

Children's Interpretation of Nutrition Messages

LESLIE A. LYTLE,¹ ALISON L. ELDRIDGE,¹ KRISTA KOTZ,² JANICE PIPER,³ SARAH WILLIAMS,⁴
AND BARBARA KALINA⁵

¹Division of Epidemiology, University of Minnesota, Minneapolis, Minnesota 55454; ²Idaho Department of Health and Welfare, Boise, Idaho 83720-0036; ³Thunder Bay District Health Unit, Thunder Bay, Ontario, Canada P7B 6E7;

⁴Nutrition Education Coordinator, State of Illinois, Westchester, Illinois 60154; ⁵Minnesota Department of Children, Families and Learning, CEDA-WIC Program, St. Paul, Minnesota 55101

ABSTRACT The purpose of this research was to further our understanding of how children understand and use nutrition messages. As part of formative assessment for the development of nutrition messages for elementary age school children, focus groups and one-on-one interviews were conducted with 141 students, grades K to 6. Children were asked to interpret the messages found in the Dietary Guidelines for Americans and the Food Guide Pyramid and to indicate how they use food labels. In addition, they were asked to discuss their opinion of "good and bad foods" and "dieting" and to link specific foods with nutrition terms. Differences by cognitive development were found with younger children having more difficulty interpreting more abstract terms such as "variety" and "healthy weight." Children in grades 3 to 6 who were asked about reading food labels had difficulty describing how they use labels and offered unrealistic criteria for determining the acceptability of food based on label information. While younger children freely used terms such as "low fat" or "low sugar," they had difficulty in naming three foods within those categories. Our research suggests that nutrition messages need to be developmentally appropriate and give specific behavioral messages in order to positively inform the eating choices of children.

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INTRODUCTION

School-based nutrition education has the potential to positively impact the nutritional health and dietary behaviors of children and is included as an important element in comprehensive school health.¹⁻⁷ Recent reviews^{2,7} and the Guidelines for School Health Programs to Promote Lifelong Healthy Eating⁴ suggest that effective nutrition education is developmentally appropriate, employs social learning strate-

gies, and focuses on eating behavior change rather than knowledge acquisition.

Cognitive development theory (CDT) posits that chronological age has a major influence on a child's ability to categorize, generalize, and think causally. In the earliest stage, sensory-motor (birth to age 2), a child uses his or her own movement and sensations to experience and differentiate themselves from the world. The preoperational stage (ages 2-7) is characterized by language development, but cognitions are egocentric, circular reasoning is predominant, and deductive reasoning is not well developed. In the concrete operational stage (ages 7-11), the ability to classify experiences and to think causally begins to develop; however, thought is limited to concrete objects and specific experiences. It is not until the formal operational stage (age 11 to adulthood) that children begin to think more abstractly and formulate and imagine alternate hypotheses.^{8,9}

Social learning strategies consider the importance of environmental, individual, and behavioral factors in influencing health behavior. Social cognitive theory (SCT)¹⁰ is the most frequently cited behaviorally based theory used in nutrition education.² Cognitive knowledge is seen as one element of many that will influence eating behavior. Behavioral skills, role models in the environment, and reinforcements and incentives are seen as equally, if not more, important in influencing behavior.¹¹

The application of CDT and social learning theory in the design and evaluation of nutrition education materials for children is very important. Many, if not most, nutrition terms and nutrition messages are quite abstract. Such concepts such as lower fat, lower sodium, or high in vitamin C are abstract since one cannot usually see (or even taste, in some instances) fat, sodium, or vitamins in a food. In order for individuals to follow the advice "Eat a diet low in fat," they must be able to determine the fat content of a food, determine some acceptable level, and then make dietary choices appropriate to the "low fat" message, a task that is difficult even for adults.¹² In addition, the environment must be supportive and the individual must possess the behavioral

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Address for correspondence: Leslie A. Lytle, R.D., Ph.D., Division of Epidemiology, 1300 South Second Street, Suite 300, Minneapolis, MN 55454; Tel: (612) 624-3518; Fax: (612) 624-0315 E-mail: lytle@epivax.epi.umn.edu.

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capacity to enact the healthful choice. In evaluating nutrition education programs for children, there is a danger that parroted the correct "learned" response may occur in the absence of understanding how to use that information to make healthful food choices. This occurrence may, in part, help explain the discrepancies seen between acquired nutrition knowledge and change in eating behavior in children.^{1,2,13} While there is some research that evaluates how children understand concepts of health and the relationship of nutrition to health,^{8,14,15} and some research looking into how children classify and choose foods,^{16,17} there is little research that examines how children interpret and use nutrition messages that they hear in their environment.

