

Galloway, A. T., Lee, Y., Birch, L. L. (2003). Predictors and consequences of food neophobia and pickiness in young girls, *Journal of the American Dietetic Association*, 103(6), 692-698. (June 2003) Published by American Dietetic Association (ISSN: 1878-3570). doi:10.1053/jada.2003.50134

Predictors and consequences of food neophobia and pickiness in young girls

Amy T. Galloway, Yoona Lee, Leann L. Birch

ABSTRACT

Objective: Vegetable intake among children is well below recommended levels. We assessed whether food neophobia and pickiness contribute to low vegetable intake in school-aged girls and if there are distinct predictors for neophobia and pickiness. Children with food neophobia are reluctant to eat new foods whereas picky children resist eating many familiar foods.

Design/subjects: Participants were 192 7-year-old girls and their parents, recruited for a study of girls' nutrition and development. We examined relationships between food neophobia and pickiness and assessed whether these variables predicted girls' vegetable consumption and predictors of food neophobia and pickiness. **Analyses:** The data were analyzed using a two-step process. First, we used a two-way analysis of variance to assess whether girls who scored high or low on food neophobia and pickiness measures had different levels of vegetable

consumption. We used multiple regression analysis to determine predictors of food neophobia and pickiness in the girls. **Results:** Girls with both food neophobia and pickiness consumed fewer vegetables (1.1 ± 0.1) than girls with neither neophobia nor pickiness (1.6 ± 0.1). Neophobia and pickiness were modestly related in this sample, but had different predictors. Girls with food neophobia were more anxious and had mothers with food neophobia. Picky girls had mothers with less variety in their vegetable intake ($r = -0.22$) and mothers who perceived their family to have little time to eat healthful foods ($r = 0.36$). In addition, picky eaters were breastfed for fewer than 6 months ($r = -0.25$). Pickiness was predicted primarily by environmental or experiential factors subject to changes; neophobia was predicted by more enduring and dispositional factors. **Applications:** Because food neophobia and pickiness negatively influence vegetable intake, intervention strategies to increase vegetable intake should focus on predictors of neophobia and pickiness, especially those subject to change.

This study examined whether food neophobia and pickiness are related to vegetable consumption in 7-year-old girls and assessed if there were distinct predictors for food neophobia and pickiness. Evidence suggesting a need for increased fruit and vegetable consumption is well documented; consuming more servings of fruits and vegetables is associated with more healthful dietary patterns among adults and children (1), reducing an adult's risk of some cancers (1), coronary heart disease, stroke, cataracts, hypertension, and possibly decreasing a child's risk of asthma and bronchitis (2). In addition, increased vegetable consumption might help children maintain a healthful weight by replacing energy derived from fatty foods (3). Vegetable intake in US children is well below the levels recommended by US Department of Agriculture (USDA) guidelines (3); by one estimate, only 22% of children aged 7 to 10 years are consuming 3 servings per day (4).

There are myriad influences on children's vegetable intake. For instance, mothers' vegetable intake positively relates to vegetable intake in their daughters ([5] and [6]). Sources of influence include vegetable availability at home and at school, meal structure, food modeling, socialization, and parenting style (7). Parents have many opportunities to affect a child's consumption of vegetables (7) and parental influences on food preference reflect both genetic and environmental factors (8). Despite the opportunity that parents have for introducing vegetables into their children's diets, most vegetables eaten by children are part of school lunches consumed on weekdays (9).

Child characteristics that influence vegetable intake include food neophobia and pickiness. Food neophobia is an unwillingness to eat novel foods, whereas pickiness is an unwillingness to eat many familiar foods. Whether the unwillingness to eat familiar food is caused by a genuine dislike for the food or by a resistance to parental attempts to control the child's eating is unclear. Past research indicates that children who exhibit food neophobia have less variety in their diets ([10], [11] and [12]). Although relatively extensive studies on the causes and consequences of neophobia in children have been conducted ([13], [14] and [15]), little is known about pickiness. Measuring pickiness has been complicated by inconsistent definitions and questionnaires that do not tap the possible distinctions between these 2 concepts (16). Whereas some evidence supports the notion that the concepts of food neophobia and pickiness are related ([16] and [17]), other research suggests they are behaviorally distinct ([11] and [14]).

