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A Novel Measurement Method of, and Factors Associated with, the Healthfulness of Parent-Child Food Purchasing Interactions

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A Novel Measurement Method of, and Factors Associated with, the Healthfulness of Parent-Child Food Purchasing Interactions

by

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Dissertation

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Dedication

To my parents Maryann and Richard, and brother Alex

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A Novel Measurement Method of, and Factors Associated with, the Healthfulness of Parent-Child Food Purchasing Interactions

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The University of Texas at Austin, 2014

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The aims of this research were to 1) demonstrate the validity of using a personally-worn micro-camcorder (PWMC) method to assess in-store parent-child food-purchasing interactions and environmental factors related to these behaviors; 2) examine the relationship between child at-home TV-exposure, home food availability/accessibility, parent dietary modeling, and child-feeding style with the healthfulness of child in-store food purchasing requests; and 3) examine the relationship between parent weight status, parent diet quality, food purchasing intentions, perceived relative cost of healthy food, and the use of nutrition facts labels with the healthfulness of parent responses to child in-store food purchasing requests.

A total sample of 40 parent-child dyads completed the study. Parents were a mean age of 36.5 years (±6.3), and children were a mean age of 3.8 years (±1.1). Dyads were met at their usual grocery store and shopping time. Children wore a micro-camcorder or eButton on a hat to capture what they saw. Parents also completed a questionnaire about nutrition behaviors and the home food environment based on validated questions from the literature.

Coded personally worn micro-camcorder (PWMC) data were highly correlated (rho = 0.345-0.911, p<0.01) with in-person observational data for assessing in-store behavioral and environmental factors, and the method demonstrated a high degree of reliability for assessing purchasing decisions compared to receipt data (Cohen's kappa = 0.787). Also, inter-rater reliability for assessing environmental/behavioral variables ranged from moderate to almost perfect (Cohen's kappa = 0.466-0.937). Children whose parents reported high levels of unhealthy dietary modeling had lower odds of a food request being healthy (OR=0.50, P=0.021), and having parents who report non-directive child-feeding had increased odds of a request being healthy (OR=1.66, P=0.028). Healthy weight parents were more likely to make healthy responses to child food purchasing requests than overweight/obese parents (OR=2.06, P=0.022).

Behavioral interventions that seek to improve the healthfulness of food purchasing in families with young children should include components to promote non-directive feeding styles, discourage unhealthful dietary modeling, provide additional resources to target overweight/obese parents' responses to child requests, and use the PWMC method for efficient measurement of these behaviors.

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CHAPTER 1: INTRODUCTION

PUBLIC HEALTH PROBLEM

Obesity rates for children aged 2-5 in the USA are 8.4% with an additional 14.4% at risk (1). Overweight/obesity in preschool-aged children has been shown to track into adolescents and adulthood (2-5). Consuming diets with more nutrient-dense foods and beverages and fewer calorie-dense snack foods and sugary beverages/sugar-sweetened beverages (SSB) promotes healthy weight status and decreased chronic disease (6-8). Currently preschool-aged children do not consume adequate amounts of whole fruits, whole grains, vegetables and beans, and consume excess saturated fat and sodium (9, 10). Family food and beverage purchasing is a critical control point for modulating the home food and beverage environment. In the USA, two-thirds of family food expenditure is at the grocery store which in turn constitutes a majority of foods available for consumption in the home (11, 12). However, Americans devote only 14.4% of their grocery expenditure to fruits, vegetables, whole grains, beans, nuts and seeds, while spending 20.0% on SSB and sweet dessert foods (11).

Food in the home is the largest contributor to young child dietary exposure, especially in younger children who are more dependent on caregivers for food than older children. Young children, ≤6 years old are still establishing dietary preferences that are influenced by their home food environment (12-14). These dietary preferences that are formed early in life have been shown to influence adolescent and adulthood diet (14). With the established link between unhealthful dietary patterns and negative health outcomes, it is crucial to ensure children receive healthful food exposures early in life, which can in part be accomplished by improving the healthfulness of food purchasing decisions in families with young children.

BACKGROUND ON PARENT-CHILD FOOD PURCHASING INTERACTIONS

The healthfulness of family food purchasing behavior and factors associated with food purchases is an understudied area of nutrition behavior. Better understanding of these behaviors can help guide intervention efforts to promote healthy family food purchasing. Families with young children often bring them to the store where they act as co-shoppers making purchasing requests to which parents may yield to or resist. These parent-child interactions have caught the eye of marketing researchers who utilize the 4 Ps of the marketing mix to leverage child “pester power” to influence parental purchasing (15, 16). The most heavily studied factors associated with “pester power” have been price, product, placement, promotion, and at-home television exposure (15-17). These factors have been shown to influence parent-child interactions, but factors associated with the healthfulness of interactions have not been well explored. Interventions that seek to promote healthful food purchasing in families with young children need guidance in addressing the healthfulness of parent-child in-store food purchasing interactions.

Children often accompany their parents on grocery shopping trips (18-20), where parents cite child food preferences as a barrier to healthful grocery shopping (21, 22). So why do parents bring their children to the grocery store? Child co-shopping is often unavoidable especially in lower income groups who may not be able to afford child care during times when grocery shopping occurs. Also, for single-parent households, co-shopping with a child is often necessary and it has been shown that single parents do co-shop with children at higher rates than two-parent households (23). On the other hand, many parents also choose to bring their child shopping for reasons such as the food- and money-related learning opportunities present at the grocery store (24).

While co-shopping, children are influencing family food purchasing. Observational research has shown that child co-shoppers make between 0 to 18 purchasing requests per grocery shopping trip (25). These requests are often for unhealthy foods (18, 26). Parents report child requests have the most influence over the type of foods they buy rather than the quantity, and the types of foods children have most influence over tend to be unhealthy food groups such as breakfast cereals, sweets and soft drinks (27, 28). However, parents are ultimately the gatekeepers who determine their child's impact on family food purchasing by how they respond to their child's request. When children make requests, parents can yield to those requests by purchasing the item or resist the request by not purchasing it. Research shows parents yield to approximately half of all child requests, and parent responses do not always promote healthful food purchasing (18, 26, 29). It is estimated that purchases influenced by child requests contribute to one third to one half of family food purchasing decisions (18, 30). With child influence largely promoting unhealthful purchases, understanding the role of parent-child food purchasing interactions in the healthfulness of family food purchasing is important.

One contributor to the limited research in this area is the difficulty of studying in-store behaviors leading to a need for efficient and accurate measurement methods. Methods for studying parent-child interactions have included parent recall, laboratory study, and natural in-person observation. These methods all have inherent limitations and room for improvement. Parent recall, while efficient, can be inaccurate. Laboratory studies, in which a mock a grocery store has been created, allow for more research control and accuracy; however, the artificial environment is not likely to be able to recreate a natural setting. In-person observation in natural settings provides relatively accurate and detailed accounts of behaviors and the environment, but this method has a high level of researcher burden. With the advancement in technology in recent years, small audio/video recording devices may enable researches to efficiently gather accurate data on in-store food purchasing behaviors.

LITERATURE GAPS

The study of parent-child food purchasing interactions has mainly been conducted from a marketing perspective, and so several gaps in the literature exist. Marketing and advertising research is primarily aimed at understanding purchasing behaviors with the goal of increasing total food sales, rather than the healthfulness of those sales. Therefore there is little guidance in the literature for understanding factors associated with healthful parent-child interactions. There is also a need for an efficient and accurate measurement method of in-store behaviors, as current research relies heavily on in-person observation.

GOALS OF THIS RESEARCH

The goals of this research are to validate an efficient and accurate method to assess parent-child in-store food purchasing interactions, and to evaluate the relationship between several factors and the healthfulness of child requests and parent responses to child requests. To assess in-store parent-child behaviors, a participant-worn micro-camcorder was used to record parent-child dyads as they food shopped in their usual grocery store. This method was compared to in-person observation and receipt data to assess validity. Additionally, inter-rater reliability for coding video data was assessed. Potential factors examined for a relationship with the healthfulness of parent-child food purchasing interactions were those that were both consistent with the Social Ecological Model (SEM) and had been shown to be associated with food choice, intake, purchasing habits, or weight status. Potential child factors included TV-exposure, the healthfulness of the home food environment, the healthfulness of parental dietary modeling, and parental feeding style. Potential parent factors included parent weight status, parent diet quality, the healthfulness of food purchasing intentions, the perception of the relative cost of healthy food, and their use of nutrition facts labels while food purchasing. These factors were measured using parent-reported data from a questionnaire made up of survey questions from the literature that were modified if needed for the purpose of the study. In-store behavioral data was assessed using the participant-worn micro-camcorder method validated is this study.

OVERALL HYPOTHESES

The primary hypotheses of this study were that a) the use of a participant-worn micro-camcorder will be valid for assessing in-store parent-child interactions compared to existing methods (Chapter 3), and b & c) environmental, behavioral, anthropometric, and/or psychosocial factors will be associated with the healthfulness of child food purchasing requests (Chapter 4) and parental responses to those requests (Chapter 5). The contributions of this research included a novel and efficient measurement method of in-store parent-child food purchasing interactions, and increased understanding of factors associated with the healthfulness of these behaviors to guide intervention development.

CHAPTER 2: LITERTURE REVIEW

CURRENT MEASUREMENT METHODS

The gaps in understanding of parent-child food purchasing interactions are in part due to the difficulty of studying these behaviors in grocery-store settings. Methods for studying parent-child interactions in general have included parent recall, study in a lab/clinical setting and natural observation (16, 31-36). Parent recall is efficient, but the risk of inaccuracy and unreliability is high due to the complexity and concurrent nature of environmental/behavioral factors that affect parent-child food purchasing interactions (31-33). Parent recall studies have measured simple variables like number of child requests and types of products requested (16, 34), but it has been shown that parents may on average underestimate the number of child influence attempts during grocery store shopping by 50% (31). Study of these behaviors in lab/clinical settings in which mock grocery stores have been created (35, 36) allows complete and accurate records of behaviors to be made. However, the environment of the mock grocery stores is not familiar to the participants and it is not possible to recreate all stimuli present in the participants' real grocery stores, and so behaviors are not likely to represent typical natural interactions (33). Because of these limitations, research of parent-child purchasing interactions has largely relied on in-person observation in natural settings which provides relatively accurate and detailed accounts of behaviors and the environment; however, this method has a high level of researcher burden (33).

In-person observational approaches to the study of parent-child food purchasing behaviors in grocery stores have been varied. Some examples include Atkin, O"Dougherty et al., Galst and

White, and Ebster et al. (17, 18, 31, 37) Atkin studied parent-child interactions when shopping for cereal using a spot sampling technique (37). Five graduate students were stationed in the breakfast cereal aisle disguised as clerks to record parent-child cereal purchasing behaviors. The narrow observational scope of this approach prohibits assessment of behaviors related to different product types across the store and yields limited datasets. O'Dougherty et al. also spot sampled, recording one parent-child interaction per dyad/triad (18). In that study, behaviors were observed as the researcher moved throughout the store to allow comparison across product types for the whole sample, but only one observation per dyad/triad was made which may not be reflective of the participants' typical behaviors. Galst and White recruited parents and their children and met them at a grocery store to overtly observe each dyad for their entire shopping trip (17). This method allows comparison across product types and multiple measures per dyad can better assess behavior, but the overt nature of the observation may impart reaction effects. Ebster et al. covertly observed parent-child dyads throughout their entire grocery-shopping trip (31). This method allows comparison of product types across the store and multiple measures per dyad with minimal risk of reaction effects.

Although in-person observation provides reasonably accurate and rich data sets, it has inherent practical constraints such as human limitation in the ability to code multiple simultaneous variables, and potential of observer bias. Additionally, the burden of sending researchers into the field limits the ease of assessing inter-rater reliability and makes for a labor/time/cost intensive data collection process (33, 38). There is a need for an efficient method to collect in-store observational data on parent-child food purchasing behaviors and environmental factors that is also accurate and reliable. A possible solution involves using micro-camcorders worn by participants to collect in-store observational data.

POTENTIAL OF A PERSONALLY WORN MICRO-CAMCORDER METHOD

Advances in audio/video recording technology hold promise for expanding research methods available for studying nutrition behaviors such as parent-child food purchasing interactions in the grocery store. Video recording has long been used to collect observational data in laboratory settings and equipment is now small enough to be worn by participants to record behaviors in natural environments. Participant-worn still-photo cameras have been used recently to improve dietary intake estimation (39-42), and assessment of physical activity behaviors (43). Potential advantages of using micro-camcorders worn by participants to collect data include efficiency, reliability, and accuracy. This method has the ability to improve efficiency compared to in-person observation because data can be collected simultaneously from multiple participants, and with proper participant training there is no need to send researchers into the field. Also, micro-camcorder data can provide a comprehensive record of events beyond the capabilities of an in-person observer (38), especially when coding multiple factors that occur in relatively rapid succession (44). In addition, the coding of data occurs in a controlled lab setting where multiple coders can scrutinize video/audio data allowing for assessment of inter-rater reliability, minimizing observer bias and error, and leading to a high expectation of accuracy and reliability (38).

A potential disadvantage of using a participant worn micro-camcorder data collection method is that it is overt, which may impart reaction effects leading to social desirability bias. Parents may change their shopping behaviors and interactions with their child if they know they are being recorded. In a review by Gardner, studies of parental reaction effects in observational research of family behaviors have shown little evidence of any substantial effects on results, especially if the behaviors being studied are habitual and performed in their natural setting (33). The child co-shopper's behaviors, especially younger children, are less likely to be affected by observation than their parents (33). In the Galst and White study where observed parent-child grocery shoppers were aware of the observation, parents reported their children did not behave atypically (17). However, this concern is largely moot for studies in which participants must give prior consent to data collection, such as intervention studies. Also, reaction effects can be minimized with the addition of an acclimatization period built into the study design (45). Another issue in replacing an in-person data collector with a camcorder is potential loss of contextual understanding of behaviors due to a restricted viewing frame/audio capability that may limit interpretability. With appropriate rater training, interpretability is not expected to be compromised as video data have previously been used with high levels of reliability and validity to assess parent-child interactions in research of preschool-aged child aggressive behaviors (46). Inter-rater reliabilities (intraclass correlations, single rater, absolute agreement) for coding types of child behaviors from video data in that study were high, ranging from 0.73 – 0.98. Also, coding video data for total frequencies of behavior types was highly correlated (correlation coefficient = 0.94) with parent-rating for those behaviors.

CURRENT KNOWLEDGE OF FACTORS ASSOCIATED WITH PARENT-CHILD FOOD PURCHASING INTERACTIONS

As mentioned previously, the study of factors that are associated with child co-shopping behaviors has been largely conducted in the marketing literature, and this body of evidence has largely focused on marketing aspects of the in-store environment and home TV exposure.

The in-store environment includes aspects of marketing such as the shelf placement of products in relation to child eye-level and child focused promotions on packaging that is designed to attract child attention (15, 47-49). During observations of parent-child dyads shopping at grocery stores, Ebster et al. found eye-level placement of products was strongly associated with child (mean age 5.7 years) requests ($P<0.01$) (31). In addition to placement, promotion on packaging is an aspect of the store environment that stimulates child requests (50, 51). Young children age 3-7 years are in the perceptual stage of cognitive development and easily influenced by the appearance of objects (52). Child focused marketing on packages can include images of other children, games/prizes, cartoons, animals, and characters from child television programs (48, 49). Child focused marketing mostly promotes unhealthy foods. Batada et al. found that over 60% of foods with Nickelodeon characters on their packaging were of poor nutritional quality (53). Another in-store variable is child position during shopping trips. This includes walking, riding in the cart, or being carried (31). Children walking have less movement restriction, allowing them to view and interact with more products, and this is associated with increased number of requests ($P=0.05$) (31).

Outside of the grocery store setting, the main factor studied in child purchasing or asking behaviors is child home TV exposure. Increased TV viewing by the child leads to increased exposure to food advertisements and has been shown to affect child request behaviors. In a 2010 Yale Rudd Center study, children aged 2-11 years old are exposed to nearly 5 TV food ads each day promoting candy, snacks, breakfast cereal, or SSB (54). In one of the earliest studies of parent-child food purchasing interactions, Galst and White found increased parent-reported child exposure to TV commercials was significantly related to the number of observed child (aged 3-11 years) purchasing requests in the grocery store ($r=0.35$; $P<0.05$) (17). In more recent studies in a laboratory setting, children (aged 2-7) exposed to food advertisements were significantly more likely to display a preference for, choose, and consume food that was advertised compared to a non-exposed group (36, 55, 56).

Ultimately child influence on food purchasing depends on their ability to convince their parents to yield and purchase the requested food or beverage. Parents yield to approximately half of all child requests (18, 37), but factors that influence yielding are even less studied than those that affect child requests. In a covert-observational study, Ebster et al. examined several in-store and personal factors, but found only linguistic type of child requests, price of products, and parent income to be associated with parental yielding (31). Children have been shown to use several linguistic request tactics to influence parents including simple asks/appeals, begging/nagging/demands, being unnaturally nice/coercion, and offering a bargain such as good behavior in exchange for purchases (16, 26, 31, 57). However the most common tactic is a simple ask/appeal which is used in 80% of preschool-aged child requests (26), and parents of young children are more likely to yield to a simple ask than a demand ($P<0.01$) (31). In addition to how a child asks, the price of the food or beverage is a barrier to adult purchasing and yielding, and likely differentially affects yielding by income group (31, 51, 58). The Ebster et al. study showed lower-income parents were slightly less likely to yield to child requests than higher income parents ($P=0.03$) (31).

Another factor, the healthfulness of child requests seems intuitive, but there is little evidence that parents yield more to healthy requests. In one of the few observational studies to examine parent-child food purchasing interactions from a nutrition perspective, O'Dougherty et al., found that while parents yielded to 48% of child (aged ≤8 years) requests, they actually yielded at a slightly higher rate if those requests were for less healthful foods like sweets and snacks

(18). A study in older children (8-11 years) showed over 75% of children reported that their parents would at least sometimes buy snack foods at the grocery store if they asked for them (29). Even though parents yield to unhealthy child requests, they cite nutrition as the most important factor when choosing food for their child (59, 60). A possible explanation for this apparent contradictory behavior could be parents' use of "treats" to control behavior in the grocery store. Parents report purchasing unhealthful snack foods as "treats" in order to avoid conflict and to reward or promote good behavior while shopping (59, 61).

Although some factors associated with parent-child interactions have been identified. There is little guidance in the literature for developing interventions that seek to promote healthful parent-child food purchasing interactions. The Social Ecological Model (SEM) can be a useful framework for developing interventions and understanding the interactions of various factors (62). The potential factors examined in this research fit into different levels of the SEM.

BEHAVIORAL THEORY

The study of factors related to parent-child food purchasing interactions have been confined to in-store environmental variables and home TV exposure, while other variables that may affect in-store behaviors have not been well explored. The Social Ecological Model (SEM) can be used to conceptualize potential factors that affect the healthfulness of child requests and parent responses. The SEM is an adaptation of Bronfenbrenner's Ecological Systems Theory that states that in order to understand human behavior you must also understand the social and environmental context in which it takes place (62). In Ecological Systems Theory, behavior exists in environmental systems or layers that can influence each other bi-directionally. In the SEM, as applied to health behaviors, these layers often include *Intrapersonal* (individual characteristics), *Interpersonal* (interactions with a social network), *Institutional/Community* (social context, formal/informal rules and the physical environment in which behaviors take place), and *Macro/Policy* (public policy, laws, and cultural context) (63). The SEM and related ecological models have been used to conceptualize factors associated with parent-child nutrition communication and decision making (64), adult food choice and physical activity behaviors (65), dietary habits (66), and child weight status (67). Studies have not used an ecological approach to investigate factors effecting child requests and parental responses. Figure 1 is a SEM that was used as a guide for framing this research. The completed SEM specific to this research which includes all hypothesized factors and confounders/covariates appears near the end of chapter 2 (Figure 2).

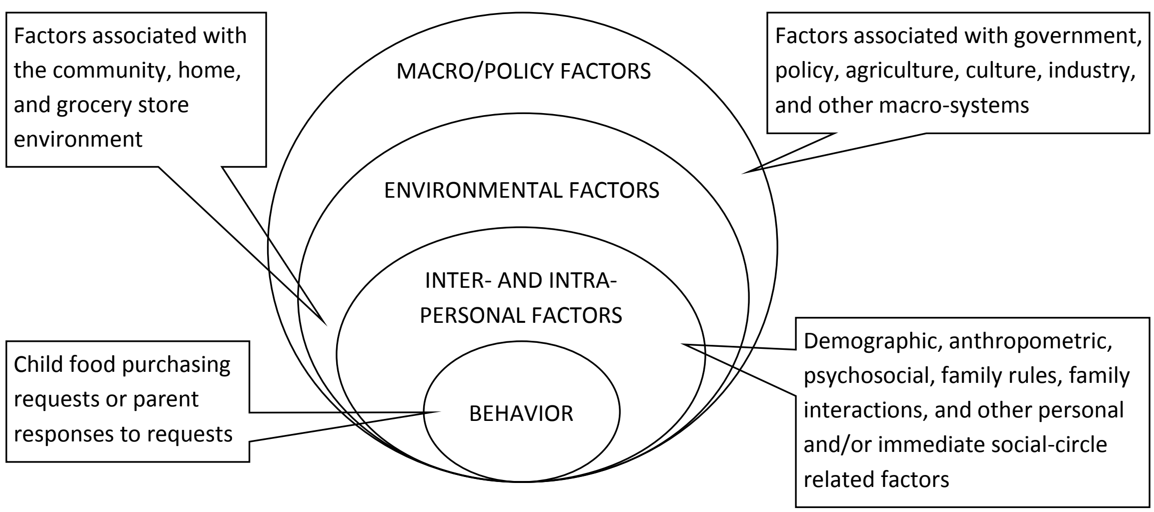

Figure 1. SEM Generic Model

POTENTIAL FACTORS TO EXPLORE

Environmental and social factors that have been shown to affect food preference, dietary intake, and related food outcomes are likely to also affect parent-child food purchasing behaviors in the grocery store. For young children, the primary physical and social environment in which they are exposed to food and food behaviors is the home (12, 13). Major modifiable home food environmental factors that have been associated with the healthfulness of child food intake and preference, and may be associated with the healthfulness of child food purchasing requests, include the types of foods available and accessible in the home, parental child-feeding style, parental food-modeling, and TV exposure (17, 68-72).

Factors that affect parents' child-related food behaviors are more related to personal factors than environmental. Parents are fully cognitively developed and influenced by more psychosocial factors than their preschool-aged children (52). Factors that may help explain the healthfulness of parental response include factors that have been shown to be associated with food choice/intake and/or child weight/intake such as parent weight status, parent diet quality, food purchasing intentions, perceived relative cost of healthy food, and the use of nutrition facts labels while shopping (73-77). Figure 2 shows the conceptual SEM of potential modifiable factors and covariates that may play a role in understanding the relationship between the home food environment and parent-child food purchasing interactions. Rationale for including these variables in the model is discussed below.