The purpose of this research is to further our understanding of how children understand and use nutrition messages that they hear in their social and physical environment. Focus groups and one-on-one interviews were conducted with children in kindergarten (K) through grade 6 evaluating how children (1) understand nutrition messages and information from the Dietary Guidelines for Americans (DGFA)^{18,19} and the Food Guide Pyramid (FGP),²⁰ (2) interpret other nutrition-related messages in their environment, and (3) translate nutrition terms into specific foods. This qualitative method was chosen in order to allow children to express, in their own words, their interpretation and application of nutrition information they receive. This research was conducted as part of a formative evaluation to develop meaningful nutrition messages for school-aged children.

METHODS

Sample selection. A convenience sample of children in K through 4th grade was recruited from after-school daycare programs; 5th and 6th graders were recruited from a middle school. The sample was drawn from primarily white, middle socioeconomic status communities in two suburban school districts near Minneapolis and St. Paul, Minnesota. Site recruitment of the K to 4th-grade sample occurred by working with a district superintendent to identify after-school sites with sufficient enrollment. Of the eight sites identified as meeting the criteria for adequate numbers of students, all but one site leader agreed to participate in the study. Each site was scheduled for 1 or more weeks of participation, depending on the number of children enrolled at each site. For recruitment of 5th- and 6th-grade students, we worked with a district-level person to identify a school that was willing to let us meet with students during the school day. Recruitment of students occurred in a similar fashion for both the K to 4th-grade students and the 5th- to 6th-grade students. Flyers were posted in the after-school areas or classrooms, and all students received invitations to participate and consent forms to take home. We did not attempt to recruit or select any particular group of children. All children who returned signed parental consent forms and consented to participate were randomly assigned to either a focus group or an individual

interview and were grouped by three grade-level classifications: K to 2nd grade, 3rd to 4th grade, and 5th to 6th grade. Our goal was to recruit enough students to conduct 15 one-on-one interviews and 10 focus groups in each of the three age groupings. Students received small incentives for their participation (i.e., water bottles, colorful pencils).

Question development. Betts et al.²¹ suggest that all research be based on a conceptual or theoretical framework. Two conceptual frameworks guided the formulation of our research design and questions: Piaget's stages of cognitive development¹⁵ and social cognitive theory.¹⁰ The questions focused on how children understood and interpreted the 1990 DGFA,¹⁸ selected information from the FGP,²⁰ and other nutrition-related messages in their environment. (At the time of the research, the 1995 DGFA¹⁹ had not been released; this research evaluates students' interpretation of the 1990 guidelines. The only substantive change in the guidelines from 1990 to 1995 was the change in the 1990 guideline: "Maintain a healthy weight" to "Balance the food you eat with physical activity; maintain or improve your weight.") In addition, in order to determine if students could identify actual foods with nutrition terms (an important step linking cognitive recognition of nutrition terms with behavioral capacity) at the end of interviews, students were asked to complete a Food Identification Task (FIT). Each child participating in an individual interview was asked to name three each of the following: foods high in fat, foods low in fat, vegetables, fruits, grain products, foods high in sugar, and foods high in salt.

Two pilot focus groups were conducted with children grades K to 2 and 3 to 4, and three pilot interviews were conducted (one with each age group) to further test the questions. Slight modifications in the question schedules were made based on responses in the pilot testing. Specifically, during pilot testing, the exact wording of the DGFA was used for "Use salt only in moderation" and "Use sugars only in moderation." We found that younger children could not verbalize any understanding of "in moderation" for those guidelines. We decided to reword our question to "If someone told you to 'Use only a little salt (sugar),' what do you think that means?" Other guidelines were unchanged. Pilot test data were not used in the final data analysis. The final questionnaire schedules are available upon request from the first author.

Data collection. The use of focus groups in nutrition education has been well documented.²¹ In particular, focus groups and structured interviews have been recommended with populations with limited literacy skills, such as young children.²²⁻²⁷ Compared to a one-on-one interview with an adult, focus groups may be a less intimidating information-collecting setting for a child since other children are present. In addition, focus groups may be particularly useful in eliciting information since the group dynamic can help stimulate thinking and encourage respondents to build on each others' responses.^{21,28} Only qualitative data can provide rich

insights into how individuals think about and understand issues and allow them to describe the issues in their own terms. These strengths are important in formative evaluation. Since it is recognized that group participation can also bias information shared with a group and since there is little published literature on how very young children (kindergarten age) respond to focus groups, one-on-one interviews were also conducted with children.