Possible predictors of food neophobia or pickiness may include aspects of a child's previous food experiences. In one recent study with infants, those who were breastfed were more likely to accept a new vegetable, presumably because the variety of flavors to which the breastfed infants were exposed reduced the neophobic response (18). In another study, researchers showed that infants who were exposed to carrot juice, either prenatally or postnatally, were more likely to accept cereal made with carrot juice than cereal made with water during weaning (19). These researchers have also shown that infants who were exposed to a variety of vegetables during weaning were more likely to accept a new vegetable than infants exposed only to one type of vegetable during the same period (20). Pelchat and Pliner (11) found that food neophobia scores were negatively related to a child's exposure to diet variety in children aged 2 to 7 years. These studies suggest that early exposure to vegetables might preclude the neophobic response to those vegetables or ameliorate the effect of pickiness.

In addition to the contribution of previous experience, there might be individual traits that predict food neophobia or pickiness. For instance, children who scored higher on several measures of anxiety were more likely to have food aversions (21) and higher food neophobia scores (14). In a more recent study, a child's food neophobia score was positively associated with emotionality and shyness, but not with sociability and activity (22). Whether these trait variables predict pickiness is unknown.

We examined the relationship between food neophobia and pickiness, assessed whether they predicted vegetable consumption in girls, and evaluated several variables as possible predictors of food neophobia and pickiness.

METHOD

Participants

Newspaper advertisements, flyers, and letters of invitation were used to recruit prospective families in a 5-county radius of central Pennsylvania. Participating families were exclusively non-Hispanic white. We collected data from 192 young girls and their parents concerning early experience, nutrition, and a range of developmental issues when the girls were on average 7.3 ± 0.3 years old. We obtained written parental consent from parents for themselves and their daughter and the study protocol was approved by the Institutional Review Board at the Pennsylvania State University.

The girls' mothers were approximately 37.4 ± 4.7 years old and had completed 14.6 ± 2.2 years of education. The fathers were 39.4 ± 5.4 years old and had completed 14.7 ± 2.6 years of education. The 76% of mothers who worked outside the home worked on average 30.2 ± 11.8 hours per week (range: 5 to 60 hours per week). Forty-seven percent of families had annual incomes greater than \$50,000, 31% had incomes between \$35,000 and \$50,000, and the remaining families had incomes below \$35,000 per year.

MEASURES

Food neophobia

We used principal components analysis (PCA) to create a standardized summary score of food neophobia (mean=0, standard deviation=1) in girls by combining items from two food neophobia measures, the Food Neophobia Scale for Children (FNS-C) a 6-item questionnaire adapted from Pliner and Hobden's (14) 10-item food neophobia scale for adults, and the Food Situations Questionnaire (15). The FNS-C and the Food Situations Questionnaire measured children's willingness to try new foods. PCA enabled us to obtain a standard scale in which items with different numbers of response options were equally weighted. Scores on the combined neophobia scale ranged from -2.5 to 3.6. Cronbach's α for the summary neophobia score was $\alpha=0.86$. The items for this measure and others are provided in Figure 1.

Summary neophobia score (using principal components analysis)

- I will eat foods that I've never tried before^a.
- It is scary to eat a food that I've never tried before^a.
- If I don't know what is in a food I won't try it^a.
- When my mom asks me to eat something I've never had before, I will eat it^a.
- I'm afraid to eat things that I've never eaten before^a.
- When my dad asks me to eat something I've never had before, I will eat it^a.
- If your mom or dad made something for dinner that you had never tasted before, how would you feel about eating that?^b
- If there was a Halloween party at school and the teacher brought some chayote (CHA-OH'-TEE) for the children, how would you feel about trying some of that^b?
- If your Mom made a new and different kind of sandwich for your lunch box, how would you feel about eating the sandwich^b?
- If dessert at your friend's house was cannoli (CAN-OH'-LEE) with chocolate sauce, how would you feel about eating that kind of dessert^b?
- If your Mom served a new kind of vegetable for dinner, how would you feel about eating that^b?
- If you went on a picnic with your friend's family, and they brought a food that you had never seen before, how would you feel about having some of their food^b?
- If you went on a school trip with your class, and for dessert you got chocolate cake with frangelico (FRAN-JEL'-IH-CO) icing, how would you feel about eating that kind of cake^b?
- If you went to a friend's birthday party, and they had cassava (CAH-SAH'-VAH) chips there for you to try, how would you feel about trying some of those^b?
- If your favorite aunt or uncle took you out for lunch and bought you kirschenkeks (KEER'-SHEN-KEX), how would you feel about eating that^b?
- If your family went on a trip to a new place, and all the food there was stuff you'd never had before, how would you feel about eating the food^b?