CHILD FACTORS

<u>Home food availability and accessibility</u> is the physical home food environment (HFE). Food availability refers to foods that are present in the home and accessibility refers to how easily (i.e., in what manner are they stored) those foods can be consumed (78). Healthy home food availability is seen in homes where many healthful foods such as fruits, vegetables, beans/legume, nuts/seeds, whole grains and lean meats are present with few unhealthful foods such as snack foods, SSBs, desserts, and fatty meats/dairy are present (79). Healthy home food accessibility is seen when healthful foods are stored in a way they can be easily reached and/or easily consumed (e.g., cut carrots or sliced oranges) (79).

As demonstrated in four descriptive studies with sample sizes between 200-500 families with preschool-aged children, there is a strong relationship between the presence and accessibility of food groups in the home and child consumption (74, 80-82). Wyse et al. examined the relationship between the amount of fruits and vegetables available and their accessibility (as separate concepts) and child intake (81). Parents reported on average they had 21.7 different varieties of fruits and vegetables available in the home and 39% reported they keep fruits and vegetables in a 'ready to eat format' (81). Both availability and accessibility of fruits and vegetables were highly significantly associated with their consumption in multivariate models (81). Ostbye et al. assessed the relationship between accessibility of unhealthy foods (SSB and snacks) and child intake in a sample with overweight and obese parents (the children were mostly $\leq 85^{th}$ percentile for BMI (75%)) (82). Ostbye et al. found that unhealthful food accessibility was related to both decreased healthful food intake and increased unhealthful food intake (82). McGowan et al. assessed the relationship between availability, but not accessibility, and child intake (74). They, unlike Wyse et al. or Ostbye et al., included both unhealthy and healthy food groups as exposures in their analysis (74). Most parents reported fruits (98.8%), vegetables (98.4%), non-core foods (i.e., snacks and sweets) (92.1%), and non-core drinks (SSBs) (60.0%) were available in their home. A significant relationship between increased availability and intake was seen during univariate analysis, but only non-core food availability was still associated with intake after controlling for multiple covariates (74). The authors noted a lack of variation in parental responses as a likely reason for the null findings (74). Spurrier et al. removed issues of parent reporting by directly observing participants' home food availability (80). They measured the amount of fruits, vegetables, snack foods and SSBs, and the fat content of dairy foods present in the home. They found that the presence of a food group in the home was statistically significantly related to child consumption of that food group in multivariate models (80).

Foods that parents purchase from the grocery store and keep accessible in their home eventually make their way into their child's diet. The healthfulness of home food availability and accessibility also sets the tone for many other aspects of the HFE. For example, if healthful foods are not present in the home, parents cannot model or serve their children these foods. Also, if healthful foods are more accessible than unhealthful foods, these foods may become the default choice. In addition, a healthy HFE leads to increased likelihood for repeated visual and taste exposures to healthful foods that are necessary to combat young children's inherent predisposition for higher fat/sugar foods and phobias of novel foods (83). Because exposure is highly associated with preference (83), children exposed to a healthful HFE are likely to have healthful food preferences and request healthful foods at the grocery store.

Parental dietary-modeling is parental food consumption that occurs in the presence of the child (81). Healthy modeling occurs when the parent consumes many healthful foods such as fruits, vegetables, beans/legume, nuts/seeds, whole grains and lean meats/fish, and few unhealthful foods in front of their children. Sometimes parent diet is used as an approximate measure of dietary modeling because parents often consume meals in the presence of their young children. However, because parent diet healthfulness may be different depending on whether they are in the presence of their child or not, and it is often not known what portion of the parents' diet was modeled, this is a less robust measure.

As demonstrated in six descriptive studies with sample sizes between 200-600 families with preschool-aged children, there is a moderate relationship between the healthfulness of parental dietary modeling and the healthfulness of child intake (74, 81, 82, 84-86). Campbell et al. defined parental dietary-modeling in terms of frequency of modeling rather than the healthfulness of foods modeled (85). They found that in families with children and adults who regularly ate together, their preschool-aged children consumed significantly more vegetables (fruit consumption was not measured), but no relationship was seen with total calories or snack food intake (85). Ostbye et al. examined parental dietary-modeling healthfulness and child intake (82). They found a significant relationship between parental healthy eating (i.e., fruits, vegetables, yogurt, and milk) in the presence of their child and both increased healthy food intake and decreased "junk" food intake (82). Murashima et al. similarly found that parents who encourage healthy eating by modeling fruit, vegetable, and milk intake had children who consumed more nutrient-dense foods and fewer energy-dense foods (84). McGowan et al. and Wardle et al. both examined parental fruit and vegetable intake (not modeling specifically) and found it to be statistically significantly related to high child fruit and vegetable intake (74, 86). Wyse et al. is among the few, if not the only study of this population, to measure parent intake and parent dietary modeling (healthfulness and frequency), and include them in the analysis as separate variables to assess a relationship with preschool-aged child intake of fruits and vegetables (81). Parents reported consuming 5.0 servings and modeling 2.3 servings of fruits and vegetables each day, and 57% reported always eating meals as a family (81). Frequency of eating as a family was not related to child intake of fruits and vegetables. Both parent intake and modeling of fruits and vegetables were statistically significantly related to child consumption in univariate analysis, but only parent intake remained significant after multiple covariates were included in the model (81). This finding was not explained by the authors. As suggested by Wyse et al., parental modeling seems to be a less well defined and a more complex variable than some other home food environment factors and more research is needed.

The healthfulness of parental dietary intake and modeling has been shown, in some cases, to be related to child intake. Parental modeling is thought to act on child food preferences by reducing neophobia to novel food when children observe parents consuming them (83, 87, 88). When parents model healthful foods, and do it frequently, children become more familiar with them and in turn more inclined to try them (83). With repeated taste exposures child preference increases (89) and they may then be more inclined to request modeled foods in the grocery store.

Parent child-feeding style refers to the degree of control the parent exerts over food the child consumes (90). The literature is somewhat fragmented as operationalization of parental child-feeding styles can vary from study to study (84). Recent prevailing constructs have been related to the manner in which parents exert feeding control. Feeding control can be directive such as pressure/restriction and use of rewards/threats, or non-directive such as encouragement, reinforcement, and positive persuasion (84). Pressure is seen when parents physically or verbally direct children to consume more food, and restriction is seen when parents try to limit the amount of unhealthful food their child consumes (90). Rewards or threats are also used to control child food intake by making them contingent on the child consuming their meal (84). Rewards include food as a reward (e.g., dessert) or non-food rewards such as TV time. Threats indicate a wanted item or food will be denied if the requested portion of food is not consumed. On the other hand, non-directive approaches, such as praising healthful eating, seek to help the child internalize the goal of eating. Operationalization of control sometimes includes parental modeling and food availability and/or accessibility. For this research these factors are treated separately form child-feeding, and only feeding behaviors that occur during the provision of food will be discussed below.

Directive feeding control is thought to be associated with unhealthy dietary outcomes, whereas non-directive control with healthful dietary outcomes. As demonstrated in eight descriptive studies with sample sizes between 100-600 families with preschool-aged children, there is a moderate relationship between parental pressure/restriction (directive control), rewards/threats (directive control), and encouragement/praise (non-directive control), and child dietary intake and/or choice (74, 81, 80, 84-86, 91, 92).

Six studies looked at the association between a pressure child-feeding style and child dietary intake (80, 81, 84-86, 92). Spurrier et al. found pressure to be associated with decreased child fruit and vegetable intake (80). Wardel et al, Murashima et al., Campbell et al., Peters et al., and Wyse et al. found no statistically significant relationship between pressure and fruit and vegetable intake after model adjustments (81, 84-86, 92). Peters et al. and Murashima et al. found no significant association between pressure and energy-dense/snack foods (84, 92). Campbell et al. found pressure to be significantly associated with increased total energy intake (85).

Four studies examined the relationship between a restrictive child-feed style and child dietary outcomes (80, 85, 91, 92). Spurrier et al. found restriction was associated with increased fruit and vegetables intake, Campbell et al. found no relationship between restriction and vegetable intake, while Peters et al. found restriction to be associated with reduced fruit and vegetable intake (80, 85, 92). These three studies used a similar operationalization of restrictive feeding style, were conducted in the same country (Australia) with similar sample characteristics. Campbell et al. and Peters et al. additionally found restriction was not associated with energy-dense/snack food intake (85, 92). However, Campbell et al. did see a significant relationship between restriction and increased total energy intake (85). Snoek et al. did not use intake as an outcome, but instead looked at the relationship between feeding style and child purchasing choices in a mock miniature grocery store (91). They found children whose parents practiced higher levels of restriction chose to purchase more high-calorie dinner options (91).

Three studies examined the relationship between the use of rewards and/or threats by parents trying to compel their children to eat more food, and child dietary outcomes (80, 84, 91). Spurrier et al. found use of rewards to be associated with decreased child intake of fruits and vegetables (80). Murashima et al. found no significant association between the use of rewards or threats and child dietary intake (84). Snoek et al. found use of rewards to be associated with child mock-purchases of more low-calorie snack foods (91).

Two studies examined the relationship between parent verbal encouragement of child healthy-eating and child dietary intake (74, 84). McGowan et al. found encouragement to be significantly related to child vegetable intake, a trend toward significance for fruit intake, and no relationship with snack food/SSB intake (74). Murashima et al. similarly found a child-centered feeding style (high levels of parental praise, non-verbal promotion, and encouragement of eating) to be associated with increased intake of nutrient-dense foods, but no association with energy-dense foods (84).

Findings in the child-feeding literature are sometimes inconsistent in variable definitions and magnitude/direction of effect. However, this parent behavior is an important factor in understanding child dietary behaviors (90). Part of the confusion may lie in the fact that parents often employ multiple strategies depending on circumstances/context (e.g., pickiness of child, child weight status, dinner occasion, etc.) (93). Brown et al. showed the vast majority of parents of young children (4-7 years old) reported high typical uses of both "covert" (i.e., non-directive; 89%) and "overt" (i.e., directive; 66%) feeding-control tactics (94). It has been shown that higher directive parental feeding-control causes children to have a diminished ability to recognize their own satiety cues (90, 95) which leads to greater eating disinhibition. Although the findings have been inconsistent, child-feeding style is an important modifiable factor that can shape dietary intake and may affect child request behavior in the grocery store.

TV exposure is most often operationalized as parent reported usual hours of child TV viewing for a specified time frame (i.e., per day or per week). Sometimes researchers have used TV viewing diaries or laboratory TV exposure sessions.

As demonstrated in seven descriptive studies with sample sizes between 200-2,500 families with preschool-aged children, there is a strong relationship between increased parent-reported TV exposure and unhealthful dietary intake (74, 85, 92, 96-99). Cross-sectional studies of TV exposure have been very consistent showing increased TV exposure, particularly above 1.5-2 hours/day, is significantly associated with Increased intake of calories (85, 97), snack foods (74, 85, 92, 96, 98, 99), SSB (74, 85, 96, 98, 99), and decreased intakes of fruits and/or vegetables (85, 97-99).

Additionally, five experimental and descriptive studies with sample sizes between 40-250 families with preschool-aged and young elementary-aged children have shown a strong relationship between TV exposure and child food brand-awareness, preference, and/or requests (17, 26, 36, 55, 56). Brody et al., Halford et al., and Borzekowski et al. performed experiments in a laboratory setting where they exposed children (2-7 years old) to TV with and without food/other product advertisement (36, 55, 56). After TV exposure, Brody et al. observed parent-child behavior in a mock grocery store (36). They found children exposed to TV advertisements made significantly more requests for advertised foods than those unexposed to advertisements (36). Borzekowski and Robinson asked children to choose products (food and toys) from a list of pictures; some were advertised while some were not (56). Children exposed to advertisement plus TV, vs. only TV, were more likely to choose advertised foods (56). No significant association was seen with toys (56). Halford et al. showed children exposed to TV with food advertisements, vs. TV with non-food advertisement, could recognize more brand names of foods advertised and voluntarily consumed more of an advertised food (55). Galst & White and Isler et al. both examined the relationship between child (3-11 years old) TV exposure in the home and child purchasing requests (17, 26). Galst & White observed parent-child dyads shopping at a grocery store and collected parent reported TV exposure data (17). They found that home exposure to TV commercials was associated with increased child ‘purchase influence attempts’ at the grocery store (17). Isler et al. instructed parents to record child TV diaries and child purchasing request diaries over a one-month period (26). They similarly found that TV exposure is related to more total requests and also more requests for unhealthy foods such as breakfast cereal and candy, but no association with requests for other food groups (26).

Food advertisements associated with child TV programming largely promote unhealthy foods such as SSB and high calorie snack foods (54, 100). In response to research and public sentiment, the Council of Better Business Bureaus partnered with several major food companies to institute a self-regulatory pact in 2006 called the Children's Food and Beverage Advertising Initiative (CFBAI) with the goal of improving the healthfulness of f/b advertised to children. However, more work is still needed in this area. In a 2010 Yale Rudd Center report, it was noted that although the ratio of unhealthy to healthier food advertisements had improved, children on average were still exposed to over 1,700 advertisements per year promoting snack food, candy, breakfast cereal, or SSB compared to 20 per year promoting fruits or vegetables (54). TV exposure is believed to negatively influence child dietary preferences through high exposure to unhealthful food advertisements that have been demonstrated to be associated with child request frequency in the grocery store, and so this factor was examined in this study.

PARENT FACTORS

Perceiving the cost of healthy foods to be higher than less healthy foods is likely to be a barrier to healthy food purchasing by parents, particularly lower SES parents. Large cross-sectional studies show that adult food shoppers perceive healthful foods to be more expensive than unhealthful foods (101, 102). Focus group studies indicate parents report high cost is a barrier to making healthful food choices (22, 103, 104). This perception, justified or not, affects food choices. In an analysis of Continuing Survey of Food Intakes by Individuals (CSFII) and Diet and

Health Knowledge Survey (DHKS) data, Beydoun et al. showed that the low dietary quality scores observed in lower SES groups could be in part explained by their perception of the high cost associated with a healthy diet (105). In a study of parents, Mushi-Brunt et al. showed that high-cost perception of fruits and vegetables was associated with less purchases and intake of fruits and vegetables by both parents and their children (76). Additionally, there is evidence that the perception of high cost may be a more powerful influencer of food choice than actual differences in price. Giskes et al, interviewed a large sample of adult food shoppers about their shopping habits and cost perceptions (101). They then followed up with surveys of food prices at local grocery stores (101). They found that differences in purchasing rates between paired healthy and less healthy food options were not explained by objectively measured price difference, but perceptions of price differences were related in several, but not all, of the selected food pairs (101).

There is some debate as to whether healthy foods are actually more expensive because observed cost differences depend largely on the metric being used. If real cost differences exist then it is a more difficult public health issue to solve, whereas an incorrect assumption of price difference could be a target in behavioral interventions through education and development of price-conscious shopping skills. Food price has been examined in two main ways, price per some defined portion (usually 100 g) or price per nutrient (usually calories). It has been shown that due to their low energy density, fruits and vegetables are among the most expensive sources of calories (106). However calories are not lacking in many American diets, and a caloric- density based analysis fails to account for the fact that fruits and vegetables, along with legumes, are the most inexpensive food sources of a majority of key vitamins and minerals (107). Recent portion- based cost analysis has given more credibility to the idea that actual cost differences may not exist, or are relatively small. Carlson et al. examined the price of foods in the Center for Nutrition Policy and Promotion's Cost of Food Database using different metrics (108). The six MyPlate food groups were ranked from most to least expensive using cost/100 calories (1. vegetables, 2. fruits, 3. protein, 4. solid fats and added sugars, 5. dairy, and 6. grains) and using cost/100 g edible portion (1. protein, 2. dairy, 3. fruit, 4. solid fats and added sugars, 5. grains, and 6.vegetables) (108). Depending on the metric used, the ranking of fruits and vegetables drastically changed.

Some other researchers have visited grocery stores to assess food prices in the field. Katz et al. surveyed grocery stores to examine price differences between healthy and less healthy versions of bread, cereal, and common snack foods per 100g of each food (109). They found no statistically significant price differences. Jetter et al. however, came to a different conclusion in their survey of grocery store prices (110). They examined cost differences between a two-week market basket (i.e., shopping cart with two weeks' worth of food) based on USDA's Thrifty Food Plan or one with healthier alternatives to the Thrifty Food Plan (110). The Thrifty Food Plan is designed to economically meet minimum Dietary Guidelines for Americans recommendations for a family of four. The healthier market basket cost $36 more per two weeks, though both market baskets lacked fresh fruits and non-starchy vegetables. The authors reported the price difference was driven mainly by the increased cost of whole grains and lean meats compared to refined grains and fattier meats, respectively.

Real price differences between healthy and unhealthy food are likely to be small and confined to certain food groups. In any case, it appears that the perception of a price difference between healthy and unhealthy food is prevalent and may influence food choice more so than actual differences. Because the relative perceived cost of healthy foods is likely to influence parental responses, and this attitude is modifiable, it may be a worthy target for interventions that seek to improve the healthfulness of parent-child food purchasing behaviors.

The healthfulness of food purchasing intentions are likely to be associated with psychosocial variables related to food purchasing and should be investigated**.** Many health behavior change interventions are framed in the Theory of Planned Behavior (TPB) which states that a person's attitudes, subjective norms and perceived behavioral control concerning a behavior predict intentions to preform that behavior, and intentions (along with perceived behavioral control) predict actually performing the behavior (111). A meta-analysis of 185 studies of health-related behaviors demonstrated significant average associations between TPB constructs, intentions, and behavior (112). In that meta-analysis, mean combined scores for attitudes, subjective norms, and perceived behavioral control were on average significantly correlated with intentions to perform the behavior ($r = 0.63$, $p < 0.001$), and intentions were significantly correlated with performing the behavior ($r = 0.47$, $p < 0.001$).

Limited research has also specifically examined the relationships between healthful food purchasing intentions and food purchasing. In a study of 270 Native American households, healthy food purchasing intentions were shown to be positively associated with healthy food purchasing ($\beta = 0.217$, $p < 0.001$) and healthy cooking behaviors ($\beta = 0.330$, $P < 0.001$), and inversely associated purchasing pre-prepared foods (-0.151, $p = 0.016$) (113). In another study, young adult Australians' intentions to purchase fast food were shown to be prospectively associated with measured fast food purchasing ($r = 0.58$, $p < 0.001$) (75).

Behavioral intentions have been shown to be associated with behavior, and some studies have demonstrated this with food purchasing behaviors. However, the relationship between food purchasing intentions and responses to children's food purchasing requests has not been established. Because many interventions seek to influence behavioral intentions, and parents often shop with their children, it is important to understand the relationship between the healthfulness of food purchasing intentions and the healthfulness of parental responses to their children's food purchasing requests.

Nutrition facts label use has been shown to be related to food purchasing, intake, and child weight status. Promoting the use and/or understanding of nutrition facts labels could be a valuable intervention strategy to promote healthier parent-child food purchasing interactions. For parents to yield to healthful food requests and resist unhealthful requests, they have to have knowledge of the nutritional characteristics of foods. Nutrition facts labels are a major source of that information, and consumers consider information from nutrition facts panels to be very credible (114). Use of nutrition facts labels is associated with increased fiber and iron intake (77), increased Healthy Eating Index (HEI) scores (115), and decreased fat intake (116). Additionally, parents who report using nutrition facts labels have lower rates of overweight children compared to non-using parents (25.9% vs. 33.5) (77).

Although over 85% of parents in one study report vetting food products before buying them for their children, and almost half consider nutritional value to be their top priority (60), many parents and consumers find the labels confusing, relying instead on common sense or focusing on limited aspects such as fat, calories, sugar, or vitamins (104, 117, 118). Additionally, some parents report using nutrition facts labels to consult the ingredients list for allergens and to identify additives which they feel make the food “too processed” and thus unhealthful (104). Though some parents say they seldom use the nutrition label in general, they are more prone to use them when their child asks for a food item they are not familiar with (104, 117). Even if some find the labels confusing, just using a few aspects of the label (e.g., only evaluating based on fat and/or sugar content) can enable parents to make more informed yielding decisions when their children ask for foods in the grocery store. Additionally, parents who use nutrition facts labels more often can build up greater knowledge of the nutritional characteristics of foods their children ask for, and this behavior may lead to higher rates of healthy responses compared to parents who do not use them.

Parent BMI and Diet has been shown to be associated with child weight and intake (119, 120). In two prospective studies, child BMI and percent of fat mass become significantly correlated with that of their parents by the ages of 4 and 7 years old, particularly after age 5 (121, 122). Whitaker et al. additionally showed that having an obese mother during the 3^{rd} to 5^{th} year of life is associated with an increased risk of obesity in young adulthood (123). These parent-child weight status associations are in part due to influences from the food environment and child diet which are largely controlled by the parent. Maternal intake of fruits ($\beta = 0.29$; $P<0.001$), vegetables ($\beta = 0.39$; $P<0.001$), snacks ($\beta = 0.25$; $P = 0.029$), SSB ($\beta = 0.32$; $P<0.001$), and HEI-2005 scores ($r = 0.44$; $P<0.001$) are significantly related to intakes of their preschool-aged children (74,120).

Overweight parents may be less likely to provide a healthy home food environment. Increased parent BMI is associated with decreased likelihood of having vegetables available in the home (73) and lower diet quality of their preschool aged children (124). Although overweight parents are concerned about their preschool-aged child's weight (125), they may lack knowledge and skills to make appropriate lifestyle adjustments. Byrd-Bredbenner et al. showed that in parents (mean age 37.9 years), increased BMI is associated with low belief in a link between diet and health, less likelihood of setting meal preparation and food shopping goals, and low self-efficacy in choosing healthy foods (126).

Parents of preschool-aged children control which foods are provided to their child and generally provide food similar to their own diet. Overweight parents may lack self-efficacy in providing healthy diets and have a low belief in the link between diet and chronic disease risk. Therefore the healthfulness of the parent's diet and/or their weight status may be associated with the healthfulness of their responses to their child's in-store food purchasing requests, and so this relationship was examined in the present study.

ADDITIONAL COVARIATES AND CONFOUNDERS

The effect of demographic variables or other variables that have been shown to be associated with diet and/or parent-child food purchasing interactions were measured so they can be controlled for in the analysis. These include age, gender, race, parent education, poverty level, use of food assistance, food insecurity, primary language used at home (proxy for acculturation), frequency of shopping with their child, frequency of child food purchasing requests per minute of shopping time, linguistic type of child request (simple ask vs. demand), store type (health food store vs. bargain store), child position during shopping, the healthfulness of child request, the presence of child focused marketing on packaging, and product placement.

