

# Mere social knowledge impacts children's consumption and categorization of foods

Jasmine M. DeJesus<sup>1</sup>  | Kristin Shutts<sup>2</sup> | Katherine D. Kinzler<sup>3</sup>

<sup>1</sup>Department of Psychology, Department of Pediatrics, University of Michigan, Ann Arbor, Michigan, USA

<sup>2</sup>Department of Psychology, University of Wisconsin-Madison, Madison, Wisconsin, USA

<sup>3</sup>Department of Psychology, Cornell University, Ithaca, New York, USA

## Correspondence

Jasmine M. DeJesus, Center for Human Growth and Development, University of Michigan, 300 N. Ingalls Street, Ann Arbor, MI 48109, USA.

Email: [dejesus@umich.edu](mailto:dejesus@umich.edu)

## Funding information

NICHD grant R01 HD070890, NSF Graduate Research Fellowship (DGE-1144082), NIH T32 Postdoctoral Research Fellowship (T32HD079350), and AHA Postdoctoral Research Fellowship (17POST33400006)

## Abstract

How does social information affect the perception of taste early in life? Does mere knowledge of other people's food preferences impact children's own experience when eating? In Experiment 1, 5- and 6-year-old children consumed more of a food described as popular with other children than a food that was described as unpopular with other children, even though the two foods were identical. In Experiment 2, children ate more of a food described as popular with children than a food described as popular with adults. Experiment 3 tested whether different perceptual experiences of otherwise identical foods contributed to the mechanisms underlying children's consumption. After sampling both endpoints of a sweet-to-sour range (applesauce with 0 mL or 5 mL of lemon juice added), children were asked to taste and categorize applesauce samples with varying amounts of lemon juice added. When classifying ambiguous samples that were near the midpoint of the range (2 mL and 3 mL), children were more likely to categorize popular foods as sweet as compared to unpopular foods. Together, these findings provide evidence that social information plays a powerful role in guiding children's consumption and perception of foods. Broader links to the sociality of food selection are discussed.

## RESEARCH HIGHLIGHTS

- We measured 5–6-year-old children's consumption and perception of foods that varied only in the social messages describing them ("very popular" vs. "not very popular").
- Children ate more of a food that was described as popular than a food that was described as unpopular (Experiment 1).
- Children ate more of a food that was described as popular with children than a food that was described as popular with adults (Experiment 2).
- When considering foods with ambiguous flavors, children were more likely to categorize popular foods as sweet (vs. sour) compared to unpopular foods (Experiment 3).
- These findings show that social information guides children's consumption and perception of foods.

## 1 | INTRODUCTION

Despite attempts by parents, practitioners, and researchers to promote healthy eating in childhood, getting children to eat more broccoli and fewer brownies can be difficult. Humans are naturally drawn to sweet and salty flavors (Birch, 1990, 1999; Desor, Maller, & Turner, 1973; Mennella, Lukasewycz, Griffith, & Beauchamp, 2011) and they prefer flavors that are familiar (Aldridge, Dovey, & Halford, 2009; Birch & Marlin, 1982; Hausner, Nicklaus, Issanchou, Mølgaard, & Møller, 2009). Young children also exhibit food neophobia and picky eating (Carruth, Ziegler, Gordon, & Barr, 2004; Cooke, Wardle, & Gibson, 2003), tendencies which can reduce their consumption of healthy foods (Falciglia, Couch, Gribble, Pabst, & Frank, 2000; Galloway, Fiorito, Lee, & Birch, 2005).

Many strategies attempting to improve children's consumption of healthy foods have had limited success. For example, rewarding



vegetable consumption with desserts or fun activities (e.g., watching television) has proven largely ineffective at changing behavior (Birch, Marlin, & Rotter, 1984; Newman & Taylor, 1992; Wardle, Herrera, Cooke, & Gibson, 2003). In addition, describing foods as “healthy” can actually backfire and reduce children’s consumption of those foods (Maimaran & Fishbach, 2014; Wardle & Huon, 2000). Repeatedly exposing children to a particular food can increase their acceptance of that food (Birch, 1999; Birch & Marlin, 1982; Sullivan & Birch, 1990; Wardle et al., 2003), but the familiarization process takes time (e.g., 8 to 15 attempts; Sullivan & Birch, 1990) and can therefore be difficult to implement, especially for families with limited resources (Daniel, 2016).

The strategies outlined thus far for influencing children’s eating behavior have another key limitation: They do not take advantage of the social nature of eating and food selection. Eating is an inherently social and cultural experience (Rozin, 1999; Shutts, Kinzler, & DeJesus, 2013). Methods of food preparation, preferred flavor combinations, and even designations of acceptable food practices vary widely across cultures (Rozin, Haidt, & McCauley, 1999; Van Huis et al., 2013). Moreover, food preferences and sharing are related to social relationships: Infants associate shared food preferences with social affiliation (Lieberman, Kinzler, & Woodward, 2014; Lieberman, Woodward, Sullivan, & Kinzler, 2016), adults expect that people who share foods in more intimate ways (e.g., eating from the same plate or feeding each other) have more intimate relationships (Miller, Rozin, & Fiske, 1998), and adults have more positive interactions with other people with whom they have previously shared food (Woolley & Fishbach, 2017). Thus, reframing food selection as a social phenomenon may effectively guide children’s eating behavior. The present research investigates the impact of social messages on children’s consumption and categorization of otherwise identical foods.