Child Feeding Questionnaire (14): Pickiness subscale

- My child's diet consists of only a few foods.
- My child is unwilling to eat many of the foods that our family eats at mealtimes.
- My child is fussy or picky about what she eats.

Child Feeding Questionnaire (15): No Time to Eat Healthy subscale

- Sometimes life is so stressful or crazy that making sure my kids eat healthy is the least of my worries.
- I have bigger problems to worry about than which foods my children are eating.
- Because our schedules are too hectic to eat a meal at home, we often eat fast food.
- We have so little free time, that at meals I worry more about convenience than whether foods are healthy.

Fig. 1.

Questionnaire items. Data from aFood Neophobia Scale for Children (14) and bFood Situations Questionnaire (15).

Pickiness

The Child Feeding Questionnaire assessed dimensions of parental attitudes about issues related the child feeding. One subscale of this questionnaire, "Pickiness" (3 items), examined parents' reports of how they perceived their child's willingness to eat during mealtimes. Cronbach's $\alpha=0.85$. All items were measured using a 5-point Likert-type scale; responses ranged from "disagree" to "agree." A total score was calculated taking the mean of item scores, and high scores on the pickiness subscale represent higher levels of pickiness.

Girls' vegetable intake

We collected dietary information from the mothers and girls by administering three 24-hour food recalls, two on weekdays and one on a weekend day, randomly selected within a 2-week period. During each recall, mothers reported their daughters' food intake in the presence of the child and selected the amount of food eaten during the previous day using a food portion poster (23). Participants were aware of the time period during which these calls would be made, but not of the exact time or date. Children's vegetable intakes were estimated using a computer-assisted Nutrition Data System for Research (Nutrient Database version 12A, Food Database version 27, 1995, Nutrition Coordinating Center, University of Minnesota, Minneapolis). The mean of the 3-day data recall was used to represent the number of vegetable servings eaten daily. The size of vegetable servings was based on USDA Food Guide Pyramid guidelines (24) for the appropriate age group. French fries and potato chips were excluded from the vegetable servings score for the analyses in this study.

Predictors of food neophobia and pickiness

Children's symptoms of anxiety were measured using an adapted version of the Manifest Anxiety Scale (25). The age-adapted scale was developed for children grade 1 through 12 and contained 37 items. Item examples include "I worry a lot of the time" and "I am always kind." All items have a response option of 1=yes or 2=no. The mean of these responses represents the total score, higher scores indicating higher levels of anxiety. An internal consistency estimate of 0.85 has been reported (26), and in our sample, Cronbach's $\alpha=0.90$.

Mothers' and fathers' avoidance of new foods was measured using the 10-item Food Neophobia Scale for Adults (14). A 7-point Likert-type scale was used ranging from "agree strongly" to "disagree strongly." Cronbach's α from this study was $\alpha=0.88$.

A food frequency questionnaire developed by Kristal used to measure the "usual" dietary intake of free-living persons (27) was used. We created a separate subscale to measure the variety of vegetables reported eaten during a 3-month period by mothers. There were 20 vegetable categories included on the food frequency questionnaire; the total number of categories from which vegetables were consumed constituted the vegetable variety score. Values for this measure provide the total number of different categories of vegetables eaten during the

previous 3-month period. The validity of the food frequency instrument was evaluated based on a sample of 110 participants who also completed food records (27).

The Child Feeding Questionnaire examined dimensions of parental attitudes about issues related the child feeding. One subscale, "No Time to Eat Healthy" (4 items), measured the extent to which mothers felt that a lack of time and daily hassles affected her families' ability to eat healthful foods. Cronbach's $\alpha=0.77$. All items were measured using a 5-point Likert scale; each point on the scale was represented by a word anchor ranging from "disagree" to "agree." A total score was calculated by taking the mean of item scores. Mothers' high scores on the "No Time to Eat Healthy" scale represented more daily hassles and a belief that their family had no time to eat healthful foods.

The question, "How many months did you breastfeed your daughter?" was one item on a background questionnaire completed by mothers. Each mother provided the number of months, if any, that she breastfed her child. In addition, mothers reported if they breastfed or formula fed exclusively, used both feeding practices throughout early feeding, or began breastfeeding and then switched to formula.

