 2004; Bere et al 2007; Cooke et al 2004; Cullen et al 2003; Knai et al 2006).

Another study also found that F&V in sliced and diced form were consumed double than when they are in their natural form (Heath et al 2011). As F&V are available in an attractive form,

children can easily pick and eat them, whether in a snack or a mealtime. It was found that repeated exposure of small portions of vegetables was an important step in increasing vegetable intake in preschool children (Jacka et al 2011). The optimal number of exposure in different studies is not constant but it ranges between 8 to15 times to get positive results in children's vegetable consumption (Anzman-Frasca et al 2011; Caton et al 2012; Cooke et al 2011; Hausner et al 2012; O'Connell et al 2012; Remington et al 2012; Wolfenden et al 2012). A study found that parents at home give up after reaching 3 times of exposure (Carruth et al 2000). Therefore, there is difficulty in reaching the optimal range of numbers of exposure to increase the children's F&V acceptance at home.

Children's F&V consumption is varied between the first years of age to school age (Cashdan 1994). Preschool children 2 to 4 years old showed a drop in F&V consumption when compared to other children in childhood (Cashdan 1994). Therefore, preschool children are considered an important group to study and understand their preferences and the factors that impact their F&V consumption.

A study showed the impact of ethnicity on children's F&V consumption, where Hispanic children tended to consume less F&V than children from other ethnicity groups (Erinosho et al 2011). Another study reported that the Caucasian children tended to eat more fruit than other ethnic groups (Cooke et al 2004). Therefore, ethnicity of children has an impact on F&V consumption and it would be beneficial to study it.

The impact of gender on children's F&V consumption is not consistent in the literature. A literature review reported that 27 out of 49 studies indicated gender differences in F&V consumption among children, and the females tended to consume more F&V than males (Rasmussen et al 2006). This finding was also supported by another literature review (Krølner et al 2011). Another study examined the gender differences in children's F&V consumption in different countries and found no significant differences (Jaenke et al 2012).

Determinants of F&V consumption among children are varied in the level of importance and effect. More determinants considered in a research study would be more beneficial to build stronger association and correlation between variables and provide logical explanation of children's F&V consumption.

2.4 Strategies to Promote Vegetable Consumption

2.4.1 Theory

Developing interventions to increase F&V consumption of children was built on different theories as reported in some published studies (Krølner et al 2011; Rasmussen et al 2006). A number of these theories were considered to conceptualize the processes of intervention to influence F&V consumption. For example, behavioral change theories used to understand factors that cause behavioral changes include the Social Cognitive Theory (SCT) and the Theory of Planned Behavior (TPB) (Ajzen 1991; Bandura 1989). The SCT presumes that human dietary behavior is the controller of environmental factors (such as accessibility and availability) and personal factors (such as self-efficacy and intention) (Bandura 1989). A study that applied the SCT framework found that F&V preferences and accessibility to children were considered strong predictors of their intake (Bere et al 2004). The TPB is a theory more focused on the interpersonal factors (beliefs, norms, attitudes and self-efficacy) that control individual's behaviors. Studies found that interpersonal factors contribute approximately 30% influence on nutritional behaviors and F&V intake (Achterberg et al 2004; Lytle et al 2003). Another study used the TPB framework to assess the impact of personal factors (attitude, preferences, modeling, social influence, self-efficacy) on an intervention to promote F&V consumption among children and compared these personal factors to other ecological factors (Reinaerts et al 2007). Habits showed that the largest contributors to children's F&V consumption and children's surroundings were determinants such as parental intake as well the availability of F&V and exposure to F&V (Reinaerts et al 2007).

A broader framework such as the Social–Ecological Model that has been developed for the Pro Children Project (refer to Appendix A: Theoretical framework for the Pro Children Project) considered many factors that influence behaviors at different levels such as individual, social, physical and cultural environments (French et al 2001; Klepp et al 2005). Planning interventions to promote F&V to children should be based partly on theoretical frameworks that systematically consider the influence of different environmental sectors linked together as an interactive chain (Klepp et al 2005). For example, targeting parents to promote F&V to their children recognizes that they are the controllers of availability and accessibility of F&V in the young children's

surrounding environment (French et al 2001;Klepp et al 2005). Thus, it is recommended that, in reviewing the effectiveness of different nutrition education interventions to promote vegetable consumption in children, strategies must focus on behavioral problems that children may have with F&V and should consider theoretical systems that involve different environmental sectors such as parents, community, and the availability and accessibility of F&V (Hoelscher et al 2002). Preschool children's mental development indicate that they process facts according to a counterfactual thinking by hypothetical inference, which means altering the fact (object) with an alternative or imagined symbol (Byrne 2007). For example, children imagine a broom as a horse and cardboard box as a fort. Children are exploring the environment and the more experiences children have the more alternative concepts they use to explain their environment and experiences (Flavell 1999). Therefore, promoting interventions that also consider the intellectual capacities (i.e., knowledge and attitude) of children could be part of the personal factor as determined in the Social Ecological Model.

2.4.2 Preschool children's perception of vegetables

Preschool children are in an early stage of cognitive development and they learn from their environment and experiences (Matheson et al 2002). The intellectual development of children occurs by processing the quality of knowledge which they gain from their interaction with the surrounding environment (Flavell 1999). Piaget's theory described children's intellectual development as a balance between the processing or fitting of a new experience within old experiences and modifying the new experience with new information (Piaget 1971). The same theory divides preschool children's intellectual development into two stages: first, describing the objects and events by symbols, and second, advanced use of symbols to describe something with something else, for example, using a broom as a horse (Piaget 1971). Thus, using the fun element in introducing foods to children may add the fun idea to foods and replace a bad experience with food to a new good experience filled with fun. A study explored preschool children's perceptions of food and found that they do not categorize food according to the traditional food groups (Matheson et al 2002). They used the physical characteristics of food (shape, color, texture) to group different items (Matheson et al 2002). Also, the preschool children's rational perception was categorizing food under two main groups, which were the color and shape of food (Matheson et al 2002). Children's perception of food is an important predictor of the expected

behavior (Matheson et al 2002). Therefore, these findings point out the importance of using colors and shapes to increase their intakes.

2.4.3 Intervention to increase vegetable consumption

In health sciences, the importance of adequate consumption of F&V in public health is recognized (Shields 2005). Therefore, there are many programs and interventions testing different strategies to promote F&V to children in different settings (Wolfenden et al 2012; Krølner et al 2011; Rasmussen et al 2006). The types of interventions to increase children's F&V consumption were educational and experimental in nature and have been conducted in different settings such as homes, childcare centres, health centres and community centres (Krølner et al 2011; Rasmussen et al 2006; Wolfenden et al 2012). Repeated exposure-learning strategies were implemented in studies with different applications and terminologies such as "mere exposure", "association condition exposure (adding flavour/motivation reward) to vegetable" and "visual exposure".

In the different studies that promoted vegetables to preschool children using exposure intervention strategies, all interventions revealed inconsistent results about the effectiveness of the repeat exposure intervention in increasing vegetable consumption. Two randomized controlled trial (RCT) studies showed increased vegetable consumption and liking when children were repeatedly exposed to vegetables. The increase in consumption was more significant in the groups who only had the vegetable without any flavoured dips (Anzman-Frasca et al 2011; Hausner et al 2012). A quasi-experimental study showed that the intake of vegetables in children, who are sensitive to the bitter taste decreased over the repeated exposure trials (Fisher et al 2011).

The "mere repeated exposure" appeared to be the most efficient in changing children's acceptance and intake of a new vegetable snack, in a pureed form, and increased the acceptance by the fifth exposure and the increase continued after 6 months follow up (Hausner et al 2012). Also adding flavour to the vegetables appeared to increase consumption (Hausner et al 2012). Repeated exposure significantly affected the consumption of familiar vegetables and unfamiliar ones (Caton et al 2012). In a school setting intervention where children consumed small portions of raw vegetables provided 8 times in different times, the findings showed a positive impact of

repeated exposure of vegetables associated with a preferred dip (Anzman-Frasca et al 2011). However, another study conducted in school setting that measured the consumption of raw vegetables at lunchtime showed no significant improvement after 30 days of repeated exposure to the vegetables, and this was attributed to the influence of peer interference. The children's consumption was associated with the average intake of other children at the same table (Anzman-Frasca et al 2011).

The findings from another school study conducted in Hispanic children from low income families who were sensitive to the bitter taste showed that repeated exposure of a single vegetable snack 14 times associated with preferred dips did not show any improvement in liking and intake of the vegetable (Fisher et al 2011). All the studies reported different findings and did not agree on the effectiveness of repeated exposure in improving of children's vegetable consumption.

Children do not prefer the sensory characteristics of vegetables, including the bitter and sour tastes (Bergström et al 2012). It seems that children are born with this preference to protect them from food poisoning (Bergström et al 2012). Many researchers found that masking the taste of vegetables improve children's liking and consumption of vegetables (Fisher et al 2011; Hausner et al 2012; Havermans et al 2007; Johnston et al 2011). A RCT of school-aged children who were already involved in nutrition education and behavior intervention indicated that masking the taste of vegetables with peanut butter showed a significant increase in the number of the children consuming the vegetables (Johnston et al 2011). Another study tested the impact of repeated exposure to raw vegetables with salad dressing on preschool children and there was a significant increase in vegetable consumption among the children who were sensitive to the bitter taste (Fisher et al 2011). One study assessed the impact of exposing preschool children 10 times to sweetened pureed vegetables and the findings showed a significant increase in intake over time and after 6 months follow up (Hausner et al 2012).

Repeated exposure to increase children's vegetable consumption was associated with other behavioral components to increase efficacy in children. For example, a RCT study in a home setting showed that repeated exposure to a disliked vegetable with a tangible reward as an incentive increased preschool children's consumption compared to the control group who were

not exposed to any nutritional intervention; the findings showed a modest improvement in the intervention group (Remington et al 2012). Another study using the same strategy showed a significant increase in vegetable consumption for the group getting a tangible non-food reward compared with the control group who were not exposed to any nutritional intervention (Cooke et al 2011). In the two studies which paired reward with repeated exposure strategy, the preschool children's vegetable consumption was improved in the short term (Cooke et al 2011; Remington et al 2012).

Promoting vegetables to children was not limited to experiencing the taste of vegetables by exposure to it many times. The impact of exposing children to pictures of vegetables as a learning element and increasing their familiarity to new vegetables has been studied. The visual exposure to vegetables in a picture book intervention showed a decrease in children's willingness to eat vegetables they already know, and an increase in willingness to taste unfamiliar fruits (Houston-Price et al 2009). In a school setting intervention on a small sample of children measuring the impact of visual repeated exposure to new vegetables, the vegetables were shown to the children 30 times during the 12-week experiment period (O'Connell et al 2012). Their finding was that more exposure to familiar vegetables decreased their willingness to eat them (O'Connell et al 2012). Despite all differences in the previous studies, all researchers agreed that repeated exposure is a predictor of children's vegetable consumption.

Food presentation is an influential determinant that impacts children's food consumption (Liem et al 2009, Jansen et al 2010). A study comparing the preference of organizing the F&V on a plate between children and their parents found that children preferred a colorful plate which was different from that of the adults (Zampollo et al 2012). This shed a light on the differences of children's preference based on the aesthetic aspects of presenting food. According to the study, the children were highly sensitive to structural influences. They preferred an organized distribution of various foods and it increased their consumption of food (Kahn et al 2004). A study strongly illustrated the impact of changing the shape of vegetables in increasing its level of acceptance (Olsen et al 2012). They cut and shaped F&V in different ways, to make it more accessible, and compared them with the regular form and they observed whether the children were interested in eating them (Olsen et al 2012). The results showed that children mostly preferred the star-shaped vegetables more than the slices, sticks and ordinary cuts (Olsen et al

2012). Also, a study tested the impact of changing the presentation of fruits on children's consumption. The results showed that interesting presentation of fruits increased the consumption of children double that of the regular presentation (Jansen et al 2010).

In summary, the repeated exposure strategy was tested in different studies that also used other tactics to encourage vegetable consumption in children. However, many of these studies found inconsistent results and the effectiveness or impact of the strategies on children's consumption of F&V was not all positive. The findings also showed that children are influenced by food presentation and shaping the F&V to small accessible sizes increased their interest to eat them. Thus, planning interventions to promote F&V to children should consider combining these varied strategies to be effective.

CHAPTER 3: RESEARCH DESIGN AND METHODS

Although the literature reviewed focussed on F&V, there seemed to be no problem with fruit consumption due to the liking for the sweet taste of most fruits by most children. Thus, our study aimed to focus only on vegetables as there seems to be low consumption of this half of the combination food group.

This quasi-experimental research followed a combination of quantitative and qualitative methods (exposure levels and field notes) to test the impact of repeating the exposure of a set of vegetables that were cut into new shapes and observing the effect of the different shapes of vegetables in increasing their consumption by preschool children. The field notes were used to determine the factors that may affect vegetable consumption by preschool children such as familiarity with vegetables, vegetable preferences, accessibility and availability.

3.1 Research Questions

This research study has four objectives as discussed briefly in Chapter 1, but these are restated here including a sample question under each objective:

Objective 1:

Explore the impact of new shapes of vegetables in preschool children's consumption in different childcare centres in the London-Middlesex region of Ontario for a one month intervention period (June to July).

Q - Will the change in the shapes of vegetables increase the preschool children's consumption of natural shaped vegetables?

Objective 2:

Explore the impact of repeating the exposure to vegetables in the preschool children's consumption.

Q - Will repeating the exposure to shaped vegetables increase the preschool children's consumption?

Objective 3:

Compare the consumption amount of natural shaped and the new shaped forms of vegetables by preschool children.

Q - Will the preschool children's consumption of natural shaped vegetables be less than the new shaped vegetables?

Objective 4:

Determine exposure/access to vegetables at home and how it is served by the parents/caregivers.

Q - Will frequent exposure and easy access to vegetables in children's homes increase the preschool children's consumption?

3.2 Research Design

3.2.1 Pre-recruitment of childcare centres

Several childcare centres in London Ontario were contacted and provided with the research framework (Appendix B: Material Provided to Childcare Centres) to participate in the study. Different centres in different locations were chosen out of those interested to participate, taking into account the areas of distribution to highlight the heterogeneous demographic characteristics of the participating families (Appendix C: Map of Child Care Centre Locations). The childcare centres that were contacted to participate in the study were the B Child Care Centre (Central), C Child Care Centre (North East), D Child Care Centre (South West) and A Child Care Centre (North West). The Director of each of the childcare centres was given a Letter of Information (Appendix D: Letter of Information for Directors of Child Care Centres) that had the main information about the research. The letter also requested the participation of the centre and the teachers in the study. Consent Forms (Appendix E: Consent Form for Directors of Child Care Centres) were provided, which were duly signed and returned to the co-investigator. The consent form was required by the Western University's Health Sciences Research Ethics Board before the approval for the study to proceed. Subsequently, the childcare centres' administrators were provided with the ethical approval to proceed with the research in the centre.

3.2.2 Recruitment of children and their parents

After receiving the ethical approval, the children's parents were given a Letter of Information (Appendix F: Letter of Information for Parents/Caregivers), the Consent Form (Appendix G: Consent Form for Parents/ Caregivers) and a questionnaire on vegetable availability/accessibility (Appendix H: Vegetable Accessibility (at home) Assessment Questionnaire). The consent form ensured that children had permission from their parents to participate in the experiment. The parents' Consent Form and the completed questionnaire were returned to the co-investigator through the teachers. At the top of the Letter of Information and the Consent Form, there was an initial box to indicate that they had read the materials. The initials and the children's codes were listed in a Master Sheet (Appendix I: Master Sheet).

In estimating the sample size, we used the means (4.7 and 4.4) and standard deviation (±0.8) from one study (Anzman-Frasca et al 2011). We set the α at the conventional p = 0.05 and power at 90%. Applying these data in the following formula gave us an estimated sample size of 46 children (Monsen 2008). However, due to time constraints to complete the study and other barriers encountered during actual data collection, we were able to conduct the study with only 42 children.

Sample Size = $(SD1^2 + SD2^2)(Z1-\alpha + \boldsymbol{Z1}-\beta) / (\text{Mean } 2-\text{Mean}1)^2$

$= (0.8^2 + 0.8^2)(1.96+1.28) / (4.4- 4.7)^2 = 46$.

3.2.3 Inclusion and exclusion criteria

All preschool children between the ages of 2 to 5 years attending childcare centres in London, Ontario were invited to participate in the study. Those children in the same centres who were older than 5 years of age were excluded.

3.2.4 Ethical consideration of research

The Western University's Health Sciences Research Ethics Board (HSREB) approved the protocol of this study (Appendix J: Ethics Approval Notice). The childcare centres and the children's parents were informed about the research. Signing the consent form was required for

participation. The confidentiality and anonymity of the research participants were protected as each participant was identified by a code known only to the researchers and recorded in a master sheet which was kept separate from the data. This code was used only to ensure completeness of data collected. The responses to the questionnaire completed by child's parent were coded to ensure all participants remained anonymous. Once all data were collected, the code was deleted from all forms prior to data analysis. All data collection forms were stored in a locked cabinet in a secure office at Brescia University College. The participants were informed that the research records will be shredded and destroyed after 5 years as appropriate and if the results of the study are published, only group data will be included and no individual data will be identified. The potential risks were explained in the Letters of Information to the directors of the childcare centres and the children's parents. The children were also informed about potential risks of discomfort in participating in the height and weight measurement, the eating of vegetables and/or dislike for the taste of the dip that may occur. If any of this happened, the children were allowed to discontinue their participation. The parent and/or child were allowed to withdraw voluntarily from this study at any time without change in their status and care or service provided by the childcare centre.

3.2.5 Instruments used in the study

Questionnaire

The questionnaire (Appendix H: Vegetable Accessibility (at home) Assessment Questionnaire) was divided into two sections.

The first section determined the demographic characteristics and family socioeconomic status (high, medium, low), ethnicity, and whether a child had an allergy to vegetables or any other food. Also in this section was a question to determine the vegetable dip most served by parents, which was added to the list of choices provided to the children in the preliminary test period.

