2019

Comparison of Parent and Child Ratings of Fruit and Vegetable Liking to Assess Parent Accuracy as Proxy Reporters

Virginia C. Stage
East Carolina University, carrawaystagev@ecu.edu

Carrie Downing
East Carolina University

Archana V. Hegde
East Carolina University, hegdea@ecu.edu

Dipti Dev
University of Nebraska-Lincoln, ddev2@unl.edu

Amanda D. Peterson
East Carolina University, petersonam@ecu.edu

See next page for additional authors

Comparison of Parent and Child Ratings of Fruit and Vegetable Liking to Assess Parent Accuracy as Proxy Reporters

Virginia C. Stage,[1] Carrie Downing,[1] Archana V. Hegde,[2] Dipti A. Dev,[3] Amanda D. Peterson,[1] and L. Suzanne Goodell [4]

1 Department of Nutrition Science, East Carolina University, Greenville, North Carolina
2 Department of Human Development and Family Science, East Carolina University, Greenville, North Carolina
3 Department of Child, Youth and Family Studies, University of Nebraska, Lincoln, Nebraska
4 Department of Food, Bioprocessing & Nutrition Sciences, North Carolina State University, Raleigh, North Carolina

Corresponding author — Virginia C. Stage, carrawaystagev@ecu.edu ; Department of Nutrition Science, College of Allied Health Sciences, Health Sciences Building, 2435B, North Carolina, USA

Abstract

This study examined the accuracy of parent-report child fruit/ vegetable (FV) liking. Child/parent dyads (n = 24) were recruited from six Head Start preschools in North Carolina. Liking for 10 FVs was assessed using a validated pictorial tool for children; a similar scale was used for parents. Negative relationships were observed between parent/child for one fruit (grapes) and one vegetable (broccoli). Positive relationships were observed among oranges, grapes, and overall fruit rankings.

Published in *Ecology of Food and Nutrition* 58:2 (2019), pp 166–186.
doi 10.1080/03670244.2019.1572002

This study was conducted according to the guidelines laid down by the Declaration of Helsinki and all procedures involving human subjects/patients were approved by North Carolina State University's Human Institutional Review Board. Written informed consent was obtained from all participants.

Parents tended to rank children's liking of fruits higher than their children, while children ranked liking vegetables higher. Findings suggest parents may not be accurate respondents for preschool children's FV liking.

Keywords: Fruit and vegetables, liking, parent-report, preschool children

Introduction

Food preferences are developed in early childhood (Birch 1999). Children's willingness to try new foods peaks in early infancy but declines through the preschool years (Cashdan 1994; Grimm et al. 2014). These first several years of life represent a critical period of development when children develop food likes and dislikes that often persist into adulthood (Rollins, Loken, and Birch 2010; Skinner et al. 2002). Food preferences have been cited as the main predictor of intake (Baxter and Thompson 2002; Bere and Klepp 2005; Birch 1999; Jaramillo et al. 2006); foods that children report liking are strongly and positively correlated with intake when compared to foods with a lower preference (Birch 1999, 1979b; Jaramillo et al. 2006). These findings indicate an important indicator of future consumption among young children may be the assessment of food preferences (Birch 1999), particularly among children <5 years.

Researchers have reported that most liked foods among children include snacks (e.g. chips and cookies), fast foods (e.g. pizza), and some fruits (e.g. applesauce) (Skinner et al. 1998). Further, vegetable consumption among young children has consistently been reported as a challenge (Johnson 2016). The reason behind this phenomenon may be children's inherent preference for foods that are energy dense with sweet and/or salty flavor profiles, which contrasts with the nutrient dense bitter and/or sour flavors presented by most vegetable varieties (Birch 1999, 1979a; Cooke, Wardle, and Gibson 2003; Dominguez 2014). Such reports of food preferences among preschool-aged children are in alignment with food intake patterns (Deming, Briefel, and Reidy 2014; Fox et al. 2010; Johnson 2016). The most recent report from the National Health and Nutrition Examination Survey (NHANES) related to young children's dietary intake revealed vegetable intake remains low, while fruit intake has slightly increased when comparing data collected in 2009–2010 to 2003–2004. In general, young children's FV intake is still too low with approximately

60% of children consuming below the recommended intake for fruits, and 93% of children consuming below the recommended intake for vegetables (Kim et al. 2014). Low FV intake during the early years is concerning considering the links between early dietary behaviors and long-term dietary and chronic disease risks (Boeing et al. 2012; Hung et al. 2004; Roberts and Barnard 2005). During this period, it is important for children to consume a healthy diet in order to support long-term health and disease prevention (Dwyer et al. 2010).

What, where, when, and how parents expose children to foods, may play as large a role as biology on children's food preferences and acceptance (Johnson 2016). Parents are often cited as having a large influence on children's food preferences (Bere and Klepp 2005; Birch 1999, 1979b; Russell, Worsle, and Liem 2014; Skinner et al. 2002) due to the role they play in making decisions about the types of food they will personally consume (modeling); the types of foods they will offer to children; the frequency with which these foods are offered; and their expectations for their child's consumption. For these reasons, parents are often asked to report on behalf of children (Russell, Worsle, and Liem 2014; Skinner et al. 1998; Wardle et al. 2001).

Some studies have determined young children are capable of providing responses for food preferences using a ranking method (Birch 1979a, 1979b; Sullivan and Birch 1990), or responses for food liking using rating tools (Jaramillo et al. 2006; Sullivan and Birch 1990; Vereecken et al. 2010). The "taste and rate" method is the most common (Birch 1979a; Birch and Sullivan 1991); but, more recently, use of pictorial hedonic tools to assess food preferences have shown positive results with young children (Carraway-Stage et al. 2014; Jaramillo et al. 2006; Vereecken et al. 2010). Working with children still poses many limitations to researchers, including short attention spans (Borgers, de Leeuw, and Hox 2000).

Although parents are commonly used as proxy reporters to provide responses for children (Russell, Worsle., and Liem 2014; Skinner et al. 1998; Wardle et al. 2001), few studies have attempted to determine the accuracy of these reports, particularly among preschool-aged children (Reinaerts, Nooijer, and de Vries 2007; Skinner et al. 2002; Vereecken et al. 2012, 2010). In one study, Vereecken et al. (2010) assessed food liking in preschool-aged children (n = 139) using a pictorial rating tool. The assessment tool was computerized and included a 4-point pictorial rating scale, including an option for "never tried" that

was included in dislike rating data. Findings indicated low to moderate agreement between parent and child reports for FV ratings. Unfortunately, the majority of these studies (Caporale et al. 2009; Reinaerts, Nooijer, and de Vries 2007; Vereecken et al. 2012, 2010) were conducted outside of the United States and none explored the phenomenon among low-income, low-resource families where FV are least consumed (Dubowitz et al. 2008; Irala-Estevez et al. 2000). Further, findings from these studies have been mixed, leaving little to no consensus in the literature about the validity of using parent reports for assessment of children's dietary intake. Therefore, the purpose of this study is to examine agreement in responses for FV liking between parents and children attending Head Start using a validated assessment tool to expand knowledge on the accuracy of parents' reports for children's FV liking. Head Start is the federally funded preschool program in the United States that serves low-income, low-resource children (3–5 years) and their families (Office of Head Start, 2017). The current study will expand the limited literature available investigating the accuracy of parent response data on children's fruit and vegetable.

