

If it's Useful and You Know it, Do You Eat? Preschoolers Refrain from Instrumental Food

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Marketers, educators, and caregivers often refer to instrumental benefits to convince preschoolers to eat (e.g., “this food will make you strong”). We propose that preschoolers infer that if food is instrumental to achieve a goal, it is less tasty, and therefore they consume less of it. Accordingly, we find that preschoolers (3-5.5 years old) rated crackers as less tasty and consumed fewer of them when the crackers were presented as instrumental to achieve a health goal (studies 1-2). In addition, preschoolers consumed fewer carrots and crackers when these were presented as instrumental to knowing how to read (study 3) and count (studies 4-5). This research supports an inference account for the negative impact of certain persuasive messages on consumption: preschoolers who are exposed to one association (e.g., between eating carrots and intellectual performance) infer another association (e.g., between carrots and taste) must be weaker.

If you told a three year old she should try a certain dish because it will make her smart, would she conclude it must not taste very good? If you told her a certain food will make her strong, would she conclude it is less tasty? In this research we ask what children, as young as three years old, learn from persuasive messages about food, and how these messages affect their consumption and enjoyment of food.

We propose that young children infer from messages on food instrumentality that if a certain food is good for one goal, it cannot be a good means to achieve another goal. As such, if food is presented as making them strong, or as instrumental to a non-health goal such as knowing how to read, these children will conclude the food is not as tasty, and will therefore consume less of it, compared to when the food is presented as tasty or with no accompanying message.

We test these predictions among children three to five years old, because they are at the beginning of learning about food-related persuasion attempts in person and through the media (Desrochers and Holt 2007; Powell, Szczypka, and Chaloupka 2007). As such, understanding information processing among these young children and how these messages affect their behavior is important. We focus on the food domain using different food items (crackers and carrots) and different messages (health- and academic-related, such as associating eating carrots with knowing how to count). By testing young children and using messages about academic, non-health goals, we are able to go beyond a potential explanation based on learned associations. This explanation suggests that children learn through experience that food presented as healthy is less tasty, and thus consume less of it. By contrast, we propose that no prior experience or learning is necessary for children to infer that if food serves an external goal, it is less tasty.

Given our societal objective to promote healthy eating among young children, understanding how persuasion messages affect learning and consumption has important policy

implications. Ultimately, we find that simply serving the food, without any message about the goal eating it might serve, maximizes consumption of healthy (e.g., carrots) or neutral (e.g., crackers) food items. Next, we review the literature on information processing and motivation related to our basic premise, and present five studies that tested this premise.

THEORETICAL BACKGROUND

Children are frequently exposed to and influenced by persuasion attempts through food advertising (Batada and Wootan 2007; Borzekowski and Robinson 2001; Cairns, Angus, and Hastings 2009; Jeffrey, McLellarn, and Fox 1982; Moore and Rideout 2007; Roberto et al. 2010; Robinson et al. 2001), and these advertisements can have long term effects (Connel, Brucks, and Nielsen 2014). To understand how food messages affect children's consumption decisions, we rely on the distinction between instrumental and experiential benefits of activities. Specifically, the actions in which consumers engage offer various types of benefits. Some are more experiential, and hence the benefit is an immediate part of pursuing the activity, and some are more instrumental and offer benefits only after the action is completed. Experiential benefits are an integral part of the activity itself and are realized at the time of pursuing the activity, such as relaxing while reading a good book. In this case, the experience, reading the book, forms its end; hence the activity is intrinsically motivated. Instrumental benefits, on the other hand, are realized only after the action is completed and are associated with the goal the action represents, such as appearing up to date after reading a bestseller. In this case, the activity, reading the book, is instrumental for achieving the end and is considered extrinsically motivated (Choi and Fishbach 2011; Csikszentmihalyi 2000; Deci and Ryan 1985; Harackiewicz and Sansone 1991; Higgins

and Trope 1990; Lepper 1981). For activities that offer both experiential and instrumental benefits, research has documented reduced enjoyment (i.e., experiential benefits) when adult individuals focus on the activity's instrumentality (Fishbach and Choi 2012). That is, individuals infer that an activity that offers instrumental benefits is less enjoyable.