SOCIAL ECOLOGICAL MODEL

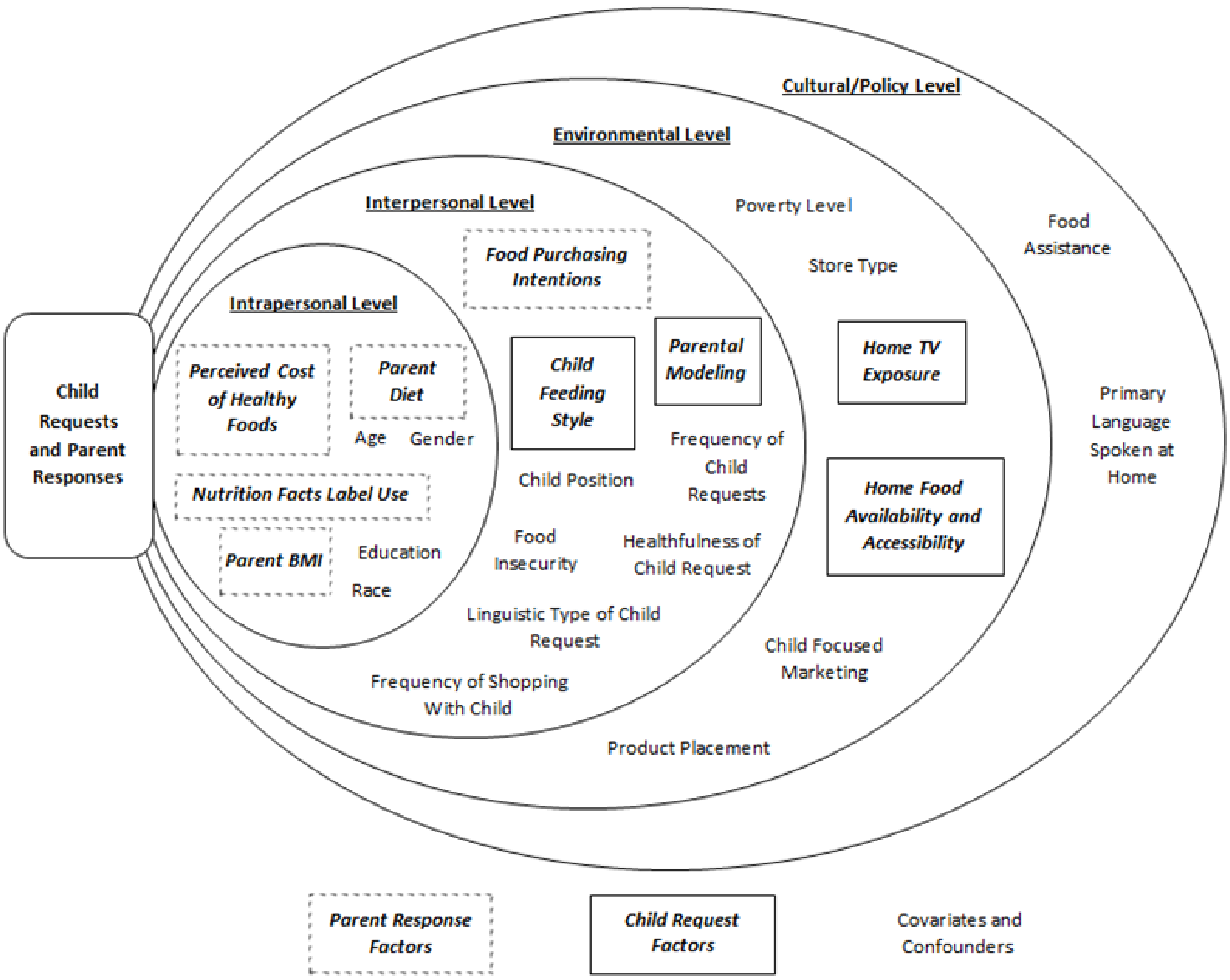

Figure 2. SEM for Parent-Child Food Purchasing Interactions

AIMS OF THIS RESEARCH

The aims of this research include: 1) demonstrating the validity of using a personally-worn micro-camcorder method to assess in-store parent-child food-purchasing interactions and environmental factors related to these behaviors; 2) examining the relationship between child at-home TV-exposure, home food availability/accessibility, parent dietary modeling, and child-feeding style with the healthfulness of child in-store food purchasing requests; and 3) examining the relationship between parent weight status, parent diet quality, food purchasing intentions, perceived relative cost of healthy food, and the use of nutrition facts labels while shopping with the healthfulness of parent responses to child in-store food purchasing requests.

CHAPTER 3: VALIDATION OF PARTICIPANT-WORN MICRO-CAMCORDER METHOD FOR ASSESSING PARENT-CHILD FOOD PURCHASING INTERACTIONS

ABSTRACT

The healthfulness of family grocery shopping has a large impact on the home food environment. Parents and their preschool-aged children often grocery shop as co-shoppers where children make requests and parents respond to child requests or consult children on purchasing decisions. The study of these parent-child food purchasing interactions has relied on in-person observational methods. These methods of data collection can be inefficient, prone to observer bias, and may provide incomplete and inaccurate data. An alternative method examined in this study is the use of participant worn micro-camcorders (PWMC) to collect data on parent-child food and beverage purchasing interactions in the grocery store. This method has the potential to collect an accurate and near complete record of events on multiple participants simultaneously.

Parent-child dyads (n=32) were met at their usual grocery store and shopping time. Parents were mostly Caucasian (n=27, 84.4%), mothers (n=30, 93.8%), and had a college degree (n=29, 90.6%). Children were 2-6 years old with 15 girls and 17 boys. A micro-camcorder was affixed to a baseball style hat worn by the child. The dyad proceeded to shop while being shadowed by an in-person observer. Video/audio data were coded by trained raters for behavioral (e.g., child request type) and environmental (e.g., product shelf-placement) variables. The PWMC method was compared to in-person observation to assess sensitivity and relative validity for measuring

parent-child interactions, and compared to receipt data to assess criterion validity for evaluating purchasing decisions (purchased vs. not purchased). Inter-rater reliability for coding video/audio data collected using the PWMC method was also assessed.

The PWMC method proved to be more sensitive than in-person observation revealing on average 1.4 ($p<0.01$) more parent-child food and beverage purchasing interactions per shopping trip. Inter-rater reliability for coding PWMC data showed moderate to almost perfect agreement (Cohen's kappa =0.461-0.937). The PWMC method was significantly correlated with in-person observation for measuring occurrences of parent-child food purchasing interactions (rho=0.911, $p<0.01$) and characteristics of those interactions (rho=0.345-0.850, $p<0.01$). Additionally, there was substantial agreement between the PWMC method and receipt data for measuring purchasing decisions (Cohen's kappa=0.787).

The PWMC method proved well suited to assess parent-child food and beverage purchasing interactions in the grocery store.

INTRODUCTION

Young children frequently accompany their parents to the grocery store (18-20), where parents consult children on purchases by making food offers and children make food purchasing requests (18, 37). Parent-child interactions in the grocery store are estimated to contribute to one-third to one-half of family food purchasing decisions (18, 30).

Perhaps because of the costs and constraints of in-person observation, investigation of factors that affect parent-child in-store food purchasing interactions has mainly been from a marketing perspective. The four Ps of marketing (i.e., placement, product, promotion, and price) represent major strategies used to influence food purchasing (15). For example, placement of products at eye level more easily attracts parent and child attention and may stimulate offers and requests (31, 127). Food product characteristics (e.g., food type) can affect purchasing interactions as research with older children has shown child influence may vary depending on the type of food product requested (27, 28). Promotion such as child-focused marketing on packaging (e.g., cartoon characters, TV tie-ins, colorful shapes, images of other young children, etc.) is meant to attract child attention and largely promotes unhealthy foods in the grocery store (48, 53, 100). Price can be a limiting factor for food purchasing and may influence parental response to child requests (58, 128). In addition to the four Ps of marketing, other environmental and personal factors influence parent and child shopping behaviors. The linguistic type of child request (appeal vs. demand) has been shown to affect parental response (31), and child physical position during shopping trips (i.e., in the cart, walking, or being held) was associated with the amount of total child requests (31). Tools used to measure parent-child food purchasing behaviors need to have the capability to measure these environmental factors.

Research of parent-child food purchasing interactions has relied heavily on in-person observational techniques which have practical constraints. In-person coding multiple simultaneous variables in the field can lead to a risk of observer bias and inaccuracy, limited ability to assess inter-rater reliability, and a labor/time/cost intensive data collection process. There is a need for an efficient, accurate, and reliable method for collecting in-store data on parent-child food purchasing behaviors and environmental factors. A possible solution is using a participant worn micro-camcorder (PWMC) method to collect in-store observational data.

The purpose of this study was to describe the benefits and limitations of using a PWMC method to collect and code data on parent-child food purchasing interactions and resulting purchase decisions in the grocery store, and assess validity, inter-method sensitivity and inter-rater reliability. Variables of interest are behavioral characteristics of parent-child in-store food purchasing interactions and environmental factors that have been shown to be important for understanding these behaviors. Variables include food description (to match observed purchases with receipt data), food type, presence of child focused marketing, price, product placement, child position during shopping, occurrence of parent-child food purchasing interaction, initiation of interaction (child vs. parent), type of child request, parental response, child response, and purchase decision (15, 26, 28, 31, 37, 48). Qualitative/experiential findings such as strengths, limitations and implications for research are included in addition to assessment of **relative sensitivity** (For measuring *occurrences* of purchasing interactions), **inter-rater reliability** (For coding PWMC data), **relative convergent validity** (For measuring *occurrences* of purchasing interactions per trip, and *characteristics* of purchasing interactions), and **criterion validity** (For measuring *purchase decisions*).

METHODS

Recruitment and Enrollment

Recruitment of parent-child dyads was conducted at four preschools in Central Texas and via an email mailing list. Three of the recruitment sites were located in low-income zip codes with an average annual household income at or below 150% of the federal poverty line for a family of four people. An additional recruitment site was in a higher income zip code with an average annual household income approximately 270% of the federal poverty line for a family of four people. The email mailing list recruited from faculty, staff, students and alumni of the University of Texas at Austin. There was also inadvertent sampling when recruited parents posted study links on parenting related web-forums or mentioned the study to friends.

One parent-child dyad was recruited per family. Inclusion criteria were: 1) have a child aged 2-6 years; 2) be the primary food purchaser for your family (performs ≥50% of the food purchasing duties); 3) be willing to shop in a one-parent and one-child dyad; and 4) converse in English. Preschool-aged children were chosen because their dietary preferences are more modifiable (i.e., more suitable subjects for future nutrition intervention studies) and children in this age group make more purchasing requests than older children (26, 31). The primary food purchaser was included to ensure behaviors in the store reflect as closely as possible usual parent-child interactions. Parent-child dyads (i.e., one parent and one child configuration) were used because this is the most common shopping configuration when parents shop with children (18, 24).

All parents provided consent prior to enrollment. This study was approved by the University of Texas at Austin's Institutional Review Board for Human Subjects.

Observation Procedure

Dyads were observed at their usual grocery store and shopping time. One grocery shopping observation was scheduled per family during a "major" shopping trip. Because families have different grocery shopping patterns, the recruited parent determined if a trip constituted a "major" shopping trip for their family. Dyads were met outside the grocery store for instructions. The child put on a baseball style hat facing backwards and the micro-camcorder (Veho VCC-004-ATOM; 4cm x 2cm x 2cm) was clipped to the strap so to face the same direction as the child's face (Figure 3.). To ease any apprehension the children were allowed to hold the camera and ask questions about it before beginning. They were also told in advance they could bring and use their own hat if it had an acceptable strap to mount the camera. Children were given colorful stickers and parents were given a $15 gift card for participating. Micro-camcorders were not worn by parents due to privacy concerns expressed by a subset of parents regarding having their children's images in the video recordings. The micro-camcorder had a removable memory card slot, could capture color images, had a battery life of 60 minutes, and a sensitive microphone.

Before shopping, the parent answered questions including: "When was the last time you and your child ate a meal or snack?"; "Are you or your child feeling ill?"; "Does anyone you are shopping for have any food allergies?"; And "Is anyone you are shopping for on any special diet outside of their normal diet?". Dyads that were ill or had not eaten in the last three hours were rescheduled. The dyad then proceeded to shop while being overtly shadowed by an in-person observer. The observer followed behind the dyad as they shopped to record parent-child behaviors and environmental factors onto an observation form. The observer remained as unobtrusive as possible, maintained a distance of 2-5 meters and did not interact with the dyad as they shopped. A similar overt

Figure 3. Method for Mounting Micro-Camcorder

shadowing method was used by Galst and White (17). Only one in-person observer was used throughout the study. After the shopping trip was completed, the parent provided the observer with their grocery receipt.

Observation Form

A prototype observation form was created based on expected behaviors and environmental factors presented in the literature (15, 26, 28, 31, 37, 48). The observation form was arranged in a grid format with behavioral/environmental factors (e.g., 'child request type', presence of 'child focused marketing', 'food type', etc.) as column headings and each row representing an individual parent-child food purchasing interaction. Within each box were multiple numerical codes that could be quickly circled by an in-person observer. These codes represented anticipated behavioral/environmental subtypes of each column heading (e.g., codes that specify the type of child request). The prototype form was pilot tested with four dyads and the coding scheme was refined. Final column headings included: 'time' the parent-child interaction took place, 'food description', 'food type', presence of 'child focused marketing' on the packaging (present vs. not), food 'price', 'product placement' (child eye level, above, below, not present), 'location in store' (aisle/location description), 'child position' code (in cart, walking, or carried), 'initiation of interaction' (parent vs. child), 'type of child request', type of 'parental response' to child request, type of 'child response' to parent offer, type of 'parent subsequent response', 'purchase' (yes vs. no), and 'comments'. See Appendix A.

Coding Guide

The same coding guide and observation form was used for both in-person observation and for coding PWMC data.

Parent-child food purchasing interaction: Any instance when both a food choice is being made and an interaction occurs, verbal or non-verbal, between the parent and child regarding the food choice regardless of whether it is purchased or not.

Food description: Brief description of the food item was made, including distinguishing characteristics (e.g., 2% fat cow's milk) and brand name when possible.

Food Type: Food group assignments were based on a food's culinary category, not botanical category (e.g., tomatoes are coded as vegetables). Food groups included grains, fruits, vegetables, meat (poultry, beef, pork, lamb, and fish), beans, nuts/seeds, dairy, sugar sweetened beverages (SSB), snack foods (SF), breakfast cereal, fruit juice, composite items, and other. SSB included all sugary soft drinks, non-100% fruit juice, sports drinks, and sugary punch drinks (e.g., Kool Aid). SF included salty snacks like potato chips and other chip variations, and sweet snacks such as cookies, cakes, and ice cream. The 'other' category included condiments, non-caloric beverages, and raw ingredients like cooking oil. Some food items of ambiguous classification were coded conservatively taking into account added sugar, total fat, and/or sodium content before other macro/micro nutrients. These included flavored milk (coded as 'SSB'), popcorn (coded as 'SF' due to association with added butter), pretzels (coded as 'grain'), and pickles (coded as 'other'). Foods made of multiple food types were coded as composite items.

Child focused marketing: Child focused marketing was on packaging such as images of cartoon characters, animals, children, child television tie-ins, and/or toys/games/prizes. Also, packaging shaped like animals, cartoon characters or toys was considered child focused marketing (48, 49, 53).

Price: Price of the food as it appeared on the shelving price tag and/or on the packaging.

Product placement: Placement was defined as the spatial relationship between the food product and the child's eye level. If the child is less than 5 feet (1.5 m) away from the product, 'eye level' is considered shoulder-level to 8" (20.3 cm) above the head. If the child is over 5 feet (1.5 m) away, 'eye level' is considered hip-level to 20" (50.8 cm) above the head (31). If the child requested an item that was not in the viewing area or not in the area of the store in which the request was made it was coded as 'not present/not visible'.

Child Position: Position was coded as 'riding in the cart', being 'carried by parent', or 'walking' (31).

Initiation of parent-child food purchasing interaction: Parent offers were parent initiated interactions, and child requests were child initiated interactions (37). To be coded as a *Parent offer*: the parent must be consulting the child on the purchase of a specific food or food group, or directing the purchasing-offer towards a specific food product or food group. Nonspecific open-ended questions about foods were not considered parent offers. To be coded as a *Child Request*: the child must be asking or mentioning the food with the intent of influencing the parent to purchase the product. Requests for free samples or simple observations were not counted. If the child simply pointed out or mentioned a food, and it was not explicitly clear whether this was a request or not, the parent response was used to determine the influence attempt. If the parent responded in a way that indicated a request was made (e.g., "No we don't need that") then it was coded as a request. Also, if the child responded to a nonspecific open-ended offer by the parent such as "What do you want to eat?", a child response to such a question was coded as a child request. Child requests were coded for linguistic type.

Type of Parent Offer: Although different types of parent offers are conceivable (e.g., "Do you want this fruit or this other one?" or "Will you stop fussing if I promise to buy you this?"), parent offers were not coded by type because little guidance was found in the published literature and parent offers were expected to be relatively homogenous.

Type of Child Request: Coding included ‘simple ask/point out’ food to influence purchasing; ‘demands’ included the words “I want”, “I need”, or related terms with an elevated/excited mood; ‘bargains’ included requests for food in which the child promised something in return (e.g., “I will be good for the rest of the trip if you purchase this”); and any attempts to ‘put an item in the cart’ without asking.

Parental Response Type: Categories for coding the responses included ‘flat yes’, ‘offering a cheaper brand’, ‘offering a healthier option’, ‘bargain’ (e.g., “I will buy this if you are good”), ‘flat no’, ‘no with a reason’, or ‘stall/ignore’.

Child Response Type: Categories included ‘agreement/no response’, ‘disappointment/anger/tantrum’, ‘ask again’, ‘bargain’, or ‘no’

Purchase Decision: Purchases resulting from parent-child interactions occurred when either a parent or child responded affirmatively to, or did not resist, a food request or offer.

Video Coding Procedure

Three raters were trained to code videos for this study. Training included the provision of verbal instruction and a detailed coding guide, followed by a coding demonstration. After initial training was completed, the raters independently practiced coding videos that were collected in a pilot test of the PWMC method. Raters' coding of the videos was discussed and corrections were made. Raters continued to code the videos while receiving feedback until they achieved ≥80% agreement with the lead author for coding occurrences of parent-child food purchasing interactions. Two trained raters independently coded each video collected in the current study onto separate observation forms (formatted identically to the in-person observer’s form). Raters made two quality assurance passes over their dataset: 1) to ensure each coded interaction complied with the coding guide, and 2) to check for inconsistencies and coding errors. Datasets were reconciled by a third trained rater. Before analysis, the reconciled dataset was checked for coding errors and inconsistencies by the lead author.

Qualitative/Experiential Methods

Field notes were taken during the observation and coding phases of this study. These notes, as well as participant scheduling records and other documentation, were consulted to describe practical information and limitations of the technology and process.

Statistical Approach

To assess *relative sensitivity of the PWMC for measuring occurrences* of parent-child food purchasing interactions per shopping trip, the PWMC method was compared to in-person observation. Comparison was made using a two-tailed t-test for paired samples with alpha level set at 0.05.

To assess inter-rater reliability between two independent video raters for coding PWMC video/audio data, Cohen's kappa was calculated with the measure of success being >0.6 (129). Variables assessed included food type, presence of child focused marketing, price, product placement, child position during shopping, initiation of interaction (child vs. parent), type of child request, parental response, and child response.

To assess *relative convergent validity for measuring occurrences* of parent-child food purchasing interactions per shopping trip, the PWMC method and in-person observation were compared using Spearman's rank correlation coefficient with a measure of success being alpha level 0.05. Because an objective measure of occurrences of interactions was not available for this study, only relative validity was established for measuring this variable.

To assess *relative convergent validity for measuring characteristics* of parent-child food purchasing interactions between the PWMC method and in-person observation, comparison was made using Spearman's rank correlation coefficient with a measure of success being alpha level 0.05. Variables assessed were the same as those used for H2. Because an objective measure of the characteristics of interactions was not available for this study, only relative validity was established for measuring these variables.

To assess *criterion validity for measuring purchasing decisions* resulting from parent-child interactions, coded PWMC data were compared to grocery receipts. All parent-child food purchasing interactions revealed using the PWMC method were coded for purchased vs. not purchased, and detailed descriptions of each food were made. Grocery receipt data were searched to determine which foods were purchased or not purchased for each dyad. Cohen's kappa was calculated to determine inter-method reliability. Kappa >0.6 is considered substantial agreement (129). Because an objective measure (receipt data) is available for this variable, criterion validity was established for measuring purchases decisions that result from purchasing interactions.

When interactions were not shared (i.e., not coded on one dataset or the other) between methods or raters, two sample z-tests were used to compare proportions of coded variables between shared and unshared interactions. All analysis was performed using Statistical Analysis System (SAS) version 9.2.

RESULTS

Demographics

The recruited sample of 43 parent-child dyads who scheduled shopping observations yielded complete data from 32 dyads (74.4%). Because this validation study began before all recruitment was finished, these 32 dyads are a subset of the final sample. Of the 11 dyads without complete data, 8 were no-shows and could not be rescheduled, one child was ill and could not be rescheduled, one child requested an inordinate amount of foods during the trip and the father indicated the behavior was very atypical, and one child refused to wear the micro-camcorder. Most parent-child dyads in the analytic sample had a Caucasian parent (n=27, 84.4%) and a parent with a college degree (n=29, 90.6%). Half of the dyads had an annual family income above $80,000 (n=16, 50.0%) with a small minority below $40,000 (n=5, 15.6%). Mean parent age was 36.4 years (SD=4.5) and mean child age was 3.9 years (SD=1.1). Parents were predominately mothers (93.8%, n=30) and children were approximately evenly split by sex with 15 girls and 17 boys.

Qualitative/Experiential Findings

Dyads primarily shopped on weekends (n=20, 62.5%) with the remainder evenly scattered throughout the week, and either before 12:00pm (n=13, 40.6%) or between 12:00-5:00pm (n=15, 46.9%). Hat/micro-camcorder acceptability was high with only one child-refusal, though a few children required coaxing from their parent. The child-mounted micro-camcorder captured images of 86.0% of food items discussed during parent-child food purchasing interactions. All discussed food items were either mentioned by brand name/food name, shown in frame, or both. Video images possessed sufficient clarity to assess product type/brand, packaging characteristics such as child focused marketing, and read grocery shelf price tags (~2 cm font size) from up to approximately 2 meters away. The microphone was able to plainly capture the parent's voice from 3-5 meters away from the child. The mean shopping time was 32.8 minutes (SD=10.8, Range 11-55) and the reported battery life of 60 minutes was never reached. Coding each video took approximately 1.25 times the length of the video per rater. The micro-camcorders used were relatively inexpensive and available commercially for about $80 each at the time of the study.

Some problems with the technology were encountered during the study; however most of these issues can be addressed easily. Data storage requirements are high with videos stored in AVI format and file size ranging from 0.7-2 GB per participant. The camera malfunctioned once during a shopping trip, likely due to being left on the charger for too long (24 hours), and had to be replaced. The buttons on the camera are sensitive and make it vulnerable to inadvertent shut-offs so parents were asked to tell children not to touch the camera during the shopping trip. Rapid head movements by the child caused blurred images, though during interactions this was rarely an issue as the child's attention was focused on the parent and/or food item being discussed.