The second section determined accessibility level by asking three types of questions. The first question determined the usual kinds of vegetables that were purchased and whether the vegetables were of the regular size or the mini size which were considered more accessible. The second question asked for the ways vegetables were usually provided to the children. The third

set of questions measured the usual vegetable intake of children at home, e.g., how many times a day the vegetables are provided to children and how many times they consume vegetables in a typical day. The fourth question was on environmental accessibility assessment, e.g., describing the places where the vegetables are kept or presented to the children. These questions provided an estimated measurement of the usual amount of vegetable consumption.

Research suggests that parental reporting on their children's F&V consumption is considered more valid and accurate than a report coming from children (Tak et al 2006; Bere et al 2004). However, parents may overestimate the availability of F&V at home and their children's consumption of F&V too (Van Ansem et al 2012).

The questionnaire was developed specifically for this study and was based on other studies (Bere et al 2005; Dave et al 2010; Kristjansdottir et al 2009). The questions on the accessibility levels have not been verified for reliability of measurement and there are no validated instruments available in the literature to examine the accessibility levels (Ganann et al 2012). However, pilot testing for the validity of the questions was done by providing the colleagues the first edition of the questionnaire for some feedback. The vegetables that were listed in the questionnaire are raw vegetables that children can eat fresh. Also, these vegetables seemed to be served to children in most of studies reviewed; thus, the listing gave us initial information about the access to vegetables that parents usually buy and bring home for consumption by the family. The questionnaire focussed on the degree of access to vegetables by children and not the parenteral control in facilitating the availability of the vegetables. For the accessibility level, responses to the questions were given scores such as 2, 1, 0. The response scores differentiated the availability of vegetables to children at home and the ease of access to vegetables for children. The scores were interpreted as high availability/accessibility to vegetables (score = 2), moderate availability/ accessibility (score = 1) and low availability/accessibility (score = 0). The sum of all scores determined the level of accessibility (high, moderate, low). The highest total score of 15 for the eight questions was divided into percentiles (25^{th}, 50^{th}, 75^{th}). Thus, the scores for high level access was set at 11.25-15, moderate access at 7.5 to < 11.25, and low access at less than 7.5. The response scores were not seen by the parents/caregivers (Appendix K: Calculation of Accessibility Levels).

Vegetable cutters

The cutters used were round cookie cutters with hollow centres of different shapes (Appendix L: Instrument for Shaping Vegetables). They came in different sets of different centre shapes. They were made of stainless steel and in this study we used the star, flower, and owl/ bat shapes. However, the chosen sets did not withstand the frequent daily use during the study. It was a challenge to keep them sharp and in good shape for cutting vegetables toward the end of the research.

Food scale and weighing scale

The StarFrit® Slim Glass Kitchen was used in this study to measure the weight of vegetables before and after consumption. It was a portable scale with quite a good review rating. A pair of this scale was used in this study to overcome the freezing problem that occurred in one scale during the preparation of the vegetables, caused by the vegetables wetting the scale surface. The pair was calibrated before use in each centre by using standard weights.

The digital glass scale and Seca-stadiometer

The Taylor® glass scale was used to weigh the children participating in the study. It was a portable scale that facilitated transportation from one childcare centre to another. It was calibrated before use in each centre by using standard weights. The Seca- stadiometer was used to measure their heights.

3.2.6 Data collection

To understand the impact of providing more accessible and shaped vegetables to children, data were collected by measuring the differences in the weight of the vegetables before and after eating and by interviewing children for some of their perceptions. Thus, we used a mixed method approach to collect quantitative and qualitative data.

Preliminary determination of likes and dislikes

In the preliminary period (Day one), the children's likes and dislikes for dips were determined from a list of examples and the preferred ones were recorded. This individually preferred dip was

served on the side in small container during the four consecutive days of the actual vegetable tasting period. The weight and height of the children were measured with clothes on and shoes off by the co-investigator (SA) and research assistants using the Taylor® digital glass scale and the Seca-stadiometer. The data were recorded in the data collection sheet (Appendix M: Data Collection Sheet). Also, the data collected in the preliminary and study periods and from the questionnaire were all recorded on the same data collection sheets (Appendix M: Data Collection Sheet). The qualitative data from interviewing the children were recorded in Appendix N (Interviewing Sheet).

The teachers of the children were requested to help the researcher in gathering the children so that the vegetable testing and other measurements could be obtained efficiently and to avoid any discomfort that the children may feel during the conduct of study. At any time a child became uncomfortable about (or decided to discontinue) participating, they were allowed to do so.

The actual study consisted of three phases as follows:

Phase one

During the first phase, the preferred dip was determined in the first day before providing the vegetables. All children were seated at the tables and two small containers filled with two types of dip were placed in front of each child. The teacher asked the children to dip their finger in each container and decide which one they liked most. The co-investigator (SA) recorded the preferred dip for each child in the data collection sheet (Appendix M: Data Collection Sheet). Afterwards, the natural shaped vegetables were provided with their preferred dip.

Phase two

In phase two, the shaped vegetables in easily accessible form (Appendix B.2: Shaped Vegetables) were provided with the preferred dip and this was repeated over a period of three days. In the first day of phase two, the children were given the star-shaped vegetables with the preferred dip. The second day, they were given the bird-shaped (owl or bat) vegetable with the preferred dip. In the third day, the children were given the flower-shaped vegetable with the preferred dip. In the next three days, the children were presented the same sequence of the shaped vegetables but without the preferred dip. This sequence was followed in three centres;

however, the serving with and without dip was reversed in another centre (see Table 1 on page 30). All the childcare centres were responsible for providing the vegetables and the dips, as per food safety rules. However, one centre did not facilitate the dips in the first day, which led to reversing the dip sequence different than from the other three centres (see Table 1 on page 30).

Phase three

Phase three was similar to phase one, where the natural shaped vegetables were offered but this time it was without the preferred dip.

Serving the vegetables

The vegetables used in this study were carrots, cucumbers, and sweet red peppers, as it was initially determined that none of the children had any allergies to these vegetables. These vegetables were also chosen based on a study finding that these were most preferred by children (Olsen et al 2012). The vegetables were cut in the shape of stars, birds and flowers. The size was small like a cracker, almost 2.5 inch square. The vegetable assortment was organized, not mixed on a plate, because a study showed that children prefer an organized order of food presentation (Kahn et al 2004). The vegetable was served n a small white plate and the preferred dip in a small container was placed on the side. The children chose one dip to be served at all periods of the study. The two dips, chosen by the children were Hidden Valley® ranch original and PC® creamy dill dip.

The quasi-experimental setting

In the beginning of the experiment, the children were individually tested in the morning before their lunch break or during their afternoon break. Each child was seated on a side of the classroom away from the other children and asked to have the snack alone. This was done to limit peer interference. On the first day, each child was encouraged to eat by the co-investigator (SA) who recited a little story about a caterpillar which is trying to eat as much as he can to grow and become a beautiful butterfly. This story aimed to limit their discomfort to be out of the group and be engaged in the test period. After the first day when children got used to the daily vegetable consumption testing and interviewing, the teachers requested the co-investigator to have more children tested at same table to preserve the teachers' time and effort. Therefore,

groups of two or three children were tested and interviewed in the same table with the understanding that when they did not want more or were done eating vegetables, they can leave the table. Also, the teachers were available during the testing and the interview to minimize any emotional discomfort of the children. This whole process took place over a period of one and a half months.

Vegetable consumption test

Once the child had eaten as much as he or she could, the co-investigator took the left-over vegetables and placed it in a plastic bag with the child's code. This step saved some teacher's time as they waited for all the children to take the vegetable consumption test. All coded plastic bags were weighed at the end of each testing, within about 40 minutes after. In one day, the researcher was able to test at least 10 children. After eating the vegetables, the children were asked about their experience and which vegetable shape they liked most. The conversation was recorded with an audio recorder. The interview sheet (Appendix N: Interviewing Sheet) had a space for writing the children's responses at the time of interview and the recording of their responses were transcribed at a later date. The researcher who did the interview is not the same person who transcribed the recording. All the data (quantitative and qualitative) collected were recorded in specific data collection sheets (Appendix M: Data Collection Sheet; Appendix N: Interviewing Sheet).

The weight of the vegetables before and after testing was measured using two identical food scales, which were standardized/calibrated at each centre before the testing started. The difference in weight before and after testing was used as the measure of intake. It was difficult to provide a standardized weight before eating throughout the eight different days of the experiment because the vegetable density varied in the different days, which was a limitation of this study. It was observed that the vegetables sometimes had a high water content which was lost while cutting and shaping the vegetables, and at other times they had a high content of fibre and less water loss while cutting which increased the weight. However, the amount of vegetables served according to size is quite similar in all testing days.

Instrument breakdown

Another unexpected limitation was that it was hard to keep the vegetable cutters in good shape and sharpness. This was especially true when the owl-shaped cutter broke in the middle of the study. The cutters used were bought online and it was considered time consuming to wait for the next 10 days for the shipping of the new cutter set. In London, a search for a similar cutter (owl-shape) was in vain. Considering research time constraints, a quick decision was made for an alternative bird shape. It was decided to change the owl shape to a bat shape and continue the data collection for the research as scheduled. The similarity of shapes was based on the fact that both are considered flying animals and the complex shapes were a good contrast to the other shapes (flower and star).

Sequence of vegetable consumption

Vegetable consumption was measured in grams for 8 days. Table 1 lists the sequence of providing the shaped vegetables to the children in eight days with and without dips in each of the four childcare centres.

Table 1. Sequence of Shaped Vegetable Consumption in the Four Childcare Centres

Centre	Day1	Day 2	Day3	Day4	Day5	Day6	Day7	Day8
A	Natural with dip	Star with dip	Flower with dip	Owl with dip	Star *without* dip	Flower *without* dip	Bat *without* dip	Natural *without* dip
C	Natural with dip	Star with dip	Flower with dip	Owl with dip	Star *without* dip	Flower without dip	Bat *without* dip	Natural *without* dip
D	Natural with dip	Star with dip	Flower with dip	Bat with dip	Star *without* dip	Flower *without* dip	Bat *without* dip	Natural *without* dip
B	Natural *without* dip	Star *without* dip	Flower *without* dip	Bat *without* dip	Star with dip	Flower with dip	Bat with dip	Natural with dip

Interview procedure (qualitative data)

The qualitative data were collected by writing down on the interview sheet the responses of the children after eating the vegetables. The researcher asked if they knew the vegetables, if they

liked the shape of the vegetables and which shape they preferred most. Also, the interview was audio recorded by a smart phone that directly sent the audio file to the researcher's laptop where it was saved.

The interview was a good opportunity to see the children interacting with the accessible shaped vegetables and how they valued this experience. It gave a better understanding of the history or past experience children faced with regard to vegetables. Also, it provided a glimpse of new influential factors that need to be considered in future research. All data collected in the interview and with the recorder were classified into meaningful themes by the team of researchers after careful analysis.

3.2.7 Data analysis

In this study, the quantitative data were analyzed using SPSS and SAS while the qualitative data were analysed using NVivo 9 (QSR International Pty Ltd, Australia, 2010). The following sections list the software programs used in data analysis.

Descriptive statistics

The IBM SPSS Statistics (Version 21) provided statistical tests for the descriptive analysis of collected data. It was used to calculate the mean percentage of daily vegetable consumption and relate that with the demographic characteristics of the participants and the accessibility level of vegetables.

Analytical statistics

This experiment was complicated as a result of several unexpected or unforeseen factors such as changing the owl shape to the bat shape due to the cutter breakdown, testing the consumption over time with missing values, and the difficulty of testing the effect of the experiment when one school had a different sequence of providing the dip. Therefore, the SAS package (version 9.3; Cary, NC) was used for the analytical procedures as recommended by the statistical consultant.

The changing of the owl shape to a bat shape was hypothesized as not being significantly different and the hypothesis was tested by using the GLM Procedure Repeated Measures Analysis of Variance. This procedure enabled us to test the hypothesis within the shapes and the

interaction between shapes factor and the dip use factor. Also, the same procedure was used to test the interaction between the access level and school location. To treat missing values, a mixed regression model was used instead of the Repeated Measures ANOVA. These analyses were followed by Tukey's process for multi-comparisons so as to compare the differences between mean vegetable consumption in the days of different shaped vegetables and dip presence. One-way ANOVA was used to test the significant differences between different factors (ethnicity groups, BMI categories, income level status, and sex) according to the mean vegetable consumption. Also, in this experiment two factors were considered – the different shapes each day and the day's sequence of providing the dip. Thus, pair wise comparison test was used to test whether or not there was a significant difference between and within the two factors. To test the hypothesis, paired t-test was used to see the effect of repeated exposure of interesting-shaped vegetables on children's consumption of the natural-shaped vegetables at the end of the experiment. Also, t- test was used to test the differences between interesting-shaped vegetables and natural-shaped vegetables.

Qualitative analysis

The NVivo 9 (QSR International Pty Ltd, Australia, 2010) computerized software was used to generate themes from the field notes and calculate the percentage of times the themes occurred. This was done by formatting themes folders. The researchers reviewed the field notes and coded each word or sentence that indicated where it belonged in the different themes.

In summary, this study used a quasi-experimental trial to test the influence of exposure to interesting shapes and accessibility on vegetable consumption in preschool children. In addition, the children's perceptions were also captured through individual interviews. Both qualitative and quantitative data were analyzed using available and appropriate software programs.

CHAPTER 4: RESULTS

In this chapter, the effect of changing the shape of vegetables using a quasi-experimental design and repeating the experiment in different places under different conditions are presented. The qualitative data from interviewing preschool children on their perceptions of the test vegetables are summarized and the themes are presented together with the researchers' observations.

4.1 Characteristics of Participants

The responses to the questionnaire from the parents of children provided demographic data and the level of accessibility of vegetables in their homes. All these data were analyzed using descriptive statistics. Table 2 presents the frequency distribution of certain characteristics and the results of one-way ANOVA to test for the differences in characteristics among all four childcare centres. The majority of participants (69%) were Caucasian/white. Almost ¾ of children (74%) communicated in English, and only four children had English as a second language. The income levels of the children's families were varied depending on the location of the childcare centres. The calculated access levels of vegetables were varied among the four childcare centres, with the medium access level as the most available level (52%). The number of male and female children in this study was similar at 52% and 48%, respectively. The BMI for age was calculated and interpreted as underweight, healthy, risk for overweight, overweight, and obese categories according to the WHO growth charts for Canada (Appendix O: WHO/ BMI for 2-19 years Boys Growth Chart [Canadian Version]; Appendix P: WHO/ BMI for 2-19 years Girls Growth Chart [Canadian Version]). The BMI categories were quite close in three of the childcare centres, except for the A childcare centre which had 50% of their participating children who were obese.

There were no significant differences in the demographic and socioeconomic characteristics. However, the BMI categories in one centre (A) was significantly different from the other three centres ($p=0.01$).

Table 2. Frequency Distribution of Demographic & Socio-economic Characteristics Participants and Their Families (%)

Childcare Centre / Variables	C (N.East)	B (Central)	D (S.West)	A (N.West)	All	*P-value between groups
Ethnicity (%)						**0.6**
White	80	40	67	90	69.0	
Asian	20	30	17	10	19.0	
African	__	10	8	__	4.8	
Native	__	10	8	__	2.4	
Latin/Hispanic	__	10	__	__	2.4	
Other	__	40	__	__	2.4	
Language (%)						***0.62***
English	90	60	67	80	73.8	
French	__	10	8	__	4.8	
Spanish	__	10	__	__	2.4	
Other	10	10	__	10	7.1	
English +Other	__	10	25	10	11.9	
Accessibility level						***0.63***
High	40	10	__	10	14.3	
Medium	10	80	67	50	52.4	
Low	50	10	33	40	33.3	
Income Level						**0.42**
<$20K	20	10	15	10	14.6	
$21K-$50K	20	40	70		31.7	
$51K - $80K	30	10	0	10	12.2	
>$80K	30	40	15	80	41.5	
Age of children (Mean ± standard deviation)						***0.43***
	3.65 ± .91	3.8 ± .42	3 ± .86	3.3 ± .42	3.4 ± .75	
Sex						**0.6**
Female	60	30	67	30	47.6	
Male	40	70	33	70	52.4	
BMI (%)						***0.011***
Healthy weight	50	70	70	37.5	57.9	
Risk for overweight	30	30	30	12.5	26.3	
Overweight	20	0	0	0	5.3	
Obese	0	0	0	50	10.5	
* Significance level p≤0.05 n= 42						

In this study the children's vegetables consumption was measured in grams, and the average of amount of vegetables provided was 124.6 g for 8 days in all childcare centres. The difference between the served amount and consumed amount of vegetables is presented in later analyses as absolute amounts or percentages of the average amount of provided vegetables.

4.2 Vegetable Consumption Organized by Sex, Income level, Ethnicity and BMI

Table 3 presents differences within each factor according to the mean vegetable consumption. The mean consumption among girls was higher than boys. However, there was no significant difference between consumption values ($p = 0.59$).

The mean consumption of vegetables increased as the income level increased to more than $20,000. However, there was no significant difference ($p = .417$) in the mean vegetable consumption between the income levels. Since the participant numbers at each income level were not equal, it seemed that more income did not predict more vegetable consumption.

The children's mean consumption of vegetables were not significantly different between the different ethnicity groups ($p = 0.59$). The children of African descent had the highest mean consumption of vegetables although there were only two children in this group. The children of Asian descent had the second highest mean consumption. The one child of Latino/Hispanic had the lowest vegetable consumption. Since the number of participants from different ethnicity groups was not balanced, the effect of ethnicity on vegetable consumption for preschool children could not be appropriately tested.

There was no significant difference in vegetable consumption between the different BMI categories ($p = .43$). Children with healthy body weights had the highest mean vegetable consumption (45 ± 40.02).