We attempted to develop questions that would keep the students engaged using creative imagery, posters, and collages and attempted to keep the group sizes smaller with the younger children and the length of the questioning to under 30 minutes. There was considerable overlap in the content of focus group and interview questions, but some deviation was planned to maximize the scope of information obtained without overtaxing the children with lengthy sessions and to make use of group dynamics when appropriate. No sex differences in response to the questions and no apparent inhibition to participate in the discussion with a mixed-gender group were observed during the pilot testing phase of question development, so focus groups included both males and females and the results were summarized by grade grouping only.

Data analysis. The focus group sessions were recorded on videotape; audiotapes were used to record the individual interviews. Data analysis occurred using a three-step approach: data reduction, data display, and conclusion drawing/verification.²⁹ Data reduction occurred by transcribing the tapes verbatim and having the transcription reviewed and verified by an independent party. Data display occurred by using coding sheets to compile and extract concepts from transcripts. The final step of conclusion drawing was conducted by sorting and summarizing information. Each step in the analysis procedure involved checks for accuracy, completeness, and interpretation using at least two independent reviewers to protect against bias. Specifically, after initial transcription, each audiotope and videotape was reviewed by a research staff member to verify the accuracy and completeness of the transcribed copy. During data display, two staff members were responsible for independently coding each transcript, using a coding template based on the interview or focus group schedule to organize information retrieved. Information was summarized on these coding sheets, identified by a focus group or interview identification number. After the coding was completed, the two independent coding sheets were reviewed and discrepancies in retaining, eliminating, or combining transcript data were resolved by a third party. For the final step of data summary, a narrative was prepared by a primary analyst using the coding sheets. A second analyst independently evaluated the coding documents; discrepancies in summarizing or interpreting findings were resolved by a third party. This duplication of effort in each stage of the analysis was done in order to protect against bias. One of the concerns with the use of qualitative research is the potential for the researchers' bias to influence what is heard, recorded, and summarized. This bias is very serious

and, at its worst, can invalidate the findings. Only by careful and independent review at all stages did we feel that we could protect against bias in interpreting our results.

The analysis revealed similar concepts emerging from both the focus groups and one-on-one interviews. Unless noted, results combine findings from interviews and focus groups. Quotations used in reporting the results are meant to represent common ideas expressed by participants and to illustrate the terminology children used when discussing nutrition topics.

Analysis of the FIT occurred by reviewing a small subsample of the data (specifically, five sets of answers for each age group category) to come up with a code book to be used in scoring the answers. Two independent reviewers evaluated each child's responses for each of the food categories and scored them as correct or incorrect. For example, if a child named apple, banana, and celery as three vegetables, he/she received a score of 1 out of 3. Inter-rater reliability of the scoring was 98%. The few discrepancies from the independent scoring were resolved by a third member of the research team.

RESULTS

Sample. A total of 141 children (65 boys and 76 girls) participated in focus groups and interviews (Table 1). The size of the groups ranged from two to nine students per group. One group in grade level 3 to 4 had two students and one group in grade level K to 2 had nine students; all of the other groups had three to eight. Focus groups and interviews took between 20 and 40 minutes. The following questions were asked of both focus group and interview participants except where noted.

Interpretation of the DGFA and serving size information from the FGP.

Eat a variety of foods. Children in all grades were asked "What do you think you should eat if someone told you to 'Eat a variety of foods?'" The most common response among K to 2 children was a listing of foods. Approximately one-third of the K to 2 children replied that they did not know, forgot, or had never heard the term variety before. A few children in grades K to 2 interpreted the word variety to mean different kinds of foods or a big selection from which to choose. One child summed it up by saying "lots of different foods instead of just eating beans everyday."

Third and fourth graders commonly responded that eating a variety of foods meant "to eat good/healthy food" or "to eat foods from the Food Groups or the Pyramid." Many third and fourth graders were unsure of the meaning of variety. One child verbalized a good understanding of variety, saying that "Variety of foods means that you have a whole bunch of things to choose from."

About half of the 5th to 6th graders said that eating a variety meant that you should eat foods from all of the food groups. Food groups that were delineated by these children include (1)

Table 1. Number of participants by grade, sex, and type of discussion.

