Published in final edited form as:
Dev Sci. 2012 January ; 15(1): 87–98. doi:10.1111/j.1467-7687.2011.01106.x.

I'll Have What She's Having: The Impact of Model Characteristics on Children's Food Choices

Brandy N. Frazier
University of Hawaii at Manoa

Susan A. Gelman, **Niko Kaciroti**, **Joshua W. Russell**, and **Julie C. Lumeng**
University of Michigan

Abstract

The current research investigates children's use of social categories in their food selection. Across three studies, we presented preschoolers with sets of photographs that contrasted food-eating models with different characteristics, including model gender, race (Black, White), age (child or adult), and/or expression (acceptance or rejection of the food). Children were asked to pick between the photographs to choose which food they would like for snack. Results demonstrated that preschoolers prefer foods being eaten by models with positive over negative expressions, foods being eaten by child over adult models, and foods being eaten by child models of the same gender as themselves over models of the other gender. This work connects with previous research on children's understanding of social categories and also has important practical implications for how characteristics of a food-eating model can affect children's willingness to try new foods.

The preschool years are a period of rapid development in terms of both eating behavior and food preference formation (Birch & Fisher, 1998; Cashdan, 1994). With the growing public health concern regarding childhood obesity (Hedley et al., 2004), especially among socioeconomically disadvantaged children (Feese et al., 2003), intervention for this age group is of particular interest.

Preschoolers are often reluctant to try new foods (a phenomenon called food neophobia; Cashdan, 1998) and many factors can influence children's food preferences. Willingness to try a new food depends in part on its appearance. Dovey, Staples, Gibson, and Halford (2008) hypothesized that children develop schemata for how an acceptable food "should look" and food not sufficiently close to this schema is rejected. However, if the food is accepted visually, it will be tasted. A powerful contributor to this decision is the food's familiarity (Aldridge, Dovey, & Halford, 2009). A sense of familiarity can be induced by simply having a food widely available in the child's environment, pairing the food with other familiar stimuli, or helping the child to recognize that a novel food belongs in the same category as a familiar food (Aldridge et al., 2009).

Another important way that children may obtain information about novel foods prior to tasting them is through observing others' reactions. Social learning of this sort plays an important role in children's preferences across a wide range of domains (Bandura, 1977). However, food is a particularly important domain within which to examine social learning (Birch & Fisher, 1998). Even non-human animals show effects of social factors on food preferences (Heyes & Galef, 1996). Moreover, food is a unique stimulus in social learning:

Address for correspondence: Brandy Frazier, University of Hawaii at Manoa, Department of Psychology, 2530 Dole Street, Sakamaki C400, Honolulu, HI 96822, brandy2@hawaii.edu.

children perceive adult informants as more knowledgeable about food, but child informants as more knowledgeable about toys (VanderBorght & Jaswal, 2009). Shutts, Banaji, and Spelke (2010) found that children prefer stimuli (food and non-food) endorsed by models of the same gender as themselves, and by models of the same age group (as opposed to adults). They did not, however, describe differences based on the stimulus being food or non-food.

In the present research, we are interested in whether and how others' modeling of eating may influence children's food preferences and their willingness to try new foods. We build on the prior work by Shutts and colleagues (2010) by examining the relative influence of model characteristics (e.g., age, gender), as well as interaction effects (e.g., Is gender a powerful influence only when the model is a child, but not an adult?). We also examined developmental differences, and therefore include a wider age range of participants. Finally, we included children of more diverse race/ethnicity and socioeconomic status. Lower-income and minority ethnicity children are frequently the recipients of public health interventions that invoke modeling of healthy eating, and such interventions could be more accurately informed by a more diverse sample of participants.

In summary, we examine whether some models are more effective than others. Specifically, we investigate the importance of varying model characteristics (facial expression, age, gender, and race) on children's willingness to select a food for snack. We are particularly interested in gender and race, for both theoretical reasons (ongoing questions regarding the relative salience of different social categories in childhood; Kinzler, Shutts, & Correll, 2010) and practical reasons (as these model characteristics are frequently matched to the intended audience in media messages about nutrition aimed at children). Below we review the relevant evidence from prior research.

Model Expression—Are children influenced by the expression displayed by a food-eating model? Intuitively, this should have an impact on children's willingness to try a new food, with positive expressions leading to the modeled food being more appealing, and expressions of disgust leading to the modeled food being less appealing (perhaps conveying evolutionarily adaptive information regarding palatable versus unpalatable foods, e.g. Rozin, Haidt, & McCauley, 2008). Research with adults supports this idea: In one study, participants were shown photographs of an unfamiliar meat product on a plate in front of models poised to begin eating; models displayed varying facial expressions. Both men and women expressed a greater desire to eat the unfamiliar meat product when it was paired with models showing a neutral or happy facial expression, compared to models displaying a disgusted facial expression (Rousset, Schlich, Chatonnier, Barthomeuf, & Droit-Volet, 2007).

Prior research demonstrates that social referencing begins at a young age. Twelve-month-olds respond to the emotional responses of those around them when determining whether they should interact with a novel object (e.g., Moses, Baldwin, Rosicky, & Tidball, 2001; Mumme & Fernald, 2003). Negative emotional displays seem to be particularly powerful in cuing avoidance (Vaish, Grossmann, & Woodward, 2008).

With regard to food, children themselves demonstrate clear negative facial expressions when eating foods they dislike (Zeinstra, Koelen, Colindres, Kok, & de Graaf, 2009), and 12-month-olds were more likely to reach for a food being offered by a speaker of their native language who displayed positive affect than a speaker of a foreign language displaying negative affect (Shutts, Kinzler, McKee, & Spelke, 2009). However, this study did not separately examine the influence of expression apart from language, thus leaving open the question of how expression alone may influence preschool-age children's food choices.