Table 3. Vegetable Consumption Organized by Sex, Income Level, Ethnicity & BMI

Characteristics	***Intake (g) ± SD**		****P-value Between groups**
Sex (n)			***0.6***
Male (20)	52.9 ± 29.5		
Female (22)	57.6 ± 27.1		
Total (42)	55.4 ± 28.0		
Income Levels (n)			***0.4***
Less than $20,000 (6)	39.3± 22.2		
$20,000- 50,000 (13)	59.4 ± 32.9		
$51,000-80,000 (5)	66 ± 22.6		
More than $80,000 (17)	55.7 ± 27.6		
Total (41)	55.7 ± 28.3		
Ethnicity			***0.6***
White (29)	53 ± 28.5		
Asian (8)	59.3 ± 30.1		
African (2)	86.5 ± 7.1		
Native (1)	40.6 ± 0		
Latino/Hispanic (1)	34.5 ± 0		
Other (1)	66.6 ± 0		
Total (42)	55.4 ± 28.0		
BMI			***0.43***
Healthy weight (22)	45 ± 40.0	Risk overweight	0.21
		Overweight	0.28
		Obese	0.34
Risk for overweight (10)	29.1± 15.3	Healthy weight	0.21
		Overweight	0.67
		Obese	0.94
Overweight (2)	18.2± 23.6	Healthy	0.28
		Risk overweight	0.67
		Obese	0.74
Obese (4)	27.6 ± 9.7	Healthy weight	0.34
		Risk overweight	0.94
		Overweight	0.74
Total (38)	37.6 ± 32.7		

*Mean consumption of the average amount of provided vegetables =124.6 g for eight days (dependent variable in ANOVA)

** Significance level p≤0.05

4.3 Information from Parents

Table 4 shows the frequency distribution of the vegetables that the children's parents usually bought. These vegetables were listed as examples of vegetables that children can eat as fresh. From the results, the researchers identified carrots, peppers and cucumbers as the most frequently bought vegetables. Thus, these were used in the experiment as the children were most familiar with them. The most accessible and purchased vegetable was baby carrot. The least purchased vegetables were snap peas, spinach and celery.

Table 4. Kinds of Vegetables Usually Bought (%)

**Vegetable	Carrot	Cucumber	Pepper	Tomato	Snap-peas	Celery	Lettuce	Spinach
Baby/Green*	20.9	0.9	11.1	0.9				
Regular/sweet	25.5	41.9	1.7	22				
Both	39.9	34	67.6	52.2				
Not Purchased	13.9	23.3	19.5	24.8	62.9	36.2	18.2	43.6
Total	86.1	76.8	80.5	75.2	37.1	63.8	81.8	56.4

*Green just for pepper.

** Vegetables listed in the questionnaires as reported by parents

Number of returned list=42

Table 5 shows the mean vegetable consumption of children organized by the type of vegetables parents usually bought. The parents reported that the highest mean consumption of usually bought vegetables were the ones most accessible such as baby tomato and cucumber. However, only one parent reported buying both the baby tomato and mini or baby cucumber and this affected findings on the effect of accessibility of vegetables at home and therefore was not a good indicator of vegetable consumption by children. Accessibility level of vegetables cannot be represented by only one aspect, e.g., type of vegetables parents usually bought, because there were other factors included in scoring accessibility.

Table 5. Comparison of Mean Vegetable Consumption Organized by Vegetables Usually Bought By Parents

Vegetables*	****Intake (g) ± SD**	**n**
Green pepper	32.1 ± 12.5	5
Baby/ Regular carrots	32.9 ± 18.4	19
Regular cucumbers	34.2 ± 19.2	21
Baby carrots	34.5 ± 19.8	12
Sweet pepper (red, yellow)	36.5 ± 12.6	4
Lettuce	37.1 ± 34.1	36
Regular tomato	38.8 ± 16.3	8
Tomato (baby/cherry, regular)	39.1 ± 38.7	25
Spinach	39.1 ± 39.9	25
Celery	39.4 ± 37.5	28
Sweet (red/yellow)/Green pepper	40.7 ± 37.0	29
Baby/ Regular cucumbers	43.4 ± 49.9	14
Snap peas	44.7 ± 46.7	17
Baby cucumbers	51.8 ± 0	1
Regular carrots	53.4 ± 59.4	9
Baby tomato	73.5 ± 0	1
*Vegetables listed in the questionnaires provided to parents **Mean consumption of provided vegetables (average amount of vegetables =124.6 g) for eight days		

4.3.1 Testing the effect of unplanned change (Owl to Bat)

Table 6 shows the MEANS procedure to summarize the computation of descriptive data for two shapes (owl and bat) and dip presence as variables across all data and within groups of data.

Repeated Measures Analysis of Variance was used to test the hypothesis that there was no difference between the consumption of owl-shaped and bat-shaped vegetables and within-type effects and related interactions (shape and dip presence). The results showed that there was no significant difference between the two shapes ($p = 0.38$). Also, there was no significant effect of the interaction between the owl and bat shapes ($p = 0.11$). Therefore, in subsequent analyses the bat and owl shapes were combined as one group for comparison with the other shapes.

Table 6. Mean Consumption of Vegetables by Children (Owl and Bat)

Day (n)	**Shapes (n)**	***Intake (%) ± SD**	**P-value (between groups of the shapes)**	**P-value (between the groups of the interaction-shapes x dip)**
Owl dip/Bat no dip (32)	Owl (28)	29.6 ± 19.25	0.38	0.11
	Bat (26)	28.7 ± 21.11		
Owl no dip/Bat dip (10)	Owl (8)	40.9 ± 27.02		
	Bat (6)	53.2 ± 224.19		
* Mean consumption (average amount of vegetables =60.42 g) for owl & bat days of different shaped vegetables				

4.3.2 Testing the effect of more accessible shaped vegetables

Forty-two preschool children from four different childcare centres were provided with a series of different shapes of vegetables in different sequences and their consumption was observed in this experiment. Twenty-six of the 42 preschool children have the full record for eight days. However, sixteen children have missing observations in the experiment period as a result of illness, vacation or other reasons. The mean consumption of vegetable was computed for eight variables based on the shapes and the presence (or not) of the dip. The results showed that on the days when the star-shaped vegetables without the dip was provided the children had the highest mean consumption compared to all groups. However, within the dip group the mean consumption of the flower and owl/bat shapes were the highest. Since there were missing data in the daily consumption of some of children, we used a mixed regression model that considered two factor effects (shapes and dip presence) for the analysis. The type III test of fixed effects (mean squares test) showed that there was a significant difference effect within the different shapes of the vegetables. Also, there was a significant interaction effect between shapes and the presence of the dip ($p = 0.05$). This means that we cannot ignore the effect of the availability/presence or absence of dips on the shaped vegetable consumption.

Table 7. Interaction between Shapes Factor and Dip Presence Factor

Type III. Tests of Fixed Effects		
Effect	**F value**	***P> F**
Dip	0.00	0.97
Shape	6.98	0.0002
Dip*shape	2.65	0.05
*Significance level $p \leq 0.05$		

4.3.3 Testing the effect of shaping vegetables

Table 8 shows the pair wise comparison of the children's vegetable consumption considering two variables - shapes and presence of dips. There is a significant difference between the mean consumption of different shaped vegetables and the different dip availability. Since there was an interaction effect between shapes and the presence of dips, it is hard to compare between shapes and ignore the effect of dips. Thus, a mixed regression model was used to treat the eight conditions as a single combination factor of shape x dip interaction using an overall $p<.001$. The results showed that there were no significant differences between all the combinations.

Table 8. Pair Wise Comparison for Testing Significant Differences (Shapes Factor and Dip Presence Factor as a Single Combination Factor)

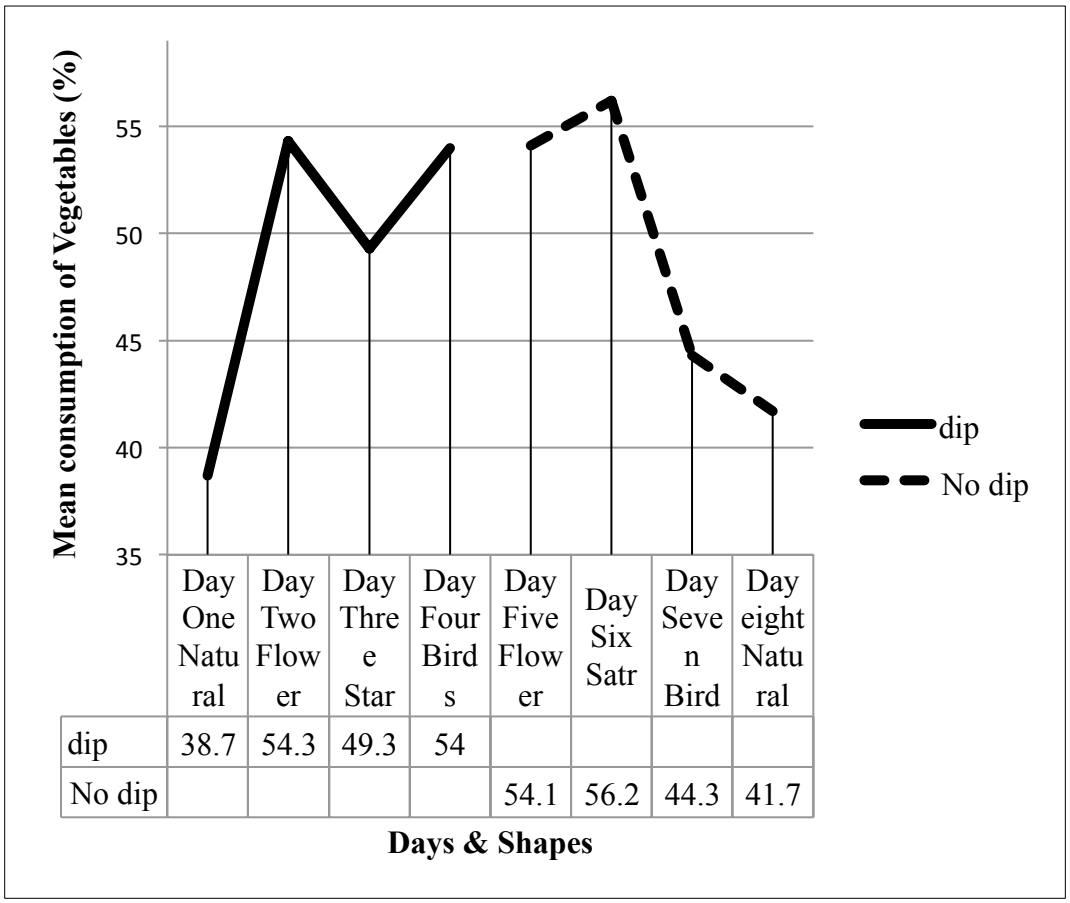
Shapes / Dip	Natural / No Dip	Star / Dip	Star / No Dip	Flower / Dip	Flower / No Dip	Owl Bat Dip	Owl Bat / No Dip
Natural / Dip	.999	.354	.006	.038	.011	.036	.994
Natural / No Dip		.790	.066	.239	.101	.218	>.999
Star / Dip			.857	.993	.916	.984	.858
Star / No Dip				.998	>.999	>.999	.091
Flower / Dip					>.999	>.999	.307
Flower / No Dip						>.999	.131
Owl/Bat / Dip							.282
*Significance level p<0.001							

Table 9 is a comparison between the mean consumption of different figures of shaped vegetables and the consumption with or without dip. The highest mean consumption of vegetables was for the star-shaped vegetables without the dip (62.1 ± 32.2SD). This was the sixth exposure in the three schools where children were provided with the dip in the first four days and the third exposure for the one school where the sequence days of providing the shaped vegetable with the dip was reversed. Even when the school that had different sequence of providing the shaped vegetables with the dip was excluded, the highest consumption was still the star-shaped without the dip (56.3 ± 30). Figure 1 displays in a line chart the mean consumption of vegetables for different days (excluding the one school with a different dip sequence). It showed an improvement in vegetable consumption which peaked in the sixth day for the star-shaped vegetables. For the natural-shaped vegetables, there was a 10.5% improvement in consumption at the end of the experiment.

Table 9. Descriptive Statistics-Mean Consumption of Vegetables by Children (Shapes Factor and Dip Presence Factor)

Days	**Dip** **[n] Mean (%) ± SD**	**No Dip** **[n] Mean (%) ± SD**
Natural	[37] 40.1 ± 34.2	[32] 50.6 ± 29.1
Flower	[40] 57.9 ± 29.7	[36] 57.1 ± 33.0
Owl/Bat	[34] 57.2 ± 32.8	[34] 48.8 ± 34.0
Star	[33] 53.3 ± 31.7	[37] 62.1 ± 32.2
Descriptive statistics – [n] *Mean (%) ± SD – excluding School 2		
Natural	[31] 38.7 ± 32.7	[23] 41.7 ± 26.1
Flower	[31] 54.3 ± 27.2	[28] 54.1 ± 30.9
Owl/Bat	[28] 54.0 ± 32.6	[26] 44.3 ± 30.5
Star	[27] 49.3 ± 31.2	[27] 56.2 ± 30.0
* Mean consumption of provided vegetables (average amount of vegetables =124.6 g) for eight days		

Figure 1. Mean Vegetable Consumption over Time in all Schools



	Day One Natural	Day Two Flower	Day Three Star	Day Four Birds	Day Five Flower	Day Six Satr	Day Seven Bird	Day eight Natural
dip	38.7	54.3	49.3	54				
No dip					54.1	56.2	44.3	41.7

Excludes school with reverse dip sequence

Mean consumption of provided vegetables (average amount of vegetables =124.6 g) for eight days

Tukey's test to adjust for multiple comparisons was used to determine if there was a significant effect of the presence or absence of the dips on the consumption of the different shapes of vegetables. Table 10 shows that when no dip was provided, there were differences in consumption of the different shapes (overall p <.001). The natural shape was different from the star and flower shapes but not from the owl/bat shapes. However, the star and flower shapes were not different within-group whether or not the dip is provided. In the groups where the dip was provided (overall p =.007), there were no differences among the shapes. The natural shape was not different from flower and owl/bat shapes and none of the other pairs were significantly different.

Table 10. Pair Wise Comparisons for Testing Significant Differences (Shapes Factor and Dip Presence Factor)

Days	**No Dip***			**Dip****		
Shapes	**Star**	**Flower**	**Owl/Bat**	**Star**	**Flower**	**Owl/Bat**
Natural	<.001	<.001	.93	.087	.014	.02
Star		>.999	.005		.946	.94
Flower			.005			>.999
*Significance level p<0.001 ** Significance level p=0.007						

The t-test was used to compare the mean consumption of vegetables on the days when the natural-shaped vegetables were provided with the mean consumption during the days when the shaped vegetables (star, flower, owl/bat) were provided. This was done to test the effect of shaping vegetables on children's consumption. Table 11 shows that there was a significant difference between the mean consumption of natural-shaped vegetables and the shaped vegetables ($p<0.001$). The interesting shaped vegetables had higher mean consumption (57.32±29.20) than that of the natural shaped vegetables. Therefore, this result rejected the hypothesis that the shapes will not increase the preschool children's consumption.

Table 11. Comparing the Mean Consumption of Natural Shaped and the Figure Shaped Vegetables

Days (n)	*Mean (g)± SD	P-value between groups
Natural (42)	47 ± 31.4	.00
Shapes (38)	57.3 ± 29.2	.00
*Mean consumption of provided vegetables (average amount of vegetables =124.6 g) for eight days ** Significance level $p\leq0.05$		

The t-test was also used to test the impact of repeated exposure to shaped vegetables on the consumption of the natural-shaped vegetable. In Table 12, the mean consumption of the natural-shaped vegetables in day one was lower (40.12 ± 34.2) than the consumption in day eight when the natural-shaped vegetables were re-introduced (50.56 ± 29.1). In other words, there was a significant increase in the consumption of the natural-shaped vegetables after six exposures with the interesting shaped vegetables. Therefore, this result rejected the null hypothesis that the more exposure to interesting-shaped vegetables will not increase the preschool children's consumption of natural-shaped vegetables. The type III mean squares test also showed similar results as presented in Table 11 where there was a significant difference in consumption of the natural-shaped vegetables in the beginning and at the end of the repeated exposure ($p<0.001$). Also in Table 12, we used a mixed model considering the two factors effect of dip presence and mean value of consumption on different days. The results showed that there was a significant interaction effect between the factors - dip presence, mean consumption of natural-shaped vegetables in different days ($p = .000$). This was an indication that dip plays a significant role in decreasing the vegetable consumption.

Table 12. Comparison of the Consumption of Natural-Shaped Vegetables Before and After Exposure

Day x Dip (n)	***Intake (%) ± SD**	****P-value**
Day One/ dip (37)	40.1 ± 34.20	.000
Day Eight/ No dip (32)	50.6 ± 29.06	
Day Interaction		.000
* Mean consumption (average =101.5 g of provided vegetables) for natural shaped days (1st & 8th)		
** Significance level $p \leq 0.05$		

4.3.4 Testing the dip effect

The dip effect has been tested using the SPSS program by calculating the mean consumption of vegetables with the presence of the dip and without the presence of the dip. Then the t-test was employed to find any significant difference between both groups. Table 13 clearly indicates that when no dip was provided, the mean consumption of vegetables was higher (56.55 ± 27.53) than when dip was provided with the vegetables (47.79 ± 25.15). The results also showed that the difference between the two groups was significant ($p<.001$) which could suggest that providing dip with the vegetable decreases the consumption of that vegetable after repeated exposure.

Table 13. Differences Between Consumption With and Without Dip

Days of serving vegetables with (n)	*Mean (g)± SD	**P-value
No Dip (24)	56.6±27.53	.001
Dip (27)	47.8±25.15	
*Mean consumption of provided vegetables (average amount of vegetables =124.6 g) for eight days ** Significance level $p\leq0.05$		

4.3.5 Accessibility level data

For Figure 2 and Table 14, the mixed model ANOVA was used to test differences between the shaped vegetable consumption and the accessibility level of vegetables at the children's home. The results showed statistically significant differences between different shapes ($p< 0.001$), but no statistically significant differences between the different access levels ($p = 0.5$). Moreover, there was no significant effect of the access levels factor on the vegetable consumption within different the shapes factor ($p = 0.86$). In other words, the high access level does not increase the consumption of natural-shaped or the interesting-shaped vegetables. Thus, there was no significant difference between access levels ($p = 0.5$), and this means that the results accepted the null hypothesis that high accessibility level of vegetables at home will not increase the preschool children's consumption.