A few previous studies suggest that at least one social approach to changing children’s eating—namely, direct modeling by peers—holds promise. In one study, Birch (1980) seated preschool-age children at school lunchroom tables with other children who had different food preferences. For example, participating children who initially reported that they liked carrots and disliked peas were seated with peers who expressed the opposite preference pattern. After observing peers select a vegetable that participating children initially disliked for four days, participating children’s preferences changed: Those who previously reported disliking peas were now relatively more likely to choose peas (compared to their baseline assessments). In another school-based study, 4-year-old children were more likely to try novel foods that were modeled by another child compared to foods that were modeled by their teachers (Hendy & Raudenbush, 2000).

Although these studies provide promising initial evidence of peer influences on food selection, important questions remain. The first question concerns the mechanism underlying the effectiveness of social modeling. One possibility is that children select foods modeled by others to signal their understanding of which foods are socially relevant to them (i.e., foods that are liked by other children), without any actual change in their liking of those foods. Alternatively, knowing

that other children like a particular food may actually cause children to experience that food differently—to them, the foods their peers like may actually taste better. A second question concerns whether children must see other children eat and endorse particular foods in order for interventions to be successful, or whether testimony from an adult about other children’s preferences could suffice. This second question is of great practical importance, as most parents and practitioners who are struggling to convince their children to eat particular foods (e.g., vegetables) would find it difficult to implement the sorts of peer social modeling interventions outlined previously.

The present research investigates the degree to which information about other children’s preferences, in the absence of actual peers, influences children’s food consumption<sup>1</sup> and experience of taste in three experiments. In Experiment 1, we measured children’s consumption and evaluation of two otherwise identical foods that were described by an adult as being either popular or unpopular with other children. We hypothesized that simply learning via testimony that other children like a food would lead participants to eat more of that food and evaluate it more positively, even when compared to an otherwise identical food. Such findings would provide initial support for the hypothesis that mere social knowledge can impact children’s experience of taste, above and beyond any desire to signal their affiliation towards other children and without requiring other children to even be present. In Experiments 2 and 3, we further explored the mechanisms underlying children’s consumption and perception of foods. We conducted these studies with 5- and 6-year-old children in light of evidence from past studies that children around this age are influenced by the food choices of their peers and testimony about food from adults (Birch, 1980; Frazier, Gelman, Kaciroti, Russell, & Lumeng, 2012; Hendy & Raudenbush, 2000; Lumeng, Cardinal, Jankowski, Kaciroti, & Gelman, 2008; Shutts, Banaji, & Spelke, 2010).

## 2 | EXPERIMENT 1

In Experiment 1, an adult presented participants with two identical foods. She described one food as popular and the other food as unpopular with other children. The adult then left the room, and children’s consumption and evaluation of each food was assessed.

### 2.1 | Method

#### 2.1.1 | Participants

Participants included 32 5- and 6-year-old children (16 boys, 16 girls;  $M = 5.92$  years, range = 5.00–7.10 years) from a large Midwestern US city; 11 children were White, 9 were African-American, 4 were Hispanic, and 7 were more than one race/ethnicity; one parent did not report the child’s race/ethnicity. One additional child was excluded due to experimenter error. No children in Experiment 1 participated in subsequent experiments.

## 2.1.2 | Materials

On each of two trials, children were presented with two bowls that contained identical foods. On one trial, children were given a yellow bowl and a green bowl, each containing approximately 50 g of Gerber® 2<sup>nd</sup> Foods Pear Blueberry sauce; on another trial, children were given a red bowl and a blue bowl, each containing approximately 50 g of Motts® Natural Applesauce. There was a plastic spoon in each bowl and the bowls were presented to participants on a tray.

## 2.1.3 | Procedure

Children entered the testing room with an experimenter who introduced the child to a second experimenter, who was described to children as a “teacher” in light of findings that children trust teachers as sources of information in a variety of domains (Corriveau & Harris, 2009; Hendy & Raudenbush, 2000; Nguyen, 2012). The teacher was seated at a rectangular table that contained one pair of bowls with foods. The experimenter left the room while the teacher described each food to the child. The teacher stated that one food was popular with children (“This food is very popular. All the kids think it’s a cool food to eat. Everyone eats it at school with their friends. So that was the food in the [yellow] bowl. It’s very popular.”), whereas the other food was unpopular with children (“This food is not very popular. Kids don’t think this is a cool food to eat. No one eats it at school with their friends. So that was the food in the [green] bowl. It’s not very popular.”).

After the teacher described the foods, the experimenter re-entered the testing room and told the teacher, “Someone needs you out here.” The teacher said to the child, “you can eat whatever you want”, and left the room. The teacher was not in the room while children ate, and the experimenter was not in the room when the teacher delivered the messages. Thus, the experimenter was not aware of which message was paired with which food, and children were not subject to the social pressure of being asked to eat or respond in front of the teacher who had delivered the messages.

After the teacher left the room, the experimenter gave the child 60 seconds to freely eat the provided foods; she looked down and read a magazine while the participant ate. After 60 seconds, the experimenter asked the child to evaluate each food on a 5-point Likert scale that increased in positivity from “not yummy at all” (scored as 0) to “really really yummy” (scored as 4). After the child evaluated the foods, the teacher returned to the testing room with a second set of foods, and the procedure was repeated for a second trial with a new set of foods.

## 2.1.4 | Design and scoring

Pairings of messages with bowls (e.g., whether the food in the green bowl was described as popular or unpopular) were counterbalanced across participants. Whether children heard a positive or negative message first in a trial was counterbalanced within and across participants. Consumption was calculated by measuring each sample of applesauce before and after the test session on a digital scale.