	Grade Level			Overall
	K-2	3-4	5-6	
Type of Discussion				
<i>Focus Groups</i>				
Number of groups	10	7	7	24
Number of participants (boys, girls)	35 (16, 19)	24 (14, 10)	36 (13, 23)	95 (43, 52)
Range of participants per group (mean size of group)	3-9 (3.5)	2-6 (3.4)	5-6 (5.1)	2-9 (4.0)
<i>Interview</i>				
Number of participants (boys, girls)	16 (6,10)	15 (9, 6)	15 (7, 8)	46 (22,24)
Total Participants (boys, girls)	51 (22, 29)	39 (23, 16)	51 (20, 31)	141 (65, 76)

four food groups — dairy, fruits and vegetables, poultry, and meat;" (2) six food groups—"vegetables, fruits, protein, milk, breads, fish;" and (3) the FGP—"meat, vegetables, dairy, bread, and fruit." Also suggested was to eat ". . .stuff that's good, like salad, instead of stuff that's more like a treat." When asked what the word variety meant, almost all children in this older group—described the word to mean "different kinds of things."

Maintain a healthy weight. Children participating in the one-on-one interviews were asked "What do you think it means to maintain a healthy weight?" Over half of the K to 2 children answering the question said that they did not know. When asked "How do you know if you weigh a healthy weight?" the three most common responses among K to 2 children were "I don't know," "I would weigh myself on a scale," and "I would exercise."

Among 3rd to 4th graders, almost half replied that they did not know what it means to maintain a healthy weight. Those that had a response answered "to keep healthy," "stay skinny," "diet," "stop eating fattening foods," "eat a healthy diet," "keep control of your weight," and "not overeat." The children who were able to respond to the previous question were then asked "How do you know if you weigh a healthy weight?" The two most common answers were "checking on a scale" and "asking a doctor."

To 5th to 6th graders, maintaining a healthy weight meant eating a certain way. Limiting "junk food" was commonly mentioned; others suggested simply "eating right" or "eating healthy." The other common meaning of maintaining a healthy weight described by 5th to 6th graders was not being overweight or underweight but being of average weight. Most children did not know how you would decide if you weighed a healthy weight.

Choose a diet low in fat, saturated fat, and cholesterol. All children were asked "If someone told you to 'Choose a diet

low in fat,' what do you think you should eat?" Children in K to 2 answered the question by indicating that they would avoid high-fat foods such as desserts or sweets, some meats, such as bacon or fried chicken, whole milk, french fries, and pizza. Many in the K to 2 group seemed to associate high-fat foods with any treat, as evidenced by their inclusion of soft drinks, Tear Jerkers, Fruit Roll-Ups, suckers, gum, and pretzels as high-fat foods. Only a few children verbalized some understanding of low fat, saying that they would have skim milk rather than 2% or whole milk.

Most 3rd to 4th graders responded that they would "eat healthy" or "eat good foods" when eating a diet low in fat. The Four Food Groups and foods from the FGP were mentioned by several children. Third and fourth graders said that they would avoid meats, like hot dogs and chicken, potato chips, and desserts or sweets such as ice cream, candy bars, and cookies for a diet low in fat.

Third and fourth graders were then asked about cholesterol. Most indicated that they had heard of cholesterol but they did not know what it meant. One child said, ". . .[cholesterol]'s a certain thing that makes you fatter. It's bad for you. It could cause heart problems." This child, however, had no response when asked what foods you should stay away from if advised to choose a diet low in cholesterol. This same child was one of only three children who responded to questions about saturated fat, associating saturated fat with heart problems and mentioning that you should stay away from butter. Another child mentioned butter or margarine as being high in saturated fat, and the third child mentioned that you should stay away from eggs and doughnuts because of saturated fat.

When 5th to 6th graders were asked about choosing a diet low in fat, the overwhelming response was to eat fruits and vegetables. One focus group had a discussion about how cooking methods affect the fat content of foods. The most common foods 5th to 6th graders said to avoid when eating

a low-fat diet were fatty meats, potato chips, pizza, and desserts like cookies, cake, and candy. Even though most students correctly named high- and low-fat foods, some students thought that they should avoid high-caffeine soft drinks, sugar, and salt on a low-fat diet.

When asked about eating a low cholesterol diet, one 5th to 6th grader suggested reading the label to see how much cholesterol was in the food. Meats, chips, desserts, and pizza were listed as foods to avoid by students in both focus groups and interviews. Most 5th to 6th graders did not know what was wrong with cholesterol, but some thought it was bad in some way and a few mentioned a relative that had high blood cholesterol. A few children thought that cholesterol in the diet "clogs the arteries like fat, only worse" or could "wreck your heart." While many of the 5th to 6th graders said that they had heard of saturated fat, most did not know what saturated fat was or how saturated fat in the diet affects health; those that did have an idea said that it was the same as fat or that it clogged up arteries. One child attempted to make some sense out of saturated fat and cholesterol, reasoning that "... 2 grams of saturated fat plus 2 grams of other saturated fat equals 4 grams of cholesterol."