This type of inference is consistent with the general principle of causal discounting, according to which the presence of one causal factor casts doubt on another causal factor (Einhorn and Hogarth 1986; Kelley 1972). For example, the presence of peer pressure to purchase a certain brand casts doubt on the effect of personal preference on the purchase decision. Research has documented the inference process involved in discounting across various domains (Khemlani and Oppenheimer 2011; McClure 1998; Oppenheimer 2004), using adult participants (Hewstone 1994; Morris and Larrick 1995) and school-age children (Karniol and Ross 1976; Sedlak and Kurtz 1981; Smith 1975). For example, Kasin, Lowe, and Gibbons (1980) showed that kindergarteners judged a triangle pushed by another square to be (directionally) less "motivated" to move forward compared to an "independent" triangle.

Moreover, the inference that an activity that offers instrumental benefits would be less enjoyable is consistent with the principle of outcome discounting, or the "means-goals dilution" (Zhang, Fishbach, and Kruglanski 2007; see also Orehek et al. 2012). This principle suggests that adding goals (i.e., outcomes) casts doubts on the effectiveness of the common cause for each specific goal. Thus people perceive a means that serves more than one goal as less effective in achieving each goal than a means that serves only one goal. For example, exercising is perceived as less effective in achieving either goal when it serves two goals (e.g., building muscles and losing weight) than when it serves just one of these goals (Zhang et al. 2007). This principle

implies that individuals infer that if an action is effective in achieving instrumental benefits, it is less effective in achieving a positive experience.

Research on over-justification documented a potentially similar inference process when children expressed lower motivation for an intrinsically motivated action (e.g., drawing) after they were first offered a reward (e.g., stickers) and then the reward was removed (Deci 1971; Deci and Ryan 1985; Lepper, Greene, and Nisbett 1973; Ross 1976; Wells and Shultz 1980). Specifically, young children may infer that in the presence of the external reward, they have completed the task not because it was enjoyable, but rather because of the reward. Hence, when the reward is removed, they are no longer motivated to complete the task. Importantly, research on intrinsic motivation typically measured motivation after an external reward was introduced and then removed, allowing children to learn about their experience without, with, and then again without the external reward. However, introducing the reward might decrease motivation before it is even removed, in particular, if it is not very enticing.

CHILDREN'S INSTRUMENTAL EATING

Research on causal discounting and means-goal dilution mainly assessed inferences of causality or instrumentality among adults. Although some research on over-justification assessed children's consumption (Cooke et al. 2011; Wardle et al. 2003), it was limited to using external rewards and measuring consumption after these rewards were removed. Building on previous findings, we ask whether instrumental benefits will reduce consumption when they are still in place.

Specifically, we ask whether discounting-like inference processes occur among preschoolers in the food domain and if so, whether these processes can affect actual consumption. That is, would presenting food as instrumental to achieving a certain goal (e.g., being strong, knowing to count) lead children to conclude the food cannot be an effective means to achieve a taste goal (which by default, children assume food should have this goal), and therefore children would consume less of that food?

Eating provides experiential benefits (good taste, satisfying hunger) and instrumental benefits (e.g., being strong). Attending to the instrumental benefits can make the food seem less tasty, by inducing the inference that if food serves one goal (i.e., the instrumental benefit), it serves another goal (e.g., a taste goal) to a lesser extent than if it does not serve the first goal. This inference, in turn, can lead to reduced consumption. Accordingly, we predict that emphasizing the food's instrumental rather than taste benefits, or not emphasizing benefits at all, will shift children's attention from the experience (i.e., enjoying the taste) to the instrumentality (e.g., promoting strength) of eating. Moreover, we predict this shift in attention will decrease enjoyment of the food such that young consumers will rate it as less tasty and will therefore reduce current and planned consumption of the food.