Relative Sensitivity

Rater A coded 324 total parent-child food purchasing interactions. Rater B coded 313 total parent-child food purchasing interactions. Rater A coded 39 interactions that were not in rater B's dataset, and rater B coded 28 interactions that were not in rater A's dataset, leaving 285 ‘shared’ interactions that appeared on both rater’s datasets. A third rater confirmed that 38 of rater A’s unshared interactions were valid and 26 of rater B’s unshared interactions were valid leaving a final PWMC sample of 349 total parent-child food purchasing interactions (M=10.9, SD=5.0 per trip). In-person observation revealed 305 total parent-child food purchasing interactions (M=9.5, SD=4.7 per trip). The PWMC data collection method revealed significantly more interactions ($t(31)=2.98$, $p<0.01$).

Inter-Rater Reliability

The 285 coded interactions identified using the PWMC method that were shared on both raters’ datasets represented 81.7% of the total PWMC collected interactions and were assessed for inter-rater reliability of second level coding (i.e., coding for characteristics of food purchasing interactions). Variables assessed for inter-rater reliability include food type, presence of child focused marketing, price, product placement, child position during shopping, initiation of interaction (child vs. parent), type of child request, parental response, and child response. The distinction between a child walking, sitting in the cart, or being carried was very apparent leading to perfect agreement between methods and raters, and so child position was not included in Tables 1 and 2. Product price was only able to be determined for 46.1% of food items (n=161) with the PWMC method and so price was also excluded from Tables 1 and 2.

Interactions shared on both raters’ datasets (n=285) were compared to unshared interactions (n=64) to assess differences in proportions of identified characteristics between the datasets. There was no difference for percent of interactions by food type, initiation (child vs. parent), child request type (simple ask vs. other), child response (agree vs. other), or products at child eye level. Two assessed characteristics were significantly different between datasets. Parent response (flat yes vs. other) to child requests in the shared dataset (51.1%) were more likely to be a “flat yes” than parent responses in the unshared dataset (25.8%), $p<0.01$. Child requests in the shared dataset (9.8%) were more likely to have child focused marketing on the packaging than those in the unshared dataset (3.1%), $p<0.05$.

Table 1 shows kappa scores and percent agreement between raters. All assessed variables for shared data had kappa scores ranging from moderate to almost perfect agreement between raters.

Coding for ‘child request type’ showed very good overall percent-agreement, but resulted in only moderate kappa scores. The PWMC method revealed a total 172 requests and children displayed only two request types: ‘simple asks/point out’ (n=159) or ‘demands’ (n=13). Percent agreement for instances when at least one rater coded a ‘simple asks/point out’ was 92.6%, while percent agreement when at least one rater coded a ‘demand’ was only 33.3%. The limited variability of child request types makes it difficult to establish inter-rater reliability as between-rater disagreement becomes exaggerated compared to the within-rater variability. Child responses to a parent initiated food purchasing interaction were also of predominately one type, but parent responses to child initiated interactions were varied. Children displayed three response types to parent offers including ‘agreement/no response’ (n=160), ‘no’ (n=14) and ‘disappointment/anger/tantrum’ (n=3). Parents displayed seven types of responses to child requests including ‘flat yes’ (n=80), ‘flat no’ (n=41), ‘no with a reason’ (n=29), ‘stall/ignore’ (n=11), ‘offering a healthier option’ (n=5), ‘offering a cheaper brand’ (n=4) and ‘bargain’ (n=2). Another variable that showed relatively lower agreement scores was ‘product placement’. The definition used in this study was complicated and proved to be poorly suited for video coding, likely contributing to moderate kappa scores and percent agreement.

Table 1. inter-rater reliability for coding characteristics of parent-child food purchasing interactions using PWMC[1] method audio/video data

Inter-rater reliability[2]	**kappa**	**ASE**	**95% CI**	**Percent Agreement**
Food type[a]	0.906	0.019	0.868-0.944	92.6%
Initiation of interaction[b]	0.937	0.021	0.896-0.977	96.8%
Child request type[c]	0.466	0.141	0.189-0.743	94.9%
Parent response type[d]	0.670	0.048	0.575-0.764	76.8%
child response type[e]	0.695	0.095	0.509-0.881	93.5%
Items with CFM[f]	0.754	0.063	0.631-0.877	95.1%
Product placement[g]	0.461	0.046	0.370-0.552	68.8%

1: participant-worn micro-camcorder; **2**: compared 285 interactions in both raters' datasets using Cohen's kappa
a: 13 food and beverage categories; **b**: parent or child initiated; **c**: simple asks vs. demands; **d**: 7 types of parental responses; **e**: 3 types of child responses; **f**: presence of child focused marketing; **g**: below, at, or above eye-level or not in immediate area

Relative Validity and Criterion Validity

The amounts of parent-child food purchasing interactions identified for each of the thirty-two observed shopping trips were compared for each method. The in-person observation method identified a median of 8 (range 4-23) parent-child interactions per trip, and the PWMC identified a median of 10 (range 3-24). The two methods were compared using Spearman's rank correlation coefficient and were highly significantly correlated (Table 2).

Of the 349 interactions coded using the PWMC method and the 305 interactions coded using in-person observation, 206 interactions were recorded for both methods and are called 'shared'.

There are 143 ‘unshared’ interactions that appear only in the PWMC dataset and 99 ‘unshared’ interactions that appear only on the in-person observation dataset. Shared and unshared interactions were compared for differences in proportions of coded request characteristics between shared and unshared subgroups, as well as within shared and unshared subgroups. Shared interactions (i.e., PWMC (n=206 vs. in-person observation (n=206)) were not significantly different for any assessed variable including food type, initiation (child vs. parent), child request type (simple ask vs. other), child response (agree vs. other), parent response (flat yes vs. other) to child requests, requests with child focused marketing on the packaging, or interactions at child eye level. For unshared data (i.e., unshared PWMC (n=143) vs. unshared in-person observation (n=99)), interactions that appear only on the PWMC dataset are more likely to be “simple asks” (100% of child requests vs. 93.0%; $p<0.05$), and less likely to have child focused marketing on the packaging (4.9% vs. 13.1%; $p<0.05$) or be at the child’s eye-level (56.6% vs. 73.7%; $p<0.01$) compared to interactions that appear only on the in-person observer dataset; while all other variables were not significantly different. Comparing pooled shared and pooled unshared data [i.e., (unshared PWMC (n=143) vs. shared PWMC (n=206) and (unshared in-person observation (n=99) vs. shared in-person observation (n=206)] showed no significant differences for variables measured.

Final datasets collected using the PWMC method and in-person observation were correlated to assess relative validity for measuring environmental and behavioral characteristics of interactions. The two methods were highly significantly correlated for assessing all measured characteristics of parent-child food purchasing interactions, other than price, indicating a strong linear relationship (Table 2).

Purchase decisions (purchased vs. not purchased) coded for the final PWMC dataset showed substantial agreement with receipt data (Table 2). This finding is strong evidence that the PWMC method can be used to accurately assess purchase decisions resulting from parent-child interactions, and additional collection of food receipts may not be necessary for this purpose.

DISCUSSION

The PWMC method described in the study showed high agreement with existing data collection methods and should be considered a valid technique to collect observational data on parent-child food purchasing interactions with preschool-aged children in the grocery store.

The micro-camcorder used in this study performed well, although some safeguards should be in place to ensure practicality and data quality. Future studies should ensure they compress files or have high data storage capacity due to large file size of each video, create study protocol for battery charging to ensure cameras are not left on the charger for longer than recommended by the manufacturer and have funds budgeted to replace damaged micro-camcorders, and use protective transparent covers to encase the micro-camcorder to ensure children do not inadvertently turn off cameras during observation.

The PWMC method proved to be significantly more sensitive for recording instances of parent-child food purchasing interactions compared to in-person observation. Both methods in this study recorded a wide range of amounts of interactions per trip, from less than 5 to greater than 20. Similar ranges have been reported in a previous study of parents and young children (0-12 years old) shopping in toy and grocery stores (25). In that study parents were observed making 0-8 offers and children made 0-18 requests per shopping trip (25). The increased sensitivity of the PWMC method is likely due to the close proximity of the camcorder to the dyad and ability to scrutinize and code videos in a controlled environment. However, the PWMC method required three raters to achieve a significant sensitivity advantage vs. one in-person observer which may introduce bias and explain this result. This finding indicates the PWMC method demonstrates superior sensitivity compared to in-person observation when multiple raters are used.

Although raters coding PWMC method data were able to reliably code most characteristics of parent-child food purchasing interactions, augmentation of the method and coding terminology is needed to better assess price, product placement and child request types.

Price data could not be obtained for over half of the parent-child interactions. The large proportion of missing price data was due to the reliance on a shelf/packaging price tag being present, the child facing the direction of the tag, and being in range (≤2 meters, depending on font size) for the tag to be legible. Reliable collection of price data may require collection of participants' receipts combined with in-store/website follow-ups to fill-in missing data. Alternatively, adding a parent camera might solve this problem without additional data collection, but would be more cumbersome and may be unacceptable for parents who do not want their child's face to appear in videos.

Product placement on the shelf relative to child eye level proved difficult to code, leading to only moderate inter-rater reliability. A modification of the operationalization of this variable is needed. Perhaps operationalization should not require video coders to assess spatial relationships between the child and food, but instead uses aspects of the shelving itself (e.g., the order of the shelves) to assess product placement. A more straightforward definition using low-, middle-, or high-shelf designations used by Sigurdsson et al. would have simplified the coding scheme, though ambiguity may exist when coding for products on different shelf configurations or on shelves between low and middle, and middle and high (127). Valenzuela et al. defined product placement in a grid format by assigning each shelf (row) a letter and visually dividing the shelving into numbered columns (130). This method allowed for specific assignment of product placement (e.g., position E4) without having to take into account the spatial relationship between the shopper and product and may be better suited for video assessment.

Finally, when a child request was not a blatant 'simple ask', the raters had difficulty reliably coding a 'simple ask' vs. a 'demand'. Although the children in this study predominately made 'simple asks' (92.4%), and the literature similarly shows that young children (3-11 years old) predominately use 'simple asks' (75.9%) when making requests (26), careful consideration should be given to operationalization of more sophisticated request types and a third rater should be used to reconcile disagreement.

This study's main objective was to establish validity of the PWMC for assessing three primary elements of parent-child food purchasing interactions: occurrences of parent-child food purchasing interactions, characteristics of those interactions, and purchasing decisions resulting from those interactions. Due to lack of objective measures for occurrences and characteristics of parent-child food purchasing interactions, only relative validity was established. However, for assessing purchasing decisions, receipt data were available as an objective measure, and so criterion validity was established.

Table 2. Relative validity comparing PWMC[1] method to in-person observation, and criterion validity comparing PWMC[1] method to receipt data for observed shopping trips (n=32)

Relative validity[2]	**n**	**rho**	**p value**
Number of interactions per trip	32	0.911	<0.01
Food type[a]	206	0.850	<0.01
Initiation of interaction[b]	206	0.690	<0.01
Child request type[c]	94	0.499	<0.01
Parent response type[d]	94	0.345	<0.01
Child response type[e]	80	0.715	<0.01
Items with CFM[f]	187	0.553	<0.01
Product placement[g]	187	0.563	<0.01

Criterion validity[3]	**n**	**kappa**	**ASE**	**95% CI**	**Percent Agreement**
Purchase decisions[h]	349	0.787	0.035	0.718-0.856	90.5%

1: participant-worn micro-camcorder; **2**: validity of PWMC relative to in-person observation, compared using Spearman's rank correlation coefficient; **3**: validity of PWMC method to measure purchase decisions compared to objective receipt data using Cohen's kappa
a: 13 food and beverage categories, 206 interactions coded by both methods; **b**: parent or child initiated, 206 interactions coded by both methods; **c**: simple asks vs. demands, 94 interactions coded for child initiation by both methods; **d**: 7 types of parental responses, 94 interactions coded for child initiation by both methods; **e**: three types of child responses, 80 interactions coded for parent initiation by both methods; **f**: presence of child focused marketing, 187 products coded by both methods and that visibly appeared in frame using the micro-camcorder; **g**: below, at, or above eye-level or not in immediate area, 187 products coded by both methods and that visibly appeared in frame using the micro-camcorder; **h**: purchased vs. not purchased, PWMC compared to receipt data, 349 purchasing interactions coded via PWMC method

Significant between-method correlations were seen for measuring occurrences and characteristics of parent-child food purchasing interactions, indicating relative validity of the PWMC method compared to in-person observation. The lowest significant correlation (other than price which could not be reliably assessed) was for 'parent response type' (rho=0.345). This is likely due to the location of the micro-camcorder compared to the in-person observer. The parent's voice was usually projected away from the observer (who traveled behind the dyad), but toward the micro-camcorder worn by the child, enabling the PWMC method to more easily assess this variable.

Inter-method validity was established for measuring purchasing decisions as well. A purchasing decision was considered to have been made when the parent responded affirmatively (i.e., yielded) to a child request, or the child responded affirmatively to a parent offer. Rates of parent yielding (46.5%) and child yielding (90.4%) in this study were very similar to published observational data for comparable populations (48% and 88%, respectively) (18, 37). This method of assessing purchasing decisions using PWMC data proved to be highly reliable when compared to objective receipt data.

This study was not the first to demonstrate the validity of using video data to assess parent-child behaviors. For example, video data has previously been used with high levels of reliability to assess parent-child interactions in research of preschool-aged child aggressive behaviors (46). Inter-rater reliabilities (intraclass correlations, single rater, absolute agreement) for coding types of child behaviors from video data in that study were high, ranging from 0.73 – 0.98, and correlation with parent assessment was highly significant (r=0.94). However, this study expands the potential application of this technology by demonstrating its validity as a participant-worn device capable of facilitating reliable and accurate coding of data in a natural environment (i.e., grocery store).

Several limitations of the current study exist and should be considered when interpreting the results. Despite efforts to recruit from a diverse set of neighborhoods, this sample was on average more educated and from a higher income group than typical parents of preschool-aged children and so their behaviors may not be reflective of typical behaviors of this population. However, the amounts and types of interactions observed in this sample are similar to parent-child behaviors reported in other studies (18, 25, 26, 37). A second limitation is the lack of an acclimatization phase which would allow participants to get accustomed to the presence of the micro-camcorder and observer, and reduce reaction effects (45). This is unlikely to directly affect child behaviors, but may have some effect on the healthfulness of parent food offers and responses to child requests. Although, observation conditions were identical for the data collection methods assessed in this study so the results are not likely influenced. Additionally, in-person observation is coded prospectively in real time, making this data prone to observer bias; while PWMC data, though collected prospectively, is coded retrospectively and under different conditions. Having one observer in the field means assessment of reliability of in-person observation was not possible, so it is unknown if this effected the study's findings. Finally, the use of one in-person observer compared to three video coders may introduce bias and explain some of the sensitivity advantage seen with the PWMC method.

CONCLUSIONS

The primary advantages of using the PWMC method include the ability to collect a comprehensive record of events beyond the capabilities of an in-person observer (38), especially when coding multiple factors in the field that occur in relatively rapid succession (44), and coding of data occurs in a controlled lab setting where multiple coders can scrutinize video/audio, minimizing observer bias and error, and leading to a high expectation of accuracy and reliability (38). To add to the PWMC method's advantages compared to in-person observation, future research needs to be conducted to explore its efficiency potential. For instance, participants could be trained to use the camera while shopping and email back raw digital data at scheduled time points to efficiently gather longitudinal data without the researcher burden associated with in-person observation. A major disadvantage, compared to covert observational techniques, is the introduction of reaction effects due to participant awareness of data collection. Therefore the PWMC method is best suited for data collection in intervention studies with parent-child shopping behaviors and in-store factors as primary outcomes, exploratory studies with the goal of hypothesis development, or studies that seek to validate observational techniques by comparison to PWMC data. This is the first study to validate a PWMC method to collect data on parent-child purchasing interactions in the grocery store. The PWMC method proved well suited for this purpose, though future studies are needed to explore the method's efficiency potential, improve collection of price data, coding of product placement, and distinguishing sophisticated child request types.

CHAPTER 4: FACTORS ASSOCIATED WITH THE HEALTHFULNESS OF CHILD IN-STORE FOOD PURCHASING REQUESTS

ABSTRACT

To intervene and improve the healthfulness of food purchasing for families with young children it is important to understand factors associated with the healthfulness of child in-store food purchasing requests; however, there is little guidance in the nutrition and health literature. The purpose of this study was to investigate the relationship between the home food environment (availability and accessibility), parental dietary modeling, child-feeding style, and child TV exposure with the healthfulness of child food purchasing requests in the grocery store.

Parent-child dyads were recruited from five preschools in Central Texas and via an email mailing list. Dyads were observed shopping at their usual grocery store and shopping time. Data for parent-child behaviors and environmental factors in the grocery store were collected using small child-worn audio/visual recording devices attached to a hat. Parents also completed a questionnaire measuring the home food environment and food behaviors. Child total food requests per minute of shopping time, and healthy and unhealthy food requests per minute of shopping time were compared to independent variables in univariate analysis, and odds of making a healthy request were analyzed in an adjusted request level model.

Overall, children made 80 (36%) healthful requests and 142 non-healthful requests. Of these requests, 85 were for snack foods, SSBs, or sugary cereals, while 60 were for fruits or vegetables. Children who were non-white made more healthy food purchasing requests per

minute of shopping time in univariate analysis (P=0.03), compared to white children. In the adjusted request level model, having parents with high levels of unhealthy dietary modeling was associated with lower odds of a request being healthy (OR=0.50, P=0.02), and having parents who practice non-directive child-feeding was associated with increased odds of a request being healthy (OR=1.66, P=0.03).

Although more research is needed to establish causality, these results suggest that parents' food behaviors at home may influence the healthfulness of child requests in the grocery store, and family-based interventions that seek to improve the healthfulness of food purchasing in families with young children should include components to address parental dietary modeling and child-feeding practices.

INTRODUCTION

Many preschool-aged children in the USA are overweight and do not consume recommended amounts of nutrient dense foods such as fruits and vegetables (1, 132). One possible family-based approach to increase consumption of healthy foods and beverages and reduce consumption of unhealthy foods and beverages by preschool children is to influence grocery store purchasing behaviors of parents and children who often act as co-shoppers. Young children frequently accompany their parents to the grocery store (18-20), where children make food purchasing requests (18, 37). Children are estimated to influence one-half to one-third of family food purchases (19, 30).

Child co-shoppers can make up to 18 purchasing requests per grocery shopping trip (25) with preschool-aged children making more requests than older children (26). These requests are often for unhealthy foods (18, 26) and parents report child food preferences as a barrier to healthful grocery shopping (21). Child requests have the most influence over the type of foods purchased rather than the quantity, and the types of foods children have most influence over tend to be unhealthy food groups such as breakfast cereal, sweets and soft drinks (27, 28). To intervene and improve the healthfulness of food purchasing for families with young children it is important to address child in-store food purchasing requests.

There is little guidance in the literature for modifiable factors associated with the healthfulness of child requests. Environmental and behavioral factors that have been shown to affect food preference, dietary intake, and related food outcomes are likely to also be related to the healthfulness of child requests in the grocery store. For preschool-aged children, the primary environment in which they are exposed to food and food behaviors is the home (12, 13, 69). Major modifiable home food environmental factors that have been associated with the healthfulness of child food intake and preference include the types of foods available and accessible in the home, parental child-feeding style, parental dietary modeling, and TV exposure (13, 68, 69, 71, 133).

The examination of modifiable intervention targets associated with the healthfulness of children's in-store food requests is needed. Home food environmental and behavioral factors are likely to be related to child requests in the grocery store. Therefore, the purpose of this study was to investigate the relationship between the home food environment (availability and accessibility), parental dietary modeling, child-feeding style, and child TV exposure with the healthfulness of child food purchasing requests in the grocery store.

METHODS

Recruitment and Enrollment

Recruitment of parent-child dyads was conducted at five preschools in Central Texas and via an email mailing list. Four of the recruitment sites were located in low-income zip codes with an average annual household income at or below 185% of the federal poverty line for a family of four people, and one was in a higher income zip code with an average annual household income approximately 270% of the federal poverty line for a family of four people. The email mailing list recruited from faculty, staff, students and alumni of the University of Texas at Austin. There was also inadvertent sampling when recruited parents posted study links on parenting related web-forums or mentioned the study to friends.

One parent-child dyad was recruited per family. Inclusion criteria were: 1) have a child aged 2-6 years; 2) be the primary food purchaser for your family (performs ≥50% of the food purchasing duties); 3) be willing to shop in a one-parent and one-child dyad for purpose of this study; and 4) converse in English. Preschool-aged children were chosen because their dietary preferences are more modifiable (i.e., more suitable subjects for future nutrition intervention studies) and children in this age group make more purchasing requests than older children (26). The primary food purchaser was included to ensure behaviors in the store reflect as closely as possible to usual parent-child interactions. Parent-child dyads (i.e., one parent and one child configuration) were used because this is the most common shopping configuration when parents shop with children (18, 24).

All parents provided consent prior to enrollment. This study was approved by the University of Texas at Austin's Institutional Review Board for Human Subjects.

In-Store Data Collection Procedure

Dyads were observed at their usual grocery store and shopping time. One grocery shopping observation was scheduled per family during a "major" shopping trip. Because families have different grocery shopping patterns, the recruited parent determined if a trip constituted a "major" shopping trip for their family. Dyads were met outside the grocery store for instructions. Data for parent-child behaviors and environmental factors in the grocery store were collected using very small child-worn audio/visual recording devices attached to a hat. Two types of devices were used; the eButton and the Veho Muvi Atom Super Micro-Camcorder. In-store data collection for the first four participants was performed using the eButton plus a separate audio recorder worn on a lanyard around the neck. The eButton captured a still frame every 1-3 seconds, while the audio recorder collected verbal interactions between the parent and child. Data collection for the remaining participants was performed using the Veho Muvi Atom Super Micro-Camcorder, which collected continuous audio/video data. Both devices were small and inconspicuous. As part of this study, dyads were also shadowed by an in-person observer who recorded data for use in validating the audio/visual collection method (see Chapter 3). The in-person observer remained as unobtrusive as possible, maintained a distance of 2-5 meters and did not interact with the dyad as they shopped. Before shopping, the child put on a baseball style hat facing backwards with the small audio/visual recording device was clipped to the strap so to face the same direction as the child's face (Figure 3). Devices were not worn by parents due to privacy concerns expressed by a subset of parents regarding having their children's images recorded. The dyad then proceeded to shop and behavioral/environmental factors were recorded. Children were given colorful stickers and parents were given a $15 gift card for participating.

Audio/Visual Coding

Three raters were trained to code the raw audio/visual data for this study. Training included the provision of verbal instruction and a detailed coding guide, followed by a coding demonstration. After initial training was completed, the raters independently practiced coding data collected in a pilot test of the PWMC method. Raters' coding was discussed and corrections were made. Raters continued to code the videos while receiving feedback until they achieved ≥80% agreement with the lead author for coding occurrences of parent-child food purchasing interactions. Two trained raters independently coded each shopping trip onto separate observation forms. Raters made two quality assurance passes over their dataset: 1) to ensure each coded interaction complied with the coding guide, and 2) to check for inconsistencies and coding errors. Datasets were reconciled by a third trained rater. Before analysis, the reconciled dataset was checked for coding errors and inconsistencies by the lead author.

