Short communication

An apple a day keeps the doctor away: Children’s evaluative categories of food

Simone P. Nguyen
Department of Psychology, University of North Carolina, 601 South College Road, Wilmington, NC 28403 5612, USA

Received 19 May 2006; accepted 12 June 2006

Abstract

This study explores how children evaluatively categorize foods based on their nutritional value. Three-year-olds, four-year-olds, seven-year-olds, and adults completed a task in which they categorized a list of 70 foods as healthy or junky. The results showed important developmental differences in participants’ ability to accurately classify foods as healthy/junky and to provide relevant justifications for these classifications. These results suggest that a large amount of category learning occurs with development, especially as children incorporate different types of information about food nutrition into their evaluative category representations.

Keywords: Evaluative categorization; Classification; Food; Nutrition; Healthy; Junky

Introduction

Children are exposed to a lot of information about the nutritional value of foods. Some of this information is straightforward. For example, parents and teachers often point out to children the consequences of consuming certain foods (e.g., “Milk gives you strong bones.”). Similarly, parents provide children with rules about which foods they can and cannot eat for a meal (e.g., “You can’t have cookies for breakfast!”) (Birch, Fisher, & Grimm-Thomas, 1999). Also, many children’s television programs encourage children to eat healthy foods (e.g., “Healthy foods taste great and are good to eat all the time!”) (Cohen & Kotler, 2005). However, some of this information is not so straightforward. For example, many television advertisements misleadingly tout the nutritional value of unhealthy foods such as sugared cereals, sweets, and sodas (e.g., “Part of a well balanced diet.”) (Kunkel et al., 2004).

How do children conceptually represent and organize this rich set of information about food nutrition? One possibility is through forming evaluative categories, which includes items that share the same value laden assessment (e.g., Nguyen & Murphy, 2003; Ross & Murphy, 1999). Presently, research on this issue is lacking in the field of cognitive development. As a starting point, this investigation focused on the basic evaluative dichotomy of healthy versus unhealthy foods. In this study, children participated in a classification task in which they evaluatively classified foods as either healthy or junky. Although research on this particular issue is sparse, other related research provides a basis for predictions. On the one hand, children’s categories might be quite inaccurate. In fact, Nguyen and Rosengren (2004) have shown that children often develop misconceptions when they attempt to incorporate new information into their concepts, including misconceptions related to food and health (e.g., “Candy is good for you.”). On the other hand, research also reveals that children are adept at categorization within the domain of food (e.g., Nguyen & Murphy, 2003). For example, recent research indicates that in addition to being able to make affective distinctions between foods (e.g., disgusting, delicious) (e.g., Fallon, Rozin, & Pliner, 1984; Rozin, 1990; Rozin, Hammer, Oster, & Horowitz, 1986), children are also able to successfully cross-classify foods into many categories that have very different bases (e.g., taxonomic, script) (Nguyen & Murphy, 2003). Thus, if children have an accurate evaluative category representation of the healthfulness...
of foods, then they should be above chance in their performance on the classification task.

Method

Participants

Forty-eight children participated in this study: 16 three-year-olds ($M = 3;5$, $range = 3;1–3;9$, 6 boys and 10 girls); 16 four-year-olds ($M = 4;6$, $range = 4;1–4;9$, 8 boys and 8 girls) and 16 seven-year-olds ($M = 7;2$, $range = 6;9–7;7$, 8 boys and 8 girls). Sixteen adults ($M = 19;0$, $range = 18–20$; 9 men and 7 women) also participated. Adults were included to serve as a developmental end point (see Markman, 1989; Murphy, 2002; and Smiley & Brown, 1979, for a discussion on education and category acquisition). None of the participants had food restrictions (e.g., allergies, vegetarian) (based on self and parental reports). All participants were recruited from schools and universities located in the Midwestern and Southeastern United States.

Materials

The stimuli consisted of 70 pictures of foods ranging in nutritional value (e.g., apple, broccoli, cookie, potato chips). The stimuli were adapted from Nguyen and Murphy (2003) who found these items to be quite familiar to children in the age range of interest. The foods were presented to children in the form of $2.5 \times 3$ in. color photographs printed on $8.5 \times 11$ in. pieces of paper with labels underneath each photograph. Adults participated in a modified paper and pencil version of the study without viewing pictures of the foods, just the labels.

Procedure

A child-friendly procedure using vocabulary that children could understand about food and nutrition was developed based on pilot work with young children as well as interviews with teachers and nutritionists.