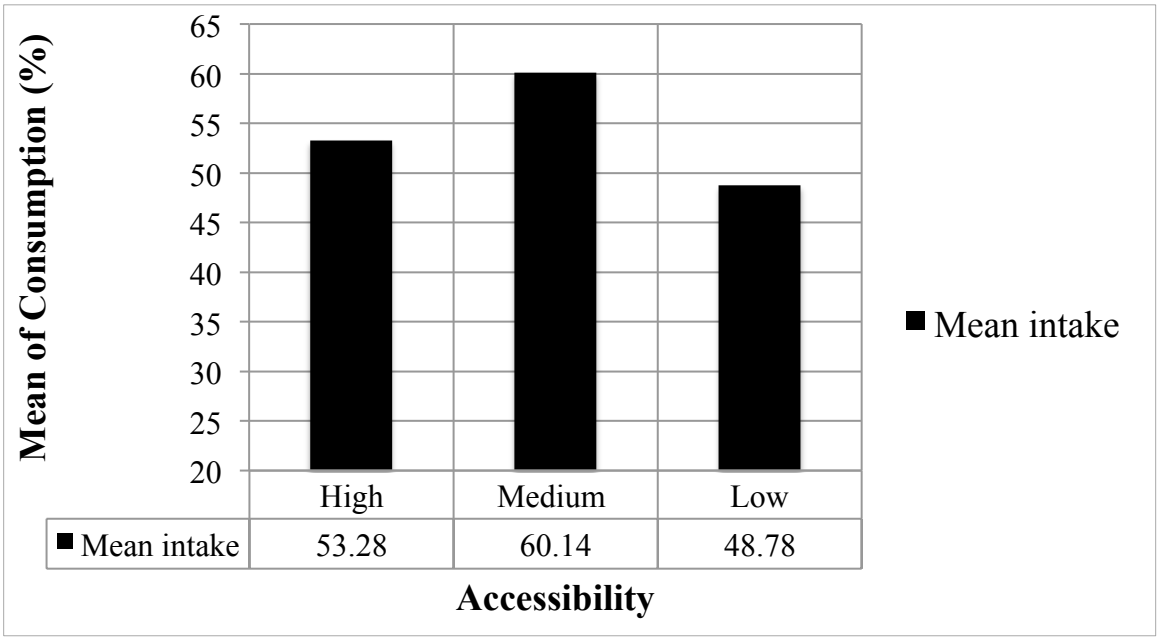
The same mixed model ANOVA was used to test differences between the mean consumption of vegetables in interesting shapes and the parents' educational level. The results showed a significant difference between different shapes ($p<.001$). However, there was no significant difference between parents' educational levels and their children's vegetables consumption ($p=0.09$). Also, there was no significant effect of parents' educational level on the consumption of the vegetables with different shapes.

Table 14. Mean Consumption of Shaped Vegetables by Children Organized by Access and Parental Educational Levels

	*Mean (%) ± SD					***P-value		
Days	**Flower**	**Star**	**Owl/Bat**	**Natural**	**Total**	**Between the shapes group**	**Interaction Shapes x Access**	**P-value between access level group**
Average (g)	71.48	68.39	60.2	101.5	124.6			
Access Level (n)						<.001	.864	.5
High (6)	56.3 ± 33.4	56.9 ± 40.4	54.6 ± 41.4	51.8 ± 36.1	53.3 ± 34.69			
Medium (22)	66.3 ± 33.4	61.7 ± 31.9	60.9 ± 36.1	51.4 ± 34.9	60.1 ± 31.56			
Low(14)	52.5 ± 21.9	55.0 ± 23.5	45.0 ± 21.1	38.0 ± 22.7	48.78 ± 17.81			
Education (n)						**Between the shapes group**	**Interaction Shapes x Education**	**P-value between education groups**
High School or less (7)	53.6 ± 31.6	57.2 ± 30.6	49.1±32.0	41.0 ±33.6	51.5± 30.39	<.001	.51	.09
College/Diploma (10)	49.3 ± 35.3	39.9 ± 26.2	40.3 ± 33.5	30.4 ± 29.6	39.8± 27.42			
University Degree (25)	66.5 ± 26.9	66.8 ± 28.8	63.5 ± 31.9	55.3 ± 29.6	62.7 ± 25.82			

*Mean consumption of average provided amount in grams
**Average of the provided amount of vegetables in grams for each day
*** Significance level $p \leq 0.05$

Figure 2. Mean Vegetable Consumption by Accessibility Levels*



*Mean consumption of provided vegetables (average amount of vegetables =124.6 g) for eight days

The Univariate Analysis of Variance test was used to determine the effect of parents' educational level on access level and mean consumption of vegetables. The results (Table 15) showed that parents' educational level had no significant effect on children's vegetables consumption ($p = 0.06$). Also, the access level had no effect on vegetable consumption. There was no significant effect of the interaction between parents' educational levels and access level on the mean vegetable consumption of children. In other words, a higher educational level does not mean a higher consumption of and access level to vegetables.

Table 15. Mean Consumption of Vegetable Organized by Children's Access Level and Parental Educational levels

Education level	Accessibility level (n)	*Intake (g)± SD	P-value Interaction Access x Educational Level
High school or less	High (2)	36.0 ± 47.23	
	Medium (5)	57.8 ± 25.66	0.5
	Total (7)	51.5 ± 30.39	
College/diploma	Medium (8)	40 ± 31.13	
	Low (2)	38.9 ± 2.49	
	Total (10)	39.8 ± 27.48	
University degree	High (4)	61.9 ± 31.03	
	Medium (9)	79.4 ± 24.79	
	Low (12)	50.4 ± 18.81	
	Total (25)	62.7 ± 25.82	
Total	High (6)	53.3 ± 34.69	
	Medium (22)	60.2 ± 31.56	
	Low (14)	48.8 ± 17.81	
	Total (42)	55.4 ± 28.03	

*Mean consumption of provided vegetables (average amount of vegetables 124.6 g) for eight days (as dependent variable in ANOVA)

** Significance level $p \leq 0.05$

Table 16 shows the result of the crosstabs analysis of parents' educational levels by childcare centre. The highest number with a university degree was the parents of the children at B. Also, C and D Childcare centres both have a high number of parents with high school education or lower.

Table 16. Frequency Distribution of Parental Educational Levels by Child Care Centres

School / Education Level	C (North East)	B (Central)	D (South West)	A (North West)	Total
High School or lower	3	0	3	1	7
Diploma/ College	1	1	5	3	10
University degree	6	9	4	6	25
Total	10	10	12	10	42

4.3.6 Location and consumption

Table 17 shows the mean consumption of vegetables provided to preschool children for eight days and organized by the childcare centres and the accessibility levels. This table shows a comparison of the different childcare centre locations with the mean consumption of vegetables by children. The highest mean consumption was in the B childcare centre located in the central area of London, Ontario.

Also presented in the table are the access levels to vegetables in the children's homes as calculated from the questionnaire completed by parents. The high access level group had the highest mean of consumption in two childcare centres, B (100 ± 0) and A (65 ± 0). However, C childcare centre showed the highest mean consumption in medium access level group (59 ± 0). D childcare centre showed a relationship as the low access level had the highest mean of consumption.

The results showed unbalanced numbers of participants between the childcare centre location factor and the access level factor, so General Linear Model Analysis was used to test the interaction of unbalanced data. The result of the analysis showed a $p = 0.6$ which means there was no evidence of an interaction. In other words, the location of the daycare centre did not impact on the accessibility levels of vegetables in the children's homes.

Table 17. Mean Consumption of Vegetables by Children Organized by Access Level and Childcare Centres

Centres/ Location (n)	***Mean (g) ± SD**	**Access level (n)**	**Intake (g) ± SD**	**P-value of the interaction Childcare x Access level**	**P-value between Childcare**
C (North East) (10)	44.07± 22.4	High (4)	38.7 ± 30.8	0.6	0.64
		Medium (1)	59.7 ± 0		
		Low (5)	45.3 ± 18.1		
B (Central) (10)	71.42± 35.1	High (1)	100 ± 0		
		Medium (8)	72.5 ± 35.7		
		Low (1)	34.5 ± 0		
D (South West) (12)	48.58 ± 27.6	Medium (8)	45.7 ± 31.3		
		Low (4)	54.3 ± 21.2		
A (North West) (10)	58.80± 20.3	High (1)	65 ± 0		
		Medium (5)	63.6 ± 23.7		
		Low (4)	51.3 ± 18.8		
* Mean consumption of provided vegetables (average amount of vegetables =124.6 g) for eight days (as dependent variable in ANOVA)/** Significance level $p \leq 0.05$					

4.4 Qualitative Results: Field Notes

While observing children during the vegetable consumption period, field notes were recorded as supportive data to explain some of the quantitative numbers collected in the actual experiment days and the responses from the questionnaire. Observing children allowed the researchers to address many practices and behaviors the children exhibited while consuming the vegetables. Also, it helped in recovering missing data about familiarity with vegetables, i.e., the vegetables they liked most and the order of choosing the vegetables they followed while eating them. Moreover, the field notes provided the researchers with useful information on the changes in the surrounding environment during the vegetable consumption periods and the children's reaction toward the vegetables.

4.4.1 Major themes*:*

Analysis of the field notes in the context of children's vegetable consumption in the different childcare centres revealed some major themes such as: chewing ability, vegetable familiarity, naming the vegetable, interference, liking for the vegetables, and using or not using the dip. Many codes fell under each of these major themes. The themes and codes are summarized in Table 18. Sample observations (and sometimes quotes from children) and explanations or descriptions are listed following the table to illustrate each theme and/or code. At the end of each sample observation or quote, acronyms (in letters and numbers) are listed that describe the shape of vegetables (such as N for natural, F for flower, S for star, B for owl/bat and whether it is served with a dip (D) or not (nD) followed by the number of the child in the experiment (01, 02, etc.).

Table 18. Qualitative Data-Description of Major Themes and Codes*

Chewing ability: • *Fast* • *Slowly* • *Well* • *Not well* • *Full mouth with food*	**Dip:** • *Ask for dip* • *Not using the dip* • *Yes to eating the dip alone* • *Yes to using the dip with the vegetable*
The Familiar Vegetable: • *Child knows:* o *Carrot* o *Pepper* o *Cucumber* • *Child does not know:* o *Carrot* o *Pepper* o *Cucumber*	**Like:** • *Carrot* • *Pepper* • *Cucumber* **Shape:** • *Owl* • *Star* • *Flower* • *Other* **Dislike:** • *Carrot* • *Pepper* • *Cucumber*
Naming vegetables by: • *Color* • *Called vegetable with different name*	**Order of eating vegetable:** • *Carrot* • *Pepper* • *Cucumber*
Interference: *Language Barrier* *Peer interference* • *Encouragement* • *Hinder* *Vegetable consumption was hindered by dip* *Want to Eat More:* • *But time is out* • *From one type of vegetables*	**Noticing the shape:** • *Ignoring the shape* • *Knowing the shape* • *Does not know the shape* • *Playing with the shaped vegetable* • *Address vegetable by a different name*
*Themes are **bolded** and *codes* are italicized	

The following are sample observations and quotes from the children to illustrate the themes listed in Table 18.

Chewing ability:

Well:

She knew all vegetables. She started with pepper, then carrot. The flower shape is a star. She likes the carrot, and when I asked her if it is hard, she said it is good. She likes to close her eyes, so she will not see the seeds of the cucumber. She chews well. She put many pieces in her mouth and she chews well. She asked how to shape the vegetables because she likes it.(FnD 22)

Not well:

She started with the carrot and then she had a bite from the pepper. She said the carrot is hard to eat. She changed to the pepper. She said she had pepper at home. It tastes good when it is wet. She found it hard to eat the cucumber, too; she peeled the cucumber with her teeth then ate it. She chews her food very well. She said, it is too hard to eat; she wanted to continue eating, but time was off. (NnD 22)

Full Mouth with food:

He ate all the vegetables except pepper (he called it 'tomatom'). He liked both the natural and the shaped one. He eats fast with his mouth full of the food" (BnD 16)

The Familiar Vegetable:

Knowing:

He started with the carrot and said he likes it. He chews the carrot with his mouth full; he also likes pepper. He said I eat a lot of carrots at home. (NnD12)

She ate the carrots and she said I will try pepper at home, but she didn't want to try them there. (FnD01)

Not knowing:

He ate the vegetables with the dip; he said he likes it. He thought that the cucumber was a kiwi fruit. He knows the carrot and ate it very fast. He did not try the pepper and did not know what it is. (SD05)

He didn't try the carrot and pepper and he did not know what the pepper is. He said, "I tried the carrot before and didn't like it". (SD05)

Naming vegetables by:

Color:

He said that cucumber is green; he likes to eat from one color, He finished the green cucumber first, and then started with the carrot, the orange vegetable. He did not eat the dip; he realized later that the orange vegetable is carrot only after eating many pieces. (SD37)

He defines vegetables according to its color. He started with the pepper but did not chew well. He ate fast. (FD11)

Different name for a vegetable:

She said before she ate that she didn't want to eat vegetable. After she looked at it, she ate the cucumber and some of carrots. She said she did not like the potatoes (pepper). She asked for more dip and she come back to have the rest of carrot. (FnD03)

He said it looks like gummies and he just ate the cucumber. (FnD29)

Interference:

Food from home:

Before snack time, he likes carrot but he started with the cucumber. He said the carrot taste like carrot but smells stinky. He did not have his snack but the snacks were put on the other side of the table, which I think hindered him from eating the vegetable. He said he like the owl. (NnD04)

Dip Obstruction:

She finished her dip without eating the vegetables with it. (ND03)

She just eat the dip in the beginning; after finishing dip she started eating the vegetables. She said she doesn't like the pepper with *flower* shape. She wanted to eat more, but time was out. (FD03)

Language Barrier:

She ate the pepper and she looked like she liked it. She doesn't speak English, so we couldn't get more info if she knows the vegetable or if she likes it. She ate the carrot as the second vegetable after finishing the pepper. (SnD38)

The NVivo 9 (QSR International Pty Ltd, Australia, 2010) computerized software was used to produce the themes from the field notes and calculate the percentage of times the themes occurred during the interviews with the children. Table 19 shows the main points from coding the final report of the field notes (Appendix Q: The Final Report of Childcare Centre's Fields Notes) using the computerized software. The results showed that B childcare centre had the highest percentage in the themes "Chewing well", "Knowing the vegetable" and "Eating more, but time is out" (29.30 %, 43.83%, 9.49% respectively). D had highest percentage in the theme "Playing with shaped vegetables" themes (13.4%).

Table 19. Coding Summary Report from the Fields Notes

Childcare Centres / **Theme**	**D**	**A**	**C**	**B**
Chewing well	17.29 % (7)	24.93% (10)	15.86% (9)	29.30% (14)
Not chewing well	0.81% (1)	9.24% (9)	0.82% (1)	0.14% (3)
Knowing the vegetable	8.32 (6)	7.76% (7)	23.25% (14)	43.84% (18)

Childcare Centres / Theme		D	A	C	B
Familiar with carrot		36.6% (20)	-----	19.79% (12)	43.84% (18)
Familiar with pepper		16.06 % (9)	-----	6.77% (5)	33.40% (13)
Familiar with cucumber		14.16% (9)	-----	12.29% (9)	24.93% (12)
Not knowing the vegetables		7.30 % (2)	10.05% (4)	18.78% (11)	2.04% (1)
Not knowing carrot		3.59 % (2)	1.59% (1)	1.23% (1)	-----
Not knowing cucumber		7.30% (4)	3.70% (1)	3.16% (2)	-----
Not knowing pepper		5.84% (3)	6.83% (2)	17.15% (10)	-----
Naming the vegetable by color		1.43% (1)	0.77% (2)	-----	1.13% (1)
Naming the vegetable with another food		2.75% (1)	------	23.62% (12)	3.79% (2)
Not using the dip when it is served		16.6% (6)	5.20% (4)	12.50% (6)	4.25% (4)
Eating the dip alone		4.36% (4)	-----	16.01% (7)	2.24% (1)
Carrot	Start	14.08% (10)	16.74% (9)	7.65% (4)	18.21% (10)
	Like	28.41% (17)	3.75% (3)	14.80% (9)	29.66% (15)
	Dislike	3.76% (2)	1.59% (1)	4.85% (5)	9.10% (3)
Pepper	Start	16.56% (9)	6.84% (7)	2.87% (2)	16.91% (8)

Theme \ Childcare Centres		D	A	C	B
Pepper	Like	19.89 (10)	2.81% (3)	----	45.89% (20)
	Dislike	3.66% (3)	-----	35.56% (21)	12.42% (5)
Cucumber	Start	17.08% (10)	26.43% (18)	24.11% (16)	6.91% (5)
	Like	20.33% (12)	11.52% (9)	19.62% (16)	58.71% (24)
	Dislike	7.39% (5)		4.70% (3)	7.85% (3)
Like Owl		0.61% (1)	-----	5.08% (3)	-------
Like Star		4.95% (2)	-----	-----	1.64% (2)
Like Flower		0.61% (1)	-----	0.11% (2)	3.58% (2)
Playing with the shaped vegetables		13.40% (6)	7.66% (3)	9.32% (5)	13.03% (6)
Eating more, but time is out		2.12% (1)	5.96% (3)	4.36% (2)	9.49% (3)
The coverage is in percentages and the number in parenthesis is for the number of references from the centres' coded themes					

In summary, the observations and quotes indicated that children's like and dislike for vegetables and dips were influenced by the characteristics of the vegetables itself (color, taste, smell, flavour), their knowledge of and/or familiarity with the vegetables based on their exposure at home, and the environment where they were served the vegetables recognizing potential barriers that may hinder their consumption. Thus it is important that any strategy to increase their consumption should look at these influencing factors.

CHAPTER 5: DISCUSSION

This study has been conducted to determine the impacts of increasing level of exposure, availability, accessibility, and improving the sensory characteristics of vegetables in order to identify factors which influence children's vegetable consumption, define an optimum strategy to promote vegetables in early ages, and contribute to evidence-based research. In this chapter, the results of this research are discussed in relation to relevant findings from this and other studies.

To the researchers' knowledge, there is limited published research of interventions to promote vegetables in preschool children and this is one of the few studies examining the effects of three promoting strategies in the context of improving vegetable consumption in preschool children. Most of the comparisons are based on existing studies, which used one or two of the strategies and its effect on children's vegetable consumption within a wider range of ages. Moreover, this chapter includes the strengths and limitations of the present study.