Two-year-olds can also understand and recognize preferences. In research by Fawcett and Markson (2010a), children saw two adult actors demonstrate their preferences for various toys via facial expressions and verbal statements of like or dislike. One actor consistently preferred toys that were boring over toys that were more interesting, and the other actor demonstrated the reverse preference. Later, when given a choice between pairs of visually inaccessible items, the children were able to use the actors' preferences to choose items that would match their own preferences, choosing the item liked by the actor who liked the interesting toys over the item liked by the actor who liked the boring toys. Two-year-olds did not generalize these preferences indiscriminately or extend them inappropriately across domains (Fawcett & Markson, 2010a). Children selected an unseen food from the person who liked the same kind of foods they did, but did not select a television show on that basis.

Adult versus Peer Models—With respect to children's food choices, would a peer model have a greater impact than an adult model or vice versa? Outside of the food domain, preschoolers understand that different people have different domains of expertise, for example that a doctor would know more about how to fix a broken arm than a car mechanic would (Lutz & Keil, 2002). Preschoolers also attribute different amounts of knowledge to babies, same-age peers, and adults (Taylor, Cartwright, & Bowden, 1991). However, children do not always judge adults as more expert than children. When learning novel words, preschoolers flexibly use both the reliability and age of a speaker when judging the speaker's credibility (Jaswal & Neely, 2006). When both an adult and a peer gave reliable information, children preferred the information provided by the adult; but when an adult gave unreliable information, children preferred information from a reliable peer. In other words, depending on the circumstances, preschool age children may prefer to learn from peers over adults or vice versa.

VanderBorght and Jaswal (2009) provide initial insight into how these patterns relate to learning about new foods. When asked who would know more about a novel food or toy, preschoolers preferred to direct questions about novel toys to a child informant, and questions about novel foods to an adult informant. In general, children appeared to expect adults to know more about the nutritional value of foods than other children. However, when the toy or food was described as being a favorite of one of the informants, children directed questions to that informant, regardless of age (e.g., asking the child about his/her favorite food). This study did not, however, pit the preference of an adult model against the preference of a child model, and so could not examine which is more powerful.

In previous research, adult modeling was effective in getting children to try novel foods (Addessi, Galloway, Visalberghi, & Birch, 2005; Harper & Sanders, 1975; Hendy & Raudenbush, 2000). Adult testimony that a food is palatable is remarkably powerful in shaping children's selection of a new food, even when the adult has shown different preferences from those of the child (Lumeng, Cardinal, Jankowski, Kaciroti, & Gelman, 2008). Peers can also be effective models; children imitate the observed food selections of a same-age or older peer (Brody & Stoneman, 1981; Duncker, 1938). Additionally, peers seated at the same table during preschool meals can shift the food preferences of a target child away from a previously preferred food to a non-preferred food (Birch, 1980) and can influence target children to try novel foods (Hendy, 2002).

But what happens when adult food preferences and peer food preferences are pitted against each other? Hendy and Raudenbush (2000) found that, although enthusiastic teacher modeling alone was effective in getting children to try novel foods, when a peer was also present and expressed enthusiasm for a different food, teacher modeling was no longer effective for the target food. Thus, despite children's expectations about adult expertise in other domains, children may perceive peers as more credible sources of information about

food palatability than adults. However, previous research leaves open the question of how different model characteristics may interact in their influence on children's food selection.

Models of the Same Gender and Race—Would models of the same gender or race as the child make a food more appealing? When given the opportunity to select playmates with similar or differing physical appearances, toy preferences, or food preferences from themselves, 3-year-olds prefer peers to whom they are similar (Fawcett & Markson, 2010b). Preschoolers use gender as a cue for making judgments about a person's traits, interests, and activity preferences (Taylor, 1996). Children may also use gender as a cue for whether that person's food preferences will match their own. The few studies examining the relative influence of model gender on preschool children's food preferences have yielded somewhat mixed results. Although Harper and Sanders (1975) found no significant relationship between the gender of an adult model and children's willingness to try novel foods, Hendy (2002) found that female peer models were more effective than male peer models in increasing both boys' and girls' tasting of novel foods. However, gender may be salient only when the target model and participant are the same age. Moreover, in both the previous studies, the influence of female models is compared to that of male models, without considering the possibility that models of the same gender as the child may be the most effective.

The preschool years are also a time when children develop an understanding of their own race and are beginning to show in-group favoritism (more favorable attitudes toward members of their own race) (Aboud, 2003; Quintana, 1998). Thus, children may prefer foods eaten by models of the same race as themselves or may simply believe that a model who shares their race will have similar preferences.

The influence of a model's race or group membership has only recently been explored within the food preference literature. Shutts et al. (2010) asked 3-year-old White children to choose between pairs of items labeled with novel names (including toys, foods, games, and items of clothing) that were endorsed by two individuals differing on one of three characteristics (age, gender, or race). Children preferred items endorsed by child rather than adult models, and items endorsed by models of the same gender as themselves. Race (whether the model was Black or White) did not influence children's preferences consistently across the different types of items; for toy and clothing trials, children were more likely to select the item endorsed by the child of the same race as themselves, but on food and game trials, they selected randomly between items endorsed by the same-race and other-race model.

Current Study—The present study explores the influence of model characteristics on children's food choices. We build on the previous research (particularly Shutts et al., 2010) in several important ways. First, instead of using pairs of photographs to look at a single model characteristic at a time, we use sets of four photographs to measure the relative influence of model characteristics (e.g., expression, gender, age), as well as interaction effects (e.g., Does model expression modify the influence of model age?). Additionally, we include a wider age range of participants (from ages 3 to 6), allowing us to explore developmental differences. Finally, we include both Black and White children, thus permitting a more representative exploration of race as a potential influence on food selection.

