

# **Associations Between Child Food involvement and Picky Eating Among Preschool Age Children**

by

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## **ABSTRACT**

### **ASSOCIATIONS BETWEEN CHILD FOOD INVOLVEMENT AND PICKY EATING AMONG PRESCHOOL AGE CHILDREN**

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Child food involvement, particularly in meal preparation, has been found to positively influence children's food preferences. The influence of child food involvement on picky eating is unknown. The objective of this study was to examine the association between involvement of preschool age children in meal preparation, meal planning, and grocery shopping and child picky eating. Secondary data analysis was conducted using cross-sectional baseline survey data from 62 children aged 18 months to 5.9 years from the 39 families who participated in the Guelph Family Health Study pilot. Linear regression using generalized estimating equations was used. Overall food involvement, involvement in meal preparation, and involvement in grocery shopping were inversely associated with child picky eating. No significant association was found between meal planning and picky eating. These findings suggest that children should be involved in meal preparation during the preschool years to reduce risk of picky eating.

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# 1. Introduction

Evidence strongly suggests that parenting practices have a significant influence on child outcomes. Food parenting practices are behaviours used by parents to influence their children's eating behaviours (Vaughn et al., 2015), and are associated with a number of child health outcomes including nutrient sufficiency, weight status, and the child's relationship with food (Vaughn et al., 2015). Food parenting practices can be categorized into different types, such as controlling practices, which include food restriction and pressure-to-eat and appear to have negative impacts on child health outcomes, and autonomy-support practices, which tend to have more positive influences on child health (Vaughn et al., 2015).

One example of an autonomy-support practice is child food involvement, which can be defined as the involvement of children in the planning and preparation of meals (Vaughn et al., 2015). Research has suggested that child food involvement may have a positive influence on children's dietary intake and diet quality (DeCosta, Møller, Frøst, and Olsen, 2017; DeJesus, Gelman, Herold, and Lumeng, 2019; Van der Horst, Ferrage, and Rytz, 2014; Chu, Storey, and Veugelers, 2014; Metcalfe and Fiese, 2018). However, few studies have examined its effect on children's eating behaviours, including picky eating. There is some evidence to suggest that child food involvement may improve children's food preferences (Allirot, da Quinta, Chokupermal, and Urdaneta, 2016; Chu et al., 2013); however, most of the research in this area has focused solely on the effects of child involvement in meal preparation, with little

research examining the impacts of other aspects of food involvement, such as meal planning and grocery shopping.

There has also been very little research conducted examining the impact of child food involvement on health outcomes in preschool age children. Understanding key factors influencing eating behaviours in this age group is important as studies have shown that eating habits established at this young age can track into later childhood and adulthood (Nicklas and Johnson, 2004; Singer et al., 1995; Northstone and Emmet, 2008; Mikkila et al., 2005). Additionally, picky eating appears to be most prevalent in this age group (Mascola, Bryson, and Agras, 2010). Therefore, parents' use of child food involvement as a way of potentially reducing picky eating and improving fruit and vegetable intake in the preschool age group is an important area of study in order to identify potential strategies to improve eating habits and dietary intake among preschool children. The goal of the current study is to address these key research gaps with the long-term goal of improving eating behaviours and dietary intake in young children.

## **2. Literature Review**

### **2.1 Dietary recommendations and intake among Canadian children**

According to Canada's Food Guide (2007), children between the ages of 2 and 8 should consume 4 to 5 servings of vegetables and fruit per day, 3 to 4 servings of grain products, 2 servings of milk and alternatives, and 1 serving of meat and alternatives. A more recent version of Canada's Food Guide from 2019 recommends that half of food

consumed daily should come from fruits and vegetables, a quarter from whole grains, and a quarter from protein-rich foods. However, research suggests that Canadian children do not currently meet these recommendations, especially for nutrient-dense foods such as fruits, vegetables, and whole grains (Garriguet, 2007). Data from the Canadian Community Health Survey 2.2 (Health Canada, 2012) reveals that Canadian children aged 1 to 8 years only consume approximately half of the adequate intake (AI) for fiber, and less than half the AI for potassium. These findings may be due to low consumption of fruits and vegetables, which are excellent sources of fiber, vitamins, and minerals (Slavin and Lloyd, 2012). Research suggests that Canadian children do not consume the recommended number of servings of vegetables and fruit. Pabayo, Spence, Casey, and Storey (2012) studied the dietary intake of 2015 4 and 5-year-old Canadian children and found that only 29.6% of the children consumed the recommended number of serving of fruits and vegetables and 23.5% consumed the recommended number of servings of grains. In a study by Black and Bilette (2013) examining the fruit and vegetable consumption of Canadians, 54.2% of Canadian children aged 2 to 3 met the recommended number of servings for fruits and vegetables, and only 31.2% of children aged 4 to 8 met the recommendations. These findings are concerning as adequate nutrition in childhood is necessary for proper growth and development (Nicklas and Johson, 2004) and the health benefits of consuming nutrient-dense foods and their role in preventing chronic diseases, such as cancer and cardiovascular disease, have been well established (van't Veer et al., 2000; Cox, Whichelow, and Prevost, 2000; Slavin, 2008).

