CHILDREN CONSIDER DIFFERENT SOURCES OF INFORMATION WHEN REASONING ABOUT FOOD

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This research focuses on how children learn evaluative categories of food (e.g., healthy, junky foods). An important way in which children may learn these categories is through the input they receive from different sources of information. This study examines children’s belief in external and internal sources, that is, testimonies from others (e.g., parents, teachers) and children’s own observations or experiences with different properties of foods (e.g., taste, texture). In this study, 4-year-olds, 5-year-olds, 6-year-olds, and adults were randomly assigned to one of two conditions. In both conditions, participants were presented with a series of novel foods and told that a source of information claims that the food is healthy/junky. In one condition, participants were exposed to external sources and in the other condition, participants were exposed to internal sources. Participants in both conditions were then asked whether they think that the source of information is correct. The results show that children, like adults, have differential beliefs in these sources, depending upon the type of food in question.

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Children consider different sources of information when reasoning about foods

Categorization, grouping items together, is an important way in which we mentally represent and organize the world around us. Evaluative categorization, in particular, involves grouping items together that share the same value-laden assessment such as healthy and unhealthy foods (Nguyen, 2008, 2007; Nguyen & Murphy, 2003; Ross & Murphy, 1999) or delicious and disgusting foods (see Rozin, 1990; Rozin, Hammer, Oster, & Horowitz, 1986). Evaluative categorization within the domain of food not only helps us to mentally represent and organize foods, but it can also help guide our decisions about our eating practices and behaviors. In order to evaluatively categorize a food, we might examine the food by making discriminations about its content and thinking about how the food is related to our prior knowledge and experiences. The evaluation that we make about the food may in turn affect whether eat the food and how much, depending upon our goals.

This paper focuses on two evaluative categories of food that are in great need of attention given the rise in overweight and obese children in the United States (The Center for Disease Control, 2006; The American Heart Association, 2006). Healthy foods are defined as foods that give your body what it needs to help you grow, give you long lasting energy, and keep you from getting sick whereas unhealthy foods are defined as foods that do not give your body what it needs to help you grow, do not give you long lasting energy, and do not keep you from getting sick (American Heart Association, 2006; National Institute of Health, 2005; National Institute of Child Health and Development, 2005). Past research has found that children can categorize foods as healthy/unhealthy by ages 3- to 4 years, and that major improvements in categorization accuracy occur by age 6- to 7-years of age. For example, children know that an apple is healthy whereas potato chips are unhealthy (Nguyen, 2008, Nguyen, 2007; Nguyen & Murphy, 2003).

Thus far, much of the research on children’s evaluative categorization has focused on documenting children’s categorization ability, as opposed to how children learn these categories. In fact, Gelman (2009) has recently pointed out that research in the area of cognitive development tends to
investigate children’s knowledge or abilities, but not how children learn their knowledge or gain their abilities. An important issue, which has been overlooked, is how children acquire evaluative categories of food, particularly through the input they receive from different sources of information. That is, how do children learn about what foods are healthy or unhealthy? Children are constantly exposed to information about food, including accurate and inaccurate information. Some of this information comes from external sources, that is, testimonies from others (e.g., parents, teachers). For example, children constantly hear from adults what they should/should not eat and hear messages about the nutritional value of foods advertised in television commercials (Birch, Fisher, & Grimm-Thomas, 1999). Some of this information also comes from internal sources, that is, children’s own observations or experiences with different properties of foods (e.g., taste, texture). A typical child has many opportunities to interact with foods on a daily basis through meals and snacks (Birch, et al., 1999). Although children are exposed to different sources of information, are these sources actually contributing to children’s learning of these categories? Do children take into consideration all of this information when making evaluative category decisions about the healthfulness of foods? Do children tend to believe certain sources of information more than others?

This study explores whether children take into consideration external and internal sources of information when making evaluative category decisions about the health status of foods. This study compares children’s preferences for external and internal sources of information by focusing on children ages, four, five, and six years of age as well as adults as a developmental comparison. These ages were selected because important developments occur in children’s understanding of evaluative categories during this age range (Nguyen, 2008, Nguyen, 2007; Nguyen & Murphy, 2003), which could be related to their degree of belief in different sources of information. In this study, participants were randomly assigned to one of two conditions. In both conditions, participants were presented with a series of novel foods and told that a source of information claims that the food is healthy/junky. In one condition, participants were exposed to external sources and in the other condition, participants
were exposed to internal sources. Participants in both conditions were then asked whether they think that the source of information is correct. Condition differences should emerge if participants have differential beliefs in these sources of information, which could also be affected by the type of food under consideration.