Methods

Study design & participants

Six Head Start preschool centers serving low-income children in the Raleigh– Durham area were recruited to participate in the study. Parents of the preschool children were recruited through parent-teacher meetings, information flyers sent home describing the study, and on-site recruitment during center-specific pick-up and drop-off times. The parent who spent the most time with the child was asked to complete a questionnaire assessing (1) parent and child demographics (i.e. parent gender, race, marital status, education level, and employment status, and child gender, race, and date of birth), (2) child frequency of FV consumption, and (3) parent perceived child fruit and vegetable liking. Parents were directed to return signed consent forms and completed questionnaires to their child's respective Head Start Center Director. To evaluate child FV liking, researchers used a 5-point face liking scale and FV photographs previously evaluated for use within this sample population (Carraway-Stage et al. 2014). Research Assistants

(RAs) administered the liking assessment to each participating child within the preschool setting (Carraway-Stage et al. 2014; Vereecken et al. 2010). All RAs received training in ethics and standardized data collection methods. RAs who collected data from children participated in mandatory data collection training in which they practiced administering the FV liking tool to a small sample of preschool-aged children on at least two occasions prior to the start of the study. North Carolina State University's Institutional Review Board reviewed and approved all study instruments, forms, and protocols.

Fruit and vegetable liking assessment for children

As previously highlighted, children's FV liking was assessed using a 5-point face liking scale that ranged from "super yummy," "yummy," "just okay," "yucky," and "super yucky" (Carraway-Stage et al. 2014). The tool included a cartoon face that mimicked the rating of the scale (Figure 1). RAs asked children to rate their liking of 10 FVs including six fruits (grapes, pears, apples, oranges, strawberries, bananas) and four vegetables (broccoli, carrots, corn, tomatoes). Researchers initially selected FVs (13 fruits and 10 vegetables) based on: (1) previous studies that indicated likely consumption in the population (Carraway-Stage et al. 2014; Fox et al. 2010; Jaramillo et al. 2006); and

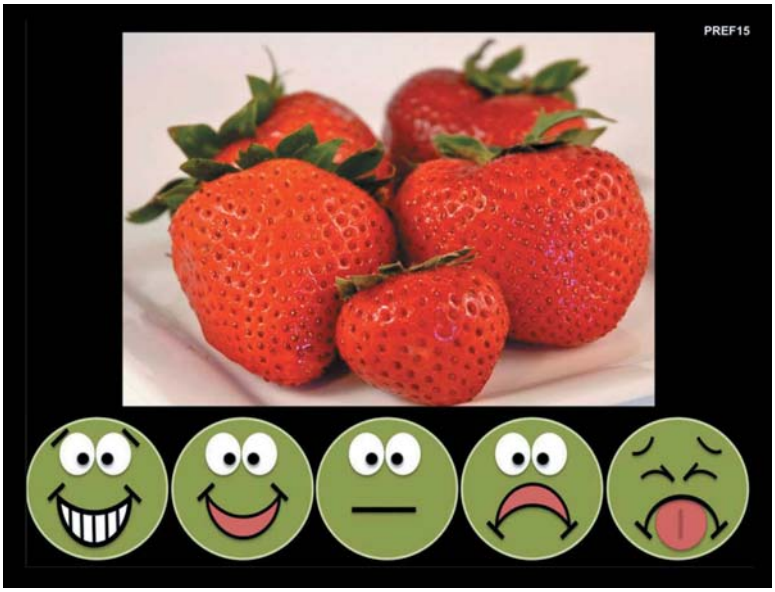

Figure 1. Example of pictorial assessment tool used to assess children's FV liking.

(2) cognitive evaluation of FV photographs with preschool-aged children in the target population (Carraway-Stage et al. 2014). A total of 41 photos remained after testing, and 10 photos were chosen to pilot-test the hedonic rating scale. See the original study for additional methodological details and outcomes of the pilot study (Carraway-Stage et al. 2014). The specific form of the pictured FVs were whole grapes, whole pear, whole apple, whole orange, whole strawberries, whole unpeeled banana, broccoli sprig, whole carrot, corn cob, and whole tomato. Each FV was presented on a white plate against a black background with the pictorial rating scale underneath (Figure 1). The assessment tool was determined to be reliable and valid using test-retest and taste-and-rate methods with this preschool-aged population (Carraway-Stage et al. 2014).

To complete the FV liking assessment, RAs assessed children individually in a low distraction area (e.g. an unused room or open area outside of the classroom) or in an area of the classroom with the child facing away from the other students. RAs sat side-by-side with children during the assessment. The RA presented the FV liking assessment as a game that involved looking at pictures and answering questions about the pictures. Before the assessment began, the child practiced making all of the faces that corresponded with the 5-point rating scale (e.g. "This is a super yummy face. This is the face you might make when you see a food you really like."). The RA then practiced the assessment process with a test picture (e.g. cereal and a slice of bread) by asking the children to name the item and point to a face on the rating scale to communicate their personal level of liking. The RA asked the children to correctly identify the fruit or vegetable on each card. If the child incorrectly named the item, the RA continued to the next picture. If the child correctly named the item, the RA followed up by asking if the child had tried the food before. If the child answered "no", the RA moved to the next card. If the child answered "yes", the RA asked the child to rate liking by pointing to a face on the scale. The RA responded to the rating by stating what the chosen face meant (e.g. "You pointed to the big smiling face, so you think this food is super yummy"). RAs followed this process for all 10 FVs in a randomized, pre-determined order. The pictorial rating scale was flipped after every F or V rating was reported (e.g. "super yummy," "yummy," "just okay," "yucky," "super yucky" exchanged with "super yucky," "yucky," "just okay," "yummy," "super yummy");

to decrease the possibility of bias in children's responses from the RAs pointing to one end of the scale during the assessment (Carraway-Stage et al. 2014).

Parental fruit and vegetable liking proxy assessment

Prior to conducting on-site child liking assessments, parents of participating children were asked to complete a non-pictorial questionnaire assessing their perception of their child's liking for the same 10 FVs included on the children's FV liking assessment. A similar 5-point rating scale was used for the parent's questionnaire; "strongly dislikes," "dislikes," "neither likes or dislikes," "likes," and "strongly likes." Parents were allowed the option to select "never tried" if they believed their child had not been previously exposed to the FV. Parents also reported the child's frequency of FV consumption for the same 10 FVs. Response options included "never," "less than 1 time per month," "1–2 times per month," or "2 or more times per month."

Data analysis

Statistical analyses were performed using the IBM Statistical Package for the Social Sciences (IBM SPSS 22, 2013). Demographic information was described using descriptive statistics. An increase in FV liking reported by parents and children connected to an increase in scale number (i.e. "super yucky"/"strongly dislikes" = 1; "super yummy"/"strongly likes" = 5). If the parent and/or child reported to have "never tried" a specific fruit or vegetable in the FV liking assessment, researchers excluded the data from final analysis to focus solely on FV liking ratings. Parent-reported child FV consumption were described using frequencies for individual FVs, and medians were used to compare frequency of consumption of combined fruits and combined vegetables. Individual FV liking ratings (child and parent-report) were described using frequencies. Median ratings were used to compare combined fruits, combined vegetables, and FV reports.

To determine the relationship between parent-reported child FV consumption and FV liking (child and parent-report), researchers utilized a Spearman's Rho correlation. Agreement between FV liking reported by parent versus child was examined using Spearman's Rho,

Wilcoxon's signed rank, and Kappa tests. More specifically, spearman's Rho Correlation was used to examine the relationship between parents' perception of the child's FV liking and the liking reported by the child. Wilcoxon's signed-rank test was used to determine any significant difference in ratings for parents and children. Cohen's Kappa was used to investigate agreement between parent and child reported FV liking.