5.1 Participant Characteristics and Consumption

Some studies have tested the impact of different variables on children's vegetable consumption such as sex, income levels, ethnicity and BMI and no significant effects have been detected, as illustrated in Table 3. However, there are some interesting statistics that support our finding that although girls had higher intakes, the difference in intakes of boys was not significant. Female children appear to consume more vegetables than males with a 4.7% mean differences, as illustrated in Table 3. A longitudinal study showed girls (12.5 to 15.5 years old) had significantly higher F&V intake than boys from the same age range and the main determinant for this difference was attributed to F&V preference (Bere et al 2007). Also, the CCHS of 2004 showed that of the children between 9-13 years old, males had significantly less intake of daily recommended amounts of vegetables than females (Shields 2005). On the other hand, another study showed that there were no significant differences between different genders in F&V intake although both sexes were willing to try them (Jaenke et al 2012). Therefore, gender difference in F&V consumption is not consistent in published literature.

A systematic review showed that the low-income population are less able to provide an adequate amount of vegetables to children (Thomson et al 2011). Also, a study investigated the predictors

of F&V consumption in preschool children from low-income level families and found that the availability and accessibility of F&V with parental effective role modeling of healthy consumption of F&V was the main predictor (Goldman et al 2012). Due to low income, children were not exposed to F&V enough on a daily basis to increase their liking and preference to consume the recommended amount. In our study, children from the lowest income level had the lowest mean consumption of vegetables; however, the higher income of families was not an indicator of a higher intake of vegetables even knowing that there was no significant differences between the income levels. Therefore, the income level of families of children could have an impact on children's vegetables consumption.

In the present study, there was no significant difference in mean consumption of vegetables between children with different BMI categories ($p = 0.42$). Those with a healthy BMI had a higher mean consumption (45% ± 40.02) than those who were at risk for overweight, overweight and obese categories, as illustrated in Table 3. This negative relationship between body weight and vegetable intake was similarly reported in the CCHS 2004 where overweight and obese children tend to be consuming less than 5 servings of the recommended daily amount of F&V (Shields 2005).

The demographic characteristics of participants were varied even with a predominant Caucasian white group and the presence of minority groups, which mirror the demographic features of the population of London, Ontario, as illustrated in Table 2. Thus, it would be a good opportunity to explore the impact of repeated exposure of interesting shaped vegetables on children belonging to ethnic groups characterized by low vegetable consumption such as the Hispanic group.

5.2 Theories One & Two

The first hypothesis of present study was that preschool children will not consume interesting shaped vegetables more than their consumption of natural shaped vegetables. However, the results showed that the preschool children consumed more of the interesting shaped vegetables (57.3% ± 29.20) than the natural shaped vegetables (47% ± 31.38), as illustrated in Table 11, and that there was a significant difference between the two means ($p< 0.001$), as illustrated Table 11. Thus, this hypothesis was negated.

The second hypothesis was that the preschool children's vegetable consumption will not improve by repeated exposure (at least 6 times) to interesting shaped vegetables. The study results showed the positive impact of the interesting shapes of vegetables by improving the consumption of the natural shaped vegetable consumption on the 8th day of the experiment (50.6 %± 29.1) compared to the consumption of the natural shaped vegetables on the first day (40.1 %± 34.2), as illustrated in Table 12. The difference between the two days was significant ($p<0.001$), as illustrated in Table 12.

Providing high quality pictures of vegetables in different shapes has been used in studies that tested the liking of and willingness to consume interesting shaped or natural shaped vegetables. One study has found that the children preferred to have a star shaped vegetable instead of the natural shaped vegetable (Olsen et al 2012). However, the children's actual consumption of vegetables have not been tested in earlier research. The results of our experiment support and agree with the expectations or assumptions of earlier research that children prefer more the interesting shaped vegetables than the natural shaped ones. Our study was able to translate the expectations or assumptions from theoretical studies into real findings based on the results of our experiment – that children prefer consuming interesting shaped vegetables compared to their natural shapes. Also, because of exposure to these vegetables, their intake of natural shapes were significantly increased after six day of repeated exposure. The data from interviewing the children which formed the qualitative results of this experiment showed that there were some children in the childcare centres who were unfamiliar with the vegetables used in the study and refused to eat them, as illustrated in Table 19. One study has pointed out that some preschool children have a fear of trying unfamiliar foods which could result in picky eating (Cashdan 1994).

Another study has indicated that preschool children accept and eat food if the food appearance agrees with their visual appearance or preference (Dovey et al 2008). This supported the importance of the strategy in the present study to use interesting shapes of vegetables in the experiment as a means to increase the mean consumption of vegetables especially among the children who were unfamiliar with the vegetables. The interesting shapes of vegetables were considered as a motivational factor to break the children's neophobia. The themes that were generated from the fields notes in the present study not only indicated the children's decreasing

fear of eating vegetables, but it also showed that some of them had fun while playing with the interesting shaped vegetables. Therefore, the playful appearance of the vegetables could be an effective strategy to promote consumption among preschool children.

Our study reported the positive impact of repeated exposure to interesting shaped vegetables in increasing their mean intakes. Our experimental design also made the assumption that improving the taste of the vegetables with a dip would probably increase consumption. This strategy was prompted by the findings of another study that found repeated exposure to vegetables without any associated promotion strategy showed a decrease in vegetable intake. This was linked to boredom from the monotony of the food, although with time intake increased (Hetherington et al 2002). The results of our study showed that there was a significant negative effect of the dip in decreasing the mean consumption of shaped vegetables. With the dip provided, the vegetable consumption was less (47.8% ± 25.15) than the consumption of vegetables provided without the dip (56.5% ± 27.53), and this difference was statistically significant ($p<0.001$). Since our assumption with the dip presence was not born out, therefore, the main influential factor in increasing vegetable consumption in this experiment was from the repeated exposure to interesting shaped vegetables. These results, i.e. significant increase in consumption of the children when the vegetables were not accompanied by any flavoured dips, are similar to the findings of two other RCT studies which showed increasing vegetable consumption with interesting shapes and increased liking with repeated exposure of such vegetables to children (Anzman-Frasca et al 2011; Hausner et al 2012). Based on our fields notes, some children played with the vegetables and run out of time even though they wanted to eat more of the shaped vegetables. This may partly explain some of the decreased consumption of vegetables.

Another possible explanation is the influence of the small size of the interesting shaped vegetables which the children liked in terms of shapes, but the small size may affect the amount of their intakes. One study investigated the impact of different shaped and sized dessert snacks (large and small) over three weeks on the children's liking and wanting the snacks (Liem et al 2009). The researchers found that children preferred the small size and shaped dessert snacks more than the large ones (Liem et al 2009). Despite the differences between this earlier study and our present study in the type of food that had been provided, the sensory characteristics of food, e.g., size which influenced texture by changing the feel of the food in the mouth, played a major

role in both experiments. Also, the consumption of the large sized and shaped dessert snacks in earlier study decreased as a result of repeated exposure and the children's constant liking of small sized dessert snacks (Liem et al 2009). However, in our experiment of repeated exposure of interesting shaped vegetables, we found a significant increase (10.5%) in the mean consumption of the bigger natural shaped vegetables. The 10.5% increase occurred on the 8th (last day) of the experiment for the natural shaped vegetables when compared to the 1st day of natural shaped vegetable consumption. This means that the repeated exposure to interesting shaped vegetables was probably more effective in increasing the liking for natural vegetable compared to the case of the desserts.

A cross–over study tested the influence of repeated exposure of interesting shaped healthy snacks (banana bread, turkey/cheese wrap and pancake) for 10 times on different occasions on preschool children's consumption (Boyer at al 2012). The results showed that shaping the snacks did not significantly increase consumption among the children (Boyer at al 2012). However, the study did no report whether the liking of the new shapes was determined or not, so it is probable that the children did not eat more of the shaped snacks because they did not like the physical characteristics (size and shape) of the food. Preschool children's liking of the appearance of food is considered an important factor to be determined initially because preschool children eat only what appears good to them (Dovey et al 2008; Keim et al 2001; Olsen et al 2012). In this study, the field notes showed that children mentioned the star shape more than the other shapes as the most preferred shape. Also the amount of consumption in this shape was the highest, which indicate the importance of shaping vegetables in improving consumption.

In our study, a similar event occurred which could have influenced their consumption. When the owl shaped cutter broke down and was replaced with a bat shape for the 7th exposure the vegetable consumption dropped a little bit compared to the 6th exposure and the reason could be inferred from the field notes. The bat shape was not clear to some of the children and not one of them liked this shape. This could be the reason for the decrease in consumption on the last day of exposure to the interesting shaped vegetables in the present experiment.

Finally, the physical characteristics and visual appearance of vegetables played an important role in increasing the playfulness of children while eating the vegetable snack which resulted in some

of them unable to eat more as they would have wanted. Repeated exposure to interesting shaped vegetables had a significant positive impact on vegetable consumption. There is a need to explore the effectiveness of this strategy in long-term follow-up experiment.

5.3 Theory Three

The third hypothesis in the present study was that high accessibility levels of vegetables in the children's homes will not increase their consumption of vegetables. This study revealed that the highest mean consumption of vegetables was in the Medium Accessibility Level (60.1% ± 31.56), and the second highest mean consumption level was in the High Access Level (53.3% ± 34.69), as illustrated in Table 14. However, there were no significant differences in the mean consumption of vegetables among the three accessibility levels ($p = 0.98$). The lowest mean consumption was in the Low Access Level. A study showed that a low availability of F&V at home was associated with low vegetables consumption among children (Van Ansem et al 2012). Also, another study found that low preference for F&V among children was associated with accessibility and availability, but not with high F&V preference (Cullen et al 2003). Therefore, low accessibility of vegetables at home would be a determinant of low vegetable consumption among preschool children.

In the present study, the parents answered the questions on accessibility levels in the questionnaires. A study found different results between parents and their children (10-12 years old) about the accessibility to F&V to children at home. Parents tended to overestimate their children's accessibility compared to the perception of the children themselves (Bere et al 2004). Therefore, the overestimation of the accessibility level of vegetables to children could be a reason why the present study did not show a clear relationship between children's vegetable consumption and the accessibility level of vegetables in their homes. Many studies have reported a positive relationship between accessibility and F&V consumption (Bere et al 2004; Christian et al 2013; Cullen 2003; Koui et al 2008; Kristjansdottir et al 2006; Van Ansem et al 2012). Multiple factors related to the parents affect children's consumption of vegetables directly than accessibility of vegetables which is also affected by them such as parental education, parenting practices and role modeling (Blanchette et al 2005; Dave et al 2010). Therefore, parents

reporting the accessibility levels of vegetables at home could be an invalid indicator to represent the impact of vegetable accessibility on children's consumption.

Many studies have investigated the effect of different factors affecting vegetable accessibility at home (Koui et al 2008; Bere et al 2004; Dave et al 2010; Kristjansdottir et al 2006). Our study is one of a limited number of studies that tested the influence of shaped vegetables in different locations with different shapes or figures to be more accessible. There was no significant effect of the high accessibility level at home on increasing the consumption of accessible shaped vegetables ($p = 0.5$), as illustrated in Table 14. Therefore, no relationship could be inferred from this study between children's vegetables consumption and accessibility levels.

Considering the location of the childcare centres and accessibility levels, it was noted that two childcare centres (Band A) had the highest mean consumption (100 ± 0, 65 ± 0, respectively), as illustrated in Table 17. The children in these two centres had a high accessibility level to vegetables in their homes, although some children who had low accessibility level also had the lowest mean consumption of vegetables ($34.5\% \pm 0$, $51.3\% \pm 18.82$), as illustrated in Table 17. Both of these childcare centres had the highest numbers of parents with university degrees and the highest vegetable consumption when parental education was a university degree ($62.7\% \pm 25.82$), as illustrated in Table 14. However, there were no significant differences in mean vegetable consumption of children between the different parental education levels, as illustrated in Table 14. It is possible that the differences could be more statistically significant with a bigger sample size. Our results are compatible with the findings of a cross-sectional survey of a prospective cohort studies from eight European countries (Fernández-Alvira et al 2013). The study tested the dietary intake of children 2-9 years old and the results showed that increasing parental educational level was associated with increased consumption of vegetables, fruits, grain products and water (Fernández-Alvira et al 2013). Higher parental education had been associated with many other positive factors such as improving knowledge and awareness about the importance of F&V higher income status and supportive home environment factors (for availability and accessibility) that impact their children's F&V consumption positively (Fernández-Alvira et al 2013). In some ways, parents with higher education are more likely practising and role modeling effectively a healthy lifestyle that improves their children's F&V

consumption for long term impact (O'Connor et al 2010). Therefore, high parental educational level could be a predictor of high vegetable consumption for children.

There are many publications that support the importance of environmental factors such as availability and accessibility of F&V for improving their consumption (Bere et al 2004; Christian et al 2013; Cullen 2003; Koui et al 2008; Kristjansdottir et al 2006; Van Ansem et al 2012). The goal of considering the relationship between the accessibility factor and other sociological and environmental factors is to maximize and reach the ideal intake of F&V by children. The present study measured the accessibility levels that have been reported by the parents, which showed that children with low accessibility level in their homes had the lowest vegetable consumption compared to the children with higher accessibility levels in their homes.

5.4 Qualitative data

The field notes showed correspondence with the quantitative results of the present study and other earlier studies (Bergström et al 2012; Boyer et al 2012; Cashdan 1994; Jacka et al 2011; Knai et al 2006; Olsen et al 2012). The formulated themes generated from the Nvivo 9 (QSR International Pty Ltd, Australia, 2010) software have not been linked with the quantitative data; however; in this section we discuss the main findings as a result of combining the qualitative and quantitative results. An interesting positive relation was found between mean consumption and the theme of "chewing well". The theme of "chewing well" (in percentage) and followed by the mean consumption (μ) of vegetables were presented in descending order (29.30%, μ=71.42), (24.93%, μ=58.80), (17.29%, μ=48.58), (15.86%, μ=44.07) for the four childcare centres, as illustrated in Table 19. This result was similar to the findings of a study that assessed exposure children to solid foods at different ages and food intakes (Coulthard et al 2009). The results showed children who were exposed to F&V in an early age between six to nine months improved their oral-motor skills and more likely ate more F&V (Coulthard et al 2009). In terms of "Familiarity with vegetables", children with the highest mean consumption of vegetables were from the B childcare centre where a large number of their parents had university degrees. This result was similar to the findings of other studies that found the positive relationship between children's familiarity with F&V and consumption (Cashdan 1994; Jacka et al 2011; Knai et al 2006). On the other hand, the lowest mean consumption of vegetables were in the childcare

centres that showed the highest number in the theme of "naming vegetables as another food" (23.62%), as illustrated in Table 19. This could be interpreted as children with low familiarity with vegetables having a low consumption of vegetables. Also, the theme of "eating dip alone" (16%) was found in the childcare centre with the lowest mean consumption, as illustrated in Table 19. This theme did not play any supportive role in increasing vegetable consumption and in getting the interest of some children to consume more vegetables with the dip. This supports the quantitative result of the present study that showed low consumption of vegetables when the dip was provided to preschool children. Also, it supports the findings of a study that reported no effect of providing a dip in increasing the liking and consumption of vegetables among preschool children (Anzman-Frasca et al 2011). Therefore, serving dip with vegetables is not an effective strategy to improve vegetable consumption for preschool children. There were no conflicts between the qualitative and quantitative results. Using the qualitative data enhanced the interpretation of the quantitative results. The new knowledge gained from the study indicated other potential predictors of vegetable consumption, for example, chewing ability of children. There are a very limited number of publications that have explored the impact of preschool children's chewing ability and consumption of vegetables.

5.5 Strengths and Limitations

One of the strengths of the present study is the researcher's first-hand experience as a mother of three children. A full understanding of her children's perspectives toward vegetables necessitated going down to their intellectual level. Based on the researcher's observational experiences, children in general like to learn and discover the surrounding environment freely without control and teaching to increase their curiosity to learn more. Vegetables are one of the food elements in the environment that most children are introduced to with parental or caregiver pressure (Heath et al 2011).

Adapting to children's preferences and teaching them food with a creative tool could be an effective strategy. This was considered in designing the present study. Having an educational background in food and nutrition from the Middle East and North America opened the domain to consider similarities or differences between varied cultures. Children's low consumption of vegetables is considered a common problem in the two cultures. Moreover, in this study there

were varied ethnic groups, including the Native/Aboriginal population. Even though the sample sizes may not have warranted separate analysis by such grouping, it provided a good example of the multi-cultural aspect of the Canadian environment. It would be a good opportunity to compare the effects of ethnicity in London, Ontario with different regional ethnic groups.

Another strength of the study is the consideration of the theoretical frameworks such as SCT and TPB in planning the experiment as well as highlighting the environmental (e.g., accessibility of vegetables) and sociological factors (such as children's physical characteristics, preference for vegetables and dips which increased their self-efficacy) as study variables. The TPB helped in this study when we considered the children's attitudes toward vegetables by addressing children's liking of and familiarity to vegetables. The SCT also helped in testing the impact of the shaped vegetables on children's intention to like vegetables and increase their consumption. Thus, the study framework resulted in an experiment using mixed methods giving us both quantitative and qualitative results. The quantitative results showed an increase in the consumption of both shaped vegetables and natural shaped vegetables. The qualitative results showed a clearer picture of the effect of shaping the vegetables, represented both in the fun aspect of children playing with the food and the variety of choices for the most preferred shape.