**METHOD**

**Participants**

The participants included 60 children: 20 four-year-olds (\(M = 4;45\), \(Range = 4;05-4;94\), 7 males, 13 females); 20 five-year-olds (\(M = 5;36\), \(Range = 5;07-5;79\), 10 males, 10 females); and, 20 six-year-olds (\(M = 6;54\), \(Range = 6;01-7;09\), 10 males, 10 females). Thirty-four adults (\(M = 18;55\), \(Range = 17;77-19;96\), 12 males, 22 females) also participated as a developmental endpoint to compare children against. A separate group of 50 adults (\(M = 18;54\), \(Range = 17;95-19;76\), 15 males, 35 females) also helped rate the stimulus materials for this study. None of these adults participated in the actual study. All of the participants were recruited from preschools/schools and a university located in the Southeastern United States.

**Materials**

The materials included 20 line drawings of shapes intended to represent novel foods. Each line drawing was also given a novel food name (e.g., “dax,” “tuv”). Please see Figure 1 for a sample food. These foods were selected from a larger set of line drawings based on adult ratings. One purpose of the ratings was to select drawings that could pass as novel foods, which was important to establish since the actual study tests conceptual representation within the domain of food. Another purpose of the ratings was to select drawings that appeared to have a neutral health status, which was important to establish since the actual study tests whether internal and external sources of information affect people’s evaluations. Adults were told that “In this task, you will see pictures of different shapes that
are meant to represent unfamiliar, imaginary foods. Please note that the food pictures aren’t drawn to scale. Your task is to: 1. Rate how much the shapes look like food. Note we are not asking you to rate if the shapes resemble foods that you are familiar with, but rather, use your imagination, and think about whether the shapes could pass as unfamiliar, imaginary foods. 2. Rate how healthy/junky you think that the food representations are, if you had to decide on their nutritional value. Healthy foods are foods that are good for you if you eat a lot of them for a long time whereas junky foods are bad for you if eat a lot of them for a long time.” During the task, adults were presented with the foods, one at a time, and asked to rate their appearance and health status using likert scales ranging from 1 (not at all looks like a food; very junky) to 7 (very much looks like a food; very healthy). Only foods that received a rating of 6-7 for appearance as well as a 4 for their health status were selected and used in the actual study.

![Dax](image)

*Figure 1. Sample novel food*

The materials also included photographs of 10 external and 10 internal sources of information. These photographs were used to help maintain children’s interest in the study. The photographs used in this study were intended to be representative or symbolic of a given source. For example, a photograph of a woman was used for a “mom” whereas a photograph of a hand was used to symbolize a food’s texture. Please see Table 1 for a list of these sources.

The drawings of the foods and the photographs of the sources of information were printed on 8.5” x 11” pieces of paper and placed into a three-ring binder. Each source of information was paired with two foods.

Table 1
External and internal sources of information

External Source of Information

Book
Dad
Doctor
Friend
Grocery store
Mom
Restaurant
School cafeteria
Teacher
Television commercial

Internal Source of Information

How a food is prepared
How the food is eaten
The food’s effect on the human body
The ingredients in the food
The label on the food
The origins of the food
The prize that accompanies the food
The taste of the food
The texture of the food
When the food is eaten