Each parent and child pair liking ratings were plotted as numerical data on a graph (Y-axis = parents and X-axis = children). Mean FV ratings were used for the pairs to show more specificity in the reports as opposed to medians. The coordinates were set based on parent and child mean liking of fruits and vegetables. Reference lines were set at the means for each group creating quadrants that show differences in reports. For example, cases in quadrant I represent high liking ratings for both parent and child, whereas cases in quadrant II represent a high liking reported by parents, but a lower rating reported by the child. Quadrant I is located in the upper right, and moving counterclockwise the quadrants increase (i.e. quadrant VI is located in lower right-hand area).

Results

A total of 37 parent-child pairs participated in this study; thirteen pairs were excluded from analysis due to parent and/or child responses of "never tried" during FV liking assessment. The final sample consisted of 24 parent-child pairs (n = 24). The majority of parents who completed questionnaires were female (83.3%) and Black/African American (AA) (58.3%). Children were also mostly Black/African American (41.7%). Children's ages range from approximately 3.5 to 6.5 years (4.83 SD = .75). Additional details related to parent/child demographics are reported in Table 1.

The majority of parents (n = 19) reported highest consumption (i.e. parents reported the child ate the FV two or more times per month) for apples and grapes. Frequency of consumption was lowest for pears; three parents reported the child "never" ate pears and 12 reported consumption "less than 1 time per month". Only two other FVs, broccoli (n = 1) and tomato (n = 2) also had reports of the child

Table 1. Demographics for parents and children (n = 24).

	Parents			*Children*	
	n	*Percent*		*n*	*Percent*
Gender					
Female	20	83.3%	Female 12 50.0%		
Male	4	16.7%	Male	9	37.5%
			Not reported	3	12.5
Race					
Black/AA	14	58.3%	Black/AA	10	41.7%
Hispanic/Latino	5	20.8%	Hispanic/Latino	6	25.0%
Caucasian	3	12.5%	Caucasian	2	8.3%
Asian	1	4.2%	Asian	1	4.2%
Black & Caucasian	1	4.2%	Black & Caucasian	-	-
			Other	2	8.3%
			Not reported	3	12.5%

"never" consuming the F or V. Overall, the median frequency for fruit consumption was 4.0 and 3.5 for vegetables (1 = never, 4 = "2 or more times per month"). This indicates that most parents reported children consumed target FVs more than 1–2 times per month, and fruits were consumed more than vegetables. Parent and child FV liking reports are described in Table 2. Parents reported children "liked" grapes most frequently (83.3%) within the fruit category. However, children reported "liking" apples, bananas, and strawberries more frequently (58.3% for each). Within the vegetable category, parents reported their children "liked" broccoli the most (54.2%); children reported "most liking" broccoli and carrots (62.5%). Children reported "disliking" the tomato (25%) more than any other fruit or vegetable. Few parents reported their child "strongly disliked" any fruit or vegetable.

Spearman's Rho test comparing FV frequency of consumption and liking reports from parents and children had correlation coefficients (r_s) ranging from .16 to .68 for comparison with parent liking reports, and correlation coefficients were −.24 to .44 for comparison with children's reports. Results determined a positive statistically significant relationship between frequency of FV consumption and FV liking reported by parents for banana, strawberries, corn, carrots, tomato, combined fruits, and combined vegetables. However, when FV consumption was compared with child FV liking reports, only tomato showed a significant relationship (Table 3).

Table 2. Children and parents liking rating (%) for individual vegetables and fruits (n = 24).

	*Liking Rating**									
	1		*2*		*3*		*4*		*5*	
Food	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Fruits										
Apple										
Parents	0	-	0	-	0	-	6	25	18	75.0
Children	3	12.5	0	-	1	4.2	6	25.0	14	58.3
Banana										
Parents	0	-	0	-	0	-	8	33.3	16	66.7
Children	3	12.5	0	-	1	4.2	6	25.0	14	58.3
Strawberries										
Parents	0	-	1	4.2	0	-	4	16.7	19	79.2
Children	0	-	1	4.2	4	16.7	5	20.8	14	58.3
Oranges										
Parents	0	-	0	-	1	4.2	4	16.7	19	79.2
Children	3	12.5	1	4.2	0	-	8	33.3	12	50.0
Pears										
Parents	1	4.2	0	-	6	25.0	10	41.7	7	29.2
Children	3	12.5	2	8.3	0	-	8	33.3	11	45.8
Grapes										
Parents	0	-	0	-	0	-	4	16.7	20	83.3
Children	3	12.5	1	4.2	1	4.2	7	29.2	12	50.0
Vegetables										
Corn										
Parents	0	-	0	-	1	4.2	12	50.0	11	45.8
Children	1	4.2	2	8.3	2	8.3	7	29.2	12	50.0
Broccoli										
Parents	0	-	1	4.2	2	8.3	9	33.3	13	54.2
Children	1	4.2	1	4.2	1	4.2	6	25.0	15	62.5
Carrots										
Parents	1	4.2	1	4.2	3	12.5	8	33.3	11	45.8
Children	1	4.2	2	8.3	2	8.2	4	16.7	15	62.5
Tomato										
Parents	0	-	2	8.3	8	33.3	10	41.7	4	16.7
Children	6	25.0	1	4.2	1	4.2	6	25.0	10	41.7

* 0 = Never Tried; 1 = Strongly Dislikes/Super Yucky; 2 = Likes/Yucky; 3 = Neither Likes or Dislikes/Just Okay; 4 = Likes/Yummy; 5 = Strongly Likes/Super Yummy

Spearman's Rho Correlation Coefficient values (r_s) for agreement between parent and child reported liking of fruits ranged from −.42 for grapes to .37 for strawberries; the values for vegetables ranged from −.42 for broccoli to .11 for tomato. Significant relationships ($p < .05$) were found for grapes ($r_s = -.42$, $p = .04$) and broccoli ($r_s = -.42$, $p = .04$) indicating a significantly negative correlation between

Table 3. Comparison of parent and child fruit and vegetable liking (*n* = 24).

	*Median (Range)**			*Spearman's Rho*		*Wilcoxon signed-rank*		*Kappa*	
Food	*Parent*	*Child*	*Difference*	r_s	*p-value*	*Test statistic (T)*	*p-value*	*Kappa*	*p-value*
Fruits									
Apple	5.0	5.0	0	−.07	.74	20.00	.06	.00	.93
Banana	5.0	5.0	0	−.16	.46	42.00	.15	.07	.24
Strawberries	5.0	5.0	0	.37	.07	9.00	.10	−.06	.45
Oranges	5.0	4.5	.5	−.07	.73	20.00	.04**	.05	.40
Pears	4.0	4.0	0	−.22	.30	96.00	.97	−.10	.38
Grapes	5.0	4.5	.5	−.42	.04**	24.00	.02**	.07	.23
Vegetables									
Corn	4.0	4.5	.5	−.14	.52	42.00	.29	−.01	.97
Broccoli	5.0	5.0	0	−.42	.04**	71.50	.85	−.16	.26
Carrots	4.0	5.0	1	−.15	.48	56.00	.82	−.06	.35
Tomato	4.0	4.0	0	.11	.61	105.00	.71	−.08	.33

* 1 = Strongly Dislikes/Super Yucky; 5 = Strongly Likes/Super Yummy

** $p \leq .05$ considered significant.

parents and child's reports (Table 3). The r_s for the combined fruit category was −.11, −.33 for the combined vegetable category, −.21 for the combined FV category (Table 4). No significant relationships were observed for the fruit or vegetable categories, or FV combined. Wilcoxon signed-rank test revealed a significant ($p < .05$) difference in the liking reported by parent and child for oranges ($p = .04$) and grapes ($p = .02$) (Table 4). No significant differences were observed among combined vegetables or combined FV; however, combined fruits were determined to be significantly different ($p = .02$) (Table 4). Kappa did not reveal any significant agreements between parent and child report for the FVs. All Kappa values were negative or close to 0, signifying no agreement between parent and child reports (Table 4).