In Study 1, we examine the relative influence of gender and expression within peer-age models. In Study 2, we first examine the relative influence of gender and expression within adult models, and then examine the relative influence of model age (child versus adult) and gender. Finally, in Study 3, we directly compare results of Studies 1 and 2 by examining the relative influences of model race, expression, and age in a single experiment.

Children's response to food stimuli may be conceptualized in several ways. Children must first overcome reluctance to sample a new food by actually agreeing to taste it. Then, after tasting it, they have a hedonic response to the stimulus, which can be reported as either a degree of liking for the stimulus, or a preference for one stimulus in relation to another. In the current study, we assess children's selection of an unknown food as one that they would like to have for a snack. For clarity of presentation, however, we refer to children's selection of the stimulus in this study as a preference for that food.

Across the three studies, we had several hypotheses. We expected that participants would prefer models with positive expressions over those with negative expressions. With regard to the influence of model age, we had two competing hypotheses. On the one hand, participants might believe adults to be more expert in the domain of food, and therefore prefer foods that adult models appear to like. On the other hand, participants might assume that people more similar to themselves (in age) will share their food preferences, in which case children should prefer foods liked by child models over those liked by adult models. This latter option would be consistent with previous research showing the effectiveness of peers in encouraging children to try novel foods (Henry & Raudenbush, 2000).

With regard to gender, we predicted that the child participants would prefer peer models of the same gender as themselves over those of the other gender. In contrast, with adult models, we predicted that participants might prefer adult female models over adult male models, because women are often responsible for the purchasing and preparation of food (McIntosh & Zey, 1989). Thus, children may see adult women as having more expertise within the food domain than men. Finally, we predicted that child participants would show a preference for foods being eaten by models of the same race as themselves more than foods being eaten by models of another race.

Study 1

Method

Participants—Participants included 35 preschoolers (mean age = 4.03, range = 3.01 to 4.94 years, *SD*=0.60; 16 girls and 19 boys) recruited from a Midwestern U.S. town using letters sent home via local preschools and posted fliers, targeting low-income communities. Children with parent-reported language delays were excluded from participation. Mothers completed demographic questionnaires and identified their children as Black (*N*=13), White (*N*=14), biracial (*N*=7), or “other” (*N*=1). Mothers' highest level of education obtained was: some high school (*N*=8), graduated high school (*N*=13), some college (*N*=12), or four-year college degree (*N*=2). Mothers were compensated with $10.

Materials—Child participants were each shown 8 sets of four photographs, with each photograph depicting a model holding a plastic spoon near a bowl, as if they were eating. To avoid the potential confounding effect of food appearance, no food was visible in the spoon or bowl. Models in the photographs were all children, ranging in age from 3 to 6 years (*M*= 5.03, *SD*=1.02).

The photographs within each set differed from one another on two dimensions: gender and facial expression (whether the models looked positive, as if they were accepting the food, or negative, as if they were rejecting the food). The models were Black children in four of the photograph sets and White children in the other four photograph sets (see Figure 1 for an example). The order of presentation of the sets and the spatial arrangement of the four photographs in a set were randomized. The child models were all photographed wearing a blue dress shirt and without any hats or eyeglasses.

Procedure—Children were presented with each set of four photographs, and the adult researcher said, “Here are some people eating. They're all having different snacks.” The researcher asked the child, “You're going to pick which one is the yummiest and you'd want to eat. Which one do you think looks the yummiest? Which one do you want to eat?” If the child asked about why the bowl appeared empty, the researcher said “They only have a little. You can't see it, but it's in there.”

After the child made his/her selection, the researcher removed the chosen photograph and said, “Uh-oh, that food is all gone so you can't have that,” and asked the child to pick the one they would want for their snack from the remaining three photographs. After the child responded, the researcher removed the child's second choice photograph and said, “Let's pretend that's all gone, too,” and asked the child to choose the one they would want from the two remaining photographs. Children were rewarded with stickers for their participation.

Results

Generalized estimating equations (GEE) (Liang & Zeger, 1986; Zeger & Liang, 1986) were used to evaluate the effect of model characteristics on preference ranking (ranging from 1 to 4, with a lower number indicating a higher (i.e., preferred) ranking). The GEE approach is similar to repeated measures analysis of variance. Terms included in the GEE model predicting preference rankings included model gender (male/female) and model expression (positive/negative). We also tested the interaction of each of these main effects with participant age (as a continuous variable) and the gender of the participants.

Participants ranked the photographs showing a child model with a positive expression significantly higher than the photographs of a child model showing a negative expression (2.21 (SE 0.07) versus 2.79 (SE 0.07) respectively, $p < .001$). Children ranked child models of the same gender as themselves higher than child models of the other gender (2.27 (SE 0.06) for same-gendered child model versus 2.73 (SE 0.06) for other-gendered child models, $p < .001$). Children did not rank female child models differently than male child models (2.39 (SE 0.07) versus 2.60 (SE 0.07) respectively).

There were no significant interactive effects of child model expression and child model gender. There were, however, interactive effects of child model expression and whether the child model's gender was the same as or different from the child participant ($p < .05$). Specifically, mean rankings for each type of photograph were: child same-gender model with positive expression = 1.93 (SE .11); child other-gender model with positive expression = 2.50 (SE .09); child same-gender model with negative expression = 2.62 (SE .10); child other-gender model with negative expression = 2.96 (SE .10). All these four values are significantly different from one another except the two middle scores (other-gender/positive and same-gender/negative). In other words, the influence of model expression on participant ranking was greater when the child model was the same gender as the participant.

There were no interactive effects of participant gender with model expression (i.e., the pattern of results with regard to child model expression did not differ between participants who were boys or girls). However, participant age did significantly modify the effect of model expression on the participants' rankings ($p < .05$ for the interaction term of age (continuous) and model expression). For the younger children ($N = 17$, mean age 3.51), model expression did not affect ranking (2.33 (SE 0.11) for positive expression versus 2.67 (SE 0.11) for negative model expression, *n.s.*). For the older children ($N = 18$, mean age 4.53), model expression significantly affected ranking (2.10 (SE 0.09) for positive expression vs. 2.90 (SE 0.09) for negative expression, $p < .001$). Participant age did not modify the effect of model gender on ranking, nor did it modify the effect of whether the model was the same gender as the child.