An experimenter tested children individually in a quiet area of their classroom for approximately 15–20 minutes. The experimenter initially told children that they would be playing a game about foods and that the object of the game was to figure out which foods are “healthy” and “junky.” To establish a common definition, the experimenter told children that “healthy foods are good for your body if you eat a lot of them for a long time,” and “junky foods are bad for your body if you eat a lot of them for a long time.” The experimenter then presented children with photographs of foods, one at a time. For each food, the experimenter asked, “Is (insert name of food) a healthy food or junky food?” The 70 foods were presented in one of two random orders. The order of the words “healthy” and “junky” was also presented in a random order. At the end of the task, the experimenter also asked children to justify their classifications. The experimenter asked children to justify only 6 foods to accommodate their attention spans; these foods were randomly selected for each child (3 foods classified as healthy and 3 foods that the child classified as junky). For each food, the experimenter reminded the child how they had originally classified it and then asked the child to provide a justification for the classification.

Coding

A coding scheme was developed to capture the major themes of participants’ justifications. The three codes were: 1. nutritional food properties 2. health outcomes; and, 3. miscellaneous. Actual examples from the data are listed in parentheses. The first code, nutritional food properties, was used for justifications that were related to the healthy/unhealthy components of the foods themselves (e.g., “Lots of vitamins.”; “Made from milk.”; “Too much sugar.”) (see Harrison, 2005). The health outcomes code was used for justifications that were related to the effects that foods have on the human body, including the following subcodes: health/illness (e.g., “You get sick.”); growth (e.g., “Grow fast.”); and, strength/energy (e.g., “Makes you strong.”) (see Wellman & Johnson, 1982). The last code, miscellaneous, was reserved for justifications that did not appear to have a consistent theme (e.g., “I don’t know.”; “Turn into a corndog.”; “Leaves a peanut butter taste in your mouth”).

Results

Correct answers were assigned a score of “1” (e.g., classifying an apple as healthy, classifying a cookie as junky) and incorrect answers were assigned a score of “0” (e.g., classifying an apple as junky, classifying a cookie as healthy). The scores were then summed together and converted into proportion to create a summary variable. A univariate analysis of variance was then conducted on this summary variable.

Classification accuracy improved with age, $F(3, 64) = 43.29$, $MSE = 0.33$, $p < .05$ (see Fig. 1). Adults (94%) were significantly better than 7-year-olds (78%), 4-year-olds (73%), and 3-year-olds (59%), Tukey HSD tests, $p’s < .05$. Three-year-olds differed significantly from 4-year-olds and
7-year-olds, Tukey HSD tests, \( p < .05 \), who did not differ from each other. Participants’ level of accuracy was also compared to chance (50%). All of the participants were significantly above chance, \( t(15) > 2, p < .05 \).

Responses for each food item were also looked at separately in order to see if the results were due to one or more individual foods. Although there were not enough items to allow for reliable comparisons, there were some apparent differences, particularly within the child age groups. It appears that children as a whole had difficulty categorizing some of the unhealthy foods. This was particularly true for foods made from vegetables (e.g., potato chips, French fries) and meats (e.g., corn dog, hamburger). There were also some grains (e.g., donut, pop tart) and beverages (e.g., soda pop, shake) that children had difficulty classifying as unhealthy. Because foods can be cross-classified, another way to understand these apparent differences is to say that children had difficulty with relatively unhealthy breakfast foods (e.g., donut), lunch/dinner foods (e.g., hamburger), and snacks (e.g., potato chips).

### Justifications

None of the 3-year-olds and only 50% of the 4-year-olds were able to provide justifications. All of the adults and the vast majority of 7-year-olds (94%) provided justifications for their classifications. The justifications were coded using the coding scheme described in the Methods section. In order to calculate inter-rater reliability on the coding, a second experimenter coded 25% of the justifications for each age group. The inter-rater reliability was relatively high between the two raters. The overall agreement was 85%, Cohen’s \( \kappa = 0.82, p < .05 \). All disagreements were discussed and resolved. See Table 1 for the percentages and frequencies of the coded justifications. There were relatively few miscellaneous justifications. Table 1 highlights some apparent differences between the two other types of justifications. Overall, there appears to be a preference for justifications relating mainly to the theme of health outcomes, especially the subtheme of health/illness (e.g., “Get cavities.”). There was less of a preference for justifications relating to the theme of nutritional food properties (e.g., “Has so much fat.”). Table 1 also highlights some apparent age related trends for each of these two types of justifications. There is an apparent age-related increase (e.g., “Calcium”) for justifications relating to nutritional food properties. In contrast, there is an apparent age-related decrease for justifications relating to health outcomes, especially for justifications relating to the subtheme of growth (e.g., “You get big.”). These trends perhaps reflect developmental differences in salience, knowledge, and understanding of health and food nutrition.

### Discussion

Although children are exposed to a large amount of information about the nutritional value of foods, research within the cognitive development literature regarding how children conceptually represent this information is relatively lacking. The aim of the present study was to investigate this issue. In this study, children were asked to evaluatively classify 70 different foods as healthy or junky. Overall, the results of the study support the hypothesis that even 3-year-olds can categorize many foods based on this evaluative distinction.