Procedure
This study used a between-participants design. The purpose of using a between-participants design was so that participants could be tested on a variety of external or internal sources of information without worry about carry-over effects and the exhaustion that could emerge if each participant was tested on a long series of both external and internal sources of information in a within-participants design. Thus, half of the participants in each age group were randomly assigned to either the external or internal condition. All of the participants were tested individually in a quiet area of their preschool or in laboratory setting for approximately 15 minutes. In both conditions, participants were initially told that they would be playing a game about new and different healthy/junky foods. Healthy foods were defined as foods that are good for you if you eat them for a long time, whereas junky foods were defined as foods that are bad for you if eat them for a long time. Then, during testing, participants in both conditions were presented with the same 20 novel foods, one at a time. However, depending upon the condition, for each food, participants were presented with either an external or internal source of information. Participants were told that the source of information says that the food is healthy/junky. Specifically, one half of the novel foods were claimed to be healthy and the other half junky by the source of information. Then, participants were asked whether they think the source is accurate. In the external condition, the sources of information were external whereas in the internal condition, the sources of information were internal. For example, in the external condition, on one test trial, participants heard, “This is a food called dax. A teacher says it’s healthy. Do you think the teacher is right?” On another test trial, participants heard, “This is a food called coo. A teacher says it’s junky. Do you think the teacher is right?” In contrast, for example, in the internal condition, participants heard, “This is a food called dax. The label on the food says it’s healthy. Do you think the label is right?” On another test trial, participants heard, “This is a food called coo. The label on the food says it’s junky. Do you think the label is right?”
The testing materials were presented in one of two random orders for both conditions. Each random order included one block of foods claimed to be healthy and one block of foods claimed to be junky by the source of information.

**RESULTS**

To score participants’ responses, a “1” was assigned when participants answered, “yes,” indicating that they believe that the source of information is right. A “0” was assigned when participants answered, “no,” indicating that they do not believe that the source of information is right. Two summary scores per condition, one for healthy foods and one for junky foods, were created by collapsing across the respective trials. A 4(age group: 4-year-olds, 5-year-olds, 6-year-olds, adults) x 2(condition: external, internal) repeated measures ANOVA was conducted with healthy and junky foods as the dependent variables. The results showed a main effect of age, $F(3, 86) = 7.11, \eta_p^2 = 0.19, p < .05$. Adults ($M = 80\%, SD = 15\%$) showed a significantly higher percentage of belief in the sources of information than 4-year-olds ($M = 64\%, SD = 23\%$), 5-year-olds ($M = 64\%, SD = 20\%$), and 6-year-olds ($M = 59\%, SD = 18\%$). There was not a significant difference between the child age groups.

There was also a main effect of condition, $F(1, 86) = 5.78, \eta_p^2 = .06, p < .05$, which was moderated by a food by condition interaction, $F(1, 86) = 4.66, \eta_p^2 = 0.05, p < .05$. Please see Figure 2 and Table 2. Two follow-up analyses were conducted to further examine this interaction. The first follow-up, a one-way ANOVA, examined whether there was a significant difference between the conditions for each of the food types. The results revealed that participants in the internal condition showed more belief than participants in the external condition for junky foods, $F(1, 93) = 7.71, p < .05$. There was no difference between the conditions for the healthy foods. The second set of follow-up analyses, paired sample t-tests, examined whether there were significant differences within each condition for the food types. Participants in the internal condition had a higher percentage of belief for
junky foods than healthy foods, $t(46) = 2.90, p < .05$. There was not a significant difference within the external condition.

![Figure 2. Percentage of belief by food and condition](image)

**Table 2. Percentage of belief by food and condition with specific sources listed separately**

<table>
<thead>
<tr>
<th>External Sources</th>
<th>Healthy</th>
<th>Junky</th>
<th>Internal Sources</th>
<th>Healthy</th>
<th>Junky</th>
</tr>
</thead>
<tbody>
<tr>
<td>Book</td>
<td>61</td>
<td>63</td>
<td>Preparation</td>
<td>63</td>
<td>80</td>
</tr>
<tr>
<td>Dad</td>
<td>59</td>
<td>61</td>
<td>How eaten</td>
<td>72</td>
<td>65</td>
</tr>
<tr>
<td>Doctor</td>
<td>72</td>
<td>76</td>
<td>Effect</td>
<td>70</td>
<td>80</td>
</tr>
<tr>
<td>Friend</td>
<td>57</td>
<td>55</td>
<td>Ingredients</td>
<td>76</td>
<td>87</td>
</tr>
<tr>
<td>Grocery store</td>
<td>74</td>
<td>65</td>
<td>Label</td>
<td>61</td>
<td>89</td>
</tr>
<tr>
<td>Mom</td>
<td>87</td>
<td>68</td>
<td>Origins</td>
<td>72</td>
<td>70</td>
</tr>
<tr>
<td>Restaurant</td>
<td>63</td>
<td>61</td>
<td>Prize</td>
<td>65</td>
<td>80</td>
</tr>
<tr>
<td>School cafeteria</td>
<td>63</td>
<td>61</td>
<td>Taste</td>
<td>65</td>
<td>78</td>
</tr>
<tr>
<td>Teacher</td>
<td>57</td>
<td>74</td>
<td>Texture</td>
<td>74</td>
<td>80</td>
</tr>
<tr>
<td>T.V. commercial</td>
<td>42</td>
<td>57</td>
<td>Time served</td>
<td>65</td>
<td>80</td>
</tr>
</tbody>
</table>