In this study, we also conducted exploratory analyses to determine if the race of the child model or child participant was related to participants' photograph rankings. Child model race and child participant race did not significantly modify the effect of model expression, model gender, or whether the model was the same gender as the child participant. Because we did not find any significant interactions for these analyses, we did not consider race as a factor in the results reported for this study.

Finally, we tested whether response patterns differed for the first 4 photo sets presented as compared to the last 4 photo sets presented, to determine if there was evidence of participant fatigue across trials. We did not find any results to support this; the interaction term for whether the photo was presented as one of the first 4 photo sets, as compared to one of the last 4 photo sets, with each covariate described above, was not significant.

Discussion

Overall, child participants demonstrated the strongest preference for foods that were being eaten by child models of the same gender as themselves who displayed positive facial expressions (appearing as if they were accepting and enjoying the target food). These results suggest that participants may have thought that children of the same gender would be more likely to have similar food preferences to themselves than children of the other gender.

In addition, participants preferred foods being eaten by peer models demonstrating positive affect over those rejecting the food. However, we found developmental differences with regard to this factor; younger children did not show this preference, perhaps suggesting that sensitivity to the information conveyed by the facial expression (within a food-eating context) may develop between 3.5 and 4.5 years of age.

In the first portion of Study 2, we were interested in determining if the results of this study would generalize to adult models. We were particularly interested in determining how the gender of the adult model would influence child participants' choices. Would children continue to choose photographs with models of the same gender as themselves, or would photographs of adult female models be more appealing to participants of both genders as we had hypothesized? In addition, in the second portion of Study 2, we examined whether participants would preferentially choose photographs of child models over adult models, or vice versa. As noted earlier, we had two competing hypotheses for this part of the study: whereas previous research suggests that child models may be more influential (Hendy & Raudenbush, 2000), it is also possible that children could view adults as more reliable informants (Taylor, Cartwright, & Bowden, 1991).

Study 2

Method

Participants—Participants included 40 preschoolers (mean age = 4.39, range = 3.17 to 6.19 years, *SD*=0.78; 20 girls and 20 boys) recruited using the same procedure as was used in Study 1. This sample included 13 children identified as Black, 21 children identified as White, 4 children identified as biracial, and 2 children identified as Hispanic. Mothers' highest level of education obtained was: some high school (*N*=1), graduated high school (*N*=11), some college (*N*=23), four-year college degree (*N*=3), and more than a college degree (*N*=2). Mothers were compensated with $10.

Materials—Children were each shown ten sets of four photographs each. In this study, the photographs differed from one another on three dimensions: gender, the model's expression (acceptance/rejection of food), and the age of the model (adult/child). Within five sets of photographs, gender and facial expression were crossed, as in Study 1. However, in contrast

to Study 1, which used child models, these sets used adult models. Within the other five sets, gender was crossed with model age (adult/child). Within these sets, all of the models' expressions reflected food acceptance. The order of presentation of the sets and the spatial arrangement of how the four photographs were presented were randomized.

Children were shown photographs of models matched to their own race (as reported by their mothers). Biracial children were shown photographs of models of the same race as the child's mother. As in Study 1, the adult and child models were all photographed wearing a blue dress shirt and without any hats or eyeglasses. The child models ranged in age from 4 to 10 years old (M=6.18, SD=1.84), and the adult models ranged in age from 19 to 76 years old (M=33.49, SD=12.88).

Procedure—Using the same procedure as in Study 1, children were presented with sets of four photographs each and were asked to rank the photographs based on which they thought looked the yummiest and that they wanted to eat for their snack.

Results

As in Study 1, the data were analyzed using GEE. Terms included in the GEE model predicting preference rankings included: model gender (male/female) and model expression (positive/negative). We also tested the interaction of each of these main effects with participant age (as a continuous variable) and with participant gender.

The Influence of Model Expression and Model Gender (Using Adult Models)—Participants ranked the photographs showing an adult model with a positive expression significantly higher than the photographs of an adult model showing a negative expression (2.07 (SE 0.05) versus 2.92 (SE 0.05), respectively, $p < .001$). Children did not rank photographs of adult models of the same gender as themselves differently from adult models of the other gender (2.43 (SE 0.05) for same-gendered adult model vs. 2.57 (SE 0.05) for other-gendered adult models, *n.s.*). Children did not rank photographs of female adult models differently from male adult models (2.45 (SE 0.05) vs. 2.55 (SE 0.05), respectively, *n.s.*). There were no interactive effects of model expression and the model gender being the same as or different from the child participant, and there were no interactive effects of model expression and model gender. In addition, these patterns did not differ based on whether the participant was a boy or a girl.

Participant age significantly modified the effect of model expression on the participants' rankings ($p < .01$ for the interaction term of age (continuous) and model expression). Although both age groups ranked models with positive expressions more highly than those with negative expressions, this effect was greater for older than younger participants. Specifically, for the younger children (N=20, mean age 3.74): positive expression = 2.22 (SE 0.07), negative expression = 2.78 (SE 0.07), $p < .001$; whereas for the older children (N=20, mean 5.03): positive expression = 1.93 (SE 0.06), negative expression = 3.07 (SE 0.06), $p < .001$). Participant age did not modify the effect of model gender on ranking, nor did it modify the effect of whether the model was the same gender as the child.

Finally, as before, we tested whether response patterns differed for the first 5 photo sets presented as compared to the last 5 photo sets presented. There was no evidence of this in any of the analyses presented above.