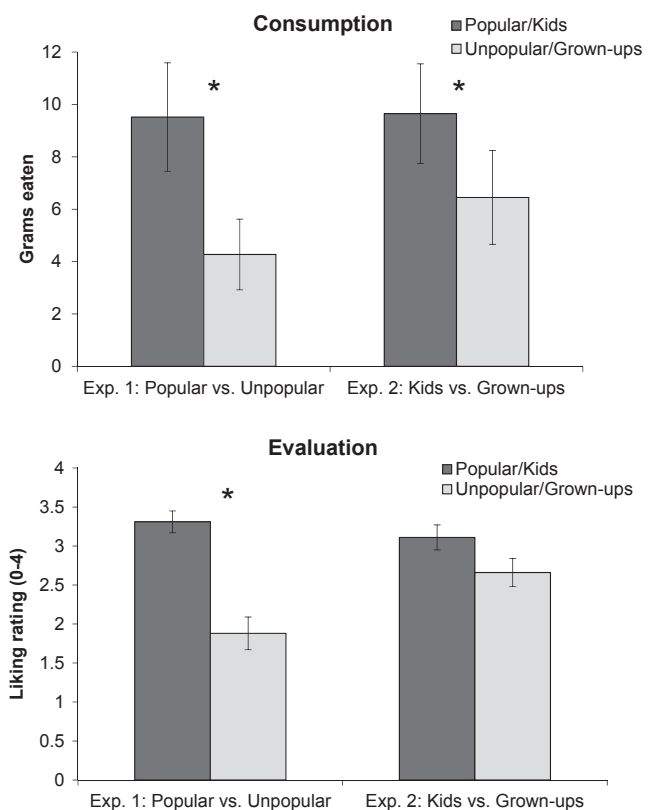
## 2.2 | Results

A paired-samples *t* test revealed that children ate more of the food described as popular ( $M = 9.52$  g,  $SE = 2.07$ ) than the food described as unpopular ( $M = 4.27$  g,  $SE = 1.35$ ),  $t(31) = 2.73$ ,  $p = .01$ ,  $d = 0.98$  (see Figure 1, top left). Children also evaluated the popular food ( $M = 3.31$ ,  $SE = 0.14$ ) as tasting better than the unpopular food ( $M = 1.88$ ,  $SE = 0.21$ ),  $t(31) = 4.84$ ,  $p < .001$ ,  $d = 1.74$  (see Figure 1, bottom left).

## 2.3 | Discussion

Children’s consumption and taste evaluations were influenced by messages about popularity: Participants ate more of a food described as popular than a food described as unpopular and rated the popular food’s flavor more positively, even though both foods were, in fact, identical. No other children were present during the test session, and the experimenter was unaware of the messages used to describe each food. These findings provide an initial demonstration that children’s experience of eating may be altered by information about popularity.

Given just the results of Experiment 1, it is unclear whether children particularly value information about a food’s popularity with peers or whether children could be equally swayed by information about a food’s popularity with non-peers (e.g., adults). Accordingly, in Experiment 2 children were presented with foods that were



**FIGURE 1** Children’s consumption and evaluation of foods described as popular vs. unpopular in Experiment 1 and foods described as popular with children vs. adults in Experiment 2. Asterisks represent  $p < .05$

described as popular with children versus popular with adults. If children are particularly attuned to peers' opinions about foods (e.g., Frazier et al., 2012; Shutts et al., 2010), we reasoned that participants in Experiment 2 would prefer and consume more of the food described as popular with children. If, however, children simply prefer foods described positively (i.e., as "popular" compared to "unpopular"), or if they value the opinions of peers and adults equally, we reasoned that participants would not distinguish between the two foods in Experiment 2.

### 3 | EXPERIMENT 2

In Experiment 2, the teacher presented participants with two identical foods per trial: She described one as popular with children and the other as popular with adults. The procedure was otherwise the same as Experiment 1.

#### 3.1 | Method

##### 3.1.1 | Participants

Participants included 32 5- and 6-year-old children (15 boys, 17 girls;  $M = 5.91$  years, range = 5.04–6.96 years) from a large Midwestern US city; 7 children were White, 14 were African-American, 3 were Hispanic, 2 were Asian and 6 were more than one race/ethnicity. No children included in Experiment 2 participated in Experiments 1 or 3. One additional child was excluded due to experimenter error.

##### 3.1.2 | Materials, procedure, and design

Experiment 2 used the same materials, procedure, and design as Experiment 1, but with different messages presented about each food. One food was described as popular with children: "This food is very popular with kids. All the kids think it's a cool food to eat. Kids all eat it with their friends. So that was the food in the [yellow] bowl. It is very popular with kids." The other food was described as popular with adults: "This food is very popular with grown-ups. All the grown-ups think it's a cool food to eat. Grown-ups all eat it with their friends. So that was the food in the [green] bowl. It is very popular with grown-ups." As in Experiment 1, the pairing of message content to bowl color (e.g., whether the food in the green bowl was described as popular with children or adults) and message order were counterbalanced.

#### 3.2 | Results

A paired-samples  $t$  test revealed that children ate more of the food described as popular with other children ( $M = 9.65$  g,  $SE = 1.90$ ) than the food described as popular with adults ( $M = 6.45$  g,  $SE = 1.79$ ),  $t(31) = 2.69$ ,  $p = .011$ ,  $d = 0.97$  (see Figure 1, top right). Children demonstrated a marginally significant preference for the food described as popular with children ( $M = 3.11$ ,  $SE = 0.16$ ) over the food

described as popular with adults ( $M = 2.66$ ,  $SE = 0.18$ ) in their evaluations,  $t(31) = 1.96$ ,  $p = .059$ ,  $d = 0.70$  (see Figure 1, bottom right).