Table 4. Comparison of parent and child fruit, vegetable, and combined Fruit and Vegetable (FV) liking (*n* = 24).

	*Median (Range)**			*Spearman's Rho*		*Wilcoxon signed-rank*	
Food	*Parent*	*Child*	*Difference*	r_s	*p-value*	*Test statistic (T)*	*p-value*
Fruit	5.0	4.5	.5	−.11	.60	34.00	.02**
Vegetable	4.0	4.5	.5	−.33	.12	95.50	.98
FV	4.5	4.5	0	−.21	.33	65.00	.37

* 1 = Strongly Dislikes/Super Yucky; 5 = Strongly Likes/Super Yummy

** $p \leq .05$ considered significant.

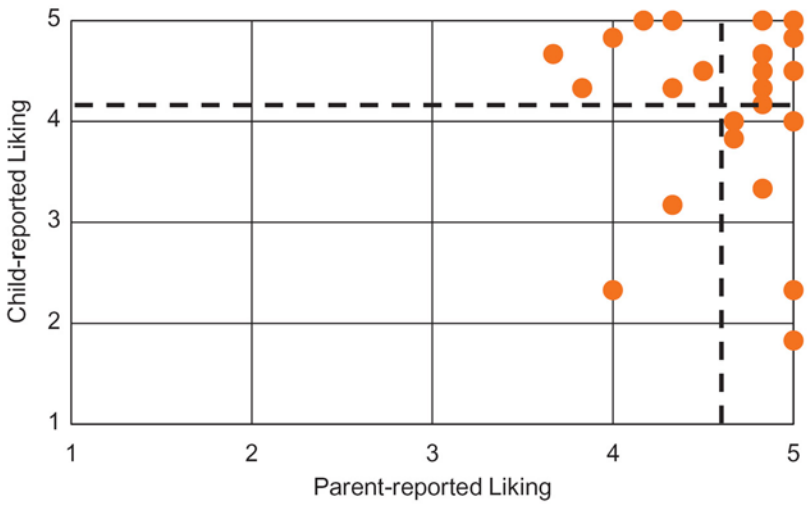

Figure 2. Mean fruit ratings for parents and children compared with the averages for each group (n = 24). Mean for parents' fruit reports: 4.60. Mean for children's fruit reports: 4.10.

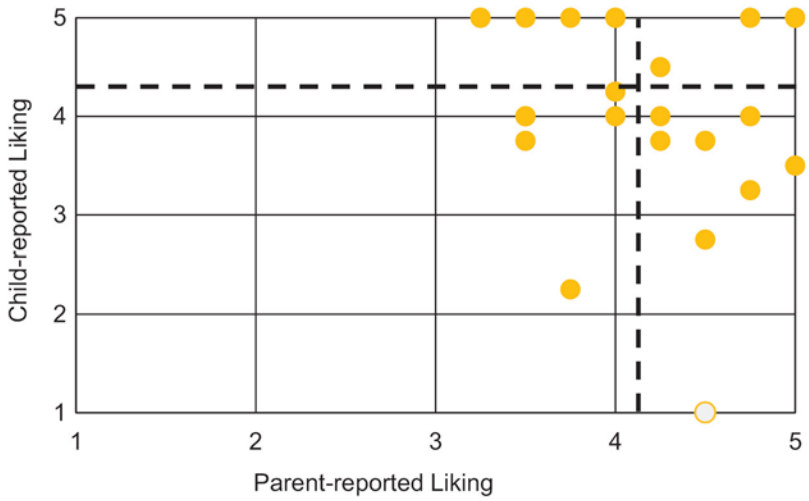

Figure 3. Mean vegetable ratings for parents and children compared with the averages for each group (n = 24 — outlier not included in means). Mean for parents' vegetable reports: 4.13. Mean for children's vegetable reports: 4.21.

Researchers plotted numerical ratings ("super yucky"/"strongly dislikes" = 1, "yucky"/"dislikes" = 2, "just okay"/"neither likes" or "dislikes" = 3, "yummy"/"likes" = 4, and "super yummy"/"strongly likes" = 5) to show the relationship of the parent versus child likings reported. The means for the combined fruit category, combined vegetable category, and combined FV category were used to plot the

data for each parent-child pair. The quadrants formed by the reference lines show difference in reports. For example, points in quadrant II show a higher rating from the parent and a lower rating from the child for the fruits or vegetables, whereas points in quadrant IV show a higher rating from the child than the parent. The average rating for fruits was 4.60 for parents and 4.10 for children (Figure 2). The average rating of vegetables was 4.13 for parents and 4.21 for children (after exclusion of 1 outlier represented by the lightened open circle on the graph) (Figure 3).

Discussion

Findings from this study suggest that parents may not be accurate respondents for children's food liking calling into question the use of parents as proxies to report children's liking and preferences for foods (Russell, Worsle., and Liem 2014; Skinner et al. 1998; Wardle et al. 2001). The present study aimed to expand the research on agreement between parent and child reported FV liking using child responses from a validated assessment tool (Carraway-Stage et al. 2014). Overall, there was no significant agreement between parents' and children's rating of the FVs tested. Findings also showed that all 10 FVs studied were rated highly (i.e. both parents and children reported children liked all FVs); however, parents were unable to distinguish the degree of liking (i.e. "strongly like" vs. "like"). While not significant, parents reported children liked fruits more and vegetables less than the child indicated. Finally, frequency of consumption was correlated to parent reports of FV liking, but not children's.

The results of this study showed no significant agreement between child and parent-reported FV liking ratings. A similar study by Vereecken et al. (2010) reported low to moderate agreement between parent and preschool child reports. Interestingly, although not significant, the present study found mostly negative correlations (r_s) between reports, indicating some level of disagreement between parent and child ratings of FV liking. Lack of agreement may be attributed to a variety of factors including children's age. Some research reports that children become more reliable reporters as they get older (Borgers, de Leeuw, and Hox 2000; Skinner et al. 2002; Vereecken et al. 2012), indicating level of cognitive development is a critical factor in

the assessment of food preference (Wiley and Hendricks 1998). As a result, it has been theorized that comparing reports from older children with parents' reports may yield more valid findings, but results of these studies are mixed. One study among older children compared parent and child reports for food liking and found strong agreement (Skinner et al. 2002); however, two other studies (Reinaerts, Nooijer, and de Vries 2007; Vereecken et al. 2012) conducted with adolescent-aged children reported comparable low to moderate agreement between child and parent liking ratings.

Additional reasons for lack of agreement between parent and child reports may relate to children's exposure to foods. Children are often exposed to new foods in the school environment; these exposures may happen without the parents' knowledge (Baranowski et al. 1991; Mata, Scheibehenne, and Todd 2008; Mazarello Paes, Ong, and Lakshman 2015). Further, parents' personal preferences may also influence the foods they provide in the home environment. For example, foods disliked by parents may not be introduced at home (Adamo and Kendra 2014; Skinner et al. 2002). Parents and caregivers should be encouraged to not prejudge or stereotype foods based on their own preferences or because they think their child will not eat or like a particular food. Instead, parents and caregivers should be encouraged to expose children to a wide variety of foods beginning early in life. This study and others (Skinner et al. 1998) have demonstrated that children generally like all FV, however, frequency of expose plays a critical role in long-term acceptance and consumption. The key is repeated expose. Parents and caregivers should not assume that one or two rejections of a specific food are predictive of long-term acceptance and consumption.