Children who are considered picky eaters may be at even greater risk of inadequate dietary intake. Evidence suggests picky eaters tend to eat less food compared to children who are not considered picky eaters, with particularly low intake of fruits, vegetables, and grains (van der Horst et al., 2016; Galloway, Fiorito, Lee, and Birch, 2005). Therefore, research focusing on interventions that may improve the intake of nutrient-dense foods in picky eaters is warranted.

## **2.2 Definition and prevalence of picky eating**

Definitions of picky eating have been inconsistent in the literature. In 2015, Taylor, Wernimont, Northstone, and Emmett conducted a systematic review examining the various definitions of picky eating that have been used in research. Overall, they found that most definitions of picky eating include consumption of an inadequate variety of foods through rejection of familiar and unfamiliar foods, restricted food intake and strong food preferences, and an unwillingness to try new foods. However, in a 2017 paper, Walton and colleagues define picky eating as “an unwillingness to eat familiar foods or to try new foods, severe enough to interfere with the parent, child, or parent-child relationship”. This definition includes the impact picky eating may have on the family and recognizes the contribution it may make to stress and frustration among families during mealtime. The authors suggest that children’s behaviours such as food restriction and food neophobia be re-conceptualized as expressions of autonomy and suggest that parents respond in a way that supports this independence.

While determining the prevalence of picky eating is challenging due to the use of varying definitions, research measuring picky eating suggests that approximately 13-50% (Machado et al., 2016; Cardona Cano et al, 2015; Mascola, Bryson, and Agras, 2010; Dubois, 2007; Galloway, Fiorito, Lee, and Birch, 2005; Carruth, Ziegler, Gordon, and Barr, 2004) of children may be considered picky eaters. These studies included children ranging in age from 4 months to 12 years and there is evidence to suggest that the prevalence of picky eating is highest within the preschool age range, peaking around the age of 2 years. Mascola, Bryson, and Agras (2010) conducted a longitudinal study, following 120 children from 2 years of age until they were 11 years old. The authors found the prevalence of picky eating to be anywhere from 13% to 22% during the study. They also found that the incidence of picky eating was the highest at age 2 and declined and leveled off by age 6. Therefore, understanding key predictors of picky eating in the preschool years is an important step to reducing picky eating and improving nutrient intake among young children.

### **2.3 Health consequences of picky eating**

Not only is picky eating prevalent among young children, it also appears to have significant influences on nutrient intake, child body weight, and the enjoyment of family meals. Research shows that children who are considered picky eaters tend to consume less food compared to non-picky eaters (van der Horst et al., 2016). Many studies have found that fruit and vegetable consumption is particularly low in picky eaters, suggesting they may be at risk for nutrient deficiencies which may impact child growth (Galloway,

Fiorito, Lee and Birch, 2005; Xue et al., 2015; Xue et al., 2015). For example, Galloway, Fiorito, Lee, and Birch (2005) studied picky eating, dietary intake, and BMI in 173 9-year-old girls and found that girls who scored high on a picky eating scale consumed significantly less fruits, vegetables, fiber, vitamin E, and folate compared to non-picky eaters; however, they also consumed significantly fewer high fat foods and sweet foods. The authors also compared body weight between the two groups and found that picky eaters had significantly lower BMIs compared to non-picky eaters. A cross-sectional study by Xue et al. (2015) studied picky eating and dietary intake and weight for age in 937 Chinese children aged 3 to 7 years and found that children who were reported as picky eaters consumed significantly fewer vegetables and had significantly lower intakes of protein, fiber, iron, and zinc. They also found that picky eating was associated with significantly lower weight for age, suggesting picky eating may negatively impact growth. Another study by Xue and colleagues (2015) also looked at picky eating, dietary intake, and BMI in 793 children aged 7 to 12 and again found significantly lower intakes of several vitamins and minerals, including vitamins A, B, C, and E as well as lower calcium, iron, and zinc compared to non-picky eaters. The authors found significantly lower BMI in the picky eating group, again concluding that picky eating may have a negative impact on growth.