### 3.3 | Discussion

Children in Experiment 2 ate more of the food described as popular with children than the food described as popular with adults, providing additional evidence that children's food choices are guided by social information. Even though both messages were positive, children ate more food that was supposedly popular with children compared to food that was supposedly popular with adults. This finding provides evidence that children's eating can be altered by social messages, and specifically that children are attentive to what other children eat, even when those children are not present. These findings raise interesting questions about the relative influence of social evidence and testimony provided by and about peers, an issue to which we return in the general discussion.

Children's differential consumption of otherwise identical foods in Experiments 1 and 2 raises the possibility that information about popularity affected how participants actually experienced the foods when eating. Experiment 3 provides a more direct test of the proposal that social information can alter children's experience of taste. Participants in Experiment 3 were asked to rate the sweetness of foods described with the same positive and negative social information as in Experiment 1. In light of findings in social and developmental psychology that people's perceptions are malleable in situations of ambiguity (Caylor, 1975; Corriveau & Harris, 2010; Jaswal et al., 2014; Nordholm, 1975), we predicted that social information would impact children's categorization of perceptually ambiguous foods. If so, this differential perceptual experience of foods brought on by social information might contribute to the mechanisms underlying children's consumption and evaluation of foods.

### 4 | EXPERIMENT 3

To test whether information about other children's preferences influenced children's categorization of perceptually ambiguous foods, we gave participants in Experiment 3 samples of applesauce to which varying amounts of lemon juice had been added. After sampling "sweet" (0 mL of lemon juice added) and "sour" (5 mL of lemon juice added) samples of applesauce during an introductory phase, children were asked to categorize applesauce with 1, 2, 3, or 4 mL of lemon juice added as "sweet" or "sour". Participants tasted two samples at each amount of added lemon juice (1, 2, 3, or 4 mL). One sample at each level was described as popular and one was described as unpopular in order to test whether identical foods would be categorized differently on the basis of social information. We predicted that foods surrounding the midpoint of the range (2 and 3 mL) would be particularly susceptible to social information, given that the food's actual flavor would provide an ambiguous perceptual signal (Caylor, 1975; Corriveau & Harris, 2010; Jaswal et al., 2014; Nordholm, 1975).



## 4.1 | Method

### 4.1.1 | Participants

Participants included 32 5- and 6-year-old children (16 boys, 16 girls;  $M = 6.06$  years, range = 4.94–7.09 years) from a large Midwestern US city; 13 were White, 11 were African-American, 2 were Hispanic, 2 were Hawaiian/Pacific Islander, 1 was Asian, and 2 reported more than one race/ethnicity; one parent did not report the child's race/ethnicity. No children included in Experiment 3 participated in Experiments 1 or 2.

### 4.1.2 | Materials

Ten servings of Mott's® Natural Applesauce were used in each session (two introductory foods, eight test foods). Each serving was prepared by measuring applesauce into a small plastic cup until a digital scale registered 40 g ( $\pm 0.5$  g). The "sweet" introductory food was applesauce with 0 mL of ReaLemon® lemon juice added and the "sour" introductory food was applesauce with 5 mL of ReaLemon® lemon juice added. Test foods contained ambiguous trials (adjacent to the midpoint of the range; 2 or 3 mL of lemon juice added), and less ambiguous trials (adjacent to an endpoint of the range; 1 or 4 mL of lemon juice added). Lemon juice was stirred into the applesauce with a plastic spoon, which remained in the cup so that children could taste the food.

### 4.1.3 | Procedure

Children were seated at a rectangular table, facing an experimenter. First, children were offered two introductory foods that were designed to introduce children to the task and set the endpoints of the sweet-to-sour range. The experimenter labeled the applesauce without lemon juice as "sweet" and asked children to take a bite. She then labeled the applesauce with 5 mL of lemon juice as "sour" and asked children to take a bite. Children were always offered the sweet food first to introduce the procedure and reduce any reluctance to eat the presented foods.

The experimenter then offered participants one test food at a time. As she offered the food to the participant, she described it as either popular or unpopular using the same messages as in Experiment 1. The experimenter was unaware of the amount of lemon juice that had been added to each food, as another research assistant prepared the foods and trial order varied across participants. Children were asked to taste each food and categorize the food as either sweet or sour. Each test food was removed from the table after children categorized the food. This procedure was repeated until all eight test foods had been sampled.

### 4.1.4 | Design and scoring

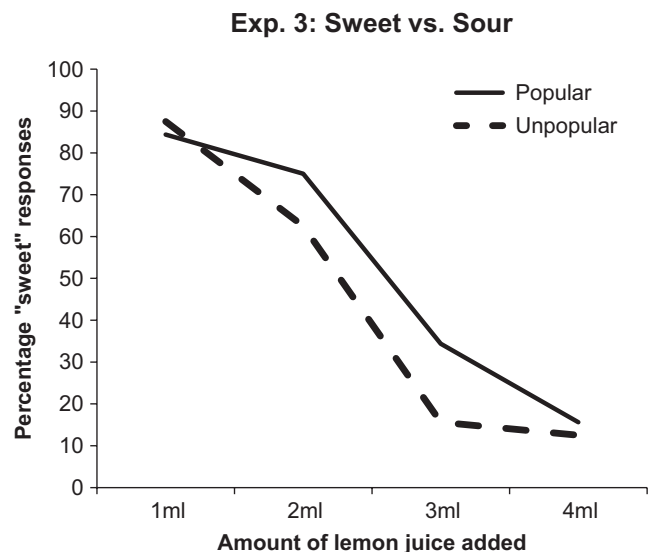
The order in which test foods and messages (popular or unpopular) were presented was counterbalanced within and between subjects,

such that each level of lemon juice was presented as both popular and unpopular to all participants. All levels of lemon juice were presented before any level was repeated. "Sweet" responses were scored as a 1 and "sour" responses were scored as 0.