Although FV liking responses from parents and children were not considered agreeable, all FVs evaluated in the present study were generally liked (i.e. rated highly) by both parents and children. The high level of liking children reported for each FV may provide support for the theory that early childhood is the ideal time to introduce children to a wide variety of healthy foods (Skinner et al. 1998). This finding may further suggest parents may have a general idea of child FV liking despite no overall agreement between reports; however, it appears that parents may not be able to distinguish the degree of liking. Parents rated most FVs in adjacent categories compared to children. In other words, if a child rated carrot as "super yummy" the parent may

have reported "likes". Favorable ratings from the children were not unexpected as the FVs evaluated were determined to be the most familiar to this population of children (Carraway-Stage et al. 2014; Fox et al. 2010; Jaramillo et al. 2006), and children tend to prefer foods that are familiar (Birch 1979a). Although most children in this study liked all FVs, when a larger variety of foods were assessed children preferred other foods to FVs (Caporale et al. 2009; Cooke and Wardle 2005; Skinner et al. 1998). Future research should aim to evaluate children's comprehensive food likings by including foods from a variety food groups to gain a better perspective of the preference for FVs that would mimic daily life.

Upon inspection of the FVs by distribution of ratings for parents and children an interesting trend was observed; parents reported children liked fruit more and liked vegetables less than the children reported. Although the data did not show significant differences between parent and child reports in this study, this trend was determined for all fruits (except pears) and vegetables. For example, 75.0% of parents reported children "strongly likes" apples, compared to 58.3% of children reported apples were "super yummy." Additionally, liking averages, medians, and means of F and V, supported this trend. Vereecken et al. (2010) reported a similar result for F. In that study parents reported higher preference scores for F than children, but no significant difference in preference rating was found for vegetables. In a related study focused on Nepper and Chai (2017) found that parents described vegetables as being more difficult to feed to their child(ren) compared to fruits. These findings are important due to the significant influence parents have on the children's food environment, specifically the role of buying FV for the child (Russell, Worsle., and Liem 2014).

Home availability of FV is a key determinant of FV consumption (e.g. carrots in the refrigerator) among children (Cullen et al. 2003; Kristiansen et al. 2016). The practice of making healthy foods available and accessible in the home is a key method parent can use to influence children's intake (Yee, Lwin, and Ho 2009). Russell, Worsle., and Liem (2014) determined 90% of parents were motived to purchase foods based on child food liking. Parents prefer to purchase food the child previously liked and therefore will more likely consume (Mauback, Hoek, and McCreanor 2009; Russell, Worsle., and Liem 2014). Parents perceived that children disliked the vegetables assessed in this study more than children reported, therefore parents may be less

likely to purchase. As previously reported, researchers have theorized that children may be less likely to accept vegetables due to their dislike of bitter and sour tastes, such as found in vegetables (e.g. broccoli) (Hill 2002). Interestingly, Russell, Worsle., and Liem (2014) reported parents who purchased foods based on perceived child liking resulted in unhealthier food preferences of children, notably low liking of FVs. Because FV availability and accessibility in the home environment, positive role modeling, and encouraging consumption of FVs are strategies that parents and caregivers can use to improve children's FV intake (Couch et al. 2014; Pearson, Biddle, and Gorely 2009), future research should explore how perceptions of child FV liking influences these strategies.

Finally, the present study reported significant agreement between parent-reported child liking and FV consumption; however, no agreement was found between consumption and child-reported liking. This is not an unexpected outcome as parents reported the child's frequency of consumption. This may suggest that parents' perception of child FV liking strongly influences their impression of their child(ren)'s intake or may suggest that children consume more of what parents perceive them to like indicating parents' perception of liking may influence child intake. The perceptions a parent holds about their child's diet is also an important factor in determining whether or not a parent will work to ensure their children's dietary intake meets the dietary recommendations (Briefel, Deming, and Reidy 2015; Eckstein et al. 2006). Briefel, Deming, and Reidy (2015) demonstrated that parents' perceptions of their child's dietary quality may be inconsistent with respect to actual FV intake. Early childhood represents a critical period in which parents and caregivers can encourage young children to consume FV through repeated exposure, which may result in increased consumption later in life (Briefel, Deming, and Reidy 2015; Cooke 2007). Future research should focus on determining the degree of influence parents' perception of child liking has on food intake while including a larger variety of foods to better mimic daily life.

Strengths and limitations

There are several notable strengths to this study. To the author's knowledge, no other study has compared parent and preschool-aged child FV liking reports in a United States population. Furthermore,

this study assessed children attending Head Start centers that serve low-income families, a population in which obesity is more prevalent (Feese et al. 2003; Mason et al. 2006; Ogden et al. 2006; Wang and Zhang 2006). In order to impact obesity prevalence, it is critical to determine factors that may influence risk for obesity, importantly children's FV liking and preferences, as food preferences are a key determinant of intake (Berg et al. 2003; Birch 1999, 1979b; Domel et al. 1996; Gibson, Wardle, and Watts 1998; Jaramillo et al. 2006; Resnicow et al. 1997). This study allowed children and parents to provide a more specific degree of FV liking (i.e. super yummy vs yummy) using a 5-point scale, a larger scale compared to similar studies. Research has shown that children 4 years old can even use a 7-point scale (Chen, Resurreccion, and Paguio 1996). Further, this study excluded cases in which "never consumed" was reported in the FV liking assessments, essentially reporting results of FV liking solely based on previous consumption. However, this also may be considered a weakness as some FVs may have been consumed by children without parents' knowledge.

In addition to the strengths of this study, there are limitations to consider. Children in the present study ranged in age from 3.5 to 6.5 years of age. Children <4 years of age may produce less reliable results than older children (Calfas, Sallis, and Nader 1991; Guthrie, Raporport, and Wardle 2000). Children around the age of 5 are continuing to develop language and cognitive functions critical to comprehending and appropriately responding to questions (Borgers, de Leeuw, and Hox 2000). Although prior research has demonstrated that young children are capable of reporting reliable and valid liking responses (Birch 1979a; Jaramillo et al. 2006; Vereecken et al. 2010) and reports from children included in this study were proven to be valid (Carraway-Stage et al. 2014), researchers should be mindful of possible impacts that may arise when assessing a younger population.

Another limitation was related to FV children and/or parents reported that they had never tried. This issue resulted in an inability to assess a child's liking and as a result, reduced our overall sample size. A similar issue was observed in a prior study (Skinner et al. 1998). It is important to encourage parents to expose children to a variety of healthy foods. As supported by Birch (Skinner et al. 1998), children who are exposed repeatedly to a novel food, learn to accept the food and are more likely to consume it and other healthy foods in the future.

The child's assessment tool evaluated FVs based on pictures of the foods, this is a limitation of the study that could affect the liking reported by children. Children are literal (Borgers, de Leeuw, and Hox 2000), therefore, a green apple may not be viewed and rated as an "apple", but the specific type of apple that a child may like differently than another. Children also may rate the same food differently depending on the lighting in the picture (Kildegaard et al. 2011). The same issue would be true for the form the F or V was presented in the picture (Poleman and Delahunty 2011), for example, a whole apple compared to apple slices. However, a "taste and rate" evaluation was completed with the assessed FVs that showed positive results for the validation of the pictorial assessment tool (Carraway-Stage et al. 2014).