Choose a diet with plenty of vegetables, fruits, and grain products. Children participating in the one-on-one interviews were asked "What do you think you should eat if someone told you to choose a diet with plenty of vegetables, fruit, and grain products?" Most of the K to 2 children named specific fruits and vegetables but only a few named grain products without prompting.

About half of the children in 3rd and 4th grade were able to name appropriate foods, mainly from the fruit and vegetable categories. Fruits were most commonly mentioned, either alone or in combination with vegetables or grains. Of those children who named grain products, the most frequently mentioned were cereals and breads.

All 5th to 6th graders answering this question gave appropriate answers. Most responded by listing specific fruits and vegetables. When asked to explain what grain products are, the most common responses were bread, breakfast cereals, rice, and crackers.

Use only a little sugar. Children in one-on-one interviews were asked what they would eat if someone told them to "Use only a little sugar." Children in K to 2 said that they would stay away from candy, doughnuts, cookies, and sugary cereals. Third and fourth graders said that they would eat less sugar ("a brownie only one time a day"), eat foods low in sugar ("cereals with only a drop of sugar"), or choose foods with natural sugar (fruit or "something that has sugar in it already and you don't have to add to it"). Fifth and sixth graders talked about limiting certain kinds of foods like cookies, candy, sugared cereals, ice cream, and Kool-aid.

Use only a little salt. Children participating in the one-on-one interviews were asked "what do you think you should stay

away from if someone told you to use only a little salt?" There was obvious confusion about salty, sugary, and fatty foods among younger children, as revealed in the comment "the most fattest food is pretzels because they have salt." Third and fourth graders suggested not adding salt to foods. Children in grades 5 to 6 told us that they would avoid chips and adding salt to foods.

Serving size information from the FGP. Children in grades 3 to 6 participating in the focus groups were shown a poster of the FGP and asked what a serving is and, given the ranges listed for servings, how they would know how many servings they should eat. The question on what a serving is resulted in a myriad of unique responses, some of which are listed in Table 2. When asked how they would know how many servings they should eat, again the answers were quite diverse, including "eating what the poster says or less, because it sounds like too much;" how much they liked a certain food group (i.e., "I'd eat more than 6 servings because I like the fruit and dairy groups"); and that it does not matter what a serving is because they eat what they are given and "work off" whatever they eat. A few children connected the number of servings to eat with weight (i.e., "... depends if you're on a diet, you should use lower [servings] to be healthy").

Interpretation of other nutrition messages: food labels, "dieting," and "good and bad foods." Students in grades 3 to 6 were asked "What do you look at, or pay attention to, when you look at food labels? What does the label tell you about this food?" Students were given a variety of food labels to look at when answering this question. Fat was the nutrient most often mentioned as being looked at on the food label. Protein, vitamins, calories, and minerals were also mentioned. A few children said that they looked at the ingredient listing and a few said that they looked at the picture on the box to see if it looked like a good food. Of those children who said that they looked at the nutrient levels on the label, many said that they used some self-assigned criteria to judge the

Table 2. Selected responses to the question "What is a serving?"

Grades 3-4	Grades 5-6
A dish	A glass of milk
A plate	A cup of milk
Bucket or teaspoon	A couple of ounces of milk
What is served to you	A little container of yogurt
2-3 apples is at least 3 servings	One banana equals a serving of fruit
14 potato chips would be 14-16 protein servings	A bowlful of cereal
Rice and meat is one serving; pasta for lunch is one serving; pancakes for breakfast is one serving	One piece of bread
Two slices of bread is one serving from the grain group	How much you eat
	How much it takes to make you full

food. Criteria used were uniformly very low. For example, most children who offered a criterion for fat believed that 3 grams of fat or less would be an acceptable amount. As one 3rd grader said, "Two grams of fat means he's going to gain weight." Likewise, calories greater than 150 calories were mentioned by several children as being "too many calories." Children using the ingredient listing to make food decisions said that if sugar was the first or second ingredient, they would know that it probably had too much sugar in it.