STATISTICAL ANALYSIS

We used complete data from 191 families and analyzed the descriptive statistics for all variables of interest. Data from two families were dropped because the girls' data included outliers in two of the bivariate distributions. Data for three measurements-pickiness, no time to eat healthy, and breastfeeding-had skewed distributions that were unaffected by transformation. To address this problem, we dichotomized the skewed variables using a median split for all subsequent analyses, and categorized the pickiness variable using quartiles when it was used as the outcome variable in the multiple regression analysis. The positively skewed girls' vegetable intake data were transformed using a square root transformation. A Spearman's correlation matrix was calculated to assess relationships of all variables included in the analyses. When describing neophobia in girls, we used the original neophobia scales for the purpose of making the scales easier to interpret. We then used the standardized summary score (mean=0, standard deviation=1) derived from PCA to examine relationships among variables in all subsequent computations, including the analyses of variance (ANOVAs) and multiple regression.

We used a 2x2 ANOVA to assess the effects of pickiness and neophobia on vegetable intake. Girls were placed into one of four groups depending on whether they scored above or below the median on neophobia and pickiness. We analyzed the vegetable consumption of girls who scored high on neophobia and pickiness vs those who scored low on neophobia and pickiness using a planned comparison. ANOVA was then used to test for main effects and for interactions between pickiness and neophobia not assessed using the planned comparison. In the second analysis, we chose potential predictive variables of pickiness and neophobia based on significant bivariate relationships in the correlation matrix and examined the predictive strength of those variables using multiple regression.

RESULTS

Descriptive measures of variables of interest

Table 1 provides descriptive information from our sample. Total vegetable consumption in girls was well below the 3 servings per day suggested by the USDA dietary guidelines (28), and below the 2.2 servings a day that Krebs-Smith et al (29) reported being consumed by this age group. As shown in Table 1, when we excluded potatoes in the form of french fries and potato chips, vegetable consumption dropped even further below these figures. Mothers' total vegetable consumption (including french fries and potato chips) was also below the recommended 3 servings per day (28).

Table 1
Mean scores \pm standard deviation of 7-year-old girls and their mothers (N=189)

Data used in the analyses	Mean \pm standard deviation
Child vegetable intake (No. servings per day)	
Including french fries and potato chips	1.7 \pm 0.9
Excluding french fries and potato chips	1.3 \pm 0.9
Maternal vegetable intake (No. servings per day)	
Including french fries and potato chips	2.7 \pm 1.4
Child neophobia score^a	0 \pm 1.0
Maternal rating of child pickiness^b	2.1 \pm 1.1
Maternal rating of "no time to eat healthy"^c	1.9 \pm 0.9
Months breastfed^d	7.2 \pm 8.1
Variety of maternal vegetable intake^e	10.8 \pm 3.1
Child anxiety^f	1.5 \pm 0.3
Maternal food neophobia^g	27.5 \pm 11.8
Maternal education (yrs)	14.6 \pm 2.2

^aHigh food neophobia=3.6. Range: -2.5-3.6.

^bHigh pickiness=5. Range: 1-5.

^cNo time to eat healthy=5. Range: 1-5.

^dRange: 0-48 months.

^eReported number of different kinds of vegetables eaten during 3-month period. Range: 0-20 vegetable categories.

^fHigh anxiety=2. Range: 1-2.

^gHigh food neophobia=70. Range: 10-70.

Approximately 33% of girls had medium to high scores on the summary FNS-C (mean=0 \pm 1.0, range=-2.5 to 3.6). Most mothers reported low levels of pickiness in their daughters; however 27% of mothers gave scores of 3 or more to their daughters (mean=2.11 \pm 1.1, range=0 to 5.0). Seventeen percent of mothers said they experienced moderate to high levels of belief that they had a lack of time to eat healthful foods. These mothers were more likely to work more hours outside the home, $r=0.15$, $P\leq.05$. Seventy-nine percent of mothers initiated breastfeeding and 50% continued to breastfeed for at least 6 months. This is above the national average of around 20% of mothers still breastfeeding at 6 months postpartum (30). Thirty-one percent of mothers in our sample reported exclusive breastfeeding, 21% reported exclusive formula feeding, and

34% reported exclusive breastfeeding followed by exclusive formula feeding, whereas 14% of mothers reported using a mixture of breastfeeding and formula feeding before weaning.