Other studies have directly examined the relationship between picky eating and child weight status. Dubois et al. (2007) conducted a longitudinal study examining the relationship between problem eating behaviours and body weight in Canadian preschool age children. Parents completed questionnaires about picky eating when

children were 2.5, 3.5, and 4.5 years old, and child BMI was calculated when children were 4.5 years old. The authors found that children who were reported as picky eaters at least once had a significantly lower BMI at age 4.5 years and were more likely to be underweight compared to children who were not picky eaters. A study by de Barse et al. (2015) examined whether child food fussiness at the age of 4 years predicted body composition at age 6 in 4191 children. They found that greater food fussiness was related to lower BMI and fat mass at age 4 and predicted a lower BMI at age 6. An observational study by Ekstein, Laniado, and Glick (2010) supports these findings. The authors analyzed data from 170 children between the ages of 14 months and 8 years. They compared weight and height in children who were considered picky eaters with those who did not display picky eating behaviours and found that a greater proportion of the picky eaters were underweight compared to non-picky eaters. However, a longitudinal study by Berger et al. (2016) found that while picky eating in childhood was associated with a low body weight, participants showed a normal weight status later in life. Brown et al. (2016) conducted a systematic review of 41 studies on the relationship between child picky eating and food neophobia and child weight status and found no association between food neophobia and body weight while the results for picky eating were mixed. Clearly, the findings about impacts on body weight are mixed, and while picky eating may affect child weight, it may not have lasting negative effects on body weight later in life.

In addition to potential negative impacts on nutrient intake and body weight, picky eating may also cause frustration and stress during mealtimes for both the parents and

the child. Ramos-Paul et al. (2014) surveyed parents of 1090 children aged 3 to 6 about their children's picky eating and dietary intake, as well as family stress. The authors found that family stress around mealtimes was significantly greater in families with children who were identified as picky eaters compared to families who did not have a picky eater. In a qualitative study by Trofholz, Schulte, and Berge (2016), parents stated that picky eating promoted meal-related parent stress. Another qualitative study by Fulkerson et al. (2011) used focus groups to identify parents' perceived barriers to enjoying family meals. The authors found that parents feel frustrated by the lack of variety in their children's diets due to their refusal to try new foods. Considering the research suggesting that picky eating may have significant physical and emotional consequences on children and their families, identifying strategies to reduce picky eating is necessary.

## **2.4 Child food involvement**

### **2.4.1 Association of child food involvement and children's dietary intake**

Research suggests that child food involvement can improve children's dietary intake (DeJesus, Gleman, Herold, and Lumeng, 2018; van der Horst, Ferrage, and Rytz, 2014), and thus may be a potential solution to picky eating. "Child food involvement" will be defined in the current study as the inclusion of children in meal planning, grocery shopping, and meal preparation. Multiple studies have explored child food involvement, particularly involvement of children in meal preparation, and have found that children who are involved in the preparation of a meal eat significantly more

than those who are simply provided with the same meal. In a study by DeJesus, Gelman, Herold, and Lumeng (2018), 59 children aged 5 to 7 years were asked to prepare a salad or a dessert using a recipe. The children were then offered the food they prepared themselves or the same food prepared in the same way by someone else. The researchers found that children ate significantly more of both the salad and the dessert they prepared themselves than the same food that was prepared by someone else and served to them. Similarly, a 2014 experimental study by van der Horst, Ferrage, and Rytz had 47 children between the ages of 6 and 10 years prepare and consume a meal with the help of a parent, or simply eat a meal that was prepared by the parent alone. They found that children ate significantly more salad, chicken, and overall energy from the meal they helped prepare, compared to children who ate the meal prepared by just the parent. Given that research suggests that children who are considered picky eaters tend to consume less food (van der Horst et al, 2016; Galloway, Fiorito, Lee and Birch, 2005), these findings support the idea that involving children in meal preparation may increase dietary intake in children who are picky eaters.

In addition to increased dietary intake, research also suggests that food involvement is associated with improved diet quality. Chu, Storey, and Veuglers (2014) surveyed Canadian children aged 10 to 11 children to measure the frequency with which they were involved in meal preparation at home. The authors also measured the diet quality of the children using a food frequency questionnaire which was analyzed using the Diet Quality Index-International (Kim, Haines, Siega-Riz, and Popkin, 2003). The authors found that child involvement in meal preparation at least once a week was

significantly associated with higher diet quality scores. Children who were involved in meal preparation reported greater intake of fruits and vegetables, grain products, dairy, and meat and alternatives, and consumed more energy than children who were reported as having no involvement (Chu et al., 2014). The results of these studies support the idea that involving children in meal preparation may increase the children's dietary intake as well as improve the quality of their diets. In a study by Metcalfe and Fiese (2018), parents of 497 preschool age children were asked to complete surveys measuring child food involvement and dietary intake when their children were 3 years old and again when they were 4. Parents were asked about the degree to which they involve their children in shopping for groceries, planning meals, and preparing meals, and a mean score for child food involvement was calculated. The authors found that greater child food involvement at age 3 significantly predicted increased fruit and vegetable intake and decreased consumption of fast food at age 4.