To test whether children indeed engage in such an inference-making process, we need a context in which such new associations can be formed. Therefore, we study young children who have had fewer opportunities to learn existing cultural associations (e.g., between taste and health). We further need a context in which food is presented as instrumental to a goal for which children have no preexisting associations (e.g., eating carrots and knowing how to read), as children may have preexisting associations between healthy food and less tasty food. Indeed, although branding can make food attractive (de Droog, Valkenburg, and Buijzen, 2011;

Wansink, Just, and Payne 2012), “healthy” branding sometimes undermines attractiveness, particularly among older children. For example, Miller et al. (2011) found that when general health claims about a cereal were presented on the package (e.g., “this is good for you”), children 8-12 years old were less likely to choose a healthy cereal over an unhealthy cereal. Wardle and Huon (2000) found that children 9-11 years old liked a drink labeled “new drink” more than a drink labeled “new health drink.” Robinson et al. (2007) found that children 3-5 years old preferred sampled food items that were branded as McDonalds, which they may have perceived as less healthy. The negative effect of health branding found in previous research could be due to preexisting associations between healthy food and less tasty food. In order to test our proposed online-inference explanation we needed to use in our research another context where we can test whether new inferences can be formed and affect consumption.

Accordingly, in our studies, we first test whether making food instrumental in achieving a health goal reduces consumption, and we then use a similar paradigm to test whether novel food-goals associations will reduce consumption. Specifically, we test whether suggesting that eating certain foods will make children know how to read or to count, and hence that eating these foods is instrumental in achieving intellectual goals, reduces consumption compared to when no goal is mentioned or when a taste goal is mentioned. This paradigm allows us to test the inference-making hypothesis in a clean manner: if children, as young as three years old, make online inferences based on discounting, they will conclude that when foods are presented as instrumental, those foods cannot be as tasty, and therefore they will consume less.

By using these novel food-goal associations, we expand prior research that looked at the effect of making food instrumental to receiving a reward (e.g. saying, “finish your dinner and you will get dessert”), a strategy often employed by parents and caregivers. This strategy

generally leads to decreased liking for the food (Birch, Marlin, and Kramer 1982; Birch, Marlin, and Rotter 1984; Lepper et al. 1982; Newman and Taylor 1992). For example, Birch et al. (1982) found that when a reward (e.g., playing) was contingent on consumption of a certain food, kids ranked the food as less preferred. In their study, children lowered their ranking of juice once it was presented as instrumental for doing another activity (e.g., “drink this juice and you get to play”). These studies reflect the strong norm that rewards are given in return for bearing costs, and children infer that food consumption has to be a negative experience if they are compensated for it, the same way they receive rewards for other disliked activities (e.g., “clean your room and then you can watch TV”). Emphasizing instrumental benefits is different from promising rewards. For instance, few food manufacturers would claim their food is best consumed with a reward, because this type of claim undermines the benefits the food has to offer by itself. By contrast, in an attempt to convince children and their caregivers to purchase this food, many would claim it provides instrumental (e.g., health) benefits. Accordingly, we study how presenting food as instrumental for health and intellectual goals influences actual consumption.

Studying the effect of these messages on actual consumption also extends the research on means-goal dilution that mainly measured perceived instrumentality of means (Zhang et al. 2007). Consumption is a measure of high external validity that does not rely on the child’s developing cognitive abilities to rate food items. Further, measuring actual consumption allows us to evaluate the net effect of messages on consumption, beyond perceived instrumentality and liking. Thus, for example, whereas presenting food as improving intellectual abilities can make adult individuals perceive it as less tasty (due to dilution or discounting) and like it less, they may still consume this food for the sake of the intellectual benefits. Given the complexity of adult’s food decision making (Bublitz, Peracchio, and Block 2010) and the fact that adults often

decide what to eat based on psychological or environmental cues rather than hunger (Tomiya, Mann, and Corner 2009; Wansink and Sobel 2007; see also General Discussion), it is not clear how such novel food-goal associations affect adults' consumption. Because preschoolers' consumption is generally driven by taste more than other variables (though other factors, such as branding and social considerations, also play a role, Birch 1981; Shutts, Kinzler, and DeJesus, 2013), we predict that preschoolers will decrease consumption of instrumental food.