Relationship between food neophobia and pickiness in families

Girls' food neophobia score and pickiness were related modestly ($r=0.19$, $P<.05$). Mothers' food neophobia scores, but not fathers', were positively associated with girls' food neophobia scores ($r=0.20$, $P<.01$). Fathers' ratings of their daughters' pickiness and fathers' food neophobia scores were not related to other measures of neophobia in mothers or girls. However, mothers' and fathers' reports of daughters' pickiness were positively related, $r=0.55$, $P<.05$.

Food neophobia, pickiness, and vegetable consumption

A correlation matrix providing relationships among all variables of interest is shown in Table 2. This matrix indicates modest significant relationships between food neophobia, pickiness, and vegetable consumption.

Table 2
Relationships among measures of food neophobia, pickiness, and other variables of interest using Spearman correlation matrix (N=189)

	Girls' food neophobia	Girls' pickiness	Girls' vegetable consumption	Mothers' vegetable variety	Girls' months breastfed	Mothers' food neophobia	Girls' anxiety	Mothers' no time to eat healthy
Girls' food neophobia	...	...	...	...	...	...	...	...
Girls' pickiness	0.19**	...	...	...	...	...	...	...
Girls' vegetable intake	-0.15*	-0.21**	...	...	...	...	...	...
Mothers' vegetable variety	-0.15*	-0.22**	0.16*	...	...	...	...	...
Girls' months breastfed	NS	-0.25***	NS	.17*	...	...	...	...
Mothers' food neophobia	0.20**	NS	-.15*	-0.38***	NS	...	...	...
Girls' anxiety	0.29***	NS	NS	NS	NS	NS	...	...
Mothers' no time to eat healthy	0.17*	0.36***	NS	-0.19**	NS	NS	NS	...
Mothers' education	NS	NS	NS	.18*	.26***	NS	NS	NS

NS=Not significant.
* $P\leq .05$.
** $P\leq .01$.
*** $P\leq .001$.

Figure 2 presents the data on vegetable consumption for the four groups defined in terms of their levels of neophobia and pickiness. ANOVA showed that there was a main effect of pickiness on vegetable consumption, $F_{3,186}=4.43$, $P<.05$, with picky girls consuming fewer servings of vegetables. Two sets of analyses were conducted to determine whether neophobia and pickiness interact to predict girls' vegetable intake. First, a planned comparison ANOVA was performed to test the hypothesis that girls with high neophobia and high pickiness would report significantly lower vegetable intake than girls categorized as low on both neophobia and pickiness. As shown in Figure 2, results supported this hypothesis ($F_{1,188}=8.64$, $P<.01$). Second,

post hoc tests were used to determine whether effects other than those predicted were present. No other effects were identified.