#### **2.4.2 Association of child food involvement and children's eating behaviour**

While there appears to be evidence supporting increased dietary intake and diet quality among children who are involved in meal preparation, less is known about how child food involvement influences children's eating behaviours. DeCosta, Moller, Frost, and Olsen (2017) conducted a systematic review of 120 experimental studies exploring interventions aimed at changing children's dietary intake and eating behaviours such as food choice, preference, willingness to taste, and food neophobia. Various interventions were reviewed, including cooking programs, which accounted for six of the reviewed studies. Only articles that studied children between the ages of 1 and 12 years were

included. The results of the systematic review suggest that involving children in cooking sessions positively affects children's consumption of and preference for vegetables, as well as their willingness to try new foods. These findings support the idea that involving children in cooking may reduce picky eating by reducing food neophobia and increasing preference for healthy foods; however, the influence of involvement in home meal preparation was not explored in this systematic review. Another study by Alliot, da Quinta, Chokupermal, and Urdaneta (2016) also found that involvement in cooking programs improved preference for foods containing vegetables in 137 children aged 7 to 11 years. The authors found that the children were more willing to choose and to taste foods that were unfamiliar to them when they had been involved in the preparation of the foods. The findings of this study support the involvement of children in meal preparation as a method of increasing children's preference for foods that contain vegetables as well as their willingness to try new foods.

A cross-sectional study by Chu et al. (2013) also revealed a positive effect of child food involvement on food preferences. The authors studied the association between frequency of involvement in home meal preparation and preference for fruits and vegetables, as well as self-efficacy in ability to select healthy foods. Surveys were completed by 3398 Canadian children aged 10 to 11. The authors found that greater frequency of involvement in meal preparation was associated with higher preference for fruits and vegetables and greater self-efficacy in selecting healthy foods. These findings reveal that involving children in home meal preparation may reduce picky eating around fruits and vegetables, thereby improving the quality of their diets.

### **2.4.3 Child food involvement and picky eating in preschool age children**

While there is some evidence to suggest that involving school-aged children in meal preparation may improve their dietary intake and quality, and reduce behaviours associated with picky eating, only one study has explored the relationship between food involvement and behaviours related to picky eating in the preschool age group (1.5 to 5 years). Vollmer and Baietto (2017) surveyed 148 parents of preschool age children to examine the association between parent feeding practices and child food preferences. They found a significant, positive relationship between parent encouragement of child involvement in meal preparation and children's preference for vegetables. While the results of this study support the idea that food involvement in preschool age children may improve acceptance of vegetables, this study did not directly assess picky eating. Thus, additional research directly assessing the association between food involvement and picky eating among preschool age children is needed.

Exploring this relationship in the preschool age group is essential as picky eating appears to be most prevalent in preschool age children (Mascola, Bryson, and Agras, 2010; Carruth, Ziegler, Gordon, and Barr, 2004; Cardano Cano et al., 2015). Studying this relationship in this age group is also important as dietary patterns formed early in life appear to track into adulthood (Nicklas and Johnson, 2004; Singer et al., 1995; Northstone and Emmet, 2016; Mikkila et al., 2005). Considering these findings, introducing healthy eating patterns as early as possible so that they may be maintained throughout life is essential. Consequently, evidence also suggests that establishing healthy eating habits in childhood is important in preventing chronic disease later in life

(Gidding et al., 2006). Thus, identifying methods of improving preschool age children's dietary intake through reducing picky eating is an important area of study.

## **2.5 Gaps in literature**

A review of the current literature on child food involvement and picky eating has revealed two key knowledge gaps. Firstly, while many studies have examined how involvement of school-aged children in grocery shopping, meal planning, and meal preparation, may influence children's eating behaviour, very few have studied child food involvement in the preschool age group, ages 1.5 to 5 years. Secondly, the majority of research studying child food involvement has thus far focused on involvement of children in meal preparation, with few examining child involvement in grocery shopping or meal planning. Only one study (Metcalf and Fiese, 2018) has examined the effect of all three variables on children's eating habits. This study attempted to address these gaps by examining whether an association exists between child involvement in meal preparation, meal planning, and grocery shopping and dietary intake in a sample of preschool age children.