Additionally, it is important to note that only 10 FVs were assessed in this study. Although found to be the most common FVs to this population (Carraway-Stage et al. 2014; Fox et al. 2010; Jaramillo et al. 2006), some children may be more familiar, consume more, or prefer less common FVs. Also, if less common FVs were included with a larger variety evaluated, overall FV liking medians may have decreased because young children generally reject new foods and prefer familiar foods (Birch 1979a). With that said, the FVs assessed in this study were limited due to children's short attention span and in attempt to ensure that most children had been exposed to the FVs so children may effectively report liking by recognizing the F or V in the picture (Carraway-Stage et al. 2014). For this reason, the assessment could not include liking of all potential FVs. Future research should aim to determine children's preferences, likes, and dislikes for a larger variety of FVs.

Further, the sample size in this study was small compared to similar studies (Jaramillo et al. 2006; Vereecken et al. 2010). Some observations discussed may be statistically significant with a larger sample. Although also considered a strength, the sample was collected from only six Head Start centers in the Raleigh–Durham, North Carolina area, decreasing diversity in the sample. Therefore, future research should attempt to include a larger, more diverse sample to examine differences in age and sociodemographic characteristics (e.g. family income and race). Finally, parents completed questionnaires to assess the child's FV liking using a similar 5-point rating scale as the children's assessment tool; however, the parent's questionnaire did not include pictures of the FVs being assessed like the children's

tool. This is important to note due to the child's tendency to answer questions literally (Borgers, de Leeuw, and Hox 2000). It is possible that parents would have rated the FVs differently based on color (e.g. green apple vs. red apple) or form (e.g. whole apple vs sliced apple) if the parent knew the specific preferences of the child. Future research should focus on development of a parent tool to use in tandem with a pictorial liking assessment tool for young children that includes the same pictures so researchers can be sure parents and children are assessing the same foods.

Overall, no significant agreement or disagreement was determined between parent and children reported FV liking using a validated assessment tool for young children. The results of this study provide additional evidence on parent's ability to provide accurate FV liking ratings for young children. Further research is needed to determine whether parents are accurate reporters for children's food liking and consumption using a larger sample and a wide variety of foods and should consider using more similar assessment tools for both populations. Additionally, future research should aim to explore the idea that parents may perceive overall liking of fruits and vegetables differently than children and explore the impact this may have on children's FV intake.

Finally, while valid methods for measuring dietary intake and food preferences among young children are needed, evidence from national studies consistently recognize FV consumption as a public health concern. Therefore, in addition to improving our valid assessment of FV intake among young children, we should also simultaneously continue work on individual, community, and policy level changes that will support the improvement of children's dietary behaviors (Welker et al. 2018). Many evidence-based strategies have been identified in the literature including, but not limited to: repeatedly exposing young children to a wide variety of health foods (Anzman-Frasca et al. 2012; Roe et al. 2013; Ventura and Worobey 2013; Fisher and Dwyer 2016); encouraging parents and caregivers to model healthy eating behaviors, including FV consumption (Perez-Escamilla, Segura-Perez, and Lott 2017; Savage, Fisher, and Birch 2007); improving early child care food environments (Korenman et al. 2013; Ritchie et al. 2012, 2015); and continuing review and improvement of government-funded programs, such as SNAP and WIC, that may facilitate the purchase of FV among low-resource families (Welker et al. 2018; Fisher and Dwyer

2016). Evidence-based strategies should also be further examined within the context of families who have increased stressors, limited resources, and who may be at higher risk for chronic disease related to diet; challenges that are often experienced among Head Start families. These families often face bigger obstacles, and while their child's dietary quality may be important to them, more immediate concerns may take precedence (Johnson 2016).

Author Contributions — Virginia Stage contributed to this work by designing the study, managing the data collection and data analysis process, and completing revisions/rewrites. Suzanne Goodell, Archana Hegde, Dipti Dev, Amanda Peterson, and Virginia Stage assisted in reviewing explanation of methods and reporting of results for accuracy and clarity, offering additional resources for review of literature, and providing substantial feedback for overall improvement of the study design and manuscript. Carrie Downing was responsible for conducting data analysis and drafting the original manuscript.

Acknowledgments — We would like to acknowledge Tiffany Cox, Kristen Nanney, and Hilary Spangler.

Funding — Financial Support was provided by the North Carolina State University Undergraduate Research Grant Award.

References

Adamo, K. B., and E. B. Kendra. 2014. Parental perceptions and childhood dietary quality. *Maternal Child Health Journal* 18 (4):978–95. doi:10.1007/s10995-013-1326-6.

Anzman-Frasca, S., J. Savage, M. Marini, J. Fisher, and L. L. Birch. 2012. Repeated exposure and associative conditioning promote preschool children's liking of vegetables. *Appetite* 58 (2):543–53. doi:10.1016/j.appet.2011.11.012.

Baranowski, T., D. Sprague, J. H. Baranowski, and J. A. Harrison. 1991. Accuracy of maternal dietary recall for preschool children. *Journal of the American Dietetic Association* 91 (6):669–74.

Baxter, S. D., and W. O. Thompson. 2002. Fourth-grade children's consumption of fruit and vegetable items available as part of school lunches is closely related to preferences. *Journal of Nutrition Education and Behavior* 34 (3):166–71.

Bere, E. K., and Klepp. 2005. Changes in accessibility and preference predict children's future fruit and vegetable intake. *International Journal of Behavioral Nutrition and Physical Activity* 2 (1):15–23. doi:10.1186/1479-5868-2-15.

Berg, C., I. Jonsson, M. Conner, and L. Lissner. 2003. Perceptions and reasons for choice of fat- and fiber-containing foods by Swedish school children. *Appetite* 40 (1):61–67.

Birch, L. L. 1979a. Dimensions of preschool children's food preferences. *Journal of Nutrition Education* 11 (2):77–80. doi:10.1016/S0022-3182(79)80089-8.

Birch, L. L. 1979b. Preschool children's food preferences and consumption patterns. *Journal of Nutrition Education* 11 (4):189–92. doi:10.1016/S0022-3182(79)80025-4.

Birch, L. L. 1999. Development of food preferences. *Annual Reviews of Nutrition* 19 (1):41–62. doi:10.1146/annurev.nutr.19.1.41.

Birch, L. L., and S. A. Sullivan. 1991. Measuring children's food preferences. *Journal of School Health* 61 (5):212–14.

Boeing, H., A. Bechthold, A. Bub, S. Ellinger, D. Haller, A. Kroke, E. Leschik-Bonnet, M. J. Müller, H. Oberritter, M. Schulze, et al. 2012. Critical review: Vegetables and fruit in the prevention of chronic diseases. *European Journal of Nutrition*. 51 (6):637–63. doi:10.1007/s00394-012-0380-y.

Borgers, N., E. de Leeuw, and J. Hox. 2000. Children as respondents in survey research: Cognitive development and response quality. *Bulletin of Sociological Methodology* 66 (1):60–75. doi:10.1177/075910630006600106.

Briefel, R. R., D. M. Deming, and K. C. Reidy. 2015. Parents' perceptions and adherence to children's diet and activity recommendations: The 2008 feeding infants and toddlers study. *Preventing Chronic Disease: Public Health Research, Practice, and Policy* 12:E150. doi:10.5888/pcd12.150110.

Calfas, K. J., J. F. Sallis, and P. R. Nader. 1991. The development of scales to measure knowledge and preference for diet and physical activity behavior in 4- to 8-year-old children. *Journal of Development & Behavioral Pediatrics* 12 (3):185–90.

Caporale, G., S. Policastro, H. Tuorila, and E. Monteleone. 2009. Hedonic ratings and consumption of school lunch among preschool children. *Food Quality and Preference* 20 (7):482–89. doi:10.1016/j.foodqual.2009.04.008.

Carraway-Stage, V., H. Sangler, M. Borges, and L. S. Goodell. 2014. Evaluation of a pictorial method to assess liking of familiar fruits and vegetables among preschool children. *Appetite* 75:11–20. doi:10.1016/j.appet.2013.12.011.