All children were asked the question "When you hear people talk about their 'diet,' what do you think they are talking about?" The majority of children said that diet meant going on a diet to lose weight or "trying to get skinnier." A few children in each age group answered that "diet" meant eating healthy foods. This question resulted in unsolicited comments by many children regarding their perception of weight loss diets. Particularly in the K to 2 group, children volunteered that their parents dieted even when they looked fine. As one boy put it, "My mom and dad keep saying they need to lose weight and I say 'Dad, you don't need to. You are skinnier than I am.'" Additionally, dieting was seen by many as eating bad-tasting food or special diet foods. Liquid diet drinks were mentioned by several children as the way their parents lose weight. One child mentioned that mom eats special diet food and remarked "Even though it tastes bad, at least you'll be skinny again." It is interesting to note that in the unsolicited discussion about adult dieting practices that occurred with this question, no child mentioned that parents or other adults in their lives increased physical activity when they were dieting or trying to lose weight. It would appear that, for these children, the role of physical activity in weight loss was not a salient message they received from adults in their environment.

All children were asked "Do you think there are 'good foods' and 'bad foods'? If so, what makes a food good or bad?" Almost all of the children thought that there were good and bad foods. Only a few children in each age group volunteered their opinion that eating "bad foods" once in a while was okay. Criteria most often mentioned as making a food good were the nutrient content of food, being healthy foods, and foods that taste good. While vitamins, calories, protein, and the absence of sugar and fat were mentioned by children in the youngest age group, children in the older age groups showed greater sophistication and mentioned the presence of carbohydrates, minerals, fiber, and natural sugar and the lack of cholesterol, caffeine, saturated fat, chemicals, and empty calories as elements of good foods. Fruits and vegetables were mentioned as good foods across all age groups.

Criteria that children used to identify "bad" foods included containing too much of a bad substance (fat, sugar, salt, caffeine, and food dyes), foods that are fattening, foods that make you acutely sick (give you a stomach ache or make you faint), foods that are bad for your teeth, and foods that are lacking in nutrients. Children in the oldest age group mentioned that "bad" foods contain grease and fat; those foods were associated with having a heart attack and causing skin problems.

Food Identification Task. At the end of the one-on-one interviews, children were asked to name three foods in each of the following categories: high fat, low fat, high sugar, high salt, fruits, vegetables, and grains. Table 3 presents the results of that inquiry, indicating by grade levels and food category the average number of foods correctly associated with each category. Children in the youngest group had particular difficulty in verbally identifying foods high in salt, high in sugar, and grain products with the average number of foods correctly identified in those groups being 0.5, 1.4, and 1.3, respectively.

In grades 3 to 4, the three most difficult categories were foods high in salt, low in fat, and high in fat, with the average number of foods mentioned per category being 1.3, 1.7, and 1.8, respectively. The oldest age group was more capable in this activity; naming three high-salt foods was again the most difficult task. Across all age groups, children had the easiest time naming fruits and vegetables.

DISCUSSION

This research needs to be considered in light of its limitations. The research was conducted with a small convenience sample of primarily Caucasian children living in Minnesota; therefore, the external validity of the study is limited. Because it is based on qualitative data, there is potential for presenting biased interpretation of results. This research should be seen as formative assessment and conclusions tested with larger samples using more quantifiable research methods.

This research should not be seen as impact or outcome evaluation of school-based nutrition education. We made no attempt to assess students' prior exposure to any formal nutrition education. Rather, we were interested in their existing perceptions, understandings, and interpretations of nutrition messages ubiquitous in their environment and

Table 3. Average number of foods correctly associated with food categories: results of the Food Identification Task.

Food Category	Grade Level		
	K-2 Number Correct (n = 14)	3-4 Number Correct (n = 14)	5-6 Number Correct (n = 14)
High fat	1.5	1.8	2.5
Low fat	2.1	1.7	2.5
Vegetables	2.3	2.6	2.9
Fruits	2.6	2.8	2.9
Grain products	1.3	2.1	2.5
High in sugar	1.4	2.0	2.5
High in salt	0.5	1.3	1.9

Possible range of responses: 0-3.

formed by any prior exposure to formal (i.e., classroom) or informal (i.e., parent or media) nutrition messages.

As formative assessment, this research sheds light on several important areas, including children's (1) ability to actively participate in qualitative nutrition education research, (2) differences in understanding of nutrition messages by age groupings, (3) abilities to translate nutrition messages and terms into behavioral responses, and (4) perceptions of the concept of "diet" and "good and bad" foods.

First, important and useful qualitative data were obtained by asking children as young as kindergarten age open-ended questions about nutrition-related topics. Going to the source as part of formative evaluation in the development of nutrition education materials should expand in scope and use. Children can contribute important insights and perspectives for nutrition education program development.