## **3. Rationale**

Research suggests that Canadian children do not consume the recommended amount of foods outlined in Canada's Food Guide. Data from Health Canada (2012) reveal that the median intake of fiber and potassium for children between the ages of 1 and 8 years was half of the adequate intake level for each nutrient. This is concerning

as the positive impacts of consuming nutrient-dense foods, such as the prevention of chronic diseases, have been clearly identified (van't Veer et al., 2000; Cox, Whichelow, and Prevost, 2000; Slavin, 2008). Evidence suggests that children who are considered picky eaters consume less food than non-picky eaters, suggesting they may be at even greater risk for nutrient deficiencies (Galloway, Fiorito, Lee, and Birch, 2005; Xue et al., 2015). Picky eating prevalence is highest during the preschool age period and dietary intake habits formed during this life stage have been shown to track into later life (Mascola, Bryson, and Agras, 2010; Nicklas and Johnson, 2004; Singer et al., 1995; Northstone and Emmet, 2016; Mikkila et al., 2005). Thus, research aimed at identifying key predictors of picky eating in order to inform strategies to reduce picky eating and improve dietary intakes among children is needed.

Evidence reveals the significant influence of food parenting practices on child health outcomes (Vaughn et al., 2015). Autonomy-support practices, which are supportive rather than controlling and encourage independence in children, have been associated with positive outcomes such as increased fruit and vegetable consumption. Child food involvement is one such autonomy-support practice that encourages involvement of children in the planning and preparation of meals. The association between child food involvement and child picky eating has not been explored; therefore, the current study aimed to identify whether an association exists between child food involvement and picky eating in preschool age children.

## **4. Research Objectives and Hypotheses**

The objective of the current study was to contribute to the body of literature surrounding child feeding by examining the association between child involvement in meal preparation, meal planning, and grocery shopping, and picky eating. Our hypothesis was that greater child food involvement would be associated with reduced picky eating.

## 5. Manuscript

### 5.1 Abstract

Child food involvement has been found to positively influence children's preferences for fruits and vegetables. The influence of child food involvement on picky eating is unknown. The objective of this study was to examine the association between involvement of preschool age children in meal preparation, meal planning, and grocery shopping and child picky eating. Secondary data analysis was conducted using cross-sectional data from 62 children aged 18 months to 5.9 years from 39 families who participated in the Guelph Family Health Study Pilot. Data included parent-report of child involvement in meal preparation, meal planning, and grocery shopping as well as child picky eating, assessed using the food fussiness scale of the Child Eating Behaviour Questionnaire. Linear regression using generalized estimating equations was used to explore the association between parent-reported child food involvement and picky eating in children. Child age, sex and household income were included in all models. Overall food involvement ( $\beta = -0.51$ , 95% CI = -0.88, -0.13), involvement in meal preparation ( $\beta = -0.44$ , 95% CI = -0.71, -0.17), and involvement in grocery shopping ( $\beta = -0.29$ , 95% CI = -0.58, -0.01, p-value = 0.04) were inversely associated with child picky eating. No significant association was found between meal planning and picky eating. These findings suggest involving children in meal preparation and grocery shopping during the preschool years may reduce picky eating. Future studies should employ a randomized control design using a larger and more socioeconomically diverse

sample of families to fully elucidate the association between child food involvement and picky eating.

## **5.2 Introduction**

Evidence suggests that parents play a key role in their children's eating and weight-related outcomes (Vaughn et al., 2015). One way by which parents influence their children's eating is through their food parenting practices, which are behaviours used by parents to influence their child's eating behaviours (Vaughan et al., 2015). Food parenting practices are associated with several child health outcomes including nutrient sufficiency, weight status, and the child's relationship with food (Vaughn et al., 2015), and can be categorized into two key types: controlling and autonomy-supported practices. Controlling practices, which are practices that involve parents' pressure, intrusiveness, and dominance in relation to children's behaviour (Vaughn et al., 2015), and have been shown to have negative influences on children's eating behaviours and preferences (Vaughn et al., 2015). In contrast, autonomy-support practices are practices which promote children's autonomy and encourage independence (Vaughn et al., 2015). Autonomy-support practices tend to be positively associated with positive eating behaviours and preferences (Vaughn et al., 2015).

Child food involvement is an autonomy-support food parenting practice. It is defined as the involvement of children in the planning and preparation of meals (Vaughan et al., 2015), and previous research shows that it may be associated with positive child eating outcomes. For example, child involvement in meal preparation has been found to be associated with children eating more of the foods served (DeJesus,

Gelman, Herold, and Lumeng, 2019; Van der Horst, Ferrage, and Rytz, 2014) and overall food involvement, which was assessed as an average score of involvement in meal preparation, grocery shopping and meal planning, has been found to be associated with improved diet quality in children (Chu, Storey, and Veugelers, 2014; Metcalfe and Fiese, 2018). Despite these findings suggesting that child food involvement is associated with improved dietary intake, the influence of child food involvement on picky eating is unknown. Research suggests that children who are considered picky eaters tend to consume less food than children who are not considered picky, especially fruits, vegetables, and whole grains (van der Horst et al., 2016; Galloway, Fiorito, Lee, and Birch, 2005), foods which are considered essential for good health and preventing chronic disease (van't Veer et al., 2000; Cox, Whichelow, and Prevost, 2000; Slavin, 2008). Considering the potential adverse consequences of sustaining a diet low in essential nutrients, research that aims to identify strategies to reduce picky eating is warranted.