**DISCUSSION**

The aim of this study was to explore whether children take into consideration external and internal sources of information when making evaluative category decisions about the health status of
foods. Two main findings emerged from this study. First, children’s belief in external and internal sources of information increases with age. The results of this study showed that adults, compared to the children, had the highest percentage of belief in these sources of information. Thus, the results suggest that as people gain expertise in the domain of food, they do not necessarily become less reliant on different sources of information. Rather, with development, people may learn that there are many kinds of information that can potentially offer valuable information about a food’s nutritional content. Table 2 lists these sources, including some apparent differences (e.g., participants tended not to believe a friend and television commercial).

Overall, this finding is consistent with Callanan’s (1990) claim that children’s ability to use categories is “likely to develop from a complex interaction among children’s theories and expectations about the properties and categories involved, the knowledge they gain through their senses, and the knowledge they gain through verbal descriptions (most notably provided by parents)” (p. 106). Now that this study has shown that people are willing to believe external and internal sources of information when considering a novel food that they know nothing about, future could also examine how belief is affected by people’s pre-existing knowledge of familiar foods. For example, how would people weigh different sources of information against their own knowledge, especially when they offer simultaneously competing information about the evaluative status of a food?

The second main finding from this study is that children and adults’ beliefs in sources of information vary depending upon the food. In particular, when it comes to junky foods, people tend to look to internal more than external sources of information. When it comes to healthy foods, people tend to rely on both internal and external sources of information. These results suggest that children and adults have nuanced beliefs about sources of information as they apply to certain kinds of food. Without having collected justifications/explanations from the participants, it is difficult to ascertain the reason for the difference between healthy and junky foods. A possible interpretation, which would
require further testing, is that people assume that internal sources typically provide helpful clues about foods—whether it is healthy or junky. In contrast, external sources may not always be so trustworthy. While there may be little reason for an external source to lie about a healthy food’s favorable health status, an external source may be very motivated to lie about a junky food’s nutritional value in order to encourage people to purchase and eat the food under false pretenses. Although the lack of ceiling effects in children’s and adults’ performance in this study would suggest some skepticism, future research should examine more systematically the development of skepticism in these sources of information (see also Koenig, Clements, & Harris, 2004; Koenig & Harris, 2005a, b). After all, at times, not only can external sources provide inaccurate information (e.g., a t.v. commercial claiming that a sugary cereal is healthy), but internal sources can be just as misleading (e.g., potato chips are made from a vegetable, but they are not healthy). In addition, some internal sources are not purely food-driven, but could be influenced by an external source of information (e.g., a food label that is determined by a manufacturer).

A major implication of these findings is that children not only learn evaluative categories of food from their own observations/experiences, but also from others’ testimonies. Relying on observations/experiences is critical for children as they learn first hand about the properties of food. Relying on testimony from others is vital given that determinations of what is healthy or not healthy are often culturally and historically defined. Of course, these sources are not always infallible, and children’s greater reliance on internal versus external sources for junky foods hints at the possibility that they understand this point. It is also possible that children’s reliance on internal sources of information is guided by their theoretical or intuitive beliefs about concepts (Johnson & Keil, 2000; Krascum & Andrews, 1992; Murphy & Medin, 1985), including the essentialist belief that members of a category share an internal or essential property that determines their identity and causes the presence of other category-typical properties (see Gelman, 2003). Future research should examine the
relationship between children’s theoretical or intuitive beliefs and children’s evaluative concepts of food. For example, perhaps children think that junky foods have a “junky essence” that is best discovered through examining the food itself, as opposed to turning to others for input. Such an examination would shed light on how children themselves go about approaching their learning of evaluative categories of food (top down vs. bottom-up processing).

**REFERENCES**


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