The Influence of Adult versus Child Models and Model Gender—Participants ranked the photographs showing a child model significantly higher than the photographs showing an adult model (2.21 (SE 0.05) versus 2.79 (SE 0.05), respectively, $p < .001$). Children ranked models of the same gender as themselves higher than models of the other

gender (2.34 (SE 0.05) for same-gendered models vs. 2.67 (SE 0.05) for other-gendered models, $p < .01$). Children did not rank female models differently from male models (2.45 (SE 0.06) versus 2.55 (SE 0.06) for male models, respectively). There were no interactive effects of model age (child/adult) and model gender, or of model age (child/adult) and whether the model was of the same or different gender from the child. There were no interactive effects of participant gender with model age (child/adult), and participant age did not significantly modify the effect of model age, model gender, or whether the child was the same or different gender from the model.

Finally, as previously, we tested whether response patterns differed for the first 5 photo sets presented as compared to the last 5 photo sets presented, to determine if there was evidence of participant fatigue. There was no evidence of this in the results.

Discussion

In contrast to the results from Study 1, in the first portion of Study 2, using photographs of adult models generally reduced participants' use of model gender as a factor for choosing the snack they would want to have. Models with positive expressions were still preferred, this time across both younger and older participants. However the participants in this study were slightly older than in Study 1 and this effect was stronger in the older participants (suggesting again that sensitivity to expression within this context is increasing with age).

In the second portion of Study 2, participants chose photographs of child models over those of adult models, providing support for the greater impact of peer modeling over adult modeling. With regard to gender, in this portion of the study children showed a preference for both child and adult models who were the same gender as themselves. These results provide an interesting contrast with the first part of Study 2.

Taken together, the results of Studies 1 and 2 suggest that children treat models that are most similar to themselves (in both age and gender) as more reliable sources for determining which food they will find most palatable. In Study 3, we explored model race as another potential characteristic that, based on similarity between the model and themselves, participants might use as a cue for determining which food they prefer. In Study 1, we did not find any differences in participants' responses to the photograph sets with Black children versus those with White children. However, in Study 3, we examined race more directly by asking participants to choose photographs from sets that included both Black and White individuals. In addition, Studies 1 and 2 found expression to be an important factor within each age group (child and adult, respectively); in Study 3 we directly examined the relative influence of model age and model expression.

Study 3

Method

Participants—Participants included 40 preschoolers (mean age = 4.70, range = 3.33 to 6.08 years, *SD*=0.74; 21 girls and 19 boys) recruited using the same procedure as was used in Study 1. The sample included 20 children identified as Black or Multiracial and 20 children identified as White. Mothers' highest level of education obtained was: some high school (*N*=5), graduated high school (*N*=7), some college (*N*=17), four-year college degree (*N*=4), and more than college (*N*=1). Mothers were compensated with $10 for their and their child's participation.

Materials—Children were each shown 9 sets of four photographs each. In this study, the photographs differed from one another on three dimensions: race (Black/White), age (adult/child), and expression (acceptance/rejection of food). Race and expression were crossed

within 3 sets of photographs; only child models were shown within these photographs. Race and model age were crossed within 3 sets of photographs; only models matched to the gender of the child were shown in these photographs (see Figure 2 for an example). Finally, model age and expression were crossed within 3 sets of photographs; only models matched with the race and gender of the child were shown in these photographs. The order of presentation of the sets and the spatial arrangement of the four photographs in a set were randomized.

As in Studies 1 and 2, the adult and child models were all photographed wearing a blue dress shirt and without any hats or eyeglasses. The child models ranged in age from 3 to 10 years old (M=6.04, SD=1.68) and the adult models ranged in age from 21 to 76 years old (M=35.48, SD=12.92).

Procedure—Using the same procedure as in Studies 1 and 2, children were presented with sets of four photographs and were asked to rank the photographs based on which one they thought looked the yummiest and that they wanted to eat for their snack.

Results

As in Studies 1 and 2, the data were analyzed using GEE. Terms included in the GEE model predicting preference rankings included model expression and model race, model age and model race, and model age and model expression. We also tested the interaction of each of these main effects with participant age (as a continuous variable), participant gender, and participant race.

The Influence of Model Expression and Model Race—Participants ranked the child model with a positive expression significantly higher than the child model showing a negative expression (2.12 (SE 0.07) vs. 2.88 (SE 0.07), respectively, $p < .001$). Children did not rank White child models differently from Black child models (2.51 (SE 0.07) vs. 2.49 (SE 0.07), respectively). Children did not rank child models of the same race as themselves differently from child models of a different race than themselves (2.45 (SE 0.07) versus 2.55 (SE 0.07), respectively). There were no interactive effects of model expression and the model race being the same or different than the child participant, and there were no interactive effects of model expression and model race. There were also no interactive effects of participant age, participant gender, or participant race.

Finally, we tested whether response patterns differed for the first 4 photo sets presented as compared to the last 5 photo sets presented. There was no order effect for whether the child participant was of the same or different race from the child model or for the model expression. However, there was an order effect of the model child's race on ranking ($p < .01$ for the interaction). Specifically, White child models were preferred more in the earlier trials and Black child models were preferred more in the later trials (2.70 (SE 0.11) for black child models presented in the first 4 photo sets, 2.31 (SE 0.09) for black child models presented in the last 5 photo sets, 2.30 (SE 0.11) for white child models presented in the first 4 photo sets, 2.68 (SE 0.08) for white child models presented in the last 5 photo sets).

The Influence of Adult versus Child Models and Model Race—Participants ranked the child models as more preferred than the adult models (2.23 (SE 0.06) vs. 2.77 (SE 0.06), respectively, $p < .001$). Children ranked White models as more preferred than Black models (2.38 (SE 0.06) vs. 2.62 (SE 0.06), respectively, $p < .05$). Children did not rank models of the same race as themselves differently from models of a different race than themselves (2.42 (SE 0.06) for models of same race vs. 2.58 (SE 0.06) for models of different race, *n.s.*). There were no interactive effects of model age and the model race being the same or

different than the child participant, and there were no interactive effects of model age and model race.