Previous studies provide some evidence to suggest that child food involvement may positively affect children's food preferences, which are likely related to picky eating behaviour in children (Allirot, da Quinta, Chokupermal, and Urdaneta, 2016; Chu et al., 2013; Cunningham-Sabo and Lohse, 2013; Cunningham-Sabo and Lohse, 2014). However, these studies focused solely on involvement in meal preparation, excluding other aspects of involvement such as involvement in meal planning and grocery shopping. Additionally, the majority of these studies included only school-age children. Very few studies have examined the association between involvement in food practices

and child food preferences in the preschool age group. A study by Vollmer and Baietto (2017) surveyed parents of 147 children ages 3 to 7, and found that involvement in meal preparation was significantly, positively associated with children's preference for vegetables. A longitudinal study by Metcalfe and Fiese (2018) found that involvement in meal preparation of children at age 3 predicted their intake of fruits and vegetables at age 4. Research examining strategies to reduce picky eating among children aged 5 and under is important because picky eating appears to be most prevalent in this age group (Mascola, Bryson, and Agras, 2010) and research shows that habits established at this age can track into adulthood (Nicklas and Johnson, 2004; Singer et al., 1995; Northstone and Emmet, 2008; Mikkila et al., 2005). Therefore, research examining the association between child food involvement and picky eating in the preschool age group is needed.

The current study aimed to address these key knowledge gaps by examining the association between child food involvement, including involvement in meal preparation, meal planning, and grocery shopping, and child picky eating among a sample of children aged 18 months to 5.9 years of age. We hypothesized that child food involvement would be inversely associated with picky eating. The results of this study will contribute to the body of literature exploring strategies to reduce picky eating, thereby improving the health of preschool children.

### **5.3 Methods**

The current study used baseline data from the Guelph Family Health Study (GFHS) Pilot Phase 2. The GFHS is a pilot randomized controlled trial exploring the impact of a

home-based intervention on early life risk factors for chronic disease in families with preschool age children. The GFHS was approved by the University of Guelph Research Ethics Board (REB14AP008).

### **5.3.1 Recruitment and Participants**

Families living in Guelph and the surrounding area were recruited to the GFHS through flyers posted in local organizations which serve families with preschool age children, including the Guelph Family Health Team, the Guelph Community Health Centre, and Ontario Early Years Centres. In-person recruitment was also utilized, as well as social media platforms such as Facebook and Twitter. Families were eligible to participate in the study if they lived in Guelph or the surrounding area (including Rockwood, Puslinch, Fergus, Elora, Erin, and Mount Forest) with no plans to move in the following year, had a child between the ages of 18 months and 5.9 years, and had at least one parent who could respond to written surveys. Parents provided written consent for themselves and their children to participate.

### **5.3.2 Data Collection**

In the GFHS Pilot Phase 2, baseline data were collected from 39 families (64 parents and 62 children). Baseline data were collected using online surveys completed by each family at baseline, between December 2015 and April 2017. Only data from Parent 1, defined as the first parent in a family to sign up for the study, were included in the analysis as Parent 2 did not answer any questions regarding child food involvement

or picky eating. Thus, our final analytic sample included data from 39 parents (36 mothers and 3 fathers) and 62 children.

### **5.2.3 Measures**

#### *Child food involvement*

The predictor variable was child food involvement. In the GFHS, parents answered three items that assessed child food involvement: “I encourage [child] to participate in grocery shopping”, “I allow [child] to help prepare family meals”, and “I involve [child] in planning family meals”. Response options include “Strongly disagree”= 1 , “Disagree”= 2, “Agree”= 3, and “Strongly agree”= 4. Responses were summed, and a mean child involvement score was calculated for each child ranging from 1 to 4 with greater scores indicating greater child involvement. Cronbach’s alpha for the 3-item child food involvement measure was  $\alpha = 0.74$ . In addition to exploring how overall food involvement was associated with child picky eating, we also examined associations between each aspect of food involvement, i.e., grocery shopping, meal preparation, meal planning, and child picky eating.