Cashdan, E. 1994. A sensitive learning period for learning about food. *Human Nature* 5 (3):279–91. doi:10.1007/BF02692155.

Chen, A. W., A. V. A. Resurreccion, and L. P. Paguio. 1996. Age appropriate hedonic scales to measure food preferences of young children. *Journal of Sensory Science* 11:141–63. doi:10.1111/j.1745-459X.1996.tb00038.x.

Cooke, L. 2007. The importance of exposure for healthy eating in childhood: A review. *Journal of Human Nutrition and Dietetics* 20 (4):294–301. doi:10.1111/j.1365-277X.2007.00804.x.

Cooke, L., J. Wardle, and E. L. Gibson. 2003. Relationship between parental report of food neophobia and everyday food consumption in 2–6 year old children. *Appetite* 41:205–06.

Cooke, L. J., and J. Wardle. 2005. Age and gender differences in children's food preferences. *British Journal of Nutrition* 93 (5):741–46.

Couch, S. C., K. Glanz, D. Zhou, J. F. Sallis, and B. E. Saelens. 2014. How food environment in relation to children's diet quality and weight status. *Journal of the Academy of Nutrition and Dietetics* 114:1569–79. doi:10.1016/j.jand.2014.05.015.

Cullen, K. W., T. Baranowski, E. Owens, T. Marsh, L. Rittenbury, and C. de Moor. 2003. Availability, accessibility, and preferences for fruit, 100% juice and vegetables influence children's dietary behavior. *Journal of Health Education and Behavior* 30:615–26. doi:10.1177/1090198103257254.

Deming, D. M., R. R. Briefel, and K. C. Reidy. 2014. Infant feeding practices and food consumption patterns of children participating in WIC. *Journal of Nutrition Education and Behavior* 46 (S3):S29–37. doi:10.1016/j.jneb.2014.02.020.

Domel, S. B., W. O. Thompson, H. C. Davis, T. Baranowski, S. B. Leonard, and J. Baranowski. 1996. Psychosocial predictors of fruit and vegetable consumption among elementary school children. *Journal of Health and Education Research* 11 (3):299–308. doi:10.1093/her/11.3.299.

Dominguez, P. 2014. Development and acquisition of flavor and food preferences in children: An update until 2010. *Journal of Food Research* 3 (1):1–17. doi:10.5539/jfr.v3n1p1.

Dubowitz, T., M. Heron, C. E. Bird, N. Lurie, B. K. Finch, R. Basurto-Davila, L. Hale, and J. J. Escarce. 2008. Neighborhood socioeconomic status and fruit and vegetable intake among white, blacks, and Mexican Americans in the United States. *American Journal of Clinical Nutrition* 87 (6):1883–91. doi:10.1093/ajcn/87.6.1883.

Dwyer, J. T., N. F. Butte, D. M. Deming, A. M. Siega-Riz, and K. C. Reidy. 2010. Feeding infants and toddlers study 2008: Progress, continuing concerns, and implications. *Journal of the American Dietetic Association* 110 (S12):S60–70. doi:10.1016/j.jada.2010.09.003.

Eckstein, K. C., L. M. Mikhail, A. J. Ariza, J. S. Thomson, S. C. Millard, and H. J. Binns; Pediatric Practice Research Group. 2006. Parents' perceptions of their child's weight and health. *Pediatrics* 117 (3):681–90. doi:10.1542/peds.2005-0910.

Feese, M., F. Franklin, M. Murdock, K. Harrington, M. Brown-Binns, T. Nicklas, S. Hughes, and M. Morales. 2003. Prevalence of obesity in children in Alabama and Texas participating in social programs. *Journal of the American Medical Association* 289 (14):1780–81. doi:10.1001/jama.289.14.1780-b.

Fisher, J. O., and J. T. Dwyer. 2016. Next steps for science and policy on promoting vegetable consumption among US infants and young children. *Advances in Nutrition* 7:261S-271S.

Fox, M. K., E. Condon, R. Briefel, K. C. Reidy, and D. M. Deming. 2010. Food consumption patterns of young preschoolers. Are they starting off on the right path? *Journal of the American Dietetic Association* 110 (12):S52–S59. doi:10.1016/j.jada.2010.09.002.

Gibson, E. L., J. Wardle, and C. J. Watts. 1998. Fruit and vegetable consumption, nutritional knowledge, and beliefs in mothers and children. *Appetite* 31 (2):205–28. doi:10.1006/appe.1998.0180.

Grimm, K. A., S. A. Kim, A. L. Yaroch, and K. S. Scanlon. 2014. Fruit and vegetable intake during infancy and early childhood. *Pediatrics* 134 (S1):S63–69. doi:10.1542/peds.2014-0646K.

Guthrie, C. A., L. Raporport, and J. Wardle. 2000. Young children's food preferences: A comparison of three modalities of food stimuli. *Appetite* 35 (1):73–77. doi:10.1006/appe.2000.0329.

Hill, J. A. 2002. Developmental issues in attitudes to food and diet. *Proceedings of the Nutrition Society* 62:259–66. doi:10.1079/PNS2002152.

Hung, H. C., K. J. Joshipura, R. Jiang, F. B. Hu, D. Hunter, S. A. Smith-Warner, G. A. Colditz, B. Rosner, D. Spiegelman, and W. C. Willett. 2004. Fruit and vegetable intake and risk of major chronic disease. *Journal of the National Cancer Institute* 96 (21):1577–84. doi:10.1093/jnci/djh296.

Irala-Estevez, J. D., M. Groth, L. Johansson, U. Oltersdorf, R. Prattala, and M. A. Martinez- Gonzalez. 2000. A systematic review of socio-economic differences in food habits in Europe: Consumption of fruit and vegetables. *European Journal of Clinical Nutrition* 54 (9):706–14.

Jaramillo, S. J., S. J. Yang, S. O. Hughes, J. O. Fisher, M. Morales, and T. A. Nicklas. 2006. Interactive computerized fruit and vegetable preference measure for African-American and Hispanic preschoolers. *Journal of Nutrition Education and Behavior* 38 (6):352–59. doi:10.1016/j.jneb.2006.06.003.

Johnson, S. L. 2016. Developmental and environmental influences on young children's vegetable preferences and consumption. *Advances in Nutrition* 7 (Suppl):220S–231S. doi:10.3945/an.115.008706.

Kildegaard, H., A. Olsen, G. Gabrielsen, P. Miller, and A. K. Thybo. 2011. A method to measure the effect of food appearance factors on children's visual preferences. *Food Quality and Preference* 22 (8):763–71. doi:10.1016/j.foodqual.2011.06.009.

Kim, S. A., L. V. Moore, D. Glauska, A. P. Wright, D. Harris, L. M. Grummer-Strawn, C. L. Merlo, A. J. Nihiser, and D. Rhodes. 2014. Vital signs: Fruit and vegetable intake among children – United States, 2003–2010. *Morbidity and Mortality Weekly Report* 63 (31):671–76.

Korenman, S., K. Abner, R. Kaestner, and R. Gordon. 2013. The child and adult care food program and the nutrition of preschoolers. *Early Childhood Research Quarterly* 28 (2):325–36. doi:10.1016/j.ecresq.2012.07.007.

Kristiansen, A. L., M. Bjelland, A. Himberg-Sundet, N. Lien, and L. F. Andersen. 2016. Associations between physical home environmental factors and vegetable consumption among Norwegian 3–5 year olds: The BRA-study. *Public Health Nutrition* 20:1173–83. doi:10.1017/S1368980016003396.