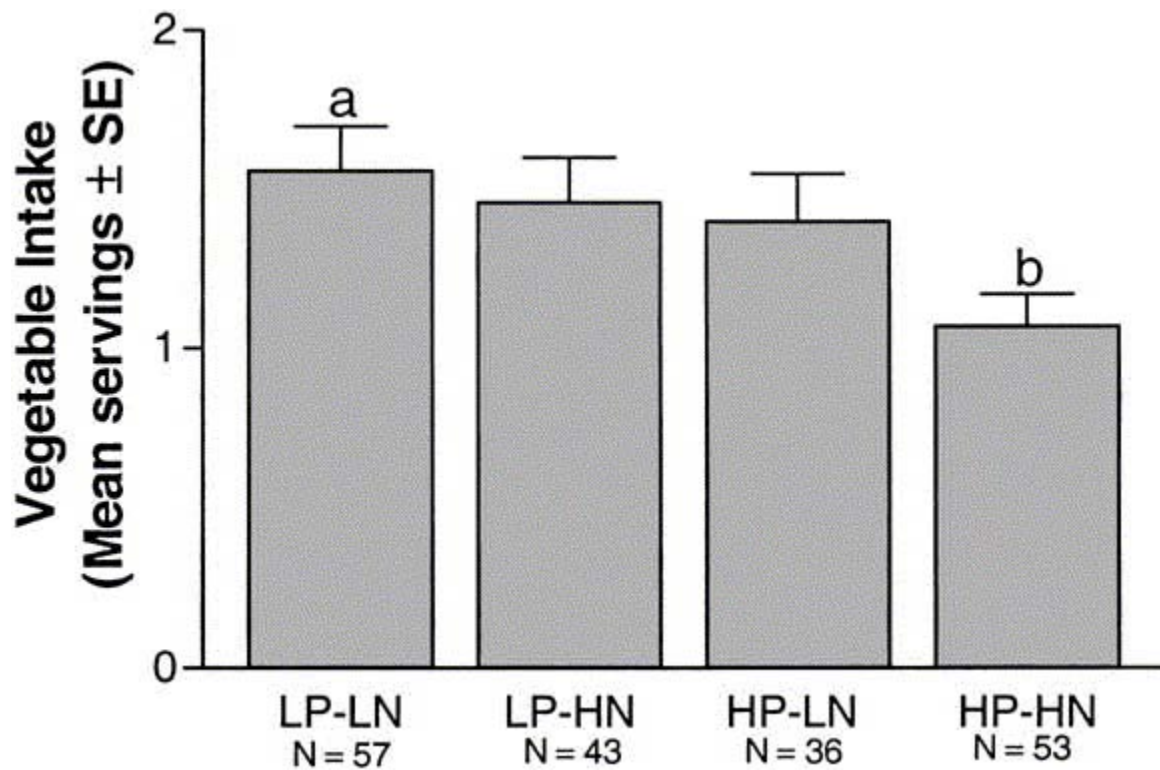


Fig. 2.

Effect of food neophobia and pickiness on girls' vegetable intake scores (excluding potatoes eaten as french fries and potato chips). P=Pickiness, N=Neophobia, H=High, L=Low. $F=8.64$, $P=.004$

Predictors of food neophobia and pickiness

Table 3 shows significant predictors of food neophobia and pickiness. Mothers with food neophobia were more likely to have daughters with food neophobia. In addition, girls who scored higher on the children's Manifest Anxiety Scale were more likely to have food neophobia. Vegetable variety in mothers' diets and whether mothers reported feeling no time to eat healthy did not predict food neophobia.

Table 3
Parameter estimates for predictors of food neophobia and pickiness
(N=189)

Predictor	Zero-order correlations	Regression weight (β)	Model R^2
Neophobia			
Mothers' food neophobia	0.20**	0.19**	0.15
Girls' anxiety	0.29***	0.27***	
Mothers' vegetable variety	-0.15*	NS	
No time to eat healthy	0.17*	NS	
Pickiness			
No time to eat healthy	0.36***	0.26***	0.15
Months breastfed	-0.25***	-0.19**	
Mothers' vegetable variety	-0.22**	-0.15*	
<hr/>			
* $P \leq .05$.			
** $P \leq .01$.			
*** $P \leq .001$.			

Table 3 indicates that mothers who reported a lack of time for healthy eating, breastfed their daughters fewer than 6 months, and reported eating a low variety of vegetables themselves were more likely to have daughters who were picky eaters.

DISCUSSION

These findings indicate that girls with neophobia and pickiness ate fewer servings of vegetables, compared with girls with neither food neophobia nor pickiness. Although they were modestly correlated, results from the regression analyses revealed that food neophobia and pickiness are distinct behavioral concepts with different predictors. Food neophobia in girls was predicted by traitlike variables: their mothers' own high food neophobia scores and their own comparatively high levels of anxiety. Pickiness, however, was predicted by experiential variables: Girls were more likely to be picky if they were breastfed for fewer than 6 months, if their mothers reported not having time to eat a healthful diet, and if their mothers consumed a more limited variety of vegetables. Predictors of pickiness included situational factors more subject to change, whereas predictors of neophobia were traitlike, including girls' anxiety and mothers' own neophobia. The latter provides some corroboration of the idea that neophobia may have a genetic basis (14).

Considering that 76% of the families had two parents working to earn the family income, the finding that some mothers reported having no time to eat healthful meals should not be surprising. We found a significant association between the number of hours worked by mothers and their reports of having time to eat healthfully. The fact that this lack of time for healthful eating is associated with pickiness suggests that mothers believe that it takes more time to eat healthfully, and that making the time to expose children to healthful foods (ie, vegetables) or knowing time-saving vegetable preparation techniques might be integral to reducing pickiness. Although it may seem as if it is the out-of-time mothers who foster pickiness in their children by

not having time to make vegetables available to them, it is also likely that the picky eaters themselves contribute to their mothers feeling overwhelmed by the prospect of healthful eating.