#### *Child picky eating*

The outcome variable was picky eating, which was measured using the food fussiness scale from the Child Eating Behaviour Questionnaire (Wardle, Guthrie, Sanderson, and Rapoport, 2001). This subscale consists of 6 items which are used to assess parents’ perceptions of picky eating in the child; examples of the items on this

subscale include “My child refuses new foods at first” and “My child is difficult to please with meals”. Response options for each item included “Never”= 1, “Rarely”= 2, “Sometimes”= 3, “Often”= 4, “Always” =5. Responses were summed, and a mean picky eating score was calculated for each child ranging from 1 to 5 with greater scores indicating greater picky eating.

### *Covariates*

#### Child age

Child age was calculated from dates of birth and date of survey completion.

#### Household Income

Annual household income was assessed using a single item: “What is the total annual income of your household before taxes? Your household income includes income from you and anyone who lives with you who depends on the same income. Be sure to include income from all sources, such as salary and wages, child support, interest, public assistance and pensions.” Response options included: “\$10,000”, “\$10,000 to \$19,999”, “\$20,000 to \$29,999”, “\$30,000 to \$39,999”, “\$40,000 to \$49,999”, “\$50,000 to \$59,999”, “\$60,000 to \$69,999”, “\$70,000 to \$79,999”, “\$80,000 to \$89,999”, “\$90,000 to \$99,999”, “\$100,000 to \$149,999”, “\$150,000”. This variable was coded as a continuous variable using the midpoint values for each response option.

#### Child Sex

Parents reported on child sex, which was coded as female= 1 and male = 2.

### **5.3.4 Statistical Analysis**

Statistical analyses were conducted using Statistical Analysis System (SAS) University Edition, version 3.8 (SAS Institute Inc, 2018). Linear regression using generalized estimating equations (GEEs) were used to explore the association between parent-reported child food involvement and picky eating in children. GEEs were used in order to account for potential correlation between siblings. We examined associations between overall child food involvement and child picky eating as well as examining separately associations between each aspect of food involvement and child picky eating. A p-value less than 0.05 was used to establish statistical significance.

## **5.4 Results**

### **5.4.1 Sample characteristics**

Descriptive statistics are presented in Table 1. The sample included 62 children from 39 families. The mean child age was 3.19 years (SD = 2.09 years), and 57% of the children were male. Approximately 57% of families had an annual household income greater than \$90,000.

Means and standard deviations for measures of parent-reported child food involvement and picky eating are included in Table 1. Involvement in grocery shopping was the most frequently endorsed form of child food involvement. Mean level of picky eating assessed as food fussiness was 3.08 (SD = 0.96).

Table 1 – Descriptive measures of child sex, child age, household income, and parent-reported child food involvement and picky eating in a sample of 62 preschool children.

| <b>Variable</b>                              | <b>Mean (SD)</b> |
|--|------------------|
| <b>Child sex, % male</b>                     | 56.67            |
| <b>Child age</b>                             | 3.19 (2.09)      |
| <b>Household income, %</b>                   |                  |
| <\$30,000                                    | 5.41             |
| \$30,000-\$59,999                            | 5.40             |
| \$60,000-\$89,999                            | 32.43            |
| \$90,000-\$149,999                           | 32.43            |
| ≥\$150,0000                                  | 24.32            |
| <b>Child food involvement, overall</b>       | 2.73 (0.63)      |
| <b>Child involvement in meal preparation</b> | 2.77 (0.76)      |
| <b>Child involvement in meal planning</b>    | 2.45 (0.76)      |
| <b>Child involvement in grocery shopping</b> | 2.95 (0.82)      |
| <b>Child picky eating (food fussiness)</b>   | 3.08 (0.96)      |

#### 5.4.2 Association between child food involvement and food fussiness

Overall child food involvement ( $\beta = -0.51$ , 95% CI = -0.93, -0.09, p-value = 0.02), involvement in meal preparation ( $\beta = -0.42$ , 95% CI = -0.74, -0.11, p-value = 0.009), and involvement in grocery shopping ( $\beta = -0.29$ , 95% CI = -0.58, -0.01, p-value = 0.04), were inversely associated with picky eating after adjustment for child age, child sex, and household income. Involvement in meal planning was not significantly associated with picky eating.

Table 2 – Associations between parent-reported child food involvement and picky eating adjusted for child age, child sex, and household income, in a sample of 62 preschool children.

|  | <b>Picky Eating</b><br>Regression coefficient estimate (95% CI) |
|--|---|
| <b>Overall food involvement</b>        | -0.51 (-0.93, -0.09)*   |
| <b>Involvement in meal preparation</b> | -0.42 (-0.74, -0.11)**  |
| <b>Involvement in meal planning</b>    | -0.24 (-0.54, 0.05)   |
| <b>Involvement in grocery shopping</b> | -0.29 (-0.58, -0.01)*   |

\*Significant at the  $p = 0.05$  level

\*\*Significant at the  $p = 0.01$  level

## 5.5. Discussion

This study explored the association between the involvement of children aged 18 months to 5.9 years in meal preparation, meal planning, and grocery shopping and child picky eating. We hypothesized that greater child involvement in these food practices would be associated with lower picky eating. The results of the study partially supported our hypothesis: overall child food involvement, involvement in meal preparation, and involvement in grocery shopping were significantly, inversely associated with parent-reported picky eating. There was no significant association found between child involvement in meal planning and picky eating.