THE PRESENT RESEARCH

To test our hypotheses, we collected data from preschoolers at the McGaw YMCA Children's Center, Evanston, Illinois, across five studies and several pretests. In these studies, an experimenter read preschoolers a picture story in individual sessions. The story featured a girl who had some food for snack (crackers or carrots). We used storytelling as the experimental procedure, because listening to a story in the classroom is a routine activity for children in this daycare, and familiarity with the situation is critical for research with children (Peracchio 1990). Depending on the experimental condition, the story either stated or did not state the benefits of the food. Our key dependent variable was preschoolers' consumption of that snack after listening to the story.

The first two studies test whether preschoolers consume less (studies 1 and 2), rate as less tasty (study 2), and are less likely to choose for future consumption (study 1) crackers that were presented as instrumental to being healthy, compared to tasty and neutral frames. Studies 3, 4, and 5 test our prediction using non-health messages. Study 3 tests whether presenting eating baby carrots as instrumental to knowing how to read reduces planned consumption of the carrots,

compared to when the carrots are presented as tasty or with no message. Study 4 tests whether presenting eating the baby carrots as instrumental to knowing how to count reduces actual consumption compared to a neutral frame. Finally, study 5 tests whether the effect of instrumentality framing on reduced consumption generalizes to stories in which the main character engages in instrumental activities after eating (e.g., go to school).

STUDY 1: “MAKES YOU STRONG” FRAME UNDERMINES CONSUMPTION

This study tests our hypothesis that presenting otherwise desirable food as instrumental to achieving health goals decreases present and planned consumption. We conducted several pretests to identify food (1) that children do not usually associate with health arguments, (2) that could be perceived as both healthy and tasty, and (3) for which we could accurately measure consumption. An initial pretest with parents revealed that children are frequently exposed to health-based persuasion attempts to eat more vegetables. Specifically, 75% of the 89 parents of children in the relevant age group we surveyed said the one item they often try to convince their children to eat by saying it is healthy is vegetables (e.g., corn, spinach, carrots, and cauliflower). The remaining 25% wrote other items (e.g., fruits, dairy, meat, $X^2(1) = 22, p < .001$). We therefore chose to use a neutral product, Wheat Thins crackers. An additional pretest with eight mothers of children in the relevant age group confirmed these moms thought their children would *like* the Wheat Thins crackers ($M = 5.78, SD = 1.2, t(8) = 4.44, p < .01$) and would think these crackers were *healthy* ($M = 5.13, SD = 0.83, t(8) = 3.81, p < .01$) and *tasty* ($M = 5.78, SD = 0.97, t(8) = 5.48, p < .01$). Significance tests are based on a one-sample t-test against the midpoint, 4, on a 7-point scale (1 = *not at all*, 7 = *very much*).

Preschoolers in our main study consumed the Wheat Thins crackers after receiving a message presenting the crackers as instrumental to achieving a health goal, or as tasty, or with no message (manipulated between subjects). We operationalized the health goal as “being strong and energetic” based on a pretest with 56 children (age range: 4-5 years, 47% female), in which we asked what they thought and knew about healthy eating. Fifty-four percent indicated eating healthy means “being strong”/“good for you”/“makes you grow”/“gives energy,” 24% indicated it means eating vegetables (with some overlap with the first category, such that some children indicated healthy eating means “getting strong” and “eating vegetables”), 17% gave various answers (e.g., “don’t eat dessert”), and 12% did not give an answer or said they did not know. Because the most frequent interpretation of healthy is being strong and energetic, we used this meaning as our operationalization of healthy. The message about the crackers was embedded in a story the experimenter read to the children. We predicted the health message would decrease present and planned consumption compared with the taste and control messages.

Method

Sixty-six children (age range: 4.5-5.5 years, 63% female) completed the experiment in one of three message conditions: healthy versus yummy versus control, manipulated between subjects. Each participant completed the study individually. In the healthy and yummy conditions the experimenter read the children a story about Tara, who ate Wheat Thins crackers before going to play (see table 1; see example in figure 1). Depending on the condition, a different message was presented. In particular, in the healthy condition, the story presented the crackers as instrumental to being strong (the story read, “Tara felt strong and healthy, and she

had all the energy...”), as did the experimenter, who pointed to her own arm muscles when reading that sentence. To verify the child understood the story, the experimenter asked after reading it, “Did you know that Wheat Thins crackers are good for your health?”