We saw differences in the understanding of more abstract terms by age grouping. Children in the preoperational or concrete operational stages of cognitive development have difficulty interpreting abstract concepts, such as nutrients,¹⁵ as well as many of those presented in the DGFA.^{18,19} For example, "Eat a variety of foods" and "Maintain a healthy weight" were concepts poorly understood among younger children. Many of the younger group replied that they did not know what variety meant and did not know what it meant to weigh a healthy weight. The group of 5th to 6th graders was able to verbalize a meaning for variety and to suggest that eating foods from the food groups would help ensure eating a variety of foods and that a healthy weight was not over- or underweight but a healthy weight. Nutrition educators directing messages about variety and healthy weight should consider making the messages more concrete or behavioral. For example, "Eat different kinds of foods everyday" and "Eat healthy foods and be active to stay fit" may have more meaning to children in the preoperational stage.

Children in K to 2 had some difficulty naming high-fat foods. High-fat foods seemed to be used synonymously with all treats and snacks. Even in the older grades, there was evidence that there was poor distinction between high-fat foods and foods high in salt or sugar. Children in grades 3 to 6 showed a very poor understanding of cholesterol and saturated fat, and there was almost no evidence that they could distinguish cholesterol from fat. Nutrition education for children should promote and encourage children to choose foods that are low in fat, saturated fat, and cholesterol. However, the message needs to focus on specific foods to eat, rather than on directives based on abstract nutrients.

Children in all age groups were able to name fruits and vegetables that they would eat when choosing a diet with plenty of fruits, vegetables, and grain products. Since children have a good working knowledge of what fruits and vegetables are, the message "Eat five servings of fruits and vegetables a day"³⁰ should be effective with children. This research suggests that specific information about what constitutes a serving should accompany the message. Reordering the foods in the 1995 DGFA to make "grain" the first food men-

tioned suggests that more nutrition education efforts are needed to educate younger children about what foods are included in the grain group.

Children at all grades held strong attitudes about sugar being a bad food. Often all "bad" foods were grouped together, whether they were high in fat, salt, or sugar. Other researchers have also reported children grouping foods high in fat, salt, or sugar into a category commonly referred to as junk food.^{16,31} As children get older, nutrition education should help them evaluate "junk" food or snack foods. Most nutrition educators would agree that not all "junk" food is created equal. Snacks high in sugar (i.e., a fruit leather) are, in general, better snack choices than a high-fat snack such as a chocolate candy bar; the only disease associated with sugar is dental caries while heart disease, cancer, and obesity are related to high fat intake.³²

The ability to translate nutrition terms and messages into behavioral responses is crucial. Children's responses to the questions regarding food labels, their understanding of servings from the FGP, and the FIT address their ability to translate information into action. Reading food labels is a common nutrition education activity with 90% of all public schools indicating that they include label reading as a nutrition education topic.³³ This qualitative research indicates, however, that students have some difficulty in understanding how to use food labels. Looking for sugar as one of the first ingredients listed was one useful strategy students mentioned that they used when looking at food labels. However, no student was able to explain how the nutrient levels listed on labels could be used to guide food decisions. Students who made up their own criteria for judging nutrient levels came up with stringent criteria that few foods could meet. Abstract concepts such as "percent daily value" will have little meaning to most children. In addition, it is not realistic to give children target nutrient intakes for a day and expect them to monitor the amount they consume by reading food labels. Teaching children what information is contained on a food label or how to read a food label may not help them learn how to use food labels to make choices.

Children may find reading food labels most helpful in comparing similar products. For example, nutrition education activities using food labels might help children compare the nutrient contents of their favorite after-school snacks. While they might not know how many grams of fat they should have every day, they will be able to see that potato chips will provide more fat than pretzels. Those types of concrete demonstrations may help them make better food-related decisions.

The use of the FGP²⁰ in nutrition education is widespread.³³ Our research showed that children had difficulty operationalizing what a serving is and how to determine the number of servings appropriate for them. Our research did not involve any nutrition education nor did it attempt to assess students' previous exposure to nutrition education in general or label reading and the FGP in particular. Therefore, we cannot discuss the effectiveness of specific nutrition education activities to improve students' abilities to operational-

ize information from the FGP or nutrition labels. However, nationwide surveys suggest that 99% of children are exposed to some nutrition education in schools,³³ and the vast majority of students had seen the FGP and reported that they looked at nutrition labels on products. Some of the 5th and 6th graders even attempted to name the food groups when describing what foods to eat for a variety in one's diet, but none correctly named the food groups from the FGP. This qualitative research suggests that students were unable to articulate information from their previous exposure to nutrition messages and education or had forgotten what they learned.