## 4.2 | Results

To test the hypothesis that perceptually ambiguous trials near the midpoint (2 and 3 mL) would be influenced by social messages, we conducted a binary logistic regression with message (popular vs. unpopular) and amount of lemon juice (2 vs. 3 mL) entered as predictors; subject was entered as a random variable given the within-subjects design. For ease of comparison, the subsequent percentages represent children's categorizations of foods as "sweet". The model revealed a significant effect of message,  $\chi^2(1) = 4.13$ ,  $p = .04$ . Children were more likely to rate the popular food as sweet as compared to the unpopular food (75% vs. 63% for 2 mL, 34% vs. 16% for 3 mL, see Figure 2). There was also a significant effect of lemon amount,  $\chi^2(1) = 25.9$ ,  $p < .001$ , as children were more likely to rate the food with 2 mL of lemon juice as sweet (69%) as compared to the food with 3 mL of lemon juice (25%). There was no significant interaction between message and amount of lemon,  $\chi^2(1) = 0.32$ ,  $p = .57$ .

We conducted the same model for children's responses to samples with 1 and 4 mL of lemon (trials adjacent to the endpoints of the range). The model revealed a significant effect of lemon amount,  $\chi^2(1) = 50.2$ ,  $p < .001$ , but no effect of message,  $\chi^2(1) = 0.00$ ,  $p > .9$ , or interaction,  $\chi^2(1) = 0.26$ ,  $p = .61$ . Children were more likely to rate the food with 1 mL of lemon juice as sweet (popular = 84%, unpopular = 88%) than the food with 4 mL of lemon juice (popular = 16%, unpopular = 13%).



**FIGURE 2** Children's categorizations of foods as sweet or sour in Experiment 3



### 4.3 | Discussion

Social messages influenced children's classification of perceptually ambiguous foods. Five- and 6-year-old children were more likely to categorize foods as sweet when they were described as popular (vs. unpopular) after tasting more ambiguous foods near the midpoint of the sweet-to-sour range (i.e., 2 or 3 mL of lemon juice added). We did not observe this effect when children categorized less ambiguous foods near the endpoints of the range (1 and 4 mL of lemon juice). These findings provide evidence that when perceptual input is unclear, children's experience of taste is influenced by information about a food's popularity with other children.

## 5 | GENERAL DISCUSSION

The present experiments demonstrate that information about popularity influences children's eating behavior. In Experiment 1, children ate more food described as popular with other children than food described as unpopular. In Experiment 2, children ate more food described as popular with children than food described as popular with adults. In Experiment 3, children were more likely to categorize perceptually ambiguous foods as "sweet" when they heard that other children liked those foods. Merely being told what other children liked, without actually having other children present in the room, was sufficient to influence children's consumption and categorization of taste. These findings suggest that social modeling about foods does more than just supply peer pressure—social influences appear to operate at the level of influencing children's subjective perception of taste. These results provide support for the hypothesis that framing food selection as a social phenomenon can powerfully shape children's consideration of foods. Such a strategy may have important implications for developing simple, low-cost tools to improve children's diets.

The effects we observed dovetail with related findings showing that, for adults, taste can be subjective and influenced by context. For instance, expert wine tasters were fooled by the color of a wine (Morrot, Brochet, & Dubourdieu, 2001), adults rated potato chips as more or less crisp or fresh depending on auditory feedback that was experimentally manipulated while they ate (i.e., how crunchy the chips sounded; Spence & Shankar, 2010), and adults evaluated dog food more positively when it was labeled as pâté (Bohannon, Goldstein, & Herschkowitsch, 2010). The current research provides evidence that context influences children's perceptions of identical foods early in development (see DeJesus, Shutts, & Kinzler, 2015, for related findings in the context of contamination) and may be an important component of human reasoning about food across the lifespan. We tested young school-age children in the present research, yet even infants are adept at learning about foods in social contexts, including the relation between food choice and patterns of social affiliation (Hamlin, Mahajan, Liberman, & Wynn, 2013; Liberman et al., 2014; Liberman et al., 2016). Taken together, these results suggest that social contexts affect the experience of taste across the lifespan.