Mason, M., P. Meleedy-Rey, K. K. Christoffel, M. Longjohn, M. P. Garcia, and C. Ashlaw. 2006. Prevalence of overweight and risk of overweight among 3- to 5-year-old Chicago children, 2002–2003. *Journal of School Health* 76 (3):104–10. doi:10.1111/j.1746-1561.2006.00077.x.

Mata, J., B. Scheibehenne, and P. M. Todd. 2008. Predicting children's meal preferences: How much do parents know? *Appetite* 50 (2):367–75. doi:10.1016/j.appet.2007.09.001.

Mauback, N., J. Hoek, and T. McCreanor. 2009. An exploration of parents' food purchasing behaviours. *Appetite* 53 (3):297–302. doi:10.1016/j.appet.2009.07.005.

Mazarello Paes, V., K. K. Ong, and R. Lakshman. 2015. Factors influencing obesogenic dietary intake in young children (0–6 years): Systematic review of qualitative evidence. *BMJ open* 5 (9):1–9. doi:10.1136/bmjopen-2014-007396.

Nepper, M. J., and W. Chai. 2017. Parental views of promoting fruit and vegetable intake among overweight preschoolers and school-aged children. *Global Qualitative Nursing Research* 4:1–11. doi:10.1177/2333393617692085.

Office of Head Start, Administration for Children and Families, U.S. Department of Health and Human Services. Head start programs. Accessed June 15, 2017. https://www.acf.hhs.gov/ohs/about/head-start

Ogden, C. L., M. D. Carroll, L. R. Curtin, M. A. McDowell, C. J. Tabak, and K. M. Flegal. 2006. Prevalence of overweight and obesity in the United States, 1999–2004. *Journal of the American Medical Association* 295 (13):1549–55. doi:10.1001/jama.295.13.1549.

Pearson, N., S. J. H. Biddle, and T. Gorely. 2009. Family correlates of fruit and vegetable consumption in children and adolescents: A systematic review. *Public Health Nutrition* 12:267–83. doi:10.1017/S1368980008002589.

Perez-Escamilla, R., S. Segura-Perez, and M. Lott. 2017. *Feeding guidelines for infants and young toddlers: A responsive feeding approach*. Durham (NC): Health Eating Research.

Poleman, A. A. M., and C. M. Delahunty. 2011. The effect of preparation method and typicality of colour on children's acceptance for vegetables. *Food Quality and Preference* 22 (4):355–64. doi:10.1016/j.foodqual.2011.01.001.

Reinaerts, E., J. Nooijer, and N. K. de Vries. 2007. Parental versus child reporting fruit and vegetable consumption. *International Journal of Behavioral Nutrition and Physical Activity* 4:33. doi:10.1186/1479-5868-4-33.

Resnicow, K., M. Davis-Hearn, M. Smith, T. Baranowski, L. S. Lin, J. Baranowski, C. Doyle, and D. T. Wang. 1997. Social cognitive predictors of fruit and vegetable intake in children. *Health Psychology* 16 (3):272–76.

Ritchie, L., M. Boyle, K. Chandran, P. Spector, S. Whaley, P. James, S. Samuels, and K. Hecht. 2012. Participation in the child and adult care food program is associated with more nutritious foods and beverages in child care. *Childhood Obesity* 8 (3):224–29. doi:10.1089/chi.2011.0061.

Ritchie, L., S. Yoshia, S. Sharma, A. Patel, E. Vitale, and K. Hecht. 2015. Drinking water in California child care sites before and after 2011–2012 beverage policy. *Prevention of Chronic Disease* 12:E89.

Roberts, C. K., and R. J. Barnard. 2005. Effects of exercise and diet on chronic disease. *Journal of Applied Physiology* 98 (1):3–30. doi:10.1152/japplphysiol.00852.2004.

Roe, L., J. Meengs, L. L. Birch, and B. Rolls. 2013. Serving a variety of vegetables and fruit as a snack increased intake in preschool children. *American Journal of Clinical Nutrition* 98 (3):693–99. doi:10.3945/ajcn.113.062901.

Rollins, B. Y., E. Loken, and L. L. Birch. 2010. Stability and change in snack food likes and dislikes from 5 to 11 years. *Appetite* 55 (2):371–73. doi:10.1016/j.appet.2010.06.012.

Russell, C. G., A. Worsle., and D. G. Liem. 2014. Parents' food choice motives and their associations with children's food preferences. *Public Health Nutrition* 18 (6):1018–27. doi:10.1017/S1368980014001128.

Savage, J., J. Fisher, and L. L. Birch. 2007. Parental influence on eating behavior: Conception to adolescence. *Journal of Law, Medicine, and Ethics* 35 (1):22–34. doi:10.1111/j.1748-720X.2007.00111.x.

Skinner, J., B. R. Carruth, J. Moran, K. Houck, J. Schmidhammer, A. Reed, F. Coletta, R. Cotter, and D. Ott. 1998. Toddlers' food preferences: Concordance with family members' preferences. *Society for Nutrition Education* 30 (1):17–22. doi:10.1016/S0022-3182(98)70270-5.

Skinner, J. D., B. R. Carruth, W. Bounds, and P. Ziegler. 2002. Children's food preferences: A longitudinal analysis. *Journal of the American Dietetic Association* 102 (11):1638–47.

Sullivan, S. A., and L. L. Birch. 1990. Pass the sugar, pass the salt: Experience dictates preference. *Developmental Psychology* 26 (4):546–51. doi:10.1037/0012-1649.26.4.546.

U.S. Department of Health and Human Services and U.S. Department of Agriculture. 2015. *2015–2020 Dietary guidelines for Americans*. 8th. Accessed January 2017. http://health.gov/dietaryguidelines/2015/guidelines

Ventura, A., and J. Worobey. 2013. Early influences on the development of food preferences. *Current Biology* 23 (9):R401–408. doi:10.1016/j.cub.2013.02.037.

Vereecken, C., M. Covents, J. Parmentier, and L. Maes. 2012. Test-retest reliability and agreement between children's and parents' reports of a computerized food preferences tool. *Public Health Nutrition* 16 (1):8–14. doi:10.1017/S1368980012001085.

Vereecken, C. A., S. Vandervorst, T. Nicklas, M. Covents, and L. Maes. 2010. Test-retest reliability and comparison of children's reports with parents' reports of young children's fruit and vegetable preferences. *Appetite* 55 (3):574–81. doi:10.1016/j.appet.2010.09.006.

Wang, Y., and Q. Zhang. 2006. Are American children and adolescents of low socioeconomic status at increased risk of obesity? Changes in the association between overweight and family income between 1971 and 2002. *American Journal of Clinical Nutrition* 84 (4):707–16. doi:10.1093/ajcn/84.4.707.

Wardle, J., G. S. Sanderson, L. L. Birch, and R. Plomin. 2001. Food and activity preferences in children of lean of obese parents. *International Journal of Obesity* 25 (7):971–77. doi:10.1038/sj.ijo.0801661.

Welker, E. M., E. F. Jacquier, D. J. Catellier, A. S. Anater, and M. T. Story. 2018. Room for improvements in food consumption patterns of young children aged 2–4 years. *The Journal of Nutrition* 148:1536S–1546S. doi:10.1093/jn/nxx053.

Wiley, D. C., and C. M. Hendricks. 1998. Using picture identification for research with preschool children. *Journal of School Health* 68 (6):227–30.

Yee, A. Z., M. O. Lwin, and S. S. Ho. 2009. Family correlates of fruit and vegetable consumption in children and adolescents: A systematic review. *Public Health Nutrition* 12:267–83. doi:10.1017/S1368980008002589.