That breastfeeding predicted pickiness strengthens the notion that pickiness might be shaped by the child's early feeding experience. One explanation for this finding is that breastfed children are less picky because they have been exposed to a diversity of flavors via breastmilk early in life (18). It might also be possible that breastfed children are less picky because they have established a different balance of control and different patterns of mother-child interactions during feeding than have formula-fed infants. It is known that breastfeeding is associated with reduced maternal control of the duration of and the amount eaten during feeding and that children who have control over their own feeding have higher energy intakes as toddlers (31).

One way of understanding the relationship between neophobia and pickiness is to consider that normal children are born with a genetic predisposition toward neophobia, but experiential factors, especially the interactions between a child's individual level of neophobia and parents' reactions to neophobia, may determine if the child will develop into a picky eater. In contrast, neophobia develops first as a widespread reaction to new foods in early childhood, and these findings suggest that it is especially likely to persist among children who are prone to anxiety. Some research has focused on the notion that a child's unwillingness to try new food might result in a limited and perhaps unhealthful diet (10). Our findings suggest that vegetable intake is limited by both a general reluctance to try new food (neophobia) and by an unwillingness to eat an assortment of familiar food (pickiness). These results augment the body of research indicating that early repeated exposure reduces food neophobia in young children and suggest that early food experience also influences whether a child is categorized as a "picky eater." Although parents frequently lament that their child is a picky eater, there is a general lack of systematic information about the prevalence of pickiness in children because neophobia and pickiness are often classified together as "feeding problems."

Whether the effects of pickiness on vegetable intake are age-dependent is unknown because it is unclear how pickiness may change with age. In this sample, pickiness was relatively stable from age 5 to 9 years ($r=0.63$, $P=.0001$), however, these findings are not consistent with Carruth et al (12). Some research indicates that neophobia decreases with age ([22], [32] and [33]). One reason neophobia may decline with age is that as children's food exposure becomes more extensive with age, fewer foods are new. It is possible that food neophobia might be more detrimental to the diets of children during early childhood, when many foods are new, whereas pickiness becomes more of a limiting factor on vegetable intake among school-aged children.

APPLICATIONS

These findings indicate that practitioners could influence increased vegetable intake by focusing on factors that reduce food neophobia and pickiness. Possible interventions include promoting breastfeeding, encouraging caregivers to model vegetable intake, and providing caregivers with time-saving vegetable preparation techniques.

REFERENCES

- [1] J Potter, J Finnegan, J-X Guinard, E Huerta, S Kelder, A Kristal, S Kumanyika, R Lin, B Motesinger, F Prendergast and G Sorensen, 5 A Day For A Day For Better Health Report, National Institutes of Health, National Cancer Institute, Bethesda, MD (2000).
- [2] MAS Van Duyn and E Pivonka, Overview of the health benefits of fruit and vegetable consumption for the dietetics professional: Selected literature. *J Am Diet Assoc*, 100 (2000), pp. 1511–1521.
- [3] KA Munoz, SM Krebs-Smith, R Ballard-Barbash and LE Cleveland, Food intakes of US children and adolescents compared with recommendation. *Pediatrics*, 100 (1997), pp. 323–329.
- [4] A Carlson, M Lino, S Gerrior and P Basiotis, Report Card on the Diet Quality of Children Ages 2-9, US Dept of Agriculture, Center for Nutrition Policy and Promotion, Alexandria, VA (2001).
- [5] J Fisher, D Mitchell, H Smiciklas-Wright and L Birch, Parental influences on young girls' fruit and vegetable, micronutrient, and fat intakes. *J Am Diet Assoc*, 102 (2002), pp. 58–64.
- [6] EL Gibson, J Wardle and CJ Watt, Fruit and vegetable consumption, nutritional knowledge and beliefs in mothers and children. *Appetite*, 31 (1998), pp. 205–228.
- [7] TA Nicklas, T Baranowski, JC Baranowski, K Cullen, L Rittenbury and N Olvera, Family and child-care provider influences on preschool children's fruit, juice, and vegetable consumption. *Nutr Rev*, 59 (2001), pp. 224–235.
- [8] L Birch, Development of food preferences. *Ann Rev Nutr*, 19 (1999), pp. 41–62.
- [9] T Baranowski, M Smith, MD Hearn, LS Lin, J Baranowski, C Doyle, K Renisow and DT Wang, Patterns in children's fruit and vegetable consumption by meal and day of the week. *J Am Coll Nutr*, 16 (1997), pp. 216–223.
- [10] GA Falciglia, SC Couch, L Siem Gribble, SM Pabst and R Frank, Food neophobia in childhood affects dietary variety. *J Am Diet Assoc*, 100 (2000), pp. 1474–1478.
- [11] ML Pelchat and P Pliner, Antecedents and correlates of feeding problems in young children. *J Nutr Educ*, 18 (1986), pp. 23–29.
- [12] B Carruth, J Skinner, K Houck, J Moran, F Coletta and D Ott, The phenomenon of "picky eater: A behavioral marker in eating patterns of toddlers. *J Am Coll Nutr*, 17 (1998), pp. 180–186.
- [13] R Casey and P Rozin, Changing children's food preferences: Parent opinions. *Appetite*, 12 (1989), pp. 171–182.
- [14] P Pliner and K Hobden, Development of a scale to measure the trait of food neophobia in humans. *Appetite*, 19 (1992), pp. 105–120.