Participant age did not significantly modify the effect of model age on the participants' rankings. Child participant age, did, however, modify the effect of model race on ranking ($p < .05$ for interaction of child participant age (continuous) and model race). Specifically, among the younger participants ($N = 20$, mean age 4.01), Black models were significantly less preferred than White models (2.69 (SE .08) vs. 2.30 (SE 0.08), respectively, $p < .01$). Among the older participants ($N = 20$, mean age 5.17), in contrast, there was no effect of model race on preference ranking (2.56 (SE .08) for black models vs. 2.43 (SE .08) for white models, *n.s.*). We further examined this result by testing the 3-way interaction of model race, child participant age, and child participant sex, which was significant, $p < .05$. We found that among younger child participants, the effect of model race on ranking differed significantly based on the participants' gender ($p < .0001$). Specifically, the effect of model race on ranking was stronger in girls than boys (2.92 (SE .09) for girl participants with black model vs. 2.08 (SE .09) for girl participants with white model; 2.48 (SE .05) for boy participants with black model vs. 2.52 (SE .05) for boy participants with white model). In contrast, among older child participants, the effect of model race on ranking was not modified by child participant sex. Participant age did not alter the effect of whether the participant child was the same race as the model on ranking.

Finally, we tested whether response patterns differed for the first 4 photo sets presented as compared to the last 5 photo sets presented. There was no order effect for whether the child participant was of the same or different race from the model, no order effect for the effect of the model child's race on ranking, and no order effect for model age.

The Influence of Adult versus Child Models and Model Expression—Participants ranked the photographs of child models as more preferred than the photographs of adult models (2.29 (SE 0.07) versus 2.79 (SE 0.07), respectively, $p < .05$). Children ranked photographs of models with a positive expression as more preferred than models with a negative expression (2.09 (SE 0.06) versus 2.91 (SE 0.06), respectively, $p < .001$). There was an interaction of participant gender and model expression ($p < .05$), such that the effect of the positive expression was stronger among boy participants than among girl participants (for boys: models with positive expressions = 1.96 SE .09 versus negative expressions = 3.04 SE .09; for girls: models with positive expressions = 2.21 SE .06 versus negative expressions = 2.79 SE .06). There were no interactive effects of model age and model expression.

Participant age did not significantly modify the effect of model age on the child's ranking, overall. However, there was a significant model age by participant age by participant gender interaction ($p < .05$). Among the younger children, the effect of model age was marginally modified by participant gender ($p = .05$ for the interaction), such that girl participants did not rank child models any differently than adult models (2.50 SE .22 versus 2.50 SE .22), but boy participants ranked child models as much more preferred than adult models (2.02 SE .11 versus 2.98 SE .11, respectively). In the older children, the effect of model age was not modified by participant gender.

Participant age also modified the effect of model expression on ranking ($p < .01$ for interaction of child participant age (continuous) and model expression). Although both age groups ranked models with positive expressions more highly than models with negative expressions, this effect was greater for older than younger participants (for the younger children: positive expression = 2.26 (SE 0.14) whereas negative expression = 2.73 (SE

0.14); for the older children, positive expression = 1.96 (SE 0.06) whereas negative expression = 3.03 (SE 0.06)), $p < .001$. This effect did not differ based on participant gender.

Finally, we tested whether response patterns differed for the first 4 photo sets presented as compared to the last 5 photo sets presented. There was no evidence of this in any of the analyses presented above.

Discussion

Across the three portions of Study 3, consistent with results from the previous two studies, participants preferred child models over adult models and models with positive expressions over models with negative expressions. Again, in one portion of this study, we found evidence of the preference for positive expressions increasing with age.

In contrast to our expectation that participants might choose models of the same race as themselves (demonstrating a preference for models with the greatest similarity to self), participants did not demonstrate any self-race preferences. In one portion of this study, young female participants demonstrated a preference for selecting White models; in another portion, participants showed an increasing preference for photographs of Black models across the trials. However, these results did not represent a consistent, interpretable pattern.

General Discussion

The present studies suggest that children consider specific characteristics of food-eating models when judging which foods are the most appealing. Preschool-aged children generally chose foods being eaten by models with positive over negative expressions, foods being eaten by child over adult models, and foods being eaten by child models of the same gender as themselves over models of the other gender.

Our strongest result across all three studies was children's preferences for both peer and adult models displaying positive expressions. Although this result is not surprising, children's sensitivity is nonetheless striking, given the sparse nature of the facial expression cues (presented in a single, still photo). Our results also suggest that these preferences may be developing and becoming stronger during the preschool years. One open question is whether these results represent participants' immediate emotional reactions or more reasoned calculations regarding the available evidence and its reliability. Infants as young as 12 months of age can use adults' emotional reactions to guide their own affective responses and the amount of time they spend examining a novel toy (Moses, Baldwin, Rosicky, & Tidball, 2001). This suggests a developmentally early-emerging ability to attend to and use the affective responses of others when guiding one's response to novel objects. During the preschool years, children may be learning to use this source of information specifically with regard to food. However, it will be important to further explore this finding in future research using a more naturalistic or information-rich context. Specifically, the findings may have differed if the children had been observing actual models with changing facial expressions and other behaviors indicting the model's response to the food, as opposed to only photographs. Such work would help to determine whether young children are still in the process of learning to use affective responses, or instead not yet skilled in extracting relevant cues from impoverished stimuli.

We proposed two competing possibilities for how participants might use the age of a model to guide their food preferences, with participants viewing either adults as more expert than peers or peers as more compelling than adults. In this study, children consistently chose foods being eaten by peer models over those being eaten by adult models. This could suggest that children are simply choosing the models that are most similar to themselves.