Variable Measurement

Data were collected using a self-administered parent questionnaire (Appendix B) or audio/visual data.

Home food availability and accessibility (Index) was measured by parent response to a modified home environment subscale from the Healthy Home Survey (79). Modifications included removing questions about storage-form of fruits and vegetables (i.e., jarred, canned, fresh, and or frozen), and adding questions assessing beans, fatty meats and other SSBs besides soda. The modified scale included nine questions concerning the presence of nine food groups in the home (availability) and nine questions concerning whether the same food groups were stored visibly out in the open or in a form easily consumed (accessibility). Healthful food groups included fruits, vegetables, whole grains, and beans. Unhealthful food groups included salty snacks, sweet snacks, sodas (not including diet soda), other SSBs, and fatty meats. Sample questions: "Do you have any fruit (fresh, frozen, canned, jarred, or dried) in your home?" (availability); "Without opening any doors (including doors to your garage, refrigerator or pantry doors) would you be able to see fruit in your home now, displayed out in the open?" (accessibility). Questions were scored on a five point Likert scale with responses including "Always", "Often", "Sometimes", "Rarely", or "Never". Percent agreement scores assessing validity of this measure were 80.5-96.3% for food availability, and 57.7-78.2% for accessibility (79).

Parental dietary modeling (Index) was measured by parent response to questions from modified "Nutrient-dense food encouraging practice" and "Energy-dense food discouraging practice" subscales of Murashima's index of feeding control (84). These scales were shown to be significantly ($P<0.05$) correlated with child dietary intake of nutrient-dense and/or energy-dense foods (84). Modifications were made in order to be consistent with the food groups measured in the other scales in this study. A question about dairy modeling was removed, while questions about modeling other food groups were added (i.e., soda, fatty meat, and beans). Also, the original question about fruit and vegetable modeling combined the foods into one group and so it was divided into two questions, one about fruit modeling and one about vegetable modeling. Similarly, one question about sweets and salty snack modeling was divided into two questions, one about sweets modeling and one about modeling salty snacks. Finally, SSB was redefined as other SSBs besides soda. Thus, the modified scale included nine questions about parental consumption of nine food groups in the presence of their child. Healthful food groups were fruits, vegetables, whole grains, and beans. Unhealthful food groups were sweet snacks, salty snacks, sodas, other SSBs, and fatty meats. Sample question: "I eat fruit in front of my child." Questions were scored on a five point Likert scale with responses including "Always", "Often", "Sometimes", "Rarely", or "Never".

Parent child-feeding style (Index) was measured by parent response to the "High control", "High contingency", and "Child-centered feeding" subscales of Murashima's index of feeding control (shown to be significantly (P<0.05) correlated with child dietary intake and BMI) (84), and one item included from the KOALA Birth Cohort Study questionnaire ("During meals at home, I get my child enthusiastic about healthy food, such as vegetables, fruit and whole grain products")(96). Two Items were removed from the Murashima et al. subscales, one concerning non-food rewards and one concerning parental assistance in food consumption. Two types of parent child-feeding style were measured. Use of directive feeding-style included use of verbal/physical pressure and threats/rewards to compel children to eat more food. The directive feeding style was measured with the "High control" and "High contingency" subscales validated by Murashima et al. (84). The second feeding style is non-directive feeding in which child-centered encouragement is used to promote child intake, and was measured using the Murashima et al. "child-centered feeding" subscale and the item from the KOALA Birth Cohort Study questionnaire (96). Sample "High control" question: "I beg my child to eat dinner." Sample "High contingency" question: "I warn my child that I will take a food away if the child doesn't eat." Sample "Child-centered feeding" question: "I say something positive about the food my child is eating during dinner to get him or her to eat.” Questions were scored on a five point Likert scale with responses including “Always”, “Often”, “Sometimes”, “Rarely”, or “Never”.

Index scoring. Index scores were calculated by averaging scores for all answered questions. Responses to parent modeling and home food availability/accessibility questions were used to create a health and unhealthy index for each, based on food healthfulness. Also, response to child feeding questions were used to make two indices, one measuring directive feeding and one measuring non-directive feeding. High scores indicate a greater degree of adherence to the variable being measured, compared to lower scores. For example, a parent who scores high on the unhealthy parent modeling reports modeling unhealthy foods more often than low scoring parents.

Child at-home TV exposure was measured by parent response to one item. Parents were asked “How many hours of TV does your child watch each day?” Possible responses ranged from 0 to 8+ hours, in 1 hour increments.

Potential confounders and covariates measured for the analysis in this study included child/family-level, store-level, and request-level variables. Parent-reported child/family-level variables such as child age, child sex, poverty level, parent education, use of food assistance, acculturation (measured using languages used at home) parental diet, and food insecurity status were assessed by parent report.

A diet quality index was created to assess parental dietary intake of nine food groups over the preceding month. Intake questions were based on NIH’s Eating at America’s Table food frequency questionnaire and NCI's Fat Intake Screener (136, 137). Eight responses for frequency of intake were possible and ranged from "never" to "5 or more times per day". Nine food groups were included and scores could range from 0 to 9, with one point awarded if intake frequency was above the sample median for healthy food groups (fruits, vegetables, whole grains, and beans) and one point awarded for intakes below the sample median for unhealthful food groups (sweet snacks, salty snacks, fatty meats, soda, and other SSB).

Food insecurity was measured using three items from the Radimer/Cornell Measures of Hunger and Food Insecurity Index (138). Those who indicated any response greater than "never," on any item, were considered to have some level of food insecurity.

A store-level variable (store type) was assessed using scheduling records and receipt data. All stores were grocery stores and classified as either "health food store" which catered to health-conscious clientele by providing large selections of organic/natural food options, or "bargain/general" stores which catered to bargain-conscious clientele.

Request-level variables included child position during shopping (i.e., walking, being carried, riding in the cart, or other), presence of child focused marketing on requested products (e.g., cartoon characters), and product placement of requested products with respect to child eye level. Request-level variables were assessed using micro-camcorder/eButton data.

Food Healthfulness Categorization

Foods requested by children were recorded with participant-worn micro-camcorder/eButton devices and then categorized into healthy and non-healthy (neutral and unhealthy) groups.

Categorization was performed in three steps, which different types of foods and beverages being categorized in different ways.

Step 1) all single-component food groups that are uniformly associated with increased or decreased chronic disease risk were categorized as healthy or unhealthy (139-143). These healthy food groups included fruits, vegetables, whole grains, legumes, nuts, and fish/seafood; while unhealthy single-component food groups were fatty or fried meats such as red/processed/fried meats (including fried fish) and fried potatoes (139-143).

Step 2) Existing food categorization schemes were consulted to classify some of the remaining foods that were more heterogeneous and/or more ambiguous with respect to healthfulness. These included eggs, regular-fat dairy, and some beverages. Eggs are considered moderate healthfulness by CATCH guidelines and the Nutrient Rich Food Index (144) due to high cholesterol and moderately high saturated fat, but also a good source of many fat soluble nutrients. For this analysis they were considered neutral. Regular-fat dairy products (e.g., whole milk, cheese, etc.) were placed in the unhealthy food category due to high saturated fat levels, which follows CATCH GO-SLOW-WHOA guidelines and the Nutrient Rich Food Index (144). Beverages considered to be SSB/soda were those that included added sugar in the ingredients list and so were placed in the unhealthy food category (145). This definition of SSB was also applied to flavored cow's milk and cow's milk substitutes with added sugar. Fruit juice (100%) was not considered a SSB because it does not contain added sugar, and is not placed in the fruit group because it is not a whole fruit, so 100% fruit juice was placed in the neutral category. Non-caloric beverages were placed in the healthy category.

Step 3) the foods that remained after step 1 and 2 were fresh lamb/pork/poultry, reduced/low/non-fat dairy, snack foods, breakfast cereals, composite foods, non-whole grains, and other. These foods were stratified into healthy, neutral and unhealthy food categories based on nutrient cut offs (listed below). Food descriptions from observation forms and nutrition facts panel information from manufacturers' websites were consulted. If brand name was not known, and could not be determined from follow-up viewing of observation video, then generic forms of those foods from the USDA Food Composition Database were used to assess nutrient information.

The food's content of key nutrients was used to assess the healthfulness of foods in step three. At least two nutrients, and up to four, were assessed, depending on the food group. These nutrients included sodium, solid fats (saturated and trans-unsaturated fat), added sugar, and fiber. Fresh lamb/pork/poultry was evaluated based on sodium and solid fat content. Reduced/low/non-fat dairy was evaluated based on added-sugar, sodium, and solid fat content. Snack foods, breakfast cereals, composite foods, non-whole grains and other foods were evaluated based on fiber, added-sugar, sodium, and solid fat content.

The amounts of the four nutrients were categorized as a healthy amount, neutral amount, or unhealthy amount based on American Cancer Society and American Heart Association guidelines, if available (139, 141). Specific guidance for added-sugar cutoffs could not be found and so for this study a healthy amount of added sugar was considered to be achieved when added sugar did not appear as one of first three ingredients listed, a neutral amount was when added sugar did not appear as one of the first two ingredients, and an unhealthy amount was when added sugar was listed as one of the first two ingredients. Healthy fiber amount was ≥5g per serving, neutral was 2-4.9g per serving, and unhealthy was all remaining (141). Healthy sodium amount was ≤140mg per serving, neutral was 141-480mg per serving, and unhealthy was all remaining (141). Healthy solid fat amount was <7% calories from saturated fat and no partially hydrogenated oil in the ingredients, neutral was 7.1-10% calories from saturated fat and ≤0.5g per serving trans-unsaturated fat, and unhealthy was all remaining (139, 141). Healthy meat was required to meet at least one healthful and one neutral nutrient category. Healthy dairy was required to meet at least two healthy and one neutral nutrient category. The remaining food groups were considered healthy if they met at least three healthy and one neutral nutrient category.

Table 3. Healthfulness categorization of selected child food purchasing requests

Healthy	**Neutral**	**Unhealthy**
Canned Beans	English Muffins	Brownie Mix
Danimals Yogurt Smoothies	Flour Tortillas	Chicken Nuggets
Fruits/Vegetables	Lean Deli Meat	Frosted Flakes
Nutri-Grain Bar	Low/Reduced Fat Milk	Hot Dogs/Sausage
Oatmeal	Peanut Butter Cliff Bar	Ice Cream
Peanut Butter	Pickles	Kool Aid/Gatorade
Salmon	Pillsbury Dinner Rolls	Macaroni and Cheese
Skim Milk	Pretzels	Nacho Lunchable
Skinless Chicken Breast	Puffin's Cereal	Potato Chips
Water	Raisin Bran Cereal	Whole Milk

Outcomes

Child in-store food purchasing request behavior was operationalized in two ways: 1) child-level outcomes included total food purchasing requests per minute of shopping time, healthy requests per minute of shopping time, non-healthy requests per minute of shopping time, and request differential (health requests per minute minus non-healthy requests per minute); and 2) request-level outcome was binary (healthy vs. non-healthy)

Statistical Approach

Analysis was conducted at both the child level (univariate) and request level (adjusted request level model).

Child level analysis was univariate (Table 4) assessing the relationship between dichotomized independent variables with continuous child request outcomes. Index scores were divided into high and low categories based on the median score (>median vs. ≤median). TV exposure was divided into 0-1 hours/day vs. 2 or more/day. This is because >2 hours of daily viewing is associated with increased BMI (99). Independent samples t-tests were used to compare means and standard deviations between variable categories to assess relationships with child total requests per minute of shopping time, healthy requests per minute, unhealthy requests per minute, and request differential. Alpha level was 0.05.

A general linear mixed model with a logit link function was used to calculate odds ratios for an association between home food environmental and behavioral factors and healthy requests. This allowed analysis to be made of factors associated with healthy requests while controlling for multiple confounders/covariates. However, clustering of requests for each child adds another source of variation at the child level. To account for this, the model included child ID as the random effect and robust “sandwich” standard error estimates were used. Additionally, store/request level factors such as child position at time of request, presence of CFM on packaging, product position on shelf (at eye-level vs. not), and store type were included in the model. To determine additional adjustment variables to include, potential confounders/covariates from the univariate analysis (Table 4) that reached p≤0.25 (146) were initially included simultaneously with request/store level factors in the adjusted request level model. All potential confounders/covariates that maintained p≤0.25 for predicting healthy requests were retained, and interactions were assessed. All interactions terms significant at p<0.05 were included. Model adjustment variables were determined in this fashion and included simultaneously with each individual hypothesized home food environmental and behavioral factor to assess the odds ratios for a healthy child request (Table 5). The hypothesized factors that reached significance (P<0.05) in Table 5 were then included simultaneously with each adjustment variable to assess any attenuation of association.

RESULTS

Sample characteristics

Fifty-six parent-child dyads agreed to participate in the study. Thirteen were no-shows and could not be rescheduled, one child was ill and could not be rescheduled, one child made an inordinate number of requests which his father indicated was very atypical, and one child refused to wear the micro-camcorder. This left forty dyads that completed the study. These forty dyads include the thirty-two dyads from the PWMC validity study (Chapter 3). Demographic data were available for eight dyads that did not complete the study. They did not significantly differ from those who completed the study for mean child age, sex, parent race, family income, poverty level, or parent education. One child that completed the study made zero requests and was not included in the child request analysis. Therefore the final analytic sample included thirty-nine parent-child dyads (68.4%).

Parents in the analytic sample were mostly mothers (n=36, 92.3%) and had a mean age of 36.5 years (±6.3). Children were mostly boys (n=22, 56.4%) and had a mean age of 3.8 years (±1.1). Approximately one-fourth of the sample was below 185% of the federal poverty line (n=11, 28.2%), with a low/middle income group between 185% and 370% (n=7, 17.9%) and a higher income group above 370% (n=21, 53.9%). All dyads indicated English was the primary language used at home, and so acculturation was not included in the analysis. Other sample descriptive data are presented in Table 4.

Index scores

Several index scores were calculated, and internal consistency was measured, to assess aspects of the child's food environment and parental food behaviors. Scores for the parent diet quality index ranged from 0 to 9 with a median of 5 and mean of 5.03 (SD = ±2.36). The remaining index scores were calculated by averaging responses to multiple five-point Likert scaled questions. Healthy home food environment scores ranged from 2.83 to 5.00 with a median of 4.50 and mean of 4.34 (±0.51). Unhealthy home food environment scores ranged from 1.40 to 4.50 with a median of 2.10 and mean of 2.35 (±0.74). Healthy parental dietary modeling scores ranged from 3.25 to 5.00 with a median of 4.58 and mean of 4.44 (±0.52). Unhealthy parental dietary modeling scores ranged from 1.40 to 4.60 with a median of 2.40 and a mean of 2.52 (±0.78). Non-directive feeding scores ranged from 2.20 to 5.00 with a median of 3.60 and a mean of 3.63 (±0.65). Directive feeding scores ranged from 1.00 to 4.50 with a median of 1.98 and a mean of 1.95 (±0.79). Internal consistency of all indices was acceptable ranging from a Cronbach's alpha of 0.60 to 0.85.

TV Exposure

An additional aspect of the home environment was child TV exposure, measured with a single item. Parent reports ranged from 0 to 4 hours of child daily TV viewing with a median of 1 hour and mean of 1.31 (±1.00).

Child requests characteristics

Dyads who completed the study (n=40) were observed using participant-worn micro-camcorder (n=36) or eButton (n=4) recording devices during one major shopping trip. Shopping times varied from 12-55 minutes (31.23±11.24). Children mostly rode in the shopping cart (n=25, 62.5%) and made a total of 222 food purchasing requests (80 healthy, 142 non-healthy). The amount of requests per trip ranged from 0 to 18 with a median of 5 and a mean of 5.55 (±3.99). Children made 2.00 (±1.63, 0 to 6)) healthy requests and 3.55 (±3.25, 0 to 14) non-healthy requests per trip (p=0.016). Children made a mean of 0.20 total (±0.15, 0.00 to 0.75), 0.07 healthy (±0.05, 0.00 to 0.21), and 0.13 non-healthy requests (±0.13, 0.00 to 0.67) per minute of shopping time. Children who wore the eButton vs. children who wore the micro-camcorder did not make significantly different amounts of requests per minute, healthy requests per minute, or non-healthy requests per minute. Child focused marketing was seen on the packaging of 29 requested foods, representing 20.8% of requested packaged foods. Requested foods were mostly at the child’s eye level (n=137, 61.7%). Figure 4 shows the distribution of requests for the six most frequently requested food groups. Although requests were predominately for snack foods/candy or fruits/vegetables, they were highly varied within food groups and across levels of healthfulness.

Univariate analysis was carried out to assess the association between measured variables and the frequency of child request types (Table 4). Being "non-white," compared to being white, was associated with more healthful requests per minute of shopping time. Also, a high frequency of unhealthy parent diet-modeling, compared to the low group, was associated with more non-healthy requests per minute and a request differential favoring unhealthy foods. Additionally, non-significant group differences in request behavior were seen where children in the high TV exposure group made more requests per minute, and children in the low food security group made more healthy requests per minute.

The potential confounder/covariates child age, child race, poverty level, food assistance use, food insecurity, and parent diet had p-values ≤0.25. These variables were initially combined with store/request-level factors (i.e., child position during shopping, presence of child focused marketing, product position, and store type) in an adjusted request level model. Potential confounders/covariates that maintained a p-value of ≤0.25 when controlling for all other adjustment variables, mentioned above, were retained. These were child age, poverty level, food assistance use, and parent diet. One significant interaction was found between parent diet and food assistance use, and this interaction was included in the model. Each hypothesized factor (i.e., child TV exposure, healthy and unhealthy home food indices, healthy and unhealthy parent modeling indices, and directive and non-directive child-feeding indices) of healthy requests were entered into the adjusted model separately, simultaneously adjusting for store/request-level factors, child age, poverty level, food assistance, parent diet, and parent diet*food assistance interaction. Results are reported in Table 5. Higher frequency of unhealthy parental modeling was associated with decreased odds of a request being healthy, and non-directive child-feeding was associated with increased odds of a request being healthy. Other hypothesized factors were not significant at the 0.05 level.

All hypothesized factors that reached significance (i.e., unhealthy parental dietary modeling and non-directive child feeding) were included in a final model simultaneously with the adjustment variables (i.e., product characteristics (child focused marketing + eye-level placement), child riding in cart (yes vs. no), store type, child age, poverty level, parent diet, food assistance, parent diet*food assistance interaction). Higher degree of unhealthy dietary modeling (OR=0.430 (CI, 0.256-0.723; P<0.001)) and increased use of non-directive child-feeding (OR=1.911 (CI, 1.353-2.701; P=0.002)) maintained significant associations with making a healthy request when controlled for each other and the adjustment variables.

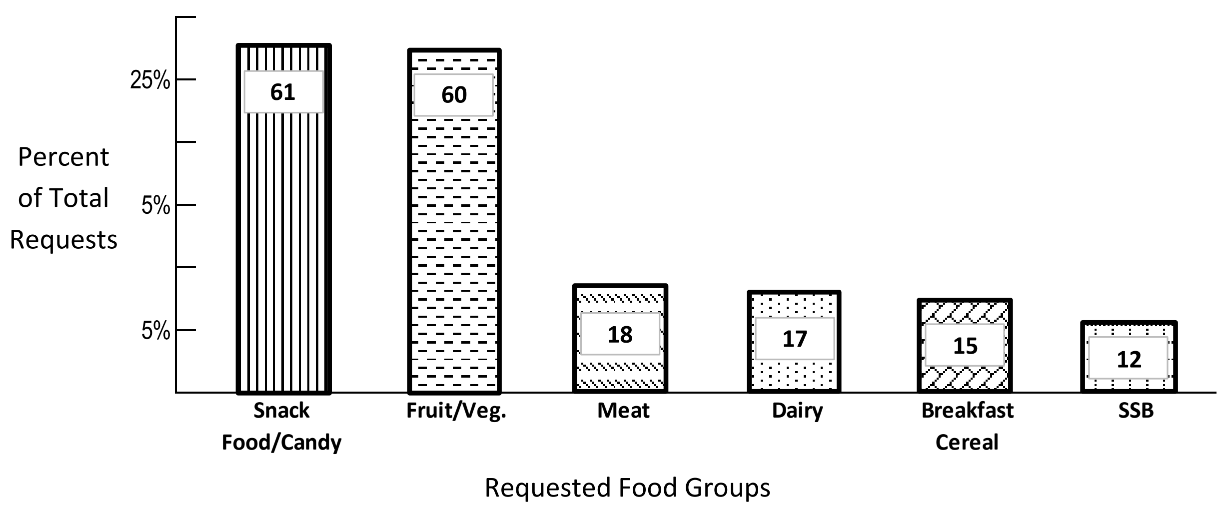

Figure 4. Distribution of child requests for six most requested food groups

DISCUSSION

The purpose of this study was to investigate the relationship between the home food environment (availability and accessibility), parental dietary modeling, child-feeding style, and child TV exposure with the healthfulness of child food purchasing requests in the grocery store. The findings show that some diet related parenting practices are associated with child request behaviors in the grocery store. In univariate analysis, children who were non-white made more healthy food-requests per minute of shopping time, while children whose parents reported higher frequencies of unhealthy dietary modeling made more unhealthy food-requests per minute of shopping time. The adjusted request level model showed child-centered feeding was significantly associated with increased odds of making a healthy request, while parental unhealthy diet modeling was significantly associated with decreased odds of making a healthy request.