In particular, a major finding from the present study is that 3-year-olds, 4-year-olds, 7-year-olds, and adults were all above chance in their ability to evaluatively categorize foods accurately. However, there is still a large amount of category learning that occurs with increasing age and

**Fig. 1.** Percentage of accuracy on the classification task by age group.

<table>
<thead>
<tr>
<th>Codes</th>
<th>Age groups</th>
<th>7-year-olds (( N = 59 ))</th>
<th>Adults (( N = 114 ))</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nutritional food properties</strong></td>
<td>9 (2)</td>
<td>15 (9)</td>
<td>18 (21)</td>
</tr>
<tr>
<td>Health outcomes</td>
<td>91 (21)</td>
<td>79 (47)</td>
<td>73 (86)</td>
</tr>
<tr>
<td>Health/illness</td>
<td>57 (13)</td>
<td>47 (28)</td>
<td>50 (58)</td>
</tr>
<tr>
<td>Growth</td>
<td>30 (7)</td>
<td>23 (14)</td>
<td>14 (17)</td>
</tr>
<tr>
<td>Strength/energy</td>
<td>4 (1)</td>
<td>9 (5)</td>
<td>9 (11)</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>0 (0)</td>
<td>5 (3)</td>
<td>6 (7)</td>
</tr>
</tbody>
</table>

Table 1

Percentage (frequency) of coded justifications by age group.
experience. Indeed, there appeared to be some foods that were particularly difficult for most of the children to categorize accurately. Many less than healthy vegetable and meat products or derivatives were often categorized incorrectly, perhaps because they are seen as generally healthy given their origins. For example, a potato, may be viewed as healthy because it is a vegetable regardless of the form it comes in whether French Fries or potato chips. Such beliefs may reflect differences in children’s eating habits and/or the misinformation that they receive about food, especially from television commercials (see Kunkel et al., 2004).

A large percentage of 7-year-olds and adults and to a lesser degree 4-year-olds were able to explain their evaluative classifications with relevant justifications, revealing some understanding of what it means for a food to be healthy or junky. It is not too surprising that 3-year-olds did not provide any explanation for their classifications given that they were just above chance on the classification task. Table 1 reveals that the majority of the justifications that 4-year-olds, 7-year-olds, and adults provided were related to health outcomes. This preference is understandable given that for most people the properties of foods are only relevant to the extent that they are associated with certain health consequences.

A caveat needs to be made about the healthy versus unhealthy dichotomy that was tested in the present study. Generally, the healthy foods that were tested in the present study were relatively high on nutritional value and low in fat, salt, added sugars, etc., whereas the junky foods were relatively low on nutritional value and high on these other components. For example, foods such as an apple, broccoli, and chicken were considered healthy whereas foods such as a cake, hamburger, and potato chips were considered junky. Some may argue that this good/bad dichotomy is oversimplified since foods are not strictly healthy or junky per se, but rather vary on a continuum and depend upon a number of complex factors. For example, some foods may be calorie dense, but are otherwise quite healthy (e.g., dark chocolate is calorie dense, but has a high level of antioxidants). The determination of a food’s nutritional value may also depend upon a number of other factors such as serving size as well as the historical, cultural, and social context of the situation. Although this dichotomy is not without problem, given the lack of research on this topic within the cognitive development literature, I would argue that this dichotomy was an important starting point because it was necessary to establish that at the most basic level, healthy versus junky is a relevant conceptual distinction for children and that they have the ability to represent these categories.

Given that the present study has demonstrated that children can and do represent these categories accurately, future studies should look at more fine grain distinctions that children may make regarding foods with varying nutritional values to see if children are sensitive to this continuum. Although this is an open question for future research, I speculate that children would actually have relatively limited sensitivity to this continuum given findings on adults. Research has shown that even adults use simplifying approaches when thinking about food nutrition; in fact, approximately 40% of adults dichotomize foods as either good or bad, agreeing with the statement that “although there are some exceptions, most foods are either good or bad for health” (Rozin, Ashmore, & Markwith, 1996).

In sum, the results of the present study show that children’s evaluative classifications of healthy and junky foods correspond to expert classifications to some degree by age 4 years, and that children begin to show signs of understanding the reasoning behind these classifications by age 4 years. These results suggest that with development, children are able to use evaluative categorization as a way to conceptually represent and organize the information that they are exposed to about the nutritional value of foods.

Acknowledgements

I am grateful to Karl Rosengren for invaluable comments on an earlier draft. I also thank Gregory Murphy and Brian Ross for their advice on this research as well as Krista Williams and Mary Beth McCullough for their research assistance. I also thank the schools, children, and parents who were involved in this research.

References