Alternatively, children may judge adults to be particularly unreliable models when determining which foods they will like. Given the possibility of age differences in food preferences (foods that appeal to adults, such as caviar, may differ from foods that appeal to children, such as sugary cereals), adults may not always be the best source of information when children are aiming to choose the most palatable food. Children may be aware of adult attempts to encourage them to eat foods that are healthier than other more appealing (and less healthy) alternatives (Nguyen & McCullough, 2009) and may therefore be more skeptical of adults' modeled reactions to novel foods compared to peers who do not have this additional motive. The findings are consistent with those of VanderBorght and Jaswal (2009), in that although adults may be perceived as more knowledgeable about nutrition content, they are not necessarily perceived as more knowledgeable about which foods are palatable. This remains an interesting area for future research, especially in light of the practical implications for encouraging healthy eating.

Our finding that children prefer peer-age models over adult models also raises a potential question for future research. In this study, the photographs we used were of children who were slightly older than the participants in our study, which may have contributed to their appeal; photographs of younger peers might be less effective (Brody & Stoneman, 1981). If younger peers are less effective models, older peers are the most effective models, and adults are less effective than older peers, it remains an open question as to at what age the efficacy of the peer model starts to wane. Would adolescent-age models be more or less effective than adult models? Future research could investigate this issue by using photographs of models of a variety of ages.

With regard to children's attention to social categories, there are several possible interpretations of our results. Children preferred peer models of the same gender as themselves, whereas gender was not as relevant a factor for children when choosing between adult models. It is interesting that children make use of model gender in guiding selection of palatable foods, when, to the best of our knowledge, food preferences do not differ by gender in children of this age. However, this result could reflect general principles of social categorization (Martin & Halverson, 1981), where children may try to be like others of the same gender. Their preferences in this study could reflect the same sort of preferences seen in studies by Ruble and colleagues who have found that children assume that if a boy is playing with a toy, then it is generally “for boys” (e.g., Ruble, Balaban, & Cooper, 1981). However, it should be noted that prior to the acquisition of gender constancy (usually around 5 to 7 years of age, slightly older than the participants in this study), children often rely on labels rather than models when selecting gender-appropriate activities (Ruble et al., 1981), and the gender of the models or the gender-appropriateness of the foods in the photographs used in this study were not explicitly labeled for child participants.

Contrary to our predictions, participants did not pick photographs of models of the same race as themselves. These results did not fit with our predictions based on the appeal of models judged to be most similar to the self (and therefore potentially more likely to share one's preferences). One possibility is that race may be a less self-relevant model characteristic within the food domain. If a model's race conveys no consistent information about whether a food is likely to appeal to the observer, then there is no benefit in selectively choosing foods eaten by those of the same race as the observer.

Interestingly, other research outside of the food domain has also found a similar pattern of results with regard to children's use of social category information, in that preschoolers use gender and age information, but not race, to guide their preferences for novel objects or reasoning about category membership (Shutts et al., 2010; Rhodes & Gelman, 2009). To explain these findings, researchers have adopted an evolutionary perspective, drawing upon

work by Cosmides, Tooby, and Kurzban (2003) suggesting that the cognitive constraints that adults use to reason about race are not specifically evolved for that purpose, but are instead a byproduct of systems evolved for other functions. From this perspective, our results could be seen as reflecting more domain-general factors affecting children's awareness of social categories and the ways in which the social category membership of models might influence children's preferences. Future research looking at these preferences developmentally, with older children and in conjunction with other measures of gender and race awareness, could provide insight into this issue. It is also possible that the nationality or culture of a model may more powerfully modify the effect of that model on child's food choices, as compared to race. Future research might examine this possibility.

Finally, our results have important practical implications for efforts to shape children's eating behavior. Interventions aimed to encourage children to eat target foods would benefit from using models of similar age and gender, showing an enthusiastic positive response to the target food, to overcome children's initial neophobia. Future research might also investigate how characteristics of a food-eating model might affect not only children's willingness to try a new food, but also shifts in preference for a food once it has already been tasted.

Acknowledgments

This research was supported by R21HD053164-01 from the National Institutes of Health to Dr. Lumeng. We are grateful to the parents, teachers, and children at the Jackson Community Action Agency Head Start, for participating in this research.

References

Aboud FE. The formation of in-group favoritism and out-group prejudice in young children: Are they distinct attitudes? Developmental Psychology. 2003; 39:48–60. [PubMed: 12518808]

Addessi E, Galloway AT, Visalberghi E, Birch LL. Specific social influences on the acceptance of novel foods in 2–5 year-old children. Appetite. 2005; 45:264–271. [PubMed: 16239048]

Aldridge V, Dovey TM, Halford JC. The role of familiarity in dietary development. Developmental Review. 2009; 29:32–44.

Bandura, A. Social learning theory. General Learning Press; 1977.

Birch LL. Effects of peer models' food choices and eating behaviors on preschoolers' food preferences. Child Development. 1980; 51:489–496.

Birch LL, Fisher JO. Development of eating behaviors among children and adolescents. Pediatrics. 1998; 101:539–549. [PubMed: 12224660]

Brody GH, Stoneman Z. Selective imitation of same-age, older, and younger peer models. Child Development. 1981; 52:717–720.

Cashdan E. A sensitive period for learning about food. Human Nature. 1994; 5:279–291.

Cashdan E. Adaptiveness of food learning and food aversions in children. Social Science Information. 1998; 37:613–632.

Cosmides L, Tooby J, Kurzban R. Perceptions of race. Trends in Cognitive Sciences. 2003; 7:173–179. [PubMed: 12691766]

Duncker K. Experimental modification of children's food preferences through social suggestion. Journal of Abnormal and Social Psychology. 1938; 33:489–507.