- [15] R Loewen and P Pliner, The food situations questionnaire: A measure of children's willingness to try novel foods in stimulating and non-stimulating situations. *Appetite*, 35 (2000), pp. 239–250.
- [16] HWW Potts and J Wardle, The list heuristic for studying personality correlates of food choice behaviour: A review and results from two samples. *Appetite*, 30 (1998), pp. 79–92.
- [17] B Raudenbush, NJ Van Der Klaauw and RA Frank, The contribution of psychological and sensory factors to food preference patterns as measured by the Food Attitudes Survey (FAS). *Appetite*, 25 (1995), pp. 1–15.
- [18] SA Sullivan and LL Birch, Infant dietary experience and acceptance of solid foods. *Pediatrics*, 93 (1994), pp. 271–277.
- [19] JA Mennella, CP Jagnow and GK Beauchamp, Prenatal and postnatal flavor learning by human infants, . *Pediatrics*, 107 (2001), p. e88 www.pediatrics.org (2001)
- [20] CJ Gerrish and JA Mennella, Flavor enhances food acceptance in formula-fed infants. *Am J Clin Nutr*, 73 (2001), pp. 1080–1085.
- [21] WI Smith, EK Powell and S Ross, Food aversions: Some additional personality correlates. *J Consult Psychol*, 19 (1955), pp. 145–149.
- [22] P Pliner and E Loewen, Temperament and food neophobia in children and their mothers. *Appetite*, 28 (1997), pp. 239–254.
- [23] 2D Food Portion Visual Framingham, MA: Nutrition Consulting Enterprises (1997).
- [24] (5th ed), *Nutrition and Your Health: Dietary Guidelines for Americans*, US Government Printing Office, Washington, DC (2000), US Department of Agriculture, US Department of Health and Human Services.
- [25] CR Reynolds and BO Richmond, What I think and feel: A revised measure of children's manifest anxiety. *J Abnorm Child Psychol*, 25 (1997), pp. 15–20.
- [26] CR Reynolds and BO Richmond, *Revised Children's Manifest Anxiety Scale (RCMAS) Manual*, Western Psychological Services, Los Angeles, CA (1985).
- [27] RE Patterson, AR Kristal, LF Tinker, RA Carter and MP Bolton, Measurement characteristics of the Women's Health Initiative Food Frequency Questionnaire. *Ann Epidemiol*, 9 (1999), pp. 178–187.
- [28] *Healthy People 2000: National Health Promotion and Disease Prevention Objectives*, US Dept of Health and Human Services, Washington, DC (1990).
- [29] SM Krebs-Smith, AD Cook, AF Subar, L Cleveland, J Friday and LL Kahle, Fruits and vegetable intakes of children and adolescents in the United States. *Arch Pediatr Adolesc Med*, 150 (1996), pp. 81–86.

[30] B Dobson and MA Murtaugh, Position of The American Dietetic Association: Breaking the barriers to breastfeeding. *J Am Diet Assoc*, 101 (2001), pp. 1213–1220.

[31] JO Fisher, LL Birch, H Smiciklas-Wright and MF Picciano, Breastfeeding through the first year predicts maternal control in feeding and subsequent toddler energy intakes. *J Am Diet Assoc*, 100 (2000), pp. 641–646.

[32] P Pliner, Development of measures of food neophobia in children. *Appetite*, 23 (1994), pp. 147–163.

[33] ML Pelchat and P Pliner, "Try it. You'll like it.: Effects of information on willingness to try novel foods. *Appetite*, 24 (1995), pp. 153–165.