Table 4. Independent samples t-tests of dichotomized independent variables and child food purchasing requests, (n=39)

Group		**n**	**Total Requests/Min**			**Healthy Req./Min**			**Non-Healthy Req./Min**			**Differential/Min**		
			Mean	SD	*P-Value*	Mean	SD	*P-Value*	Mean	SD	*P-Value*	Mean	SD	*P-Value*
COVARIATES/CONFOUNDERS														
Age	2-3 y old	16	0.184	0.127	***0.52***	0.076	0.036	***0.55***	0.108	0.107	***0.34***	-0.032	0.097	***0.24***
	4-6 y old	23	0.216	0.163		0.066	0.059		0.150	0.147		-0.084	0.152	
Gender	female	17	0.199	0.126	***0.90***	0.080	0.058	***0.31***	0.120	0.103	***0.59***	-0.040	0.111	***0.36***
	male	22	0.205	0.167		0.063	0.044		0.143	0.152		-0.080	0.149	
Race	white	28	0.181	0.121	***0.25***	0.059	0.044	***0.03***	0.122	0.097	***0.55***	-0.063	0.213	***0.99***
	non-white	11	0.259	0.200		0.099	0.056		0.160	0.199		-0.062	0.090	
Education	degree	31	0.186	0.117	***0.36***	0.070	0.052	***0.93***	0.116	0.101	***0.32***	-0.046	0.110	***0.30***
	no degree	8	0.269	0.235		0.072	0.045		0.198	0.212		-0.126	0.197	
Percent Poverty Line	<370%	18	0.224	0.183	***0.44***	0.065	0.040	***0.54***	0.159	0.161	***0.27***	-0.094	0.147	***0.17***
	≥370%	21	0.185	0.114		0.075	0.059		0.110	0.099		-0.035	0.117	
Food Assistance	Yes	7	0.335	0.230	***0.11***	0.087	0.042	***0.32***	0.248	0.213	***0.13***	-0.160	0.202	***0.17***
	no	32	0.174	0.110		0.066	0.052		0.107	0.094		-0.041	0.106	
Food Insecurity	yes	14	0.244	0.197	***0.27***	0.090	0.052	***0.06***	0.154	0.183	***0.53***	-0.064	0.185	***0.97***
	no	25	0.180	0.112		0.059	0.047		0.121	0.094		-0.062	0.098	
Parent Diet	Low	16	0.244	0.191	***0.20***	0.073	0.041	***0.81***	0.171	0.173	***0.18***	-0.099	0.164	***0.16***
	High	23	0.174	0.105		0.069	0.057		0.106	0.088		-0.037	0.104	
HYPOTHESIZED FACTORS														
Hour TV Viewing	0-1 hours/day	25	0.163	0.104	***0.06***	0.063	0.040	***0.31***	0.100	0.092	***0.08***	-0.037	0.096	***0.18***
	2-4 hours/day	14	0.274	0.190		0.083	0.065		0.191	0.171		-0.108	0.177	
Healthy Home-Food	Low	24	0.224	0.170	***0.21***	0.067	0.042	***0.66***	0.157	0.148	***0.15***	-0.090	0.135	***0.11***
	High	15	0.168	0.102		0.075	0.063		0.094	0.093		-0.019	0.122	
Unhealthy Home-Food	Low	21	0.164	0.101	***0.10***	0.066	0.059	***0.55***	0.098	0.082	***0.10***	-0.033	0.101	***0.13***
	High	18	0.248	0.183		0.075	0.039		0.173	0.167		-0.097	0.159	
Healthy Parental Dietary Modeling	Low	19	0.163	0.102	***0.10***	0.060	0.031	***0.20***	0.104	0.082	***0.18***	-0.044	0.071	***0.40***
	High	20	0.240	0.177		0.080	0.063		0.160	0.164		-0.080	0.174	
Unhealthy Parental Dietary Modeling	Low	22	0.162	0.100	***0.07***	0.070	0.057	***0.99***	0.092	0.078	***0.04***	-0.021	0.094	***0.04***
	High	17	0.256	0.185		0.070	0.042		0.186	0.167		-0.116	0.159	
Non-Directive Child-Feeding	Low	21	0.191	0.121	***0.61***	0.061	0.045	***0.24***	0.130	0.103	***0.90***	-0.069	0.102	***0.76***
	High	18	0.216	0.178		0.081	0.056		0.136	0.163		-0.055	0.166	
Directive Child-Feeding	Low	21	0.175	0.117	***0.21***	0.060	0.050	***0.18***	0.115	0.087	***0.40***	-0.055	0.082	***0.72***
	High	18	0.235	0.177		0.082	0.050		0.153	0.171		-0.071	0.178	

Unhealthy parental modeling showed the most consistent association with child request healthfulness, being related in univariate analysis and the adjusted request level model; while healthy parental modeling was not associated with request healthfulness. Past research has not assessed modeling and child food purchasing request healthfulness per se, but instead has largely examined the association between healthy parental dietary modeling (e.g., fruit and vegetable modeling) and child intake, finding strong associations (81, 82, 86). Null findings for healthy food modeling may be due to low variability in parental responses compared to unhealthy food modeling in this study. Less research has specifically examined the relationship between unhealthy parental dietary modeling and child food intake/preferences. Murashima et al. measured parental energy-dense food behaviors with a subscale that included modeling of unhealthy foods, and found a positive relationship with child energy-dense food intake ($r=0.262$, $p<0.01$) and no relationship with nutrient dense food intake (84). Although a significant relationship with request behavior was seen in this study, it is important to note that unhealthy food modeling may not exert direct effects on child food preferences. Instead this may be a proxy measure, possibly representing a less-strict parenting style in which the child has learned that unhealthy requests will be tolerated. Possible residual confounding needs to be addressed, and temporality of exposure and outcome needs to be established in order to make a case for causality.

Non-directive child feeding was associated with child request healthfulness in the adjusted request level model, while no associations were seen with directive child feeding. Non-directive child feeding, or child-centered feeding, seeks to help children internalize a goal of eating and recognize satiety cues by using positive encouragement rather than overt pressure (84, 90). Although children whose parents practice non-directive types of child-feeding have been shown to consume more fruits, vegetables, and nutrient dense foods (74, 84), research has not been done to corroborate this finding for child requests specifically. Additionally, interpretation should be made with caution as univariate analysis found only minimal, and non-significant, differences in request behaviors for high and low non-directive feeding groups. However, this null univariate finding is likely due to non-differential misclassification because a positive linear trend between the non-directive feeding index scores and healthy requests per minute was observed in the data (rho=0.286, P=0.08; r=0.341, P<0.05). Directive feeding is characterized by parental pressure to consume food (84). Parental feeding pressure has been shown to inhibit children's ability to recognize satiety cues (90), which may cause impulsive eating in the presence of food; however this did not seem to have an effect on child request behavior in this study.

Table 5. Adjusted odds ratios for healthy child In-store food purchasing requests, (n=222**)**

Hypothesized Factor	Adjusted Odds Ratio	95% CI	*P-Value*
0-1 Hours TV/Day[A]	0.774	0.327-1.830	*0.547*
Healthy Home Food Environment[B]	0.860	0.425-1.740	*0.665*
Unhealthy Home Food Environment[B]	0.736	0.467-1.159	*0.178*
Healthy Parental Dietary Modeling[B]	1.015	0.532-1.937	*0.962*
Unhealthy Parental Dietary Modeling[B]	0.504	0.284-0.893	*0.021**
Non-Directive Child-Feeding[B]	1.657	1.061-2.588	*0.028**
Directive Child-Feeding[B]	1.068	0.720-1.585	*0.736*

Hypothesized factors adjusted for: product characteristics (child focused marketing + eye-level placement), child riding in cart (yes vs. no), store type, child age, poverty level, parent diet, food assistance, parent diet*food assistance interaction. Each Hypothesized factor is not controlled for the other hypothesized factors in Table 5.
A: referent group = 2-4 hours TV/day
B: continuous index score
* = p<0.05

Measures of the home food environment (i.e., healthy and unhealthy food availability and accessibility in the home) showed no significant association with the healthfulness of child request behaviors. The healthfulness of home food availability and accessibility has been shown to be associated with the healthfulness of child dietary intake (74, 80-82). Although univariate analysis showed children with less-healthy home food environment scores made more non-healthy requests per minute of shopping time, these differences were not statistically significant. Null findings are likely due to low variability in healthy home food environment index responses and small sample size in univariate analysis limiting statistical power.

Surprisingly no significant associations were seen for child TV exposure. However, near significant differences were seen in univariate analysis, which were in the same direction as expected from other research examining child TV exposure and food behaviors. In an observational study of parent-child food purchasing behaviors in grocery stores, Galst and White showed that children's weekly hours of TV commercial viewing was associated with more child purchasing requests ($r=0.35$, $p<0.05$), although weekly hours of total TV viewing, and hours of non-commercial TV viewing were not significantly associated with frequency of requests (17). The Galst and White finding suggests TV food ads during commercials influence child request behavior. Experimental studies in a laboratory setting have similarly demonstrated that TV food ads influence child food preference and behaviors, at least in the period immediately after viewing (36, 55, 56). Null findings in this study may be due to small sample size in univariate analysis and/or measurement of total TV exposure rather than specific exposure to TV food ads. However, the attenuation of any potential relationship with TV exposure in the adjusted request level model may indicate that TV exposure does not have a direct relationship with the healthfulness of child requests in the grocery store, but is instead a proxy measure for underlying differences that may covary with TV exposure.

Racial differences in this sample reflect findings from research examining food purchasing patterns by race. Hispanic and black shoppers purchase more fruits, and Hispanic shoppers also purchase more vegetables, than white shoppers (78). This racial difference has been shown to hold true for parents of preschool-aged children as well (147). Children may mimic parental shopping habits. In observational studies of preschool aged children independently shopping in mock grocery stores, children have been shown to spontaneously assume adult shopping roles and to purchase foods with a similar level of healthfulness as their parents (35, 148). It is possible that parental modeling while shopping may explain racial differences, although more research is needed to investigate this possible relationship and establish temporality.

This study has several limitations. The overt nature of the observation in this study may influence participants' behaviors. However, child behavior is not likely to be significantly affected. Galst and White shadowed parent-child grocery shoppers who were aware of the observation and parents reported their children did not behave atypically (17). Also, there was no acclimatization phase, which would have allowed participants to become accustomed to being observed. The lack of this element in the study design increases the possibility of reaction effects. In addition, the small sample of dyads limits generalizability of findings, statistical power, and ability to control for multiple covariates. In the adjusted request level model, clustering of requests at the child level adds an additional source of variation. There was an attempt to control for this by using a general linear mixed model with the child ID as a random effect and using robust standard error estimates. A similar approach was used by Hogan et al. in studying an unrelated, though equally clustered outcome (149). Finally, only one time point was assessed and it is not known if usual behaviors were observed.

CONCLUSIONS

This study advances scientific knowledge of the healthfulness of child co-shoppers' food purchasing requests and modifiable factors associated with this behavior. A novel measurement method utilizing small audio/video recording devices was used to accurately and efficiently collect observational data of children's in-store behaviors and the environmental context in which they took place. The healthfulness of child requests was for the first time compared to modifiable home food environmental factors in an attempt to identify behavioral targets for intervention. Unhealthy parental dietary modeling and non-directive feeding practices were identified as being significantly associated with the healthfulness of child requests. Also, racial differences were seen in univariate analyses which need further research. Although more research is needed to establish causality, these results suggest that parents' food behaviors at home may influence the healthfulness of child requests in the grocery store, and family-based interventions that seek to improve the healthfulness of food purchasing in families with young children should include components to address parental dietary modeling and child-feeding practices.

CHAPTER 5: FACTORS ASSOCIATED WITH THE HEALTHFULNESS OF PARENT RESPONSES TO CHILD FOOD-PURCHASING REQUESTS

ABSTRACT

Children often accompany parents on grocery shopping trips where they influence the healthfulness of food purchasing by making requests. The degree of influence children have depends on parents' responses to their child's requests. The purpose of this paper is to investigate the relationship between parent BMI, use of nutrition facts labels, perceived relative cost of healthy foods, the healthfulness of parent diet, and food purchasing intentions with the healthfulness of parent responses to their child's in-store food purchasing requests.

Parent-child dyads were recruited from five preschools in Central Texas and via an email mailing list. Dyads were observed shopping at their usual grocery store and shopping time. Data for parent-child behaviors and environmental factors in the grocery store were collected using small child-worn audio/visual recording devices attached to a hat. Parents also completed a questionnaire measuring the home food environment and food behaviors. The percent of parental yielding, percent of healthful responses, and net number of healthy responses were compared to dichotomized independent variables in univariate analysis, and odds of making a healthy response were analyzed in an adjusted response level model.

On average, parents responded in a healthful way 62.9% (±26.7%; median = 62.5%, 0.0% to 100%) of the time. Overall, parents yielded to 46 of 80 healthy requests (57.5%), and yielded to 52 of 142 non-healthy requests (36.6%). There was a near significant relationship in univariate

analysis in which parents had a higher percentage of healthy responses if their child was male, compared to having a female child (P=0.064). In univariate analysis, parents of families at <370% of the federal poverty line were more likely to have a high percentage of healthy responses, compared to those >370% of the poverty line (P=0.010). In the adjusted response level model, healthy weight parents were more likely to make healthy responses than overweight/obese parents (OR=2.061, P=0.022).

In an observational study of dyads made up of parents with preschool-aged children, healthy-weight parents were more likely than overweight/obese parents to respond to their child's in-store food purchasing requests in a healthful way. The healthfulness of parental responses was not associated with their reported use of nutrition facts labels, perceived relative cost of healthy foods, or the healthfulness of their diet or food purchasing intentions. Behavioral interventions that seek to improve the healthfulness of food purchasing in families with young children should focus on addressing response behaviors in overweight/obese parents. Additionally, parent responses differed by family poverty level and child gender. Further research is needed to confirm and expand on these results.

INTRODUCTION

Children often accompany parents on grocery shopping trips (18-20). Child co-shopping is often unavoidable, especially in lower income groups and/or single-parent households (23). Also, many parents choose to bring their child shopping for reasons such as food and money-related learning opportunities present at the grocery store (24). Observational research has shown that child co-shoppers make anywhere from 0 to 18 purchasing requests per grocery shopping trip

(25). These requests are often for unhealthy foods (18, 26), and it is estimated children contribute to one-third to one-half of family food purchasing decisions (18, 30).

Child influence on purchasing depends on their ability to convince their parents to yield and purchase the requested food or beverage. Parents yield to approximately half of all child requests (18, 37). Some factors that have been shown to affect parental yielding include the linguistic type of child request, price of the product, and parent income (31). However, factors that influence the healthfulness of parent responses to child requests are not well understood. A healthful response is one in which a parent yields to a healthful child food purchasing request (e.g., the parent agrees to purchases a fruit that the child asks for) or resists a non-healthful request (e.g., refuses to purchase a candy bar the child asks for).

It is important to understand what factors are associated with healthfulness of parent responses in order to effectively intervene to promote healthy food purchasing in families with young children. Although parents report nutrition as a primary concern when choosing food for their children (59, 60, 117, 150), it has been shown that their responses to child requests may not always reflect this (18, 29). Not only do parents' responses impact food purchasing, they are also modeling shopping behaviors for their children (35). These behaviors have important public health significance, but there is little guidance in the literature to assist intervention development.

The purpose of this paper is to investigate the relationship between various dietary factors and the healthfulness of parent responses to their child's in-store food purchasing requests. Factors examined were those shown to be related to food choice/intake and included parent BMI (73), use of nutrition facts labels (77), perceived relative cost of healthy foods (76), and the healthfulness of parent diet (74) and food purchasing intentions (75).

METHODS

Recruitment, enrollment, in-store data collection, and video coding are identical to methods described earlier (see Chapter 3 and 4).

Variable Measurement

Data were collected using a parent questionnaire (Appendix B) or audio/visual data.

Parent BMI

Parent BMI was based on self-report height in feet and inches and weight in pounds. These data were converted into kilograms and meters, and BMI was calculated based on the standard formula kilograms divided by squared meters. Parents were grouped as healthy weight (≤ 25 kg/m^2) and overweight/obese (>25 kg/m^2).

Parent diet

A nine-item diet quality index was created to assess parental dietary intake of nine food groups over the preceding month. Intake questions were based on NIH's Eating at America's Table food frequency questionnaire and NCI's Fat Intake Screener (136, 137). Eight responses for frequency of intake were possible and ranged from "never" to "5 or more times per day". Nine food groups were included and scores could range from 0 to 9, with one point awarded if intake frequency was above the sample median for healthy food groups (fruits, vegetables, whole grains, and beans) and one point awarded for intakes below the sample median for unhealthful food groups (sweet snacks, salty snacks, fatty meats, soda, and other SSB).

Food purchasing intentions

A nine-item food purchasing intention index was created to assess parental intentions to purchase nine food groups at the grocery store. Intention questions were based on the Theory of Planned Behavior (111) and modeled after questions used by Villarubia concerning intentions to serve vegetables to children (151). Questions were scored on a five point Likert scale with responses including “Always”, “Often”, “Sometimes”, “Rarely”, or “Never”. Nine food groups were included and scores could range from 0 to 9, with one point awarded if purchasing intention frequency was above the sample median for healthy food groups (fruits, vegetables, whole grains, and beans) and one point awarded if purchasing intention frequency was below the sample median for unhealthful food groups (sweet snacks, salty snacks, fatty meats, soda, and other SSB). Sample question: “Before going to the grocery store, I intend to purchase vegetables for my family.”

The perceived relative cost of healthy food

This was measured using a single item modeled after a question from the Quality of Life Related to Dietary Change Questionnaire (152). Parents were asked to respond to the following statement: “Healthy food costs more money than unhealthy food.” Questions were scored on a five point Likert scale with responses including “Always”, “Often”, “Sometimes”, “Rarely”, or “Never”.

The use of nutrition facts labels

This was measured using a single item modeled after a question from a survey used by Hess et al. (153). Parents were asked to respond to the following statement: "I read nutrition facts labels when making decisions on which foods to buy." Questions were scored on a five point Likert scale with responses including "Always", "Often", "Sometimes", "Rarely", or "Never".

Potential confounders and covariates

These included parent/child/family-level, store-level, and response-level variables. Parents completed a questionnaire to assess parent/child/family-level variables such as child age, child gender, parent race, parent education, poverty level, acculturation (measured using language use at home), frequency of shopping with child, food assistance use, and food insecurity. Food insecurity was measured using three items from the Radimer/Cornell Measures of Hunger and Food Insecurity Index (138). Those who indicated any response greater than "never," on any item, were considered to have some level of food insecurity. An additional child variable was frequency of child requests per minute of shopping time, which was assessed using audio/video data (see Chapter 3).

A store-level variable (store type) was assessed using scheduling records and receipt data. All stores were grocery stores and classified as either "health food store" which catered to health-conscious clientele by providing large selections of organic/natural food options, or "bargain/general" stores which catered to bargain-conscious clientele.

Response-level variables, assessed using audio/video data, included the healthfulness of the child request, the linguistic type of child request (simple ask vs. demand), and the presence of child focused marketing on the packaging of the requested item. It is conceivably easier to yield to a child request than to resist because yielding will not likely result in conflict with the child. Children make fewer healthy requests than non-healthy requests. Therefore, healthy parent responses (i.e., when a parent resists an unhealthy request or yields to a healthy request) will likely have a greater chance of being a resist (i.e., resist an unhealthy request), while non-healthy parent responses will likely have a greater chance of being a yield (i.e., yielding to a non-healthy request). This could introduce bias and will be controlled for in the analyses. The linguistic type of request has been shown to affect parent yielding where parents are more likely to yield to simple asks compared to a demands (31). Additionally, child requests that have child focused marketing on the packaging may influence parent interpretation of, and response to, these products and so this will be controlled for in analysis.

Food Healthfulness Categorization

Foods requested by children were recorded with child-worn micro-camcorder/eButton devices and then categorized into healthy and non-healthy (neutral and unhealthy) groups. Categorization was described elsewhere in Chapter 4. Briefly, categorization was performed in three steps: 1) single item foods (e.g., whole fruits) were categorized based on association with chronic disease; 2) a portion of remaining foods were categorized based on CATCH Go-SLOW WHOA guidelines and Nutrient Rich Food Index (144); and 3) the foods that remained after step 1 and 2 were fresh lamb/pork/poultry, reduced/low/non-fat dairy, snack foods, breakfast cereals, composite foods, non-whole grains, and other. These foods were stratified into healthy, neutral and unhealthy food categories based on the food's content of key nutrients. At least two nutrients, and up to four, were assessed. These included sodium, solid fats (saturated and trans-unsaturated fat), added sugar, and fiber.

Outcomes

Parents could yield to (i.e., purchase) or resist (i.e., not purchase) foods children requested in the grocery store. Parent responses to child in-store food purchasing requests were considered healthy if the parent yielded to a healthy request or resisted an unhealthy request. Parent request outcomes were operationalized in two ways: 1) parent-level outcomes included total yield rate, healthy response rate, and net number of healthy responses; and 2) response-level outcome was binary (healthy response vs. non-healthy response).

Statistical Approach

Analysis was conducted at both the parent level (univariate) and response level (adjusted response level model).

Parent level analysis was univariate (Table 6) assessing the relationship between dichotomized independent variables with parental yield rate, percent healthy responses, and net number of healthy responses as the dependent variables. Scores for independent variables were divided into high and low categories based on the median score (>median vs. ≤median), reported frequencies of food behaviors/attitudes, or weight status determined by BMI (kg body weight / height in meters^2). Dependent variables were continuous. Independent samples t-tests were used to assess univariate associations between independent and dependent variables. Alpha level was 0.05.

A general linear mixed model with a logit link function was used to calculate odds ratios of an association between independent variables and a binary response level outcome variable. This allowed analysis to be made of factors associated with healthy responses while controlling for multiple confounders/covariates. However, clustering of responses at each parent adds an additional source of variation. To account for this, the model included parent ID as the random effect and robust "sandwich" standard error estimates were used. Additionally, store/response level factors such as healthfulness of the child request, linguistic type of child request (simple ask vs. demand), presence of child focused marketing on the packaging of the requested item, and store type were included in the model. To determine additional adjustment variables to include, potential confounders/covariates from the univariate analysis (Table 6) that reached $p \leq 0.25$ (146) were initially included simultaneously with response/store level factors in the adjusted response level model. All potential confounders/covariates that maintained $p \leq 0.25$ for predicting healthy responses were retained, and interactions were assessed. All interactions significant at $p < 0.05$ were included. Model adjustment variables were determined in this fashion and included simultaneously with each individual hypothesized factor to assess association with healthy parent responses (Table 7). Significant hypothesized factors were additionally adjusted for all other hypothesized factors to ensure findings were not attenuated.

RESULTS

Sample characteristics

Fifty-six parent-child dyads agreed to participate in the study. Thirteen were no-shows and could not be rescheduled, one child was ill and could not be rescheduled, one child made an inordinate number of requests which his father indicated was very atypical, and one child refused to wear the micro-camcorder. This left forty dyads that completed the study. Demographic data was available for eight dyads that did not complete the study. They did not significantly differ from those who completed the study for mean child age, sex, parent race, family income, poverty level, or parent education. One child that completed the study made zero requests and so this dyad was not included in the parent response analysis. Therefore the final analytic sample included thirty-nine parent-child dyads (68.4%). Parents in the analytic sample were mostly mothers (n=36, 92.3%) and had a mean age of 36.5 years (±6.3). Children were mostly boys (n=22, 56.4%) and had a mean age of 3.8 years (±1.1). Approximately one-fourth of the sample was below 185% of the federal poverty line (n=11, 28.2%), with the rest between 185% and 370% (n=7, 17.9%) and above 370% (n=21, 53.9%). All dyads indicated English was the primary language used at home, and so acculturation was not included in the analysis. Other sample descriptive data are presented in Table 6.

Hypothesized factors

Two index scores were calculated, and internal consistency was measured. Scores for the parent diet quality index ranged from 0 to 9 with a median of 5 and mean of 5.03 (±2.36). Internal consistency was considered adequate with a Cronbach's alpha of 0.68. Index scores for healthfulness of food purchasing intentions ranged from 1 to 9 with a median of 5 and mean of 5.10 (±2.13). Internal consistency was considered adequate with a Cronbach's alpha of 0.66. Other factors included parental BMI, parental perception of the cost of healthy foods relative to unhealthy foods, and parents' use of nutrition facts labels while food shopping. Sample parental BMI averaged 26.2 kg/m^2 (±5.8), with a median of 24.3, and a range of 18.8 to 44.3. Parents indicated that they believe healthy food "sometimes" (n=21), "often" (n=15), or "always" (n=3) costs more than unhealthy food. None of the parents believed healthy food "rarely" or "never" cost more than unhealthy food. The mean score for the food cost perception question was 3.53 (±0.64), with a median of 3 and range of 3 ("sometimes") to 5 ("always"). Parents indicated they used nutrition facts labels while shopping "rarely" (n=6), "sometimes" (n=8), "often" (n=13), “always” (n=12). The mean score for nutrition facts label use was 3.80 (±1.04), with a median of 4 and range of 2 (“rarely”) to 5 (“always”).