Dovey TM, Staples PA, Gibson EL, Halford JC. Food neophobia and 'picky/fussy' eating in children: A review. Appetite. 2008; 50:181–193. [PubMed: 17997196]

Fawcett C, Markson L. Children reason about shared preferences. Developmental Psychology. 2010; 46:299–309. [PubMed: 20210491]

Fawcett C, Markson L. Similarity predicts liking in 3-year-old children. Journal of Experimental Child Psychology. 2010; 105:345–358. [PubMed: 20092828]

Feese M, Franklin F, Murdock M, Harrington K, Brown-Binns M, Nicklas T, et al. Prevalence of obesity in children in Alabama and Texas participating in social programs. Journal of the American Medical Association. 2003; 289:1780–1781. [PubMed: 12684354]

Heyes, CM.; Galef, BG, Jr.. Social learning in animals: The roots of culture. Academic Press; New York: 1996.

Harper LV, Sanders KM. The effect of adults' eating on young children's acceptance of unfamiliar foods. Journal of Experimental Child Psychology. 1975; 20:206–214.

Hedley AA, Ogden CL, Johnson CL, Carroll MD, Curtin LR, Flegal KM. Prevalence of overweight and obesity among US children, adolescents, and adults, 1999–2002. Journal of the American Medical Association. 2004; 291:2847–2850. [PubMed: 15199035]

Hendy HM. Effectiveness of trained peer models to encourage food acceptance in preschool children. Appetite. 2002; 39:217–225. [PubMed: 12495695]

Hendy HM, Raudenbush B. Effectiveness of teacher modeling to encourage food acceptance in preschool children. Appetite. 2000; 34:61–76. [PubMed: 10744893]

Jaswal VK, Neely LA. Adults don't always know best: Preschoolers use past reliability over age when learning new words. Psychological Science. 2006; 17:757–758. [PubMed: 16984291]

Kinzler KD, Shutts K, Correll J. Priorities in social categories. European Journal of Social Psychology: Special Issue: Children's Intergroup Attitudes. 2010; 40:581–592.

Liang K-Y, Zeger SL. Longitudinal data analysis using generalized linear models. Biometrika. 1986; 73:13–22.

Lumeng JC, Cardinal TM, Jankowski M, Kaciroti N, Gelman SA. Children's use of adult testimony to guide food selection. Appetite. 2008; 51:302–310. [PubMed: 18455263]

Lutz DR, Keil FC. Early understanding of the division of cognitive labor. Child Development. 2002; 73:1073–1084. [PubMed: 12146734]

Martin CL, Halverson CF. A schematic processing model of sex typing and stereotyping in children. Child Development. 1981; 52:1119–1134.

McIntosh WA, Zey M. Women as gatekeepers of food consumption: A sociological critique. Food and Foodways. 1989; 34:317–332.

Moses LJ, Baldwin DA, Rosicky JG, Tidball G. Evidence for referential understanding in the emotions domain as twelve and eighteen months. Child Development. 2001; 72:718–735. [PubMed: 11405578]

Mumme D, Fernald A. The infant as onlooker: Learning from emotional reactions observed in a televised scenario. Child Development. 2003; 74:221–237. [PubMed: 12625447]

Nguyen, SP.; McCullough, MB. Evaluative categorization of food in children and adults. In: Ellsworth, SJ.; Schuster, RC., editors. Appetite and Nutritional Assessment. Nova Science Publishers; New York: 2009. p. 175-187.

Quintana SM. Children's developmental understanding of ethnicity and race. Applied & Preventative Psychology. 1998; 7:27–45.

Rhodes M, Gelman SA. A developmental examination of the conceptual structure of animal, artifact, and human social categories across two cultural contexts. Cognitive Psychology. 2009; 59:244–274. [PubMed: 19524886]

Rousset S, Schlich P, Chatonnier A, Barthomeuf L, Droit-Volet S. Is the desire to eat familiar and unfamiliar meat products influenced by the emotions expressed on eaters' faces? Appetite. 2007; 50:110–119. [PubMed: 17655970]

Rozin, P.; Haidt, J.; McCauley, CR. Disgust. In: Lewis, M.; Haviland-Jones, JM.; Barrett, LF., editors. Handbook of emotions. 3rd ed. Guilford Press; New York: 2008. p. 757-776.

Ruble DN, Balaban T, Cooper J. Gender constancy and the effects of sex-typed televised toy commercials. Child Development. 1981; 52:667–673. [PubMed: 7249827]

Shutts K, Banaji MR, Spelke ES. Social categories guide young children's preferences for novel objects. Developmental Science. 2010; 13:599–610. [PubMed: 20590724]

Taylor MG. The development of children's beliefs about social and biological aspects of gender differences. Child Development. 1996; 67:1555–1571. [PubMed: 8890500]

Taylor M, Cartwright BS, Bowden T. Perspective taking and theory of mind: Do children predict interpretive diversity as a function of differences in observers' knowledge? Child Development. 1991; 62:1334–1351. [PubMed: 1786719]

Vaish A, Grossman T, Woodward A. Not all emotions are created equal: The negativity bias in social-emotional development. Psychological Bulletin. 2008; 134:383–403. [PubMed: 18444702]

VanderBorght M, Jaswal VK. Who knows best? Preschoolers sometimes prefer child informants over adult informants. Infant and Child Development. 2009; 18:61–71. [PubMed: 20047013]

Zeger SL, Liang K-Y. Longitudinal data analysis for discrete and continuous outcomes. Biometrics. 1986; 42:121–130. [PubMed: 3719049]

Zeinstra GG, Koelen MA, Colindres D, Kok FJ, de Graaf C. Facial expressions in school-aged children are a good indicator of `dislikes', but not of `likes.”'. Food Quality and Preference. 2009; 20:620–624.

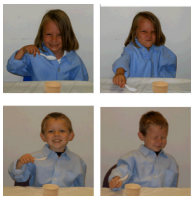

Figure 1.
Example for photographs used in Study 1

Figure 2.
Example for photographs used in Study 3