The present studies provide important initial evidence that brief social messages influence children's consumption and perception of foods; however, there are several extensions of this work that should be conducted in the future to clarify the observed effects. First, we had one type of informant provide information about the foods—a female adult described as a "teacher". Variation in the type of informant depicted, including children, unreliable adults, and groups that reach a common consensus, could lead to different patterns of results, as suggested by a broad literature on children's selective trust (Corriveau, Fusaro, & Harris, 2009; Frazier et al., 2012; Nguyen, 2012; Pasquini, Corriveau, Koenig, & Harris, 2007; Shutts et al., 2010). For instance, in one study that is particularly relevant to considerations of food choice and health, preschool-age children were less likely to trust information provided by an obese informant (Jaffer & Ma, 2015). In addition, children may view other children as more persuasive sources of information about popularity than adults—even as compared to a trusted or reliable adult. Children tend to direct questions about toys to children, rather than to adults (VanderBorghet & Jaswal, 2009) and are more likely to accept foods modeled by other children, rather than their teachers (although teachers are effective models in isolation; Hendy & Raudenbush, 2000). These past studies suggest that children can view other children as experts in some contexts, leading to the possibility that they might find a peer's testimony about what is popular particularly compelling. If children see other children eating and enjoying a particular food and that message is highlighted and reinforced by adults, these experiences may work together to promote behavior change.

Second, we focused on social messages in the present research, but acknowledge that other types of messages or contextual information could also influence children's food choices. It would be interesting to compare the power of social messages to explicit information about a food's palatability or nutrition status, for example. In addition, although we hypothesize that social messages would be effective with children of diverse ages, we acknowledge that different kinds of social messages may be differentially appealing to, or effective with, younger versus older children. Indeed, across domains, interventions that have shown success in younger children have limited success among adolescents (Yeager, Dahl, & Dweck, in press). Future research is necessary to determine whether messages about a food's popularity influence adolescents' eating. However, a recent study (Bryan et al., 2016) points to one kind of social messaging tactic that does appear to be effective in changing adolescents' behavior in the food domain: Namely, presenting information that appeals to adolescents' social values (see Yeager et al., in press, for discussion). Future examination of both the messengers and messages that most effectively guide children's and adolescents' eating behavior across development is an important endeavor.

It should be noted that our negative message purposefully presented the absence of positivity ("This food is not very popular. Kids don't think this is a cool food to eat. No one eats it at school with their friends"), rather than direct negativity, such as children being teased or ostracized for eating an unpopular food. Given that even simulated experiences of ostracism lead to increased imitation (Over & Carpenter, 2009) and increased food consumption among overweight



children (Salvy et al., 2011), messages that describe ostracism or include more clearly negative content may be even more influential than the messages in the present research. Relatedly, children and adults who immigrate to a new country often change their diets (sometimes making less healthy choices) in order to assimilate to a new culture (Guendelman, Cheryan, & Monin, 2011; Van Hook, Quiros, Frisco, & Fikru, 2016). These changes may be motivated both by the desire to adhere to the norms of their new culture and to avoid the negative attention that may stem from eating atypical foods.

Finally, it will be important to test whether the present method could be adapted to influence children's behavior outside of the lab, including to increase children's consumption of healthy foods. Familiarity increases liking of a food (Aldridge et al., 2009; Birch & Marlin, 1982; Hausner et al., 2009); however, this process may be promoted by specific contexts (e.g., flavors experienced through breastfeeding) and can require many attempts (i.e., 8 to 15 attempts), and many families do not have the resources to undertake this effort (Daniel, 2016). In addition, the modern food environment is replete with sweet foods, including nonnutritive sweeteners (Gearhardt, Grilo, DiLeone, Brownell, & Potenza, 2011; Mennella, Bobowski, & Reed, 2016). Given the high rates of childhood obesity in the United States and obesity-related health concerns (Cunningham, Kramer, & Narayan, 2014; Freedman, Ogden, Berenson, & Horlick, 2005; Nader et al., 2006), it is not only important to understand the kinds of messages that could increase children's intake of healthy foods, such as vegetables, that children may be less inclined to eat, but also to alter children's intake of familiar and sweet foods, such as the fruit sauces used in this study. Understanding how to improve children's enjoyment of healthy foods and limit their intake of unhealthy foods, without altering the foods themselves, is an important enterprise to which developmental scientists can contribute.

## ACKNOWLEDGEMENTS

This research was supported by NICHD grant R01 HD070890 to KDK and KS and NSF Graduate Research Fellowship (DGE-1144082), NIH T32 Postdoctoral Research Fellowship (T32HD079350), and AHA Postdoctoral Research Fellowship (17POST33400006) to JMD. We thank K. Crain, J. Galamba, E. Gerdin, and A. Ransom for assistance in data collection, with special thanks to K. Crain and J. Galamba for helpful discussion and suggestions for study design.

## ENDNOTE

<sup>1</sup> We refer to the amount of food children ate as "consumption" in this paper; however, the same behavior might also be called "food intake" in research from the perspectives of pediatrics and public health (e.g., Cruwys, Bevelander, & Hermans, 2015; Lumeng, Patil, & Blass, 2007; Salvy et al., 2011).