This is the first study to examine associations between multiple aspects of child food involvement and picky eating in young children. Based on the strength of the association, our results suggest that involvement in meal preparation may be a critical element of child food involvement for reducing child picky eating. This could be because involvement in meal preparation may be a more interactive form of involvement compared to meal planning, in which the child may be only passively involved. Being exposed to the food through involvement in meal preparation before being asked to consume it may help to mitigate food fussiness. The results of previous studies suggesting that child involvement in meal preparation has a positive effect on child food preferences (Vollmer and Baietto, 2018; Chu et al., 2013; Alliot, da Quinta, Chokupermal, and Urdanata, 2016; Cunningham-Sabo and Lohse, 2013; Cunningham-Sabo and Lohse, 2014) support our finding that involvement in meal preparation is inversely associated with child picky eating.

It is also possible that our findings that involvement in meal preparation was associated with reduced picky eating could be due to reverse causation, such that parents who engage their children in food practices are more likely to do so with children who are less picky. An intervention study using a randomized controlled design would provide greater clarity on the direction of this association.

To our knowledge, only one study, by Vollmer and Baietto (2017), has examined the association between child involvement in meal preparation and child food preferences in preschool children. The majority of existing experimental studies exploring the association between child involvement in food practices and food

preferences have focused on school-age children, and these studies only looked at involvement in meal preparation. A study by Alliro, da Quinta, Chokupermal, and Urdanata (2016) found that school age children who were involved in the preparation of foods containing vegetables were more likely to choose these foods as a snack compared to children who were not involved. Other experimental studies have examined the effect of a cooking intervention on preference for fruits and vegetables in school-age children (Cunningham-Sabo and Lohse, 2013; Cunningham-Sabo and Lohse, 2014). These studies found that children who were involved in the cooking programs reported significantly increased preference for vegetables compared to children in the control group. Considering the significant effects of involvement in meal preparation on food preferences in school-age children as well as the results of the current study, further experimental research examining the effect of involving young children in food practices on picky eating is warranted.

Though the association was not as strong as with involvement in meal preparation, we found that involvement in grocery shopping was also inversely associated with child picky eating. This might suggest that children may be more willing to eat foods when they are exposed to them and actively involved in choosing which foods to purchase. While, to our knowledge, no other studies have examined the association between child involvement in grocery shopping and picky eating, other studies have shown that children's food preferences influence parents' grocery store purchases (Robson, DeLuccia, Baker, Bodt, and Trabulsi, 2019; O'Dougherty, Story, and Stang, 2006), which may, in turn, influence children's dietary intake. An

observational study by Lora et al. (2016) revealed that preschool age children who were involved in selecting beverage purchases had a higher intake of the beverage compared to children who were less frequently involved. A qualitative study by O'Dougherty, Story, and Stang (2006) explored the decision-making process of parent grocery shoppers with their children present. Their findings support the idea that children can be involved in food purchasing, including choosing fruits and vegetables, and suggest that grocery shopping may be an opportunity to provide children with nutrition education. Taken together, the findings of previous research suggest that the participation of young children in grocery shopping may positively influence their eating behaviours. Future intervention studies could explore whether engagement in grocery shopping can reduce children's picky eating.

This study has several limitations that should be considered when interpreting our results. Data were collected using parent reports of child food involvement and picky eating. Parents' perceptions of picky eating may vary, resulting in inconsistent measures of picky eating across families. This random error would have biased our results toward the null. Parents may also have altered their responses regarding child involvement or child picky eating due to social desirability and the impact of this bias on our results is not clear. Future studies should attempt to obtain more direct measures of child food involvement and picky eating. The sample used in this study consisted mainly of families of higher socioeconomic status; therefore, the results may not be generalizable to families of lower SES. Future research should include a larger and more economically diverse sample of families of preschoolers and use an experimental

approach to allow for a clearer understanding of how involving children in household food practices may influence child food choices and eating patterns.

## **6. Conclusion**

This study contributed to the existing body of literature exploring how child food involvement may influence children's eating behaviours. Our study builds on existing research by examining how child involvement in various aspects of household food procurement, planning and preparation are associated with child picky eating. We found that overall food involvement and involvement of children in meal preparation and grocery shopping were inversely associated with child picky eating. Future research, including experimental studies, should be conducted to further elucidate the role of food involvement in reducing picky eating among young children.

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