Insert table 1 and figure 1 about here

In the yummy condition, the story emphasized the crackers’ taste benefits (“Tara thought the crackers were yummy, and she was happy...”), as did the experimenter, who pointed to her own stomach when reading that sentence. As in the healthy condition, the experimenter asked after reading the story, “Did you know that Wheat Thins crackers are yummy?” Both appeals (healthy and yummy) were emotionally equivalent and presented similar pictures of a smiling girl. The control condition did not use any story.

In all conditions, the experimenter then invited the child to eat Wheat Thins crackers. To minimize interaction between the experimenter and the child during eating, the experimenter invited the child to move to another table labeled as the “eating station,” where a bowl with 15 crackers sat. The number of crackers the child ate served as our dependent variable to measure consumption.

When the children finished eating, they moved back to the main experiment table and chose between a bag of Wheat Thins crackers and a bag of Ritz crackers to take home. The choice of crackers served as our dependent variable to measure planned consumption. Here and in all studies below, the experimenter then thanked participants, gave them a small thank-you gift, and had them return to class activities.

Results and Discussion

Seven children, roughly equally distributed across conditions, did not want to eat at all (e.g., one had an upset stomach, another wanted to leave), and two children (from the yummy condition) were highly distracted, resulting in a valid sample of 57 children. Including everyone in the analysis does not significantly affect the results.

Consumption: As predicted, children in the healthy condition ate fewer crackers than children in the yummy and control conditions ($M_{\text{healthy}} = 3.1, SD = 3.25; M_{\text{yummy}} = 7.2, SD = 6.13; M_{\text{control}} = 9.07, SD = 5.6, F(2, 54) = 6.94, p < .01$; see table 2 for a summary of all results). Planned contrasts revealed a significant difference between the healthy and control conditions ($t(54) = 3.7, p < .005$) and between the healthy and yummy conditions ($t(54) = 2.67, p = .012$), but not between the yummy and control conditions ($t < 1$). This finding supports our hypothesis that health messages reduce consumption among young children.

Insert table 2 about here

Choice: We find a marginal effect of the message manipulation on choice between the Wheat Thins and Ritz crackers ($X^2(2) = 4.63, p = .09$). Consistent with our prediction, children in the healthy condition planned to consume the Wheat Thins crackers less than those in the yummy condition, because they were less likely to choose them over the Ritz crackers ($M_{\text{healthy}} = 32\%$ vs. $M_{\text{yummy}} = 65\%, X^2(1) = 4.62, p = .032$). Children in the control condition were in the middle (46%) and not significantly different from those in the yummy and healthy conditions. Current consumption was positively correlated with planned consumption ($r(57) = .42, p < .005$). Although the choice results mirror the difference in consumption between the healthy and yummy conditions, we do not replicate the difference between the healthy and control conditions, possibly due to the fact that the choice variable is a binary, weaker variable.

Post measures: To tease apart the online-inference and the learned-associations accounts, we approached 35 of those who originally participated in the healthy and yummy conditions approximately two weeks after they had completed the above procedure (the remaining seven children were not in the classroom when we conducted the second session). These children then completed the control-condition procedure (i.e., eating crackers and post-eating choice). As a recall measure, the experimenter asked participants at the end of the session, “A few weeks ago I read you a story about Tara and these crackers. Do you remember what Tara thought about these crackers?” and recorded the open-ended responses. As in the first part, the experimenter then thanked the children and gave them a small thank-you gift and the crackers they chose.