The small sample size is a limitation of this study that prevents us from generalizing the statistical results to a bigger population of preschool children. However, the sample size had been estimated based on another study which had similar applications and goals as the present study. Another limitation is that the accessibility levels have been calculated especially for this research. The predictor questions of the accessibility levels have not been verified for validity and reliability of measurement and there are no validated instruments available in the literature to examine the accessibility levels (Ganann et al 2012). The accessibility levels were determined according to the eight questions developed for the present study and these questions describe mostly the environmental accessibility of vegetables at home. It is very possible that other factors outside of the child's immediate environment may affect the determination of accessibility. The number of question asked probably was not enough to determine and refine the differences between accessibility levels that represent a supportive environmental level that will facilitate children's vegetable consumption (Appendix K: Calculation of Accessibility Levels). Also, testing more than one variable, such as shapes and repeated-exposures, and providing dips

made it hard to tease out the main effect on vegetable consumption. This is a good opportunity to plan for future research that focus on the effectiveness of repeated exposure to shaped vegetables in children's consumption with long term follow-up. Overcoming the limitation of standardizing the weight of the vegetables is possible by taking into consideration the measuring of the vegetable water and fibre contents. Other limitations concern some issues and problems on the logistics of providing the vegetables and dip, which are strictly governed by food safety regulations and other government regulations. Imposing the purchasing process of the vegetables and dip on the childcare centres (as mandated by regulations) caused a modification in the sequence of providing the dip, since one of the childcare centres did not facilitate the dip at the required time for the study.

CHAPTER 6: CONCLUSIONS

6.1 Relevance and Implications for Practice

Since there is no recommended best approach to increase children's vegetable consumption, dietitians must find ways of approaching and guiding children's vegetable consumption (Knai et al 2006). Presently, there are no significant studies suggesting home strategies to increase the consumption of vegetables over an extended period of time (Heath et al 2011). Most of the strategies take place in school intervention programs and do not give practical implementation to be used at home (Heath et al 2011). Moreover, with various constraining factors that affect vegetable consumption, there is a need to further investigate practical strategies that would help parents and caregivers adopt methods for increasing children's vegetable consumption. Many research studies state that repeated exposure to vegetables visually or orally increases the liking of vegetables (Anzman-Frasca et al 2011; Heath et al 2011; Knai et al 2006). Findings show that parents who see their children avoiding vegetables are willing to force them to eat vegetables, but are not willing to frequently serve vegetables in a manner that may increase the children's familiarity with and liking of those vegetables (Heath et al 2011). Socio-economic status further complicates this problem, as families of low income will avoid spending money on foods they believe their children would not like. Thus the availability of vegetables in the home will decrease. There are studies that indicated the importance of studying preschool age because of the ability of children in this age group to adopt food patterns that last up to adult age (Mannino et al 2004; Nicklaus et al 2004). This present study is the first one that showed the interesting shapes of vegetables as providing a positive experience for vegetables among preschool children and showed the impact of shaping vegetables on preschool children's consumption. The study showed how the repeated exposure to interesting shaped vegetables increased the consumption of not just the shaped vegetables but also of the natural shaped vegetables among the preschool children. The quantitative and qualitative data in this study showed that the star shape is the most preferred shape compared other shapes (flower, bat, owl, and natural), and that the shapes increased children's positive experience and created some fun while eating. Therefore, catching the preschool children's attention to vegetables without forcing them through transforming the natural shaped vegetables into other interesting shapes was an excellent result in this study. The other interesting finding of this study was that repeated exposure to accessible shaped vegetables

increased significantly the children's consumption of both the shaped and natural shaped vegetables.

Planning promotion strategies for improving vegetables consumption to preschool children will be more efficient and effective if it is based on a theoretical framework that helps to determine the various factors that impact children's vegetable consumption. There is need to understand the children's perception of vegetables and some factors in their social and physical environments. The SCT is a broad theory that determines the broader impact of factors in the environment and the personal factors that influence behaviour and vice-versa. The SCT could be used as a database for the promotion strategy framework. The TPB helps researchers go more in depth when searching for the factors that impact vegetable consumption. Examples are children's attitude, norms and self-efficacy toward vegetables, which are totally different than those of adults. Studying them enhances the researchers' knowledge about children and their attitudes or behaviours towards vegetables. Therefore, combining features or aspects of different theories will help researchers understand better and more the factors that influence children's vegetables consumption. An excellent example was the framework developed for the Pro Children Project (Appendix A: Theoretical framework for Pro Children Project), which used several theories in their approach. Another good example are the ones used in this present study.

6.2 Recommendations

Repeated exposure to interesting shaped vegetables is a good approach that a caregiver can use to create interest in and increase the intake of vegetables among preschool children especially in different environments and settings such as their homes and school. There is need to find a tool to facilitate shaping the vegetables and make it an easy and practical process to implement for parents and caregivers. The present study showed the significant impact of this approach. At a time when young children are forming their food intake habits which they will carry on towards adulthood, it is important that they are exposed early on to healthier food choices such as vegetables first in their homes where parental guidance is much needed and in the kindergarten schools where they are exposed to peer pressure. The findings could be used in further research to find other strategies that provide easy access to vegetables. Measuring access to vegetables is an important topic that needs more research particularly in developing and/or validating tools of

measurement. In the present study, a questionnaire was developed to measure access in the homes, but this needs to be refined and appropriately validated. There is also a need to develop or validate tools for use in different settings, for example in the schools and communities where the children live. There is need to have more research on the preschool group food consumption considering the implications for future older dietary habits. There is need to determine the shape most preferred by preschool children considering their gender and ethnicity differences for maximum effectiveness in increasing their intakes. For the vegetables that cannot be shaped such as broccoli, there is need to find other interesting strategies to encourage consumption among children. In addition, this study addressed the chewing ability of preschool children and its effect on consumption of vegetables by asking the children's opinions. Thus, the study recommends that the medium ripened vegetables are the best to use in shaping them and to make allowances for differences in chewing ability. Future research that may determine the impact of different chewing ability in vegetable consumption would be interesting addition to health promotion knowledge. The findings may also be used by food manufacturers who wish to promote vegetables to children.

6.3 Conclusions

In conclusion, preschool children are in a critical age that manifests a fear of trying food, and this fear could be a possible reason for the low intake of F&V (Bergström et al 2012). Statistics has shown that they have inadequate consumption of F&V and increased intakes of unhealthy food choices (Anzman- Frasca et al 2011). The fun aspects that children find in unhealthy choices (such as miniature toys in cereal boxes) draw their attention and influence their preference more than F&V (Cairns et al 2009). Repeated exposure to interesting shaped vegetables improves preschool children's familiarity and eating experience with vegetables. This present study showed increased liking and consumption of the natural shaped vegetables after repeated exposure to interesting shapes of the same vegetables.

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APPENDICES

Appendix A: Theoretical Framework for the Pro Children Project

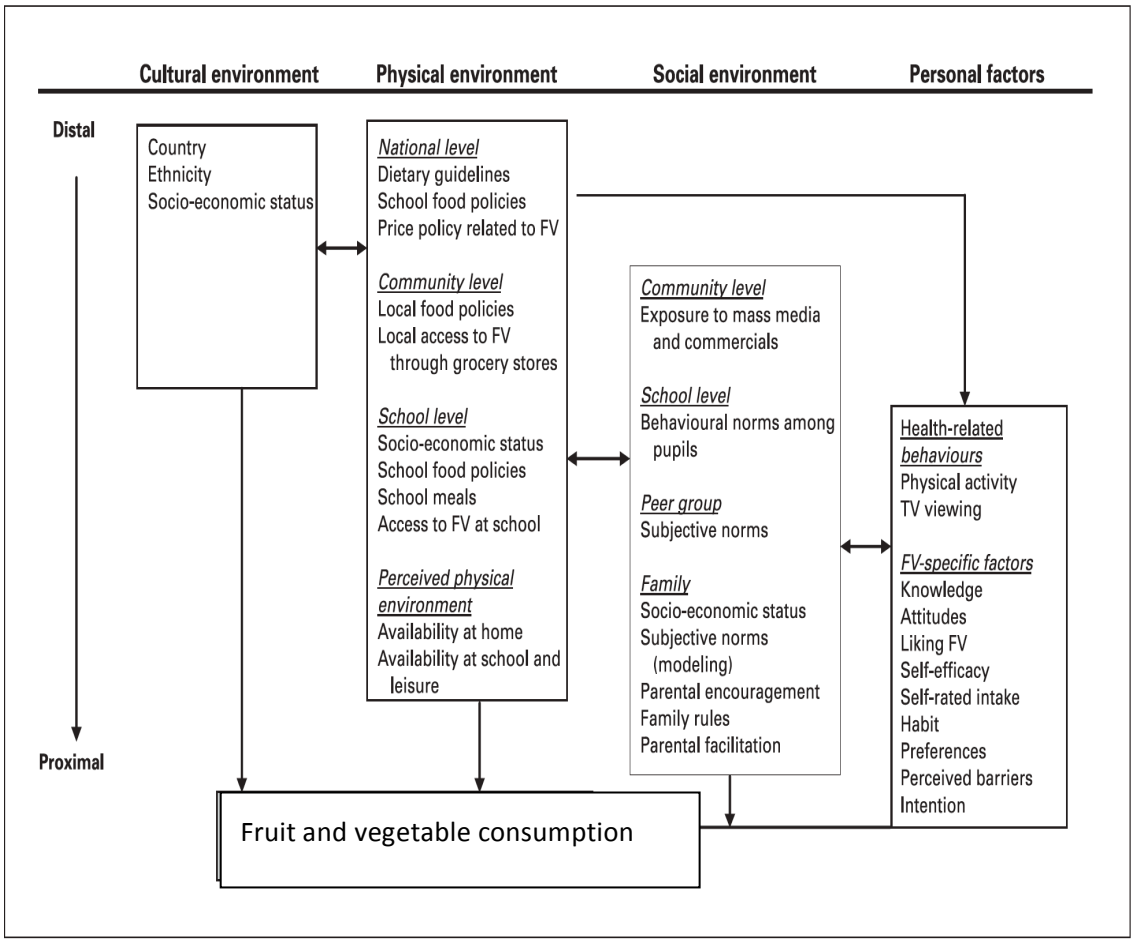


Fig. 1. Theoretical framework applied to children's fruit and vegetable (FV) consumption: the Pro Children Project.

Reference: Klepp KI, Pérez-Rodrigo C, De Bourdeaudhuij I, Due PP, Elmadfa I, Haraldsdóttir J, et al. 2005. "Promoting fruit and vegetable consumption among European schoolchildren: rationale, conceptualization and design of the Pro Children Project". *Annals of Nutrition and Metabolism,* 49(4):212–220.

Appendix B: Material Provided to Childcare Centre

Appendix B.1: Research Schedule in Childcare Centre

Research Schedule in Child care center

Week 1

- Day 1 (Monday)– distribute questionnaires and consent forms for parents/ caregivers
- Day 5 (Friday)- collect completed questionnaires and consent forms (from director and teachers)

Week 2

- Day 1 Survey of preferred dips/ Height and Weight will be taken
- Day 2 Natural- shaped with preferred dip
- Day 3 Star- shaped with preferred dip
- Day 4 flower-shaped with preferred dip
- Day 5 bird- shaped with preferred dip

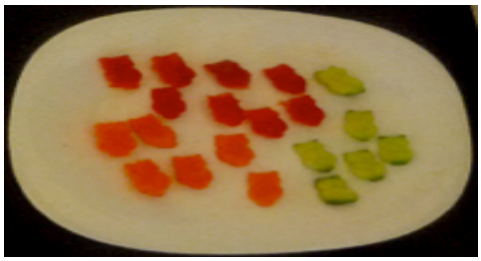
Week 3

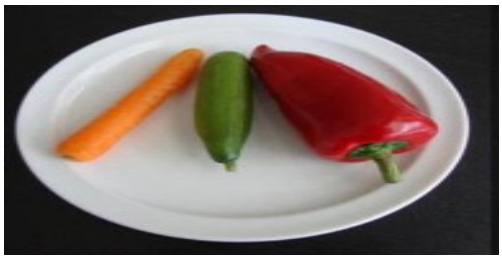
- Day 1 Star- shaped with preferred dip
- Day 2 flower-shaped with preferred dip
- Day 3 bird- shaped with preferred dip
- Day 4 Natural- shaped with preferred dip
- Day 5 Thank you and celebrate with the children

For Information:

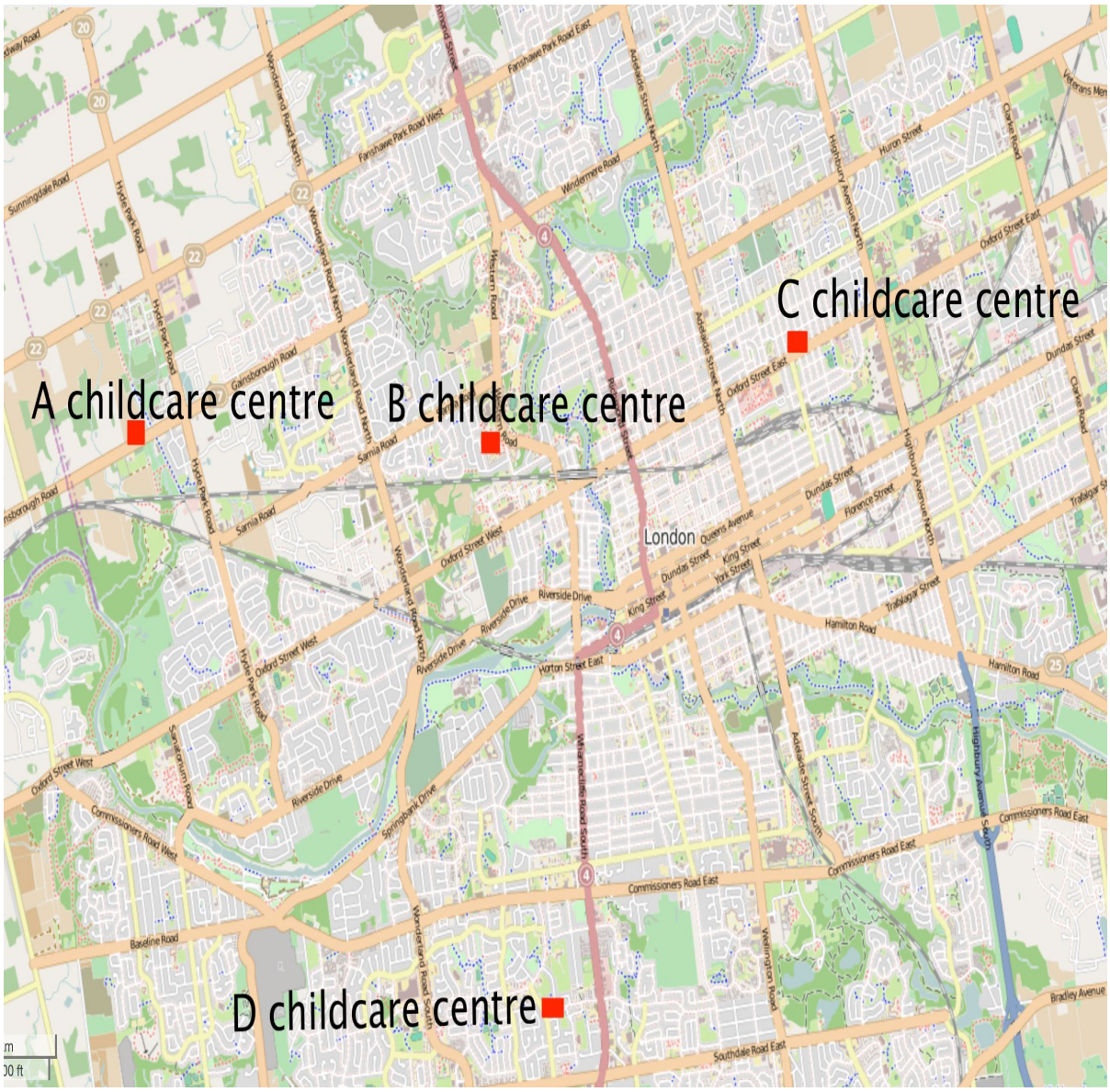
- We need teacher involvement
- Testing 10 children ~1 hour/ day
- Preparation of vegetables ~ 30 minutes
- Needed vegetables: Red sweet pepper, carrot, cucumber
- Researcher & assistants:
  - With food handler certificate
  - With police clearance

Appendix B.2: Shaped Vegetables





Appendix C: Map of Child Care Centre Locations



Appendix D: Letter of Information for Directors of Child Care Centres

Letter of Information for Directors of Child Care Centres

Title of Project: Interesting shapes of vegetables: Is it the way to promote them to preschool children?

Principle investigator: Dr. Alicia C. Garcia

Co-Investigator: Salma Alhabshi

Purpose of Study:

You are being asked to give permission to the researchers (and their research assistants) to seek the participation of the children attending the centre in a research study designed to explore the impact of new shapes of vegetables on preschool children's consumption. This research is necessary to find the best approach to promote vegetable consumption among children. The cooperation of teachers is needed in this study. If the child attending a child care centre is 2-5 years old, and he/ she did not have any allergy to vegetables. She/he can participate in this research. The minimum number of participants is 10 children from each child care centre; however, all children whose parents signed the consent form will be included in the study. If the child attending a child care centre is more than 5 years old, she/he can participate in this research but their data will not be included in the analysis **Objectives of the study:**

1. To explore the impact of new shapes of vegetables in preschool children's consumption and their perceptions of vegetables.
2. To compare the consumption of new shaped vegetables with the natural shape of these same vegetables.
3. To determine exposure/access to vegetables at home and how these are served by the parents/caregivers.

Procedures Involved in this Study:

If you agree to participate in this study, you will be asked to sign the consent form and return it to the co-investigator (SA).The child's parents will also be asked permission for their child to participate in the research, sign a consent form, as well as fill a demographic and vegetable accessibility questionnaire day care centre, the children will be provided with different shaped vegetables with their preferred dip at six different times. – all of which will need to be returned to the child's teacher. This will be done in the first week of the study. From this questionnaire, the researchers will determine the type of dip that is most served by parents.

In the daycare centre, on day 1 of the second week of the study, the researchers will ask the children to taste three different kinds of dips (Hidden Valley Ranch Original, BC Creamy Dill Dip, and the one most served by parents as determined from the vegetable accessibility questionnaire) and their most preferred dip will be recorded. This individually preferred dip will

be served on the side in a small container during the actual vegetable tasting period. On this same day, the heights and weights of the children will be taken and recorded by a pair of researchers/research assistants. There will always be two researchers when the measurements are taken. On day 2, all participating children who are present in the school will be provided the natural-shaped vegetables with their individual preferred dip. In the next three days the children will be provided with the shaped vegetables such as star-shaped, flower-shaped, and bird-shaped vegetables, respectively.