## ORCID

Jasmine M. DeJesus  <http://orcid.org/0000-0002-0981-2481>

## REFERENCES

- Aldridge, V., Dovey, T.M., & Halford, J.C.G. (2009). The role of familiarity in dietary development. *Developmental Review*, 29, 32–44.
- Birch, L.L. (1980). Effects of peer models' food choices and eating behaviors on preschoolers' food preferences. *Child Development*, 51, 489–496.
- Birch, L.L. (1990). Development of food acceptance patterns. *Developmental Psychology*, 26, 515–519.
- Birch, L.L. (1999). Development of food preferences. *Annual Review of Nutrition*, 19, 41–62.
- Birch, L.L., & Marlin, D.W. (1982). I don't like it; I never tried it: Effects of exposure on two-year-old children's food preferences. *Appetite*, 3, 353–360.
- Birch, L.L., Marlin, D.W., & Rotter, J. (1984). Eating as the "means" activity in a contingency: Effects on young children's food preference. *Child Development*, 55, 431–439.
- Bohannon, J., Goldstein, R., & Herschkowitsch, A. (2010). Can people distinguish pâté from dog food? *Chance*, 23, 43–46.
- Bryan, C.J., Yeager, D.S., Hinojosa, C.P., Chabot, A., Bergen, H., Kawamura, M., & Steubing, F. (2016). Harnessing adolescent values to motivate healthier eating. *Proceedings of the National Academy of Sciences, USA*, 113, 10830–10835.
- Carruth, B.R., Ziegler, P.J., Gordon, A., & Barr, S.I. (2004). Prevalence of picky eaters among infants and toddlers and their caregivers' decisions about offering a new food. *Journal of the American Dietetic Association*, 104, 57–64.
- Caylor, J.S. (1975). Stimulus factors in conformity. *American Psychologist*, 12, 388–388.
- Cooke, L., Wardle, J., & Gibson, E. (2003). Relationship between parental report of food neophobia and everyday food consumption in 2–6-year-old children. *Appetite*, 41, 205–206.
- Corriveau, K.H., Fusaro, M., & Harris, P.L. (2009). Going with the flow: Preschoolers prefer nondissenters as informants. *Psychological Science*, 20, 372–377.
- Corriveau, K.H., & Harris, P.L. (2009). Choosing your informant: Weighing familiarity and recent accuracy. *Developmental Science*, 12, 426–437.
- Corriveau, K.H., & Harris, P.L. (2010). Preschoolers (sometimes) defer to the majority in making simple perceptual judgments. *Developmental Psychology*, 46, 437–445.
- Cruwys, T., Bevelander, K.E., & Hermans, R.C.J. (2015). Social modeling of eating: A review of when and why social influence affects food intake and choice. *Appetite*, 86, 3–18.
- Cunningham, S.A., Kramer, M.R., & Narayan, K.V. (2014). Incidence of childhood obesity in the United States. *New England Journal of Medicine*, 370, 403–411.
- Daniel, C. (2016). Economic constraints on taste formation and the true cost of healthy eating. *Social Science and Medicine*, 148, 34–41.
- DeJesus, J.M., Shutts, K., & Kinzler, K.D. (2015). Eww she sneezed! Contamination context affects children's food preferences and consumption. *Appetite*, 87, 303–309.
- Desor, J., Maller, O., & Turner, R.E. (1973). Taste in acceptance of sugars by human infants. *Journal of Comparative and Physiological Psychology*, 84, 496–501.
- Falciglia, G.A., Couch, S.C., Gribble, L.S., Pabst, S.M., & Frank, R. (2000). Food neophobia in childhood affects dietary variety. *Journal of the American Dietetic Association*, 100, 1474–1481.
- Frazier, B.N., Gelman, S.A., Kaciroti, N., Russell, J.W., & Lumeng, J.C. (2012). I'll have what she's having: The impact of model characteristics on children's food choices. *Developmental Science*, 15, 87–98.
- Freedman, D.S., Ogden, C.L., Berenson, G.S., & Horlick, M. (2005). Body mass index and body fatness in childhood. *Current Opinion in Clinical Nutrition and Metabolic Care*, 8, 618–623.
- Galloway, A.T., Fiorito, L., Lee, Y., & Birch, L.L. (2005). Parental pressure, dietary patterns, and weight status among girls who are "picky eaters". *Journal of the American Dietetic Association*, 105, 541–548.