Parent response characteristics

On average, parents yielded to 45.5% (±28.4%) of chilren’s total food purchasing requests, with a median of 50.0% and range of 0.0% to 100%. On average, parents responded in a healthful way 62.9% (±26.7%; median = 62.5%, 0.0% to 100%) of the time, and in a non-healthful way 37.1% (±26.7%; median = 37.5%, 0.0% to 100%) of the time. Overall, parents yielded to 46 of 80 healthy requests (57.5%), and yielded to 52 of 142 non-healthy requests (36.6%). Resist strategies included “bargaining with the child” (n=2, 1.6%), “offering healthier or less expensive alternatives” (n=3, 2.4%), “saying yes initially, but not following through with a purchase” (n=3, 2.4%), “flat no” (n=30, 24.2%), “ignore the child request” (n=33, 26.6%), or “answer no, but also provide a reason to the child” (n=53, 42.7%). Very little conflict was seen in which the child was visibly angry/disappointed or engaged in a tantrum as a result of a parent resisting a child’s request, occurring in only 9.7% of resists. Parent responses that led to conflicts included “flat no” which led to a conflict 16.6% of the time (n=5), “answer no, but also provide a reason to the child” led to a conflict 11.3% of the time (n=6), and one conflict was seen with a “bargain” response, though this strategy was only used twice.

The potential confounder/covariates family poverty level, parent race, child gender, and frequency of child requests had p-values ≤0.25 in univariate analysis. These variables were initially combined with store/request-level factors (i.e., presence of child focused marketing, linguistic type of request, request healthfulness, and store type) in the adjusted response level model. Child gender and family poverty level maintained a p-value of ≤0.25 when simultaneously controlling for the other confounder/covariates and store/request-level factors, and were retained. No significant interactions were found between adjustment variables. Each hypothesized factor (i.e., Parent BMI, parent diet quality index, purchasing intentions index, healthy food cost perception, and use of nutrition facts labels) of healthful parent responses to child requests was entered into the adjusted model separately, simultaneously controlling for adjustment variables (i.e., family poverty level, child gender, presence of child focused marketing, linguistic type of request, request healthfulness, and store type). Results are reported in Table 7. Healthy parental BMI was associated with a greater likelihood of a response to a child request being healthy. Parental healthy BMI remained significant (OR = 2.184 (CI, 1.293-3.687; P=0.005) after controlling for all other hypothesized factors and adjustment variables simultaneously. Also, findings were not significantly different when including child request frequency and parent race as adjustment variables. Other hypothesized factors were not significant at the 0.05 level in the adjusted response level model, before or after controlling for all other hypothesized factors.

Table 6.Independent samples t-tests comparing dichotomized independent variables and parent responses to child in-store food purchasing requests (n=39)

Group		n	Total Yield Rate[a] Mean	SD	P-Value	Healthy Response Rate[b] Mean	SD	P-Value	Net Healthy Responses[c] Mean	SD	P-Value
COVARIATES/CONFOUNDERS											
Child Age	2-3 y old	16	49.10%	30.90%	***0.511***	65.90%	23.30%	***0.562***	1.00	1.67	***0.475***
	4-6 y old	23	42.90%	27.00%		60.80%	29.10%		1.57	3.17	
Child Gender	Female	17	50.60%	27.90%	***0.327***	53.90%	29.10%	***0.064***	0.71	2.47	***0.197***
	Male	22	41.50%	28.90%		69.90%	22.90%		1.82	2.74	
Parent Race	White	29	46.60%	30.96%	***0.680***	66.75%	26.64%	***0.128***	1.62	2.56	***0.254***
	Non-white	10	42.22%	20.50%		51.81%	24.79%		0.50	2.88	
Parent Education	Degree	31	44.67%	28.32%	***0.732***	62.58%	29.26%	***0.818***	1.29	2.76	***0.845***
	No degree	8	48.61%	30.69%		64.25%	13.89%		1.50	2.33	
Percent Poverty Line	<370%	18	44.76%	27.87%	***0.886***	74.54%	19.74%	***0.010***	2.11	2.00	***0.090***
	≥370%	21	46.10%	29.61%		52.96%	28.21%		0.67	2.99	
Food Assistance	Yes	7	45.40%	14.80%	***0.994***	63.34%	13.22%	***0.964***	2.00	2.58	***0.470***
	no	32	45.49%	30.82%		62.83%	28.96%		1.19	2.68	
Food Insecurity	yes	14	48.74%	30.27%	***0.599***	62.81%	25.29%	***0.985***	1.36	2.53	***0.967***
	no	25	43.65%	27.85%		62.98%	27.95%		1.32	2.76	
Frequency of Shopping With Child	Sometimes, rarely, or never	12	42.13%	29.16%	***0.630***	58.52%	31.82%	***0.499***	0.83	3.56	***0.525***
	Always or Often	27	46.97%	28.56%		64.88%	24.48%		1.56	2.17	
Frequency of Child Requests Per Minute	Low	20	51.17%	33.22%	***0.204***	63.92%	29.62%	***0.814***	0.55	1.57	***0.065***
	High	19	39.49%	21.68%		61.87%	23.98%		2.16	3.29	
HYPOTHSIZED FACTORS											
Parent Diet Quality	Low	16	52.61%	21.07%	***0.196***	67.38%	22.63%	***0.392***	1.88	2.55	***0.293***
	High	23	40.52%	32.14%		59.82%	29.26%		0.96	2.70	
Parent BMI	≤25 kg/m²	21	39.50%	30.74%	***0.159***	67.43%	31.67%	***0.243***	1.95	3.19	***0.102***
	>25 kg/m²	18	52.46%	24.53%		57.66%	18.90%		0.61	1.65	
Healthy Purchasing Intentions Score	Low	21	47.51%	31.21%	***0.635***	69.27%	21.32%	***0.109***	1.71	2.17	***0.339***
	High	18	43.10%	25.55%		55.51%	30.80%		0.89	3.12	
Healthy Food Is More Expensive	Sometimes	21	44.85%	28.01%	***0.884***	69.82%	24.21%	***0.081***	1.76	2.57	***0.281***
	Always or Often	18	46.21%	29.75%		54.87%	27.83%		0.83	2.73	
Use of Nutrition Facts Labels	Sometimes or rarely	14	54.71%	25.36%	***0.131***	62.54%	26.85%	***0.947***	1.71	2.79	***0.509***
	Always or Often	25	40.31%	29.25%		63.14%	27.15%		1.12	2.60	

a: percent of total child food purchasing requests which the parents purchased; **b**: percent of parental responses to child requests that promoted healthful food purchasing (i.e., resisted an unhealthy request or yielded to a healthy request); **c**: Number of healthy responses minus the number of non-healthy responses

Table 7. Adjusted odds ratios for healthy parental responses to child requests by hypothesized factor, (n=222)

Hypothesized Factors	Odds Ratio	95% CI	*P-Value*
Parent healthy weight (BMI ≤25kg/m²)[A]	2.061	1.114-3.812	*0.023**
High parental diet quality[B]	1.343	0.675-2.669	*0.390*
High healthfulness score for food purchasing intentions[c]	1.259	0.614-2.582	*0.519*
Healthy food is more expensive ("Sometimes")[D]	1.366	0.684-2.725	*0.366*
Use nutrition facts labels when food shopping ("Often" or "Always")[E]	1.211	0.577-2.541	*0.603*

Model adjusted for: child focused marketing on the packaging, healthfulness of child request, linguistic type of request, child gender, family poverty level, and store type. Hypothesized factors in Table 7 are not controlled for all other hypothesized factors.
A: referent group = >25kg/m²; **B**: referent group = Low diet quality; **C**: Low healthfulness intentions score; **D**: referent group = "Often" or "Always"; E: referent group = "Rarely" or "Sometimes"
* = p<0.05

DISCUSSION

The purpose of this study was to describe parent responses to child requests and investigate factors associated with the healthfulness of responses. Parents responded healthfully to just over 60% of child requests, which was encouraging but leaves room for improvement. On average parents in this sample yielded to 45.5% of child requests, which is similar to another observational study of parent-child dyads which reported a 48% yield rate (18). Our findings show that some demographic and anthropometric variables were associated with the healthfulness of parent responses to child in-store food purchasing requests. In univariate analysis, parents in the lower income group (<370% federal poverty line) were more likely to make a healthy response to child requests. Also, a near significant gender difference was seen where parents' responses to male children were more healthful than responses to female children. In the adjusted response level model, healthy weight parents were more likely to make a healthy response to child requests than overweight/obese parents.

Healthy parent BMI, compared to overweight/obese BMI, was significantly associated with a twofold greater likelihood of a response to a child in-store food purchasing requests being healthy. This finding was seen in the adjusted response level model and remained significant after adjusting for all other hypothesized factors. Parent BMI was not significant in univariate analysis (Table 6), though findings were in the same direction as the adjusted model. In supplementary analysis of this sample, Fisher's Exact Test was applied to dichotomized independent and dependent variables and showed healthy weight parents were significantly more likely than overweight/obese parents to be above the sample median for percentage of healthy requests (P=0.025). Other studies have not examined this relationship specifically, but research indicates overweight parents are less likely to believe healthy diets reduce disease risk, be confident in choosing a healthy diet, or set meal preparation and food shopping goals (126), and are more likely to have a young child who consumes a less healthful diet (124). Possibly due to psychosocial variables and food behaviors as suggested in the literature (126), these findings show healthy weight parents are more likely to make healthy responses to their child's food requests in the grocery store.

Parents of households closer to the federal poverty line (<370% vs. ≥370%) were more likely to make healthful responses to child food requests in univariate analysis, and this finding remained a significant covariate in the adjusted response level model (P=0.003). This is counter to conventional thought about the relationship between poverty and diet quality. According to USDA data on food expenditures, lower income households do purchase slightly less healthful food "shopping baskets" than high-income households (11). In this sample purchasing healthfulness varied very little between income groups. Lower and higher income parents in this sample purchased similar proportions of fruits, vegetables, and snack foods, but lower income parents purchased significantly higher proportions of SSB (3.3% vs. 0.5%; $P<0.01$). This is similar to income-stratified consumption and purchasing patterns shown in the literature (154, 155). So if food purchasing preferences do not explain this finding, perhaps residual confounding contributed to this result or it may be a true finding. More research is needed to examine SES differences in parent-child food purchasing interactions.

Parent diet quality was not significantly associated with the healthfulness of their responses to child requests. Parental diet quality has been shown to be low to moderately correlated with child diet quality (74, 105). However, parents report having different attitudes about foods they are choosing for themselves than their children. Parents are more likely to consider nutrition when choosing food for their children, but more likely to consider price and taste when choosing food for themselves (59, 60), possibly explaining that lack of association observed in this study.

Parents who scored highest on the food purchasing intentions index where not more likely to respond healthfully to child in-store food purchasing requests. The theory of planned behavior states intentions to perform a behavior precede the behavior (111). This relationship has been demonstrated in food purchasing behaviors as well (75, 113). However, because parents may consider nutrition most important when choosing children's food (59, 60), and due to the fact many parents use the grocery shopping time as a chance to educate children on food shopping and nutrition (24), they may be more inclined to make health conscious decisions during interactions with their children compared to their overall food purchasing. This may contribute to the lack of association between overall food purchasing intentions and responses to child requests. Additionally, the low response variability for this question limited the ability to find a significant result.

Parents who perceived healthy foods to be “always” or “often” more expensive than unhealthy foods did not respond significantly differently than those who felt healthy foods were only “sometimes” more expensive. Larger cross-sectional studies also show that food shoppers usually perceive healthful foods to be more expensive than unhealthful foods (101, 102). Parents have cited perceived food high cost as a barrier to healthy food shopping (22, 103, 104), and one study showed that high-cost perception of fruits and vegetables was associated with less purchases and lower intake of fruits and vegetables by both parents and their children (76). Although parent perception of the relative cost of healthy food was not significantly associated was parent response healthfulness, the results were in the direction expected from the literature. The null finding was likely due to low variability in parent responses.

Parents who reported using nutrition facts labels more often were not more likely to respond healthfully to their child’s food purchasing requests. In this sample, 61.5% (n=24) of participants reported they “always” or “often” use nutrition facts label when food shopping, which is almost identical to NHANES (2005-2006) data analyzed by Ollberding et l. who reported 61.6% of participants used nutrition facts labels (156). The use of nutrition facts labels has been associated with healthier diets and less risk of having an overweight child (77, 114-116), but research hasn’t specifically examined parent responses to child requests. Even though nutrition facts label use has been associated with healthier diets, many parents and consumers find the labels confusing and choose to rely on “common sense” and limited aspects of the label such as total fat, calories, vitamins, or “additives” (104, 117, 118). Participants in this sample might have had a different “common sense” definition of healthy food than the one used in this study, possibly partially explaining this null finding.

Limitations of this study include a lack of food price measurement, lack of an objective measure of nutrition facts labels, only observing one shopping trip per dyad, reaction effects, and clustering of responses at the parent level. Due to limitations of the micro-camcorder data collection method, prices of foods that were discussed, but not purchased, and the use of nutrition facts labels could not be reliably assessed. While the method has been validated to assess several aspects of the in-store environment/shopping behaviors, both of these variables rely on the child facing the direction of the parent/food item while it is on the shelf (to assess price) or while the parent is looking at the label. Food price can be a barrier to purchasing, especially for low-income shoppers (157), and has been shown to be associated with parental yielding to child in-store food purchasing requests (31). Another limitation is observing only one shopping trip which means it cannot be certain that the observed behaviors reflect typical parent-child interactions. This also increases the likelihood of reaction effects as the dyad may not have acclimatized to the presence of the micro-camcorder. Parent’s behaviors, more so than their children, may succumb to reaction effects leading to social desirability bias. However, a review by Gardner shows there is little evidence that parent behaviors are significantly affected by overt observation, especially if the behaviors being studied are habitual and performed in their natural setting (33). This is the case in this study in which dyads are performing a habitual behavior such as food shopping, and doing it at their usual grocery store. Finally, in the adjusted response level model there was clustering of the outcome at the parent level which was an additional source of variation. There was an attempt to control for this by using a general linear mixed model with the parent ID as a random effect and using robust standard error estimates. A similar approach was used by Hogan et al. in studying an unrelated, though equally clustered outcome (149).

CONCLUSIONS

In an observational study of dyads made up of parents with preschool-aged children, healthy-weight parents were more likely than overweight/obese parents to respond healthfully to their child's in-store food purchasing requests. The healthfulness of parental responses was not associated with their reported use of nutrition facts labels, perceived relative cost of healthy foods, or the healthfulness of their diet or food purchasing intentions. These findings suggest that behavioral interventions that seek to improve the healthfulness of food purchasing in families with young children should focus more resources to addressing response behaviors in overweight/obese parents. Additionally, parent responses differed by family income level and child gender. There is little literature to put these last two findings in context and more research is needed.

CHAPTER 6: CONCLUSIONS AND IMPLICATIONS

The aims of this research were to 1) demonstrate the validity of using a personally-worn micro-camcorder (PWMC) method to assess in-store parent-child food-purchasing interactions and environmental factors related to these behaviors; 2) examine the relationship between child at-home TV-exposure, home food availability/accessibility, parent dietary modeling, and child-feeding style with the healthfulness of child in-store food purchasing requests; and 3) examine the relationship between parent weight status, parent diet quality, food purchasing intentions, perceived relative cost of healthy food, and the use of nutrition facts labels while shopping with the healthfulness of parent responses to child in-store food purchasing requests.

A total sample of 56 parent-child dyads were recruited from local child care centers and via email mailing list from the Austin, TX area. Of the recruited dyads, 40 completed the study and provided full data for aims 2 and 3, while a subsample of 32 provided data for aim 1. These dyads were met at their usual grocery store and shopping time. Children wore a micro-camcorder or and eButton on a hat facing the direction of their face. Videos were coded by two independent raters, and video data were compared to in-person observation and receipt data. Parents also completed a questionnaire about nutrition behaviors and the home food environment. The relationship between independent variables and the healthfulness of parent-child food purchasing interactions was assessed.

Coded personally worn micro-camcorder (PWMC) data was highly correlated (rho = 0.345-0.911, $p<0.01$) with in-person observational data for assessing in-store behavioral and environmental factors, and the method demonstrated a high degree of reliability for assessing purchasing decisions compared to receipt data (Cohen's kappa = 0.787). Also, inter-rater reliability for assessing environmental/behavioral variables ranged from moderate to almost perfect (Cohen's kappa = 0.466-0.937).

Overall, children made 80 (36%) healthful requests and 142 non-healthful requests. Of these requests, 85 were for snack food, SSB, or sugary cereal, while 60 were for fruits or vegetables. Children who were non-white made more healthy food purchasing requests per minute of shopping time in univariate analysis (P=0.03). In the adjusted model, having parents with high levels of unhealthy dietary modeling was associated with lower odds of a request being healthy (P=0.021), and having parents who practice non-directive child-feeding was associated with increased odds of a request being healthy (P=0.028).

On average, parents responded in a healthful way 62.9% (±26.7%; median = 62.5%, 0.0% to 100%) of the time. Overall, parents yielded to 46 of 80 healthy requests (57.5%), and yielded to 52 of 142 non-healthy requests (36.6%). There was a near significant relationship in univariate analysis in which parents were more likely to have a high percentage of healthy responses if their child was male, compared to having a female child (P=0.064). In univariate analysis, parents of families at <370% of the federal poverty line were more likely to have a high percentage of healthy responses, compared to those ≥370% of the poverty line (P=0.010). In the adjusted model, healthy weight parents were more likely to make healthy responses than overweight/obese parents (P=0.022).

There are several future research needs found during this study. To add to the PWMC method's advantages compared to in-person observation, future research needs to be conducted to explore its efficiency potential. For instance, participants could be trained to use the camera while shopping and email back raw digital data at scheduled time points to efficiently gather longitudinal data. Also, several behavioral/environmental aspects of parent-child interactions were difficult to assess using the PWMC. These included collection of price data, coding of product placement, and distinguishing between sophisticated child request types. Research is needed to improve the collection and coding of these data. Additionally, several unexpected and/or near significant findings were seen which need further investigation. These included the relationships between child race, family food security, and child TV-viewing on the healthfulness of child requests, and the relationships between child gender and family poverty level on the healthfulness of parent responses to child requests. Lastly, larger studies and ones that can establish a temporal relationship between exposures and outcomes are needed.

In conclusion, the primary advantages of using the PWMC method include the ability to collect a comprehensive record of events beyond the capabilities of an in-person observer and the potential to collect data on multiple participants simultaneously. A major disadvantage, compared to covert observational techniques, is the introduction of reaction effects due to participant awareness of data collection. Therefore the PWMC method is best suited for data collection in intervention studies, exploratory studies with the goal of hypothesis development, or studies that seek to validate observational techniques by comparison to PWMC data. The relationships between the healthfulness of parent-child food purchasing interactions and environmental, behavioral, anthropometric, and/or psychosocial factors were assessed for the first time in this study. Unhealthful parental dietary modeling and non-directive feeding practices were identified as being significantly associated with the healthfulness of child requests. Healthy-weight parents were more likely than overweight/obese parents to respond healthfully to their child's in-store food purchasing requests. However, child TV-exposure, the healthfulness of home food availability/accessibility, parent diet quality, the healthfulness of food shopping intentions, perceived relative cost of healthy food, and the use of nutrition facts labels were not significantly associated with the healthfulness of parent-child food purchasing interactions. Behavioral interventions that seek to improve the healthfulness of food purchasing in families with young children should include components focusing on promoting non-directive feeding styles, discouraging unhealthful dietary modeling, provide additional resources to target overweight/obese parents' responses to child requests, and use the PWMC method for efficient measurement of these behaviors.

APPENDIX

Appendix A: Observation form

Code: Date: Time:

Time	Product Description	Product Type	Child Focused Marketing	Price	Product Placement Code	Location (aisle description)	Child Position Code	Type of Interaction Code	Parental Response Code	Child Response Code	Parent Subsequent Response	Purchase	Comments
		G F/V M B D SSB SnkFd Other:	yes no		1 2 3 4	pro brd dairy frzn cereal cndy deli other:	1 2 3 Other	1 2 3 4 5 Other	1 2 3 4 5 6 7 Other	1 2 3 4 5 6 Other	1 2 3 4 5 6 7 Other	yes no	
		G F/V M B D SSB SnkFd Other:	yes no		1 2 3 4	pro brd dairy frzn cereal cndy deli other:	1 2 3 Other	1 2 3 4 5 Other	1 2 3 4 5 6 7 Other	1 2 3 4 5 6 Other	1 2 3 4 5 6 7 Other	yes no	
		G F/V M B D SSB SnkFd Other:	yes no		1 2 3 4	pro brd dairy frzn cereal cndy deli other:	1 2 3 Other	1 2 3 4 5 Other	1 2 3 4 5 6 7 Other	1 2 3 4 5 6 Other	1 2 3 4 5 6 7 Other	yes no	
		G F/V M B D SSB SnkFd Other:	yes no		1 2 3 4	pro brd dairy frzn cereal cndy deli other:	1 2 3 Other	1 2 3 4 5 Other	1 2 3 4 5 6 7 Other	1 2 3 4 5 6 Other	1 2 3 4 5 6 7 Other	yes no	
		G F/V M B D SSB SnkFd Other:	yes no		1 2 3 4	pro brd dairy frzn cereal cndy deli other:	1 2 3 Other	1 2 3 4 5 Other	1 2 3 4 5 6 7 Other	1 2 3 4 5 6 Other	1 2 3 4 5 6 7 Other	yes no	
		G F/V M B D SSB SnkFd Other:	yes no		1 2 3 4	pro brd dairy frzn cereal cndy deli other:	1 2 3 Other	1 2 3 4 5 Other	1 2 3 4 5 6 7 Other	1 2 3 4 5 6 Other	1 2 3 4 5 6 7 Other	yes no	
		G F/V M B D SSB SnkFd Other:	yes no		1 2 3 4	pro brd dairy frzn cereal cndy deli other:	1 2 3 Other	1 2 3 4 5 Other	1 2 3 4 5 6 7 Other	1 2 3 4 5 6 Other	1 2 3 4 5 6 7 Other	yes no	
		G F/V M B D SSB SnkFd Other:	yes no		1 2 3 4	pro brd dairy frzn cereal cndy deli other:	1 2 3 Other	1 2 3 4 5 Other	1 2 3 4 5 6 7 Other	1 2 3 4 5 6 Other	1 2 3 4 5 6 7 Other	yes no	
			If **yes**, explain in comments		1 = below child eye level	If **other**, explain in comment box	1 = in cart	1 = just ask (child)	1 = offer cheaper brand	1 = agree, no response	1 = ignore, no response		*explain "other" responses in comment box
					2 = at child eye level		2 = walking	2 = demand (child)	2 = offer healthy option	2 = disappointment	2 = anger		
					3 = above eye level		3 = carried	3 = bargain (child)	3 = bargain	3 = anger, tantrum	3 = punish, threaten		
					4 = Not present		If **other**, explain	4 = put in cart (child)	4 = flat no	4 = ask again	4 = flat no		
								5 = parent initiated	5 = flat yes	5 = bargain	5 = yes		
								If **other**, explain	6 = stall, ignore	6 = no, refuse	6 = stall		
									7 = no w/reason	If **other**, explain	7 = repeat first		
									If **other**, explain		If **other**, explain		

Appendix B: Parent questionnaire

Parent Questionnaire

Code: _______
Date: _______
Researcher: _______

Thank you for taking the time to take this survey. This survey seeks to better understand food purchasing and home food environments of families with young children. Please answer all questions to the best of your ability. This survey will take approximately 10-15 minutes to complete.