In the third week of the study, the daily sequence of serving the vegetables with their preferred dip will start with the star-shaped on Monday, the flower-shaped on Tuesday, the bird-shaped on Wednesday and the natural-shaped on Thursday. On Friday, we will be glad to celebrate with the children and the day care centre in appreciation of their cooperation and support of the study by offering a vegetable cutter set for everyone (cost is approximately $1.50 per set). If used at home, this will reinforce the learning from the study.

All of the research team, i.e., the co-investigator (SA) and five research assistants will have the food handler certification and police clearance. Following the public health policy of prohibiting any outside food to be brought to the centre, the centre will be requested to provide the researchers with certain vegetables (i.e., small cucumbers, red sweet peppers, carrots) for the study. The researchers will reimburse the cost of the vegetables to the child care centre on a daily basis or in any way the centre chooses to be paid for the expenses. The amount of vegetables needed will be determined according to the number of children participating in the study.

The amount of consumption will be measured and the preferred shape will be determined by the researchers. The children will be asked about his/her experience and which vegetable shape they liked most. The conversation will be recorded with audio recorder.

Time Commitment:

The researchers/research assistants will prepare the shaped vegetables in the day care centre's kitchen facilities for about 30 minutes prior to serving them to the children. They will observe the children's vegetable consumption for about an hour on eight different days/times. The children will be served the vegetables and dip in morning before their lunch break or during their afternoon break and will be asked individually about their opinions about vegetable consumption and this will be audio-recorded.

Personal Benefits/ Risk of Participation:

There are no risks associated with this research. Children may increase their liking of vegetables after participation in the research. Indirectly, the child's parents may learn strategies from the questionnaire to increase the vegetable accessibility at home. Potential risks of discomfort about participating in the height and weight measurement, the eating of the vegetables and/or a dislike for the taste of the dip may occur. If any of this happens, the children will be allowed to discontinue their participation

Special Instructions:

If centre is already participating in another study at this time, please inform the co-investigator right away to determine if it is appropriate to implement this research in the centre.

Withdrawal from the research:

You can withdraw the centre from this study at any time. This project is an opportunity to enhance/improve your knowledge of vegetable consumption in young children.

Confidentiality:

To ensure the confidentiality of individual data, each participant will be identified by an identification code known only to the researchers and recorded in a master sheet which will be kept separate from the data collection forms in a locked cabinet in a secure room at Ursuline Hall at Brescia University College. This code is only going to be used to ensure completeness of data collected (e.g., the data source on vegetable availability and accessibility at home, height and weight, and vegetable consumption). The responses to the questionnaire completed by child's parent will be coded to ensure all participants remain anonymous. Once all data are collected, this code will be deleted from all forms prior to data analysis. All data collection forms will be stored in a locked cabinet in a secure office at Brescia University College. The research records will be shredded and destroyed after 5 years as appropriate. If the results of the study are published only group data will be included and no individual data will be identified

Contact Information:

If you have any questions about the study at any time,
please contact: Salma Al-Habshi at Tel: (519) XXX-XXXX;
E-mail: XXX@uwo.ca
Mail: Division of Food & Nutritional Sciences, Brescia University College UWO, XX Western Road, London, ON N6G 1H2.

If you have any question about your rights as a research participant or the conduct of this study, you may contact The Office of Research Ethics at Tel: XXX-XXX ; Email:XXX @uwo.ca
You do not waive your legal rights by participating in this study

This letter is yours to keep. Thank you in advance for considering your participation in our study.

Appendix E: Consent Form for Directors of Child Care Centres

Consent Form for Directors of Child Care Centres

Title of Project: Interesting shapes of vegetables: Is it the way to promote them to preschool children?

I have read the enclosed letter of information explaining the nature of the research project, my responsibilities, and the degree of the centre`s involvement. I understand and I am aware of any risks and benefits that may be associated with the centre`s involvement in this research project. In addition, it is my right to withdraw the centre at anytime during the study period. All questions I have regarding the centre participating in this study have been answered to my satisfaction. If I have questions later about the study, I can ask one of the researchers: Salma Al-Habshi, Division of Food & Nutritional Sciences, Brescia University College, (519) XXX-XXX.

_____
Signature of Person Obtaining Consent

_____
Printed Name of Director

_____
Dated at London, Ontario

_____
Signature of Director

_____
Dated at London, Ontario

_____
Printed Name of Person Obtaining Consent

Appendix F: Letter of Information for Parents/ Caregivers

Letter of Information for Parents/ Caregivers

Title of Project: Interesting shapes of vegetables: Is it the way to promote them to preschool children?

Principal Investigator: Dr. Alicia C. Garcia

Co-Investigator: Salma Alhabshi (SA)

Purpose of Study:

You are being asked to participate and to allow your child to take part in a research study to be conducted in different child care centres designed to explore the impact of new shapes of vegetables in preschool children's consumption. This research is necessary to find the best approach to promote vegetable consumption among children. If your child attending a child care centre is 2-5 years old, and he/ she did not have any allergy to vegetables. You and your child can participate in this research. The minimum number of participants is 10 children from each the child care centre; however, all children whose parents signed the consent form will be included in the study. If the child attending a child care centre is more than 5 years old, she/he can participate in this research but their data will not be included in the analysis.

Objectives of the study:

1. To explore the impact of new shapes of vegetables in preschool children's consumption and their perceptions of vegetables.
2. To compare the consumption of new shaped vegetables with the natural shapes of these same vegetables.
3. To determine exposure/access to vegetables at home and how these are served by the parents/caregivers.

Procedures Involved in this Study:

If you and your child agree to participate in this study, you will be asked to fill a demographic and vegetable accessibility questionnaire and we request that you return it to your child's teacher. In the daycare centre, on day 1 of the second week of the study, the researchers will ask the children to taste three different kinds of dips (Hidden Valley Ranch Original, BC Creamy Dill Dip, and the one most served by parents as determined from the vegetable accessibility questionnaire) and their most preferred dip will be recorded. This individually preferred dip will be served on the side in a small container during the actual vegetable tasting period. On this same day, the heights and weights of the children will be taken and recorded by a pair of researchers/research assistants. There will always be two researchers when the measurements are

taken. On day 2, all participating children who are present in the school will be provided the natural-shaped vegetables with their individual preferred dip. In the next three days the children will be provided with the shaped vegetables such as star-shaped, flower-shaped, and bird-shaped vegetables, respectively.

In the third week of the study, the daily sequence of serving the vegetables with their preferred dip will start with the star-shaped on Monday, the flower-shaped on Tuesday, the bird-shaped on Wednesday and the natural-shaped on Thursday. On Friday, we will be glad to celebrate with the children and the day care centre in appreciation of their cooperation and support of the study by offering a plastic vegetable cutter set for everyone (cost is approximately $1.50 per set). If used at home, this will reinforce the learning from the study.

The teachers of the children will be requested to help the researchers in gathering the participants, so that the vegetable testing and other measurements will be obtained efficiently and to avoid any discomfort that the children may feel during the conduct of the study. If at any time, a child becomes uncomfortable about (or decides to discontinue) participating, they will be allowed to do so.

Time Commitment:

It will take you about 5-10 minutes to fill the demographic and vegetable accessibility questionnaire.

The researchers will observe the child vegetable consumption for about 10mins/day at eight different times. The children will be served the vegetables and dip in morning before their lunch break or during their afternoon break and will be asked individually about their opinion on vegetable consumption which will be audio-recorded.

Personal Benefits/ Risk of Participation:

There are no risks associated with this research. Your child may increase their liking of vegetables after participation in the research. Indirectly, you may learn strategies from the questionnaire to increase vegetable availability/accessibility at home. Potential risks of discomfort about participating in the height and weight measurement, the eating of the vegetables and/or a dislike for the taste of the dip may occur. If any of this happens, the children will be allowed to discontinue their participation.

Special Instructions:

If you are already participating in another study at this time, please inform the researchers right away to determine if it is appropriate for you and your child to participate in this research.

Withdrawal from the research:

You and your child can withdraw from this study at any time without any change in your child's care. However, you are encouraged to answer the questions as completely as possible. This project is an opportunity to enhance/improve your knowledge of vegetable consumption in young children.

Confidentiality:

To ensure the confidentiality of individual data, you and your child will be identified by an identification code known only to the researchers and recorded in a master sheet which will be kept separate from the data collection forms in a locked cabinet in a secure office at Ursuline Hall at Brescia University College. This code is only going to be used to ensure completeness of data collected (e.g., the data from questionnaire, height and weight, and vegetable consumption). The responses to the questionnaire completed by child's parent will be coded to ensure all participants remain

anonymous. Once all data are collected, this code will be deleted from all forms prior to data analysis. All data collection forms will be stored in a locked cabinet in a secure office at Brescia University College. The research records will be shredded and destroyed after 5 years as appropriate. If the results of the study are published, only group data will be included and no individual data will be identified.

Publication of Results:

If you would like to receive a copy of the overall results of this study please put your name and address on a blank piece of paper (separate from the questionnaire) and give it to the researchers.

Contact Information:

If you have any questions about the study at any time,

Please contact: Salma Al-Habshi at Tel: (519) XXX-XXX; E-mail: XXX@uwo.ca

Mail: Division of Food & Nutritional Sciences, Brescia University College UWO, XX Western Road, London, ON N6G 1H2.

If you have any question about your rights as a research participant or the conduct of this study, you may contact The Office of Research Ethics at Tel: XXX_XXX ; Email:XXX@uwo.ca

You do not waive your legal rights by participating in this study.

This letter is yours to keep. Thanks you in advance for considering your participation in our study.

Appendix G: Consent Form for Parents/ Caregivers

Consent Form for Parents/ Caregivers

Title of Project: Interesting shapes of vegetables: Is it the way to promote them to preschool children?

I agree to take part in a research study being conducted by the: Principal investigator**:** Dr. Alicia C. Garcia, and Co-Investigator: Salma Alhabshi, Division of Food & Nutritional Sciences, Brescia University College at Western University.

I have made this decision based on the information I have read in the Letter of Information. All the procedures, any risks and benefits have been explained to me. I have had the opportunity to ask questions and to receive additional details I wanted about the study. If I have questions later about the study, I can ask one of the researchers: Salma Al-Habshi, Division of Food & Nutritional Sciences, Brescia University College, (519) XXX-XXXX.

I understand that my child and I may withdraw from the study at

Printed Name of parent/ caregiver

Printed Name of your child

Signature

Dated at London, Ontario

Printed Name of Person Obtaining Consent

Signature of Person Obtaining Consent

Dated at London, Ontario

Appendix H: Vegetable Accessibility (at home) Assessment Questionnaire

Vegetable Accessibility (at home) Assessment Questionnaire

Title of research: ***Interesting shapes of vegetables, is it the way to promote them to preschool children?***

Your feedback is important to the research and can help to enhance/improve your knowledge of vegetable consumption in young children. Please note that you have the option to skip any question that you do not want to answer.

Demographic:

1. **What is your race/ethnicity?**

☐ Asian ☐ African ☐ Hispanic/Latino ☐ Native

☐ White/Caucasian ☐ Other _____

2. **What languages are spoken in your home? (Mark all that apply)**

☐ English ☐ French ☐ Spanish ☐ Other _____

3. **How many children do you have in the child care centre?**

☐ One ☐ Two ☐ Three ☐ Four ☐ other_____

4. **How old and of what sex are your children attending the child care centre?**

Name: _____ Age:_____ Sex:_____

Name: _____ Age:_____ Sex:_____

5. **What is your educational level?**

☐ **High school or less** ☐ **College/diploma** ☐ **University degree**

6. **What was your total household income last year?**

☐ Less than C$20,000 ☐ C$20,000-50,000

☐ C$ 51,000-80,000 ☐ More than 80,000

7. **Does your child have any allergy to vegetables?**

☐ Yes ☐ No

If yes, what vegetables are your children allergic to?

_____

<u>Accessibility level:</u> (note that the numbers indicated after each response choice will measure accessibility level; but will not be included in the actual questionnaire for the parents/caregivers)

8. **What kinds of vegetable do you usually buy? (check all that apply)**

Raw vegetable	**Type / Size**	**Check**
Carrots	Baby	
	Regular	
Cucumbers	Baby	
	Regular	
Tomatoes	Baby (Cherry)	
	Regular	
Snap peas		
Spinach		
Celery		
Lettuce		
Peppers	Sweet (Red, Yellow)	
	Green	

9. **How often do you purchase vegetables?**

☐ Every day ☐ Every two days ☐ Once a week ☐ Other_____

10. **What types of vegetables do you usually provide to your child?**

☐ Fresh ☐ Cooked ☐ Frozen ☐ With dip

11. **In what shape do you usually serve the vegetable to your child?**

☐ Diced ☐ Sliced/ Cut ☐ Shaped (in different forms e.g., star)

12. **Do you think that your children are getting enough vegetables in their diet?**

☐ Yes, they eat vegetables every day ☐ They eat some during the week

☐ They do not eat vegetables

13. When do you usually serve vegetables to your children?

☐at Meal time ☐at Snack time ☐at Meal and Snack times

14. How do you usually prepare the vegetables?

☐Cooked ☐Stewed ☐Fresh ☐Other_____

15. Do you serve the vegetables to your children, or they grab them by themselves?

☐I serve them ☐They grab them

☐Both options

16. How many servings of vegetables does your child eat in a typical day?

For example, ½ cup diced carrots, cucumbers or peppers = 1 serving;

☐5 or more ☐Between 2 ☐Less than 2

17. Do you usually serve the vegetable with a dip?

☐Yes ☐No

18. If yes, what type of dips do you serve?

_____

19. Where do you usually keep the vegetables in the fridge?

☐Crisper ☐On the racks

20. Is the vegetable easy to reach by your children?

☐Yes ☐ No

21. Where do you usually place vegetables in your kitchen_____

☐On the table counter ☐In the fridge ☐In the freezer

Appendix I: Master Sheet

Title of research: ***Interesting shapes of vegetables, is it the way to promote them to preschool children?***

Initials	Code

Appendix J: Ethics Approval Notice

Western Research

Research Ethics

Use of Human Participants - Ethics Approval Notice

Principal Investigator: Dr. Alicia Garcia
File Number:103617
Review Level: Full Board
Approved Local Adult Participants:50
Approved Local Minor Participants:0
Protocol Title: Interesting shapes of vegetables: Is it the way to promote them to preschool children?
Department & Institution: Brescia\Nutrition and Food Sciences,Brescia University College
Sponsor:
Ethics Approval Date: May 24, 2013
Ethics Expiry Date: April 30, 2014

Documents Reviewed & Approved & Documents Received for Information:

Document Name	Comments	Version Date
Other	appendix B - Consent Form for Directors of Child Care Centers	2013/03/05
Other	Research Schedule in Child care center	2013/05/08
Letter of Information	Appendix A - LOI for Directors of Child Care Centers	2013/05/08
Other	Child daycare center approvals - received for information	2013/05/08
Caregiver Letter of Information & Consent	Appendix C	2013/05/16
Instruments	Appendix E-I	
Western University Protocol		

This is to notify you that the University of Western Ontario Health Sciences Research Ethics Board (HSREB) which is organized and operates according to the Tri-Council Policy Statement: Ethical Conduct of Research Involving Humans and the Health Canada/ICH Good Clinical Practice Practices: Consolidated Guidelines; and the applicable laws and regulations of Ontario has reviewed and granted approval to the above referenced study on the approval date noted above. The membership of this HSREB also complies with the membership requirements for REB's as defined in Division 5 of the Food and Drug Regulations.

The ethics approval for this study shall remain valid until the expiry date noted above assuming timely and acceptable responses to the HSREB's periodic requests for surveillance and monitoring information. If you require an updated approval notice prior to that time you must request it using the University of Western Ontario Updated Approval Request form.

Member of the HSREB that are named as investigators in research studies, or declare a conflict of interest, do not participate in discussions related to, nor vote on, such studies when they are presented to the HSREB.

The Chair of the HSREB is Dr. Joseph Gilbert. The HSREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000940.

Appendix K: Calculation of Accessibility Levels

1. **In what shape do you usually serve the vegetable to your child?**

☐Diced(1) ☐Sliced/ Cut(1) ☐Shaped (in different forms e.g., star)(1)

2. **Do you think that your children are getting enough vegetables in their diet?**

☐Yes, they eat vegetables every day (2) ☐They eat some during the week (1)

☐They do not eat vegetables (0)

3. **When do you usually serve vegetables to your children?**

☐at Meal time (1) ☐ at Snack time (1) ☐at Meal and Snack times (2)

4. **Do you serve the vegetables to your children, or they grab them by themselves?**

☐I serve them (1) ☐They grab them (1)

☐Both options (2)

5. **How many servings of vegetables does your child eat in a typical day?**

For example, ½ cup diced carrots, cucumbers or peppers = 1 serving;

☐5 or more (2) ☐Between 2 (1) ☐Less than 2 (0)

6. **Where do you usually keep the vegetables in the fridge?**

☐Crisper (0) ☐On the racks (1)

7. **Is the vegetable easy to reach by your children?**

☐Yes (1) ☐ No (0)

8. **Where do you usually place vegetables in your kitchen_____**

☐On the table counter (1) ☐ In the fridge (1) ☐In the freezer (0)**

**Note: The numbers in parenthesis (n) are the scores of each answer that give an indicator of accessibility level. The sum of all answers could fall in three ranges of accessibility. The 50th percentile of the highest score 15 is the Medium level, and the Low level is 75th percentile of the highest score 15.