- Gearhardt, A.N., Grilo, C.M., DiLeone, R.J., Brownell, K.D., & Potenza, M.N. (2011). Can food be addictive? Public health and policy implications. *Addiction*, *106*, 1208–1212.
- Guendelman, M.D., Cheryan, S., & Monin, B. (2011). Fitting in but getting fat: Identity threat and dietary choices among US immigrant groups. *Psychological Science*, *22*, 959–967.
- Hamlin, J.K., Mahajan, N., Liberman, Z., & Wynn, K. (2013). Not like me = bad: Infants prefer those who harm dissimilar others. *Psychological Science*, *24*, 589–594.
- Hausner, H., Nicklaus, S., Issanchou, S., Mølgaard, C., & Møller, P. (2009). Breastfeeding facilitates acceptance of a novel dietary flavour compound. *European e-Journal of Clinical Nutrition and Metabolism*, *4*, e231–e238.
- Hendy, H.M., & Raudenbush, B. (2000). Effectiveness of teacher modeling to encourage food acceptance in preschool children. *Appetite*, *34*, 61–76.
- Jaffer, S., & Ma, L. (2015). Preschoolers show less trust in physically disabled or obese informants. *Frontiers in Psychology*, *5*, 1524.
- Jaswal, V.K., Pérez-Edgar, K., Kondrad, R.L., Palmquist, C.M., Cole, C.A., & Cole, C.E. (2014). Can't stop believing: Inhibitory control and resistance to misleading testimony. *Developmental Science*, *17*, 965–976.
- Liberman, Z., Kinzler, K.D., & Woodward, A.L. (2014). Friends or foes: Infants use shared evaluations to infer others' social relationships. *Journal of Experimental Psychology: General*, *143*, 966–971.
- Liberman, Z., Woodward, A.L., Sullivan, K.R., & Kinzler, K.D. (2016). Early emerging system for reasoning about the social nature of food. *Proceedings of the National Academy of Sciences, USA*, *113*, 9480–9485.
- Lumeng, J.C., Cardinal, T.M., Jankowski, M., Kaciroti, N., & Gelman, S.A. (2008). Children's use of adult testimony to guide food selection. *Appetite*, *51*, 302–310.
- Lumeng, J.C., Patil, N., & Blass, E.M. (2007). Social influences on formula intake via suckling in 7 to 14-week-old-infants. *Developmental Psychobiology*, *49*, 351–361.
- Maimaran, M., & Fishbach, A. (2014). If it's useful and you know it, do you eat? Preschoolers refrain from instrumental food. *Journal of Consumer Research*, *41*, 642–655.
- Mennella, J.A., Bobowski, N.K., & Reed, D.R. (2016). The development of sweet taste: From biology to hedonics. *Reviews in Endocrine and Metabolic Disorders*, *17*, 171–178.
- Mennella, J.A., Lukasewycz, L.D., Griffith, J.W., & Beauchamp, G.K. (2011). Evaluation of the Monell forced-choice, paired-comparison tracking procedure for determining sweet taste preferences across the lifespan. *Chemical Senses*, *36*, 345–355.
- Miller, L., Rozin, P., & Fiske, A.P. (1998). Food sharing and feeding another person suggest intimacy: Two studies of American college students. *European Journal of Social Psychology*, *28*, 423–436.
- Morrot, G., Brochet, F., & Dubourdieu, D. (2001). The color of odors. *Brain and Language*, *79*, 309–320.
- Nader, P.R., O'Brien, M., Houts, R., Bradley, R., Belsky, J., Crosnoe, R., & Susman, E.J. (2006). Identifying risk for obesity in early childhood. *Pediatrics*, *118*, e594–e601.
- Newman, J., & Taylor, A. (1992). Effect of a means-end contingency on young children's food preferences. *Journal of Experimental Child Psychology*, *53*, 200–216.
- Nguyen, S.P. (2012). The role of external sources of information in children's evaluative food categories. *Infant and Child Development*, *21*, 216–235.
- Nordholm, L.A. (1975). Effects of group size and stimulus ambiguity on conformity. *Journal of Social Psychology*, *97*, 123–130.
- Over, H., & Carpenter, M. (2009). Priming third-party ostracism increases affiliative imitation in children. *Developmental Science*, *12*, F1–F8.
- Pasquini, E.S., Corriveau, K.H., Koenig, M., & Harris, P.L. (2007). Preschoolers monitor the relative accuracy of informants. *Developmental Psychology*, *43*, 1216–1226.
- Rozin, P. (1999). Food is fundamental, fun, frightening, and far-reaching. *Social Research*, *66*, 9–30.
- Rozin, P., Haidt, J., & McCauley, C.R. (1999). Disgust: The body and soul emotion. In T. Dalgleish & M.J. Power (Eds.), *Handbook of cognition and emotion* (pp. 429–445). Chichester: Wiley.
- Salvy, S.-J., Bowker, J.C., Nitecki, L.A., Kluczynski, M.A., Germeroth, L.J., & Roemmich, J.N. (2011). Impact of simulated ostracism on overweight and normal-weight youths' motivation to eat and food intake. *Appetite*, *56*, 39–45.
- Shutts, K., Banaji, M.R., & Spelke, E.S. (2010). Social categories guide young children's preferences for novel objects. *Developmental Science*, *13*, 599–610.
- Shutts, K., Kinzler, K.D., & DeJesus, J.M. (2013). Understanding infants' and children's social learning about foods: Previous research and new prospects. *Developmental Psychology*, *49*, 419–425.
- Spence, C., & Shankar, M.U. (2010). The influence of auditory cues on the perception of, and responses to, food and drink. *Journal of Sensory Studies*, *25*, 406–430.
- Sullivan, S.A., & Birch, L.L. (1990). Pass the sugar, pass the salt: Experience dictates preference. *Developmental Psychology*, *26*, 546–551.
- VanderBorghet, M., & Jaswal, V.K. (2009). Who knows best? Preschoolers sometimes prefer child informants over adult informants. *Infant and Child Development*, *18*, 61–71.
- Van Hook, J., Quiros, S., Frisco, M.L., & Fikru, E. (2016). It is hard to swim upstream: Dietary acculturation among Mexican-origin children. *Population Research and Policy Review*, *35*, 177–196.
- Van Huis, A., Van Itterbeeck, J., Klunder, H., Mertens, E., Halloran, A., Muir, G., & Vantomme, P. (2013). *Edible insects: Future prospects for food and feed security*. Geneva: Food and Agriculture Organization of the United Nations.
- Wardle, J., Herrera, M.L., Cooke, L., & Gibson, E.L. (2003). Modifying children's food preferences: The effects of exposure and reward on acceptance of an unfamiliar vegetable. *European Journal of Clinical Nutrition*, *57*, 341–348.
- Wardle, J., & Huon, G. (2000). An experimental investigation of the influence of health information on children's taste preferences. *Health Education Research*, *15*, 39–44.
- Woolley, K., & Fishbach, A. (2017). A recipe for friendship: Similar food consumption promotes trust and cooperation. *Journal of Consumer Psychology*, *27*, 1–10.
- Yeager, D.S., Dahl, R.E., & Dweck, C.S. (in press). Why interventions to influence adolescent behavior often fail but could succeed. *Perspectives on Psychological Science*.

**How to cite this article:** DeJesus JM, Shutts K, Kinzler KD. Mere social knowledge impacts children's consumption and categorization of foods. *Dev Sci*. 2018;21:e12627. <https://doi.org/10.1111/desc.12627>