Please only answer the following questions for your 2-5 year old child, not for any other children in the household. If you have more than one 2-5 year old child please choose the child whose birthday is coming up next, and answer the following questions while only thinking of this one child.

D1. How old is your preschool-aged child? (Please circle one age)
Years old: 2 3 4 5

D2. Is this child a boy or girl?
Boy
Girl

D3. What is your relationship to the child? □ Mother □ Father □ Grandparent □ Other: _________________

Note: Please remember that throughout the survey, when we ask you questions about "your child" or "my child", we are referring to this child only.

AB1.	Healthy food costs more money than unhealthy food	Always	Often	Sometimes	Rarely	Never
AB2.	When deciding which food to purchase, the first thing I consider is the **nutritional value** of the food	Always	Often	Sometimes	Rarely	Never
AB3.	When deciding which food to purchase, the first thing I consider is the **price** of the food	Always	Often	Sometimes	Rarely	Never
AB4.	When deciding which food to purchase, the first thing I consider is the **taste** of the	Always	Often	Sometimes	Rarely	Never

	food					

Please circle the answer choice that most closely matches your family:

I1.	Before going to the grocery store, I intend to purchase **vegetables** (e.g., carrot, broccoli, celery, cucumber) for my family.	Every Shopping trip	Most shopping trips	Some shopping trips	Rarely	Never
I2.	Before going to the grocery store, I intend to purchase **fruits** (e.g., apples, bananas, oranges, strawberries) for my family.	Every Shopping trip	Most shopping trips	Some shopping trips	Rarely	Never
I3.	Before going to the grocery store, I intend to purchase **whole grain foods** (e.g., whole wheat bread, oatmeal, popcorn) for my family.	Every Shopping trip	Most shopping trips	Some shopping trips	Rarely	Never
I4.	Before going to the grocery store, I intend to purchase **beans** for my family (Such as pinto, black, kidney, etc. (Dried, cooked, canned)).	Every Shopping trip	Most shopping trips	Some shopping trips	Rarely	Never
I5.	Before going to the grocery store, I intend to purchase **ground beef/hamburger meat/patties, bacon, fried meats, and/or sausage** for my family.	Every Shopping trip	Most shopping trips	Some shopping trips	Rarely	Never
I6.	Before going to the grocery store, I intend to purchase **regular soda** (not diet soda) for my family.	Every Shopping trip	Most shopping trips	Some shopping trips	Rarely	Never
I7.	Before going to the grocery store, I intend to purchase **other sugary drinks** (not diet soda) for my family (Such as Gatorade, PowerAde, punch drinks, lemonade etc. (not diet varieties, soda, or 100% fruit juice)).	Every Shopping trip	Most shopping trips	Some shopping trips	Rarely	Never
I8.	Before going to the grocery store, I intend to purchase **sweets** (e.g., cookies, cake, ice cream, candy) for my family.	Every Shopping trip	Most shopping trips	Some shopping trips	Rarely	Never
I9.	Before going to the grocery store, I intend to purchase **salty snacks** (e.g., potato chips, corn chips,	Every Shopping trip	Most shopping trips	Some shopping trips	Rarely	Never

	cheese puffs, pretzels) for my family.					

SB1. Which of the following options best describes the way you shop for food?
A. Monthly big trip, no small trips
B. Monthly big trip and a few small trips
C. Every other week big trip, no small trips
D. Every other week big trip and a few small trips
E. Weekly big trip, no small trips
F. Weekly big trip and a few small trips
G. No big trip, all small trips, as needed
H. Other: ______________________________

SB2. I read nutrition facts labels when making decisions on which foods to buy
A. Always
B. Often
C. Sometimes
D. Rarely
E. Never

SB3. How often does your child go with you on grocery shopping trips?
A. Always
B. Often
C. Sometimes
D. Rarely
E. Never

SB4. Why do you, or why do you not bring your child when grocery shopping? (circle one most important reason please)
A. I bring my child because there is no one to watch them at home
B. I bring my child to see what they want to eat
C. I bring my child because we shop as a family
D. I bring my child to teach them about food and/or shopping
E. I bring my child because I go to the store after picking them up
F. I don't bring my child because they ask for junk food
G. I don't bring child because it is faster to shop alone
H. Other: ____ (Circle one: Bring or Don't Bring)

SB5. Does your child help you shop for groceries at the store? (Skip if you do not take your child shopping)
A. Always
B. Often
C. Sometimes
D. Rarely
E. Never

SB6. How engaged is your child when you are making food selections at the grocery store? (Skip if you do not take you child shopping)

A. Always voices a preference
B. Often will voice a preference
C. Sometimes will voice a preference
D. Rarely voices a preference
E. Never will voice a preference

SB7. Who does most of the food shopping for the family?

A. Mother or step-mother
B. Dad or step-dad
C. Mother and Dad equally
D. Grandparent
E. Other: ____________________________

Please circle the answer choice that most closely matches your family:

FE1.	Do you have any **fruit** (fresh, frozen, canned, jarred, or dried) in your home?	Always	Often	Sometimes	Rarely	Never
FE2.	Without opening any doors (including doors to your garage, refrigerator or pantry doors) would you be able to see **fruit** in your home now, displayed out in the open?	Always	Often	Sometimes	Rarely	Never
FE3.	Do you have any **vegetables** (fresh, frozen, canned, jarred, or dried) in your home?	Always	Often	Sometimes	Rarely	Never
FE4.	Do you have any <u>**ready to eat**</u> **fresh vegetables** on a shelf in the refrigerator or on the kitchen counter or table? These include baby carrots, cherry tomatoes, or vegetables that you have <u>sliced to make them ready to eat</u>	Always	Often	Sometimes	Rarely	Never
FE5.	Do you have any **salty snacks** in your home? (These include pretzels, chips, crackers, etc.)	Always	Often	Sometimes	Rarely	Never
FE6.	Do you have any **salty snacks** displayed out in the open?	Always	Often	Sometimes	Rarely	Never
FE7.	Do you have any **sweet snacks** in your home? (These include cookies, ice-cream, Twinkies, doughnuts, muffins, cake, candy)	Always	Often	Sometimes	Rarely	Never
FE8.	Do you have any **sweet snacks** displayed out in the open?	Always	Often	Sometimes	Rarely	Never
FE9.	Do you have any **regular soda** (not diet soda) in your home?	Always	Often	Sometimes	Rarely	Never
FE10.	I keep **regular sodas** where my child can reach them	Always	Often	Sometimes	Rarely	Never
FE11.	Do you have any other types of **sugary drinks** in your home? (Such as Gatorade, PowerAde, punch drinks, lemonade etc. (not diet	Always	Often	Sometimes	Rarely	Never

	varieties, soda, or 100% fruit juice))					
FE12.	I keep other types of **sugary drinks** where my child can reach them (not diet varieties, soda, or 100% fruit juice).	Always	Often	Sometimes	Rarely	Never
FE13.	Do you have any **whole grain breads, whole grain tortillas, whole grain pasta, whole grain cereals and/or whole grain crackers or other whole grain foods** in your home?	Always	Often	Sometimes	Rarely	Never
FE14.	I keep **whole grain foods** where my child can reach them	Always	Often	Sometimes	Rarely	Never
FE15.	Do you have any **beans** in your home (Such as pinto, black, kidney, etc. (Dried, cooked, canned))?	Always	Often	Sometimes	Rarely	Never
FE16.	I keep **beans** where my child can reach them	Always	Often	Sometimes	Rarely	Never
FE17.	Do you have any **ground beef/hamburger meat/patties, bacon, fried meats, and/or sausage** in your home?	Always	Often	Sometimes	Rarely	Never
FE18.	I keep **ground beef/hamburger meat/patties, bacon, fried meats, and/or sausage** where my child can reach them	Always	Often	Sometimes	Rarely	Never
PM1.	I eat **fruit** in front of my child	Always	Often	Sometimes	Rarely	Never
PM2.	I eat **vegetables** in front of my child	Always	Often	Sometimes	Rarely	Never
PM3.	I eat **salty snacks** in front of my child	Always	Often	Sometimes	Rarely	Never
PM4.	I eat **sweet snacks** in front of my child	Always	Often	Sometimes	Rarely	Never
PM5.	I drink **regular soda** in front of my child	Always	Often	Sometimes	Rarely	Never
PM6.	I drink other types of **sugary drinks** (not diet varieties, soda, or 100% fruit juice) in front of my child	Always	Often	Sometimes	Rarely	Never
PM7.	I eat **whole grain foods** in front of my child	Always	Often	Sometimes	Rarely	Never
PM8.	I eat **beans** in front of my child	Always	Often	Sometimes	Rarely	Never
PM9.	I eat **ground beef/hamburger meat/patties, bacon, fried meats, and/or sausage** in front of my child	Always	Often	Sometimes	Rarely	Never

CF1.	I warn my child that I will take away something other than food if he or she doesn't eat	Always	Often	Sometimes	Rarely	Never
CF2.	I warn my child that I will take a food away if the child doesn't eat	Always	Often	Sometimes	Rarely	Never

CF3.	Do you reward your child with desserts, snacks or candy if they finish foods on their plate at dinner?	Always	Often	Sometimes	Rarely	Never
CF4.	Do you restrict dessert if your child does not eat the food on their plate?	Always	Often	Sometimes	Rarely	Never
CCF1.	I say something positive about the food my child is eating during dinner to get him or her to eat.	Always	Often	Sometimes	Rarely	Never
CCF2.	I reason with my child to get him or her to eat	Always	Often	Sometimes	Rarely	Never
CCF3.	I compliment my child for eating food	Always	Often	Sometimes	Rarely	Never
CCF4	I encourage my child to eat by arranging the food to make it more interesting	Always	Often	Sometimes	Rarely	Never
PC1.	I beg my child to eat dinner	Always	Often	Sometimes	Rarely	Never
PC2.	I spoon-feed my child or physically assist in feeding to get him or her to eat dinner.	Always	Often	Sometimes	Rarely	Never
PC3.	I physically struggle with my child to get him or her to eat	Always	Often	Sometimes	Rarely	Never
FC1.	During meals at home, I get my child enthusiastic about healthy food, such as vegetables, fruit and whole grain products	Always	Often	Sometimes	Rarely	Never
FC2.	During meals at home, do you talk to your child about eating a healthy diet?	Always	Often	Sometimes	Rarely	Never
MTB1.	My child assists in family meal preparation and/or cooking, even if they can only help a little bit	Always	Often	Sometimes	Rarely	Never
MTB2.	When we eat meals at home, our family eats together	Always	Often	Sometimes	Rarely	Never
MTB3.	My child is picky or fussy about what (s)he eats	Always	Often	Sometimes	Rarely	Never
MTB4.	I allow my child to decide when to eat meals and snacks.	Always	Often	Sometimes	Rarely	Never

Please circle the answer choice that most closely matches your family:

TV1. How many working TV's do you have in your home? Please circle one response.
0 1 2 3 4 4+

TV2. Does your child have a working TV in their bedroom?
A. Yes
B. No

TV3. How often would you say that you reward good behavior with extra TV time?
A. Always
B. Often
C. Sometimes
D. Rarely

E. Never

TV4. Does your child watch TV while eating?

A. Always
B. Often
C. Sometimes
D. Rarely
E. Never

TV5. How many hours of TV does your child watch each day? Please circle one response.

0 1 2 3 4 5 6 7 8 8+

FS1. In the past year, how often has the food your family purchased ran out and you did not have enough money to buy more?

A. Always
B. Often
C. Sometimes
D. Rarely
E. Never

FS2. Do you worry whether your family's food will run out before you get money to buy more?

A. Always
B. Often
C. Sometimes
D. Rarely
E. Never

FS3. Are you unable to provide a healthy meal to your child because you cannot afford it?

A. Always
B. Often
C. Sometimes
D. Rarely
E. Never

PD1. Over the past month, how many times per month, week, or day did **you eat fruits**? (Circle one answer please)

A. 5 or more times per **day**
B. 2-4 times per **day**
C. 1 time per **day**
D. 5-6 times per **week**
E. 3-4 times per **week**
F. 1-2 times per **week**
G. 1-3 times per **month**
H. Never

PD2. Over the past month, how many times per month, week, or day did **you eat vegetables**? (Circle one answer please)

A. 5 or more times per **day**
B. 2-4 times per **day**
C. 1 time per **day**
D. 5-6 times per **week**
E. 3-4 times per **week**
F. 1-2 times per **week**
G. 1-3 times per **month**
H. Never

PD3. Over the past month, how many times per month, week, or day did **<u>you eat salty snacks</u>**? (Circle one answer please)

A. 5 or more times per **day**
B. 2-4 times per **day**
C. 1 time per **day**
D. 5-6 times per **week**
E. 3-4 times per **week**
F. 1-2 times per **week**
G. 1-3 times per **month**
H. Never

PD4. Over the past month, how many times per month, week, or day did **<u>you eat sweet snacks</u>**? (Circle one answer please)

A. 5 or more times per **day**
B. 2-4 times per **day**
C. 1 time per **day**
D. 5-6 times per **week**
E. 3-4 times per **week**
F. 1-2 times per **week**
G. 1-3 times per **month**
H. Never

PD5. Over the past month, how many times per month, week, or day did **<u>you drink regular soda</u>**? (Circle one answer please)

A. 5 or more times per **day**
B. 2-4 times per **day**
C. 1 time per **day**
D. 5-6 times per **week**
E. 3-4 times per **week**
F. 1-2 times per **week**
G. 1-3 times per **month**
H. Never

PD6. Over the past month, how many times per month, week, or day did **<u>you drink</u>** **<u>other sugary drinks</u>** (not diet varieties, soda, or 100% fruit juice)? (Circle one answer please)

A. 5 or more times per **day**
B. 2-4 times per **day**
C. 1 time per **day**
D. 5-6 times per **week**
E. 3-4 times per **week**
F. 1-2 times per **week**
G. 1-3 times per **month**
H. Never

PD7. Over the past month, how many times per month, week, or day did **<u>you eat</u>** **<u>whole grain foods</u>**? (Circle one answer please)

A. 5 or more times per **day**
B. 2-4 times per **day**
C. 1 time per **day**
D. 5-6 times per **week**
E. 3-4 times per **week**
F. 1-2 times per **week**
G. 1-3 times per **month**
H. Never

PD8. Over the past month, how many times per month, week, or day did **<u>you eat beans</u>** (Such as pinto, black, kidney, etc. (Dried, cooked, canned))? (Circle one answer please)

A. 5 or more times per **day**
B. 2-4 times per **day**
C. 1 time per **day**
D. 5-6 times per **week**
E. 3-4 times per **week**
F. 1-2 times per **week**
G. 1-3 times per **month**
H. Never

PD9. Over the past month, how many times per month, week, or day did **<u>you eat</u>** **<u>ground beef/hamburger meat/patties, bacon, fried meats, sausage</u>**? (Circle one answer please)

A. 5 or more times per **day**
B. 2-4 times per **day**
C. 1 time per **day**
D. 5-6 times per **week**
E. 3-4 times per **week**
F. 1-2 times per **week**
G. 1-3 times per **month**
H. Never

PD10. Over the past month, how many times per month, week, or day did **<u>your family eat at/from a fast-food restaurant</u>**? (Circle one answer please)

A. 3 or more times per **day**
B. 2 times per **day**
C. 1 time per **day**
D. 5-6 times per **week**
E. 3-4 times per **week**
F. 1-2 times per **week**
G. 1-3 times per **month**
H. Never

PD11. Over the past month, how many times per month, week, or day did **<u>your family eat at a sit-down restaurant</u>**? (Circle one answer please)

A. 3 or more times per **day**
B. 2 times per **day**
C. 1 time per **day**
D. 5-6 times per **week**
E. 3-4 times per **week**
F. 1-2 times per **week**
G. 1-3 times per **month**
H. Never

D4. How many children (under 18 years of age) live in your home?

1 2 3 4 5 6 6+

D5. How many total people, including yourself, live in your home?

2 3 4 5 6 7 8 8+

D6. What is the main language that you speak in your home? □ English □ Spanish □ Other: ____________

D7. From the following options, how would you describe your ethnicity/race?

A. Black or African-American
B. White (non-Hispanic/Latino) or European-American
C. Hispanic or Latino
D. Asian or Pacific Islander
E. American Indian, Alaskan native or Hawaiian Native
F. Another race not listed (Please specify): ________________________

D8. How would you describe the ethnicity/race of your child?

A. Black or African-American
B. White (non-Hispanic/Latino) or European-American
C. Hispanic or Latino
D. Asian or Pacific Islander
E. American Indian, Alaskan native or Hawaiian Native
F. Another race not listed (Please specify): ________________________

D9. Which of the following options best describes your occupation? (If multiple jobs, choose based on your primary occupation)

A. Full time working
B. Part time working
C. Stay at home parent (working without a salary)
D. Student
E. Currently unemployed

D10. Which of the following options best describes the type of home you live in?

A. Apartment
B. Mobile home
C. Town house, duplex or condo
D. House (not connected to any other homes, with its own boundaries)

D11. What is your family's total annual household income?
A. Under $5,000
B. $5,000 to $9,999
C. $10,000 to $14,999
D. $15,000 to $19,999
E. $20,000 to $29,999
F. $30,000 to $39,999
G. $40,000 to $49,999
H. $50,000 to $59,999
I. $60,000 to $69,999
J. $70,000 to $79,999
K. $80,000 or above

D12. What is your highest level of education completed?
A. Some high school, but no degree at this time
B. High school degree or GED
C. Some college, but no degree at this time
D. Associates degree
E. Bachelor's degree
F. Graduate or professional degree

D13. Does your family receive any food assistance? (Circle all that apply)
A. WIC
B. Food stamps or SNAP
C. Free or reduced school lunch program
D. Child & Adult Care Food Program (CACFP)
E. None
F. Other:
____

D14. What is **your** height and weight? (Please answer to the best of your knowledge)

Height: _______ Feet, _______ Inches; Weight: ____________ Pounds

D15. What is **your child's** height and weight? (Please answer to the best of your knowledge)

Height: _______ Feet, _______ Inches; Weight: ____________ Pounds

D16. What is your age: _________

Thank you for completing the survey!

Appendix C: Sample consent form

Principal Investigator: Margaret Briley, PhD, RD, LD
Of The University of Texas at Austin: Nutritional Sciences; Telephone: 512-475-9762;
Email: m.briley@austin.utexas.edu

You and your child are being asked to participate in an observational research study. This form provides you with information about the study. The person in charge of this research will also describe this study to you and answer all of your questions. Please read the information below and ask any questions you might have before deciding whether or not to take part. Your participation is entirely voluntary. You can refuse to participate or stop participating at any time without penalty or loss of benefits to which you are otherwise entitled. You can stop your participation at any time and your refusal will not impact current or future relationships with UT Austin or participating sites. The researcher will provide you with a copy of this consent for your records.

The purpose of this study is to understand parent-child food-purchasing interactions and identify targets for development of a nutrition education program.

If you agree to be in this study, we will ask you to do the following things:

- Allow researchers to observe you and your child during a major grocery shopping trip
- Have child wear an audio/video recorder during this shopping trip
- Return your receipt from this shopping trip
- Complete a questionnaire

Total estimated time to participate: 1 hours

Risks of being in the study

- No risk above the level of everyday life is anticipated; however this study may involve risks that are currently unforeseeable. If you wish to discuss the information above or any other risks you may experience, you may ask questions now or call the Principal Investigator listed on the front page of this form.

Benefits By participating you will assist in the advancement of knowledge in the nutrition field, as well as receive a $15 gift card as a compensation for your time and effort.

Compensation/Cost:

- You are responsible for any taxes assessed on gift card purchases
- Transportation costs to the grocery store will not be covered

Confidentiality and Privacy Protections:

- All written data collection instruments will be coded with a code number and no participants name or identifying information will be associated. All materials will be kept in Dr Briley's lab in a locked file cabinet in a locked office which only research staff have access.
- All digital data will be stored on a secured computer hard drive located in a locked office. Only research staff will have access.
- The data resulting from your participation may be made available to other researchers in the future for research purposes not detailed within this consent form. In these cases, the data

will contain no identifying information that could associate you with it, or with your participation in any study.

- The presentation of images or audio from this study, which contain the face or voice of a participant, will require written permission from that participant

The records of this study will be stored securely and kept confidential. Authorized persons from The University of Texas at Austin, members of the Institutional Review Board, and (study sponsors, if any) have the legal right to review your research records and will protect the confidentiality of those records to the extent permitted by law. All publications will exclude any information that will make it possible to identify you as a subject. Throughout the study, the researchers will notify you of new information that may become available and that might affect your decision to remain in the study.

Contacts and Questions:

If you have any questions about the study please ask now. If you have questions later, want additional information, or wish to withdraw your participation call the researchers conducting the study. Their names, phone numbers, and e-mail addresses are at the top of this page.

If you would like to obtain information about the research study, have questions, concerns, complaints or wish to discuss problems about a research study with someone unaffiliated with the study, please contact the IRB Office at (512) 471-8871 or Jody Jensen, Ph.D., Chair, The University of Texas at Austin Institutional Review Board for the Protection of Human Subjects at (512) 232-2685. Anonymity, if desired, will be protected to the extent possible. As an alternative method of contact, an email may be sent to orsc@uts.cc.utexas.edu or a letter sent to IRB Administrator, P.O. Box 7426, Mail Code A 3200, Austin, TX 78713.

You will be given a copy of this information to keep for your records.

Statement of Consent:

I have read the above information and have sufficient information to make a decision about participating in this study. I consent to participate in the study.

Your Signature:_______________________________________ Date: __________________

____ Date: ___________________
Signature of Person Obtaining Consent

Signature of Investigator:_______________________________ Date: ___________________

GLOSSARY

95% CI	95% confidence interval
ASE	Asymptotic standard error
BMI	Body mass index
HFE	Home food environment
M	Mean
OR	Odds ratio
PWMC	Participant worn micro-camcorder
SAS	Statistical Analysis System
SD	Standard deviation
SEM	Social Ecological Model
SSB	Sugar sweetened beverage
TPB	Theory of Planned Behavior
TV	Television

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This dissertation was typed by the author