Accessibility level	High	Medium	Low
Range of answer	11.25 - 15	7.5 - <11.25	<7.5

Appendix L: Instrument for Shaping Vegetables

Bird:

Owl vs. Bat

Flower

Star

Appendix M: Data Collection Sheet

Title of research: *Interesting shapes of vegetables, is it the way to promote them to preschool children?*

	Initial data						Study data								Questionnaire data						
Code	Ht	Wt	BMI	Pref. dip			Consp.1	Consp.2	Consp.3	Consp.4	Consp.5	Consp.6	Cons p.7	Cons p.8	Allergy	Ethnicity	Sex	Age	Income level	Lang.	Level of Access
01				A	B	C											M / F				High /Medium /Low
02				A	B	C											M / F				High /Medium /Low
03				A	B	C											M / F				High /Medium /Low
04				A	B	C											M / F				High /Medium /Low
05				A	B	C											M / F				High /Medium /Low
06				A	B	C											M / F				High /Medium /Low
07				A	B	C											M / F				High /Medium /Low
08				A	B	C											M / F				High /Medium /Low
09				A	B	C											M / F				High /Medium /Low
010				A	B	C											M / F				High /Medium /Low

Appendix M: Data Collection Sheet

	Ht: height **Wt:** weight **Pref. dip:** preferred dip : (1) option A, (2) option B, (3) option C [which dip did you like the most]? **Consp:** consumption amount of vegetable **Ethnicity:** (1)Asian (2)African (3)Hispanic/Latino (4)Native (5)White/Caucasian (6)Other **Language:** (1)English (2)French (3)Spanish (4)Other **Income level:** (1) Less than Can $20,000 (1) (2) C$20,000-50,000 (3) C$ 51,000-80,000 (4) More than 80,000

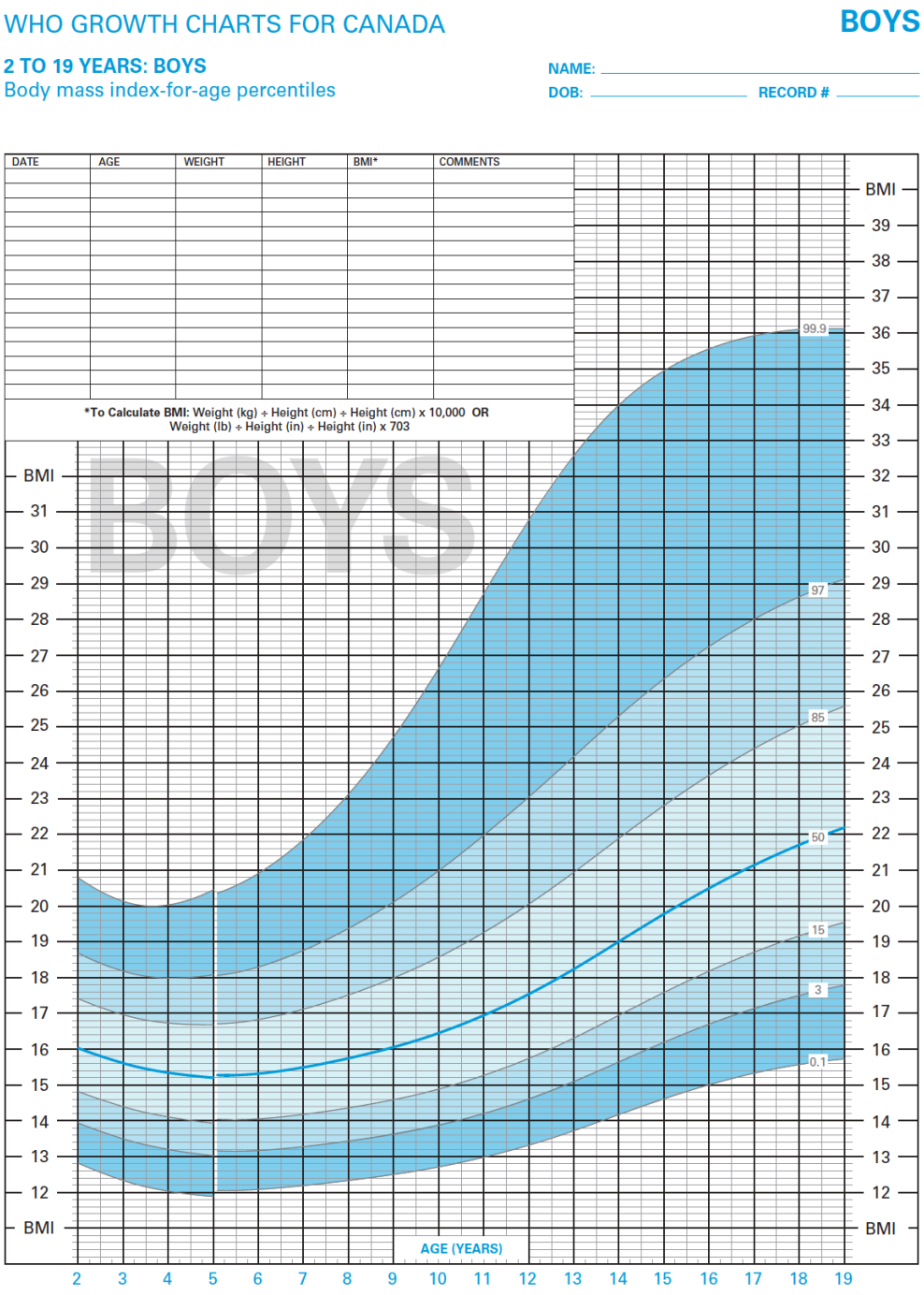
Appendix N: Interviewing Sheet

Interviewing Sheet: Child Care Centre:_____

Title of research: ***Interesting shapes of vegetables, is it the way to promote them to preschool children?***

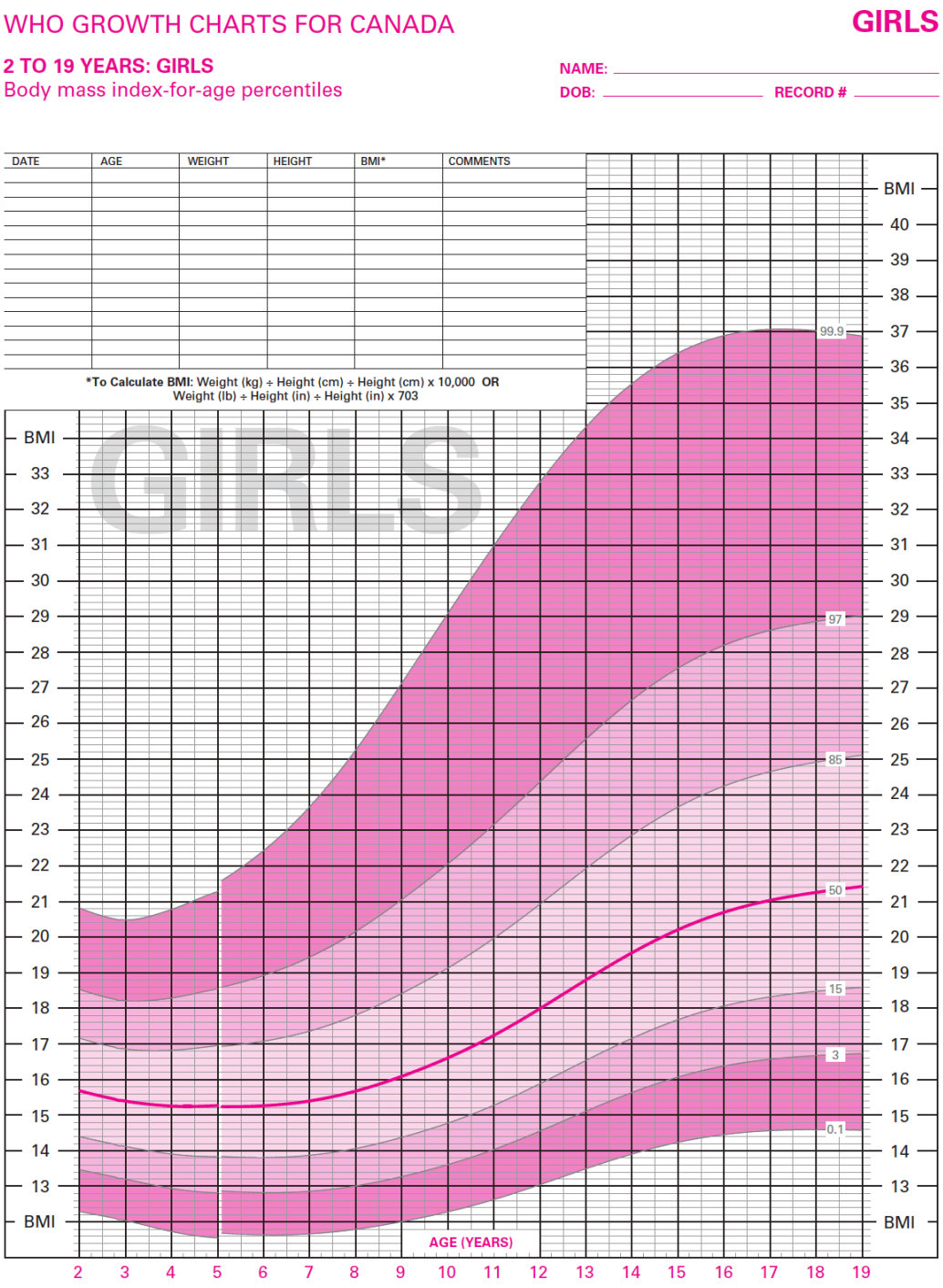
Code	What shape of vegetables did you like the most?	Transcription of Recording
01		
02		
03		
04		
05		
06		
07		
08		
09		
10		

Appendix O: WHO/ BMI for 2-19 years Boys Growth Chart (Canadian Version)



Dietitians of Canada. (2013). Retrieved from (http://www.dietitians.ca/Secondary-Pages/Public/WHO-Growth-Charts.aspx)

Appendix P: WHO/ BMI for 2-19 years Girls Growth Chart (Canadian Version)



Dietitians of Canada. (2013). Retrieved from (http://www.dietitians.ca/Secondary-Pages/Public/WHO-Growth-Charts.aspx)

Appendix Q: The Final Report of Childcare Centre's Field Notes

A Childcare centre

Hierarchical Name	Aggregate	Coverage	No. of References from Source	Number of Users Coding Source at Node
Chewing ability food fast	Yes	8.72 %	6	1
Chewing ability food slowly	No	11.23 %	6	1
Chewing food well	Yes	24.93 %	10	1
Not Chewing food well	Yes	9.24 %	9	1
Full mouth with food	No	6.50 %	4	1
Knowing the vegetable	No	7.76 %	7	1
Child familiar with carrot	Yes	4.31 %	3	1
Not New all vegetable	No	4.81 %	4	1
Not Know all vegetable	Yes	10.05 %	4	1
Not known carrot	No	1.59 %	1	1
Not know pepper	No	6.83 %	2	1
Not know cucumber	No	3.70 %	1	1
Naming vegetable By color	Yes	0.77 %	2	1
Naming By color	No	0.77 %	2	1
Interference	No	0.59 %	1	1
Peer interference	Yes	0.59 %	1	1
Child has peer Hinder	Yes	0.59 %	1	1
Not using the dip	Yes	5.20 %	4	1
Yes using the dip with vegetable	Yes	4.15 %	8	1
Dislike vegetable	Yes	1.59 %	0	1
Dislike carrot	No	1.59 %	1	1
Child want to eat more But time is out	Yes	5.96 %	3	1
Like cucumber	No	11.52 %	9	1

Like carrot	No	3.75 %	3	1
Like pepper	No	2.81 %	3	1
Prefered Shape	No	0.90 %	2	1
Preferred Shape: Other	No	0.90 %	2	1
Ignoring the shape	No	7.44 %	3	1
Knowing the shape	No	2.81 %	3	1
Address different name	No	9.07 %	6	1
Doesn't know the shape	No	4.40 %	2	1
Playing with the shaped veg	No	7.66 %	3	1
Start with Pepper	No	6.84 %	7	1
Start with Cucumber	No	26.43 %	18	1
Start with Carrot	No	16.74 %	9	1

D Childcare centre

Hierarchical Name	Aggregate	Coverage	No. of References from Source Code	Number of Users
Chewing food fast	Yes	19.43 %	10	1
Chewing food slowly	No	6.10 %	4	1
Chewing food well	Yes	17.29 %	7	1
Not Chewing food well	Yes	0.81 %	1	1
Full mouth with food	No	9.96 %	4	1
Knowing the vegetable	No	8.32 %	6	1
Child familiar with carrot	Yes	36.36 %	20	1
Child familiar with	Yes	14.16 %	9	1
Child familiar with Pepper	Yes	16.06 %	9	1
Not New all vegetable	No	3.59 %	2	1
Not Know all vegetable	Yes	7.30 %	2	1
Not Know all	No	3.59 %	2	1

Not Know all	No	5.84 %	3	1
Not Know all	No	7.30 %	4	1
Naming vegetable By	Yes	1.43 %	1	1
Naming vegetable By	Yes	2.75 %	1	1
Vegetable consumption	Yes	3.97 %	1	1
Vegetable consumption	No	5.09 %	5	1
Not using the dip	Yes	16.87 %	6	1
Using the dip with	Yes	5.01 %	2	1
Eating dip alone	Yes	4.36 %	4	1
Ask for dip	No	2.35 %	1	1
Dislike vegetable	Yes	10.86 %	0	1
Dislike carrot	No	3.76 %	2	1
Dislike cucumber	No	7.39 %	5	1
Dislike pepper	No	3.66 %	3	1
Child want to eat more But	Yes	2.12 %	1	1
Child want to eat more	Yes	3.06 %	2	1
Preferred vegetables	No	6.22 %	3	1
Like cucumber	No	20.33 %	12	1
\Like carrot	No	28.41 %	17	1
\Like pepper	No	19.89 %	10	1
Preferred Shape\Owl	No	0.61 %	1	1
Preferred Shape\Star	No	4.95 %	2	1
Preferred Shape\Flower	No	0.61 %	1	1
Preferred Shape\other	No	0.47 %	1	1
Ignoring the shape	No	1.69 %	1	1
Knowing the shape	No	8.69 %	3	1
Address different name	No	4.04 %	1	1
Doesn’t know the shape	No	5.20 %	2	1
playing with the shaped	No	13.40 %	6	1

Start with Pepper	No	16.56 %	9	1
Start with Cucumber	No	17.08 %	8	1
Start with Carrot	No	14.08 %	10	1

B Childcare centre

Hierarchical Name	Aggregate	Coverage	Number of References	Number of Users Coding Source at Node
Chewing food fast	Yes	17.83 %	9	1
Chewing food slowly	No	2.32 %	1	1
Chewing food well	Yes	29.30 %	14	1
Full mouth with food	No	6.54 %	4	1
Knowing the vegetable	No	43.84 %	18	1
Child familiar with carrot	Yes	43.84 %	18	1
Child familiar with cucumber	Yes	24.93 %	12	1
Child familiar with Pepper	Yes	33.40 %	13	1
Not New all vegetable	No	2.04 %	1	1
Not Know all vegetable	Yes	4.37 %	1	1
Not Know all vegetable\Not	No	4.37 %	3	1
Naming vegetable By color	Yes	1.13 %	1	1
Naming vegetable By	Yes	3.79 %	2	1
Communication was	No	2.16 %	1	1
Not using the dip	Yes	4.25 %	4	1
Yes using the dip with	Yes	10.60 %	8	1
Yes eating dip alone	Yes	2.24 %	1	1
Dislike vegetable	Yes	18.16 %	1	1
Dislike carrot	No	9.10 %	3	1
Dislike cucumber	No	7.85 %	3	1
Dislike pepper	No	12.42 %	5	1

Eating More	No	9.49 %	3	1
Child want to eat more But	Yes	9.49 %	3	1
Preferred vegetables	No	18.24 %	7	1
Like cucumber	No	58.71 %	24	1
Like carrot	No	29.66 %	15	1
Like pepper	No	45.89 %	20	1
Preferred Shape\Star	No	1.64 %	2	1
Preferred Shape\Flower	No	3.58 %	2	1
Preferred Shape\other	No	1.73 %	1	1
Knowing the shape	No	18.10 %	8	1
Address different name	No	3.55 %	3	1
Playing with the shaped veg	No	13.03 %	6	1
Start with Pepper	No	16.91 %	8	1
Start with Cucumber	No	6.91 %	5	1
Start with Carrot	No	18.21 %	10	1

C Childcare centre

Hierarchical Name	Aggregate	Coverage	Number of References from Source Coded at	Number of Users Coding
Chewing food fast	Yes	2.70 %	2	1
Chewing food slowly	No	3.01 %	2	1
Chewing food well	Yes	15.86 %	9	1
Not Chewing food well	Yes	0.82 %	1	1
Full mouth with food	No	6.99 %	3	1
Knowing the vegetable	No	23.25 %	14	1
Child familiar with carrot	Yes	19.79 %	12	1
Child familiar with cucumber	Yes	12.29 %	9	1
Child familiar with Pepper	Yes	6.77 %	5	1
Not New all vegetable	No	18.78 %	11	1

Not Know all vegetable	Yes	17.15 %	10	1
Not know carrot	No	1.23 %	1	1
Not know pepper	No	17.15 %	10	1
Not know cucumber	No	3.16 %	2	1
Naming vegetable By Relevant	Yes	23.62 %	12	1
Interference	No	9.92 %	6	1
Peer interference	Yes	5.01 %	1	1
Child has peer Hinder	Yes	1.93 %	1	1
Child has peer encouragement	No	3.07 %	1	1
Vegetable consumption has interfere	Yes	10.55 %	6	1
Using the dip	No	29.10 %	13	1
Not using the dip	Yes	12.50 %	6	1
Yes using the dip with vegetable	Yes	11.11 %	6	1
Yes eating dip alone	Yes	16.01 %	7	1
Ask for dip	No	2.55 %	2	1
Dislike vegetable	Yes	40.22 %	19	1
Dislike carrot	No	4.85 %	5	1
Dislike cucumber	No	4.70 %	3	1
Dislike pepper	No	35.56 %	21	1
Eating More	No	5.12 %	3	1
Child want to eat more But time is out	Yes	4.36 %	2	1
Child want to eat more from one type	Yes	0.76 %	1	1
Preferred vegetables	No	9.63 %	9	1
Like cucumber	No	19.62 %	16	1
Like carrot	No	14.80 %	9	1
Preferred Shape\Owl	No	5.08 %	3	1
Preferred Shape\Flower	No	0.11 %	2	1
Preferred Shape\other	No	1.04 %	1	1

Knowing the shape	No	25.24 %	13	1
Noticing the shape\\address different	No	11.19 %	7	1
Noticing the shape\\doesn’t know the	No	2.04 %	2	1
Noticing the shape\\playing with the	No	9.32 %	5	1
Start with Pepper	No	2.87 %	2	1
Start with Cucumber	No	24.11 %	16	1
Start with Carrot	No	7.65 %	4	1

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