The use of the FIT as part of the one-on-one interviews was conducted to see if children could concretely identify foods with common nutrition messages. We found that the youngest children, in particular, freely used terms such as "low fat," "high sugar," or "high salt" throughout the interview but had difficulty naming specific foods in those categories. Focus group results based on the DGFA often generated more food examples for the guideline. The ability to identify appropriate foods during focus groups but not during the FIT may be explained with several hypotheses: the group dynamics allowed more foods to be generated, the longer listings reflect contributions of items from multiple focus group participants, or interview fatigue negatively affected student performance on the FIT. In support of the results from the FIT, the finding that children had difficulty naming grain products in focus group settings was corroborated with the FIT. Likewise, the focus group finding that children indiscriminately group high-fat, high-sugar, and high-salt foods into a "bad" or "junk" food category may be reflected in the low scores for those categories in the FIT. More research should be conducted to examine students' abilities to identify appropriate foods to meet dietary recommendations. At the least, researchers and educators should guard against assuming that parroting of nutrition recommendations (i.e., eating a low-fat diet is healthy) can be operationalized into choosing a low-fat diet. It is not enough that children know that "low-fat" foods are good for them; they must also know how to identify and ask for specific low-fat foods.

Finally, some insight into children's perspectives of "dieting" and "good and bad" foods occurred through this research and reflects what they have learned from adults and their social environment. Adult perceptions of weight, body shape, and dieting needs are communicated to children in a variety of ways. Children learn about socially acceptable body shapes from adults in their environment. Children are also learning that to diet means drinking diet drinks, eating bad-tasting diet food, and giving up favorite foods. They are not learning that increasing physical activity is an important part of weight control. With the number of obese youths and youths with eating disorders increasing in our nation,^{34,35} perceptions of and responses to dieting and weight control have become increasingly important. Parents, teachers, and other adults in children's social environments need to be made aware of the subtle messages they give about body size, weight, and dieting.

Children are receiving strong messages about "good foods" and "bad foods." The dichotomization of foods into "good" and "bad" categories requires some study and consideration. Children in the preoperational stage are very concrete and may have some difficulty understanding moderation or foods that are appropriate "once in a while." On the other hand, this dichotomization may be setting the child up for placing value on foods that may lead to valuation of themselves as consumers of those foods. Looking at food, eating behavior, and self in a dichotomy (good/bad, healthy/unhealthy, in control/out of control) may lead to unhealthy eating behaviors and unhealthy attitudes about eating.³⁶ It may be preferable to introduce and consistently use the concept of "everyday" or "sometimes" foods. By using the word "sometimes" instead of "bad," we have removed some of the negative value of those foods and present a behavioral message regarding how those foods might be incorporated into one's diet. The attempt to replace the concept of "bad" food with "sometime" food will need to occur in nutrition-related messages for parents, teachers, and all adults who interact with children.

The challenge of understanding and using nutritional messages and dietary recommendations to affect one's diet is not unique to children. While most adults believe that nutrition is important to health and that dietary guidance is important, most struggle with implementation of nutrition messages. Adult consumers may be as confused as children about abstract nutrition concepts such as saturated fat and dietary cholesterol; many have a very poor understanding of serving size and how to use nutrition labeling to choose healthful foods.¹² Many adult consumers dichotomize foods into "good foods" and "bad foods;" however, their classification of foods into groups is often based on erroneous beliefs. Forty percent of Americans think that bread is fattening and nearly that proportion believe that starches should be avoided.³⁷ Because of the difficulty in translating nutrition messages into practice, adult consumers ask that dietary guidelines be translated into behavioral rather than nutrient-level advice and that the advice be specific, clear, and meaningful in the context of day-to-day food selection.³⁸ The message for nutrition educators should be that neither adults nor children should be expected to become nutrition scientists in order to choose a healthful diet.

In order to translate nutritional messages into information that is meaningful and useful to children, educators must strive to keep the messages as simple, positive, and behaviorally oriented as possible. Our messages must be tailored to be developmentally appropriate for children; a message that is scientifically correct but too complicated for children to understand will not be effective. Our messages need to be positive so that our children can enjoy eating and develop healthy attitudes and behaviors around eating. Eating pattern messages for children must be specific to influence healthy food choices. Finally, adults must begin to realize how their attitudes and behaviors around nutrition and food choices influence children. Adult influence goes beyond making healthful food available to children or giving children verbal messages about

a healthful diet. It is important to keep in mind that common phrase "Actions speak louder than words" when attempting to understand and influence children's eating behavior.

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