If learned associations cause the effect of health messages, we should still find an effect after a delay, because children in the health-frame condition have already learned the crackers are healthy. By contrast, if children make online inferences about the food items, we should not find an effect of the health message after the two-week delay, because the message is no longer at their focus of attention. Supporting our prediction, we found an interaction between the message and time of measurement ($F(1,33) = 8.27, p < .01$). Whereas at t_1 , participants in the healthy condition consumed less than those in the yummy condition, at t_2 , we found no differences in consumption between participants who originally were in the healthy and yummy conditions ($M_{\text{healthy}} = 7.31$ vs. $M_{\text{yummy}} = 7.86; t < 1$). Moreover, children who originally were in the healthy condition increased their consumption from t_1 , that is, immediately after the appeal ($M = 3.18$; based on the sub-sample who completed also the second measurement) to t_2 , that is, approximately two weeks after the appeal ($M = 7.31; t(16) = 3.95, p < .005$), whereas consumption of those originally in the yummy condition did not change ($t < 1$). Similarly, whereas at t_1 , participants in the healthy condition were less likely than those in the yummy

condition to choose the Wheat Thins crackers over the Ritz crackers, at t_2 , we found no difference in choice between participants who originally were in the healthy and yummy conditions ($M_{\text{healthy}} = 53\%$ vs. $M_{\text{yummy}} = 66\%$, $X^2(1) < 1$). Finally, we found no differences in consumption between children who remembered the message correctly (53% of those originally in the healthy condition and 47% in the yummy condition) and those who did not ($ps > .28$).

Taken together, these results suggest health information reduces current and planned consumption among children only when such information is salient at the time of consumption (i.e., at t_1 , when children consumed the crackers immediately after hearing the story). When the health information is not salient, even if the child can retrieve it, it does not affect consumption; thus attention to healthfulness, rather than knowledge about it, causes the effect. This finding is consistent with an online-inference account, whereby the instrumentality of the food needs to be emphasized at the time of consumption and is not consistent with a learned-association account, according to which mere knowledge about the health benefits would reduce consumption.

To summarize, the results of our first study confirm our hypothesis that presenting food as instrumental to achieving a health goal (i.e., being strong) decreases preschoolers' tendency to consume it, leading to decreased current and planned consumption. After a two-week delay, we find no effect of the health message. Whereas this null effect is consistent with our online-inference account, one could wonder about the long-term effects of our manipulation. Note our manipulation was rather minor—a single exposure to a subtle message. Other health messages to which children are exposed are probably repeated multiple times over the children's daily lives (e.g., every meal); thus we could possibly expect long-term effects even though we did not observe them in our study.

STUDY 2: “MAKES YOU STRONG” FRAME UNDERMINES CONSUMPTION AND TASTE EVALUATION

Our second study has two main goals. First, we test whether preschoolers experience healthy-framed foods as less tasty and therefore decrease their consumption. We predict that presenting the food as instrumental to achieving the health goal undermines the food’s perceived taste, and the result is lower consumption. Second, we examine whether the effect of reduced consumption is replicable among younger children (ages 3-4).

As before, we operationalized the health goal as “being strong.” To verify children this age understand the term “healthy” similarly to the older group, we asked 26 children (age range: 3.5-4.5 years, 52% female) what they think and know about healthy eating. Thirty-nine percent indicated eating healthy means “being strong”/“good for you”/“makes you grow,” 29% indicated it means “eating vegetables or fruits” (with some overlap with the first category, such that some children indicated healthy eating means being strong and eating vegetables), 18% did not give an answer, 7% gave various answers (“cereal,” “soup”), and 7% said they did not know. Thus the most frequent interpretation of healthy is being strong and energetic.

To test our predictions, we conducted a study similar to our first study, with several modifications. First, we included post-eating liking measures to assess taste perception. Second, because in study 1 yummy and control messages had similar effects on consumption, we compared a message containing only health information with a control message that did not present the crackers as instrumental. In particular, unlike study 1, in which the control condition did not present any message, in this study, the control condition presented a similar message to the one in the health condition, but without presenting the crackers as instrumental.

Method

We assigned 49 children (age range: 3-4 years; 41% female) to either a healthy-frame or control-frame condition. Two experimenters collected the data (one was blind to the research hypothesis and one was not). Here and in following studies, no effects involving the experimenter were significant, and thus we do not discuss this factor further.

All participants first went through a preliminary training procedure for the hand-opening measure (Egan and Diermeier 2012), which we later used to measure liking. The experimenter asked if the children liked puppies, and explained that if they liked puppies a lot, they should open their hands wide, but if they did not like them very much, they should open their hands a little. The experimenter measured their hand spans and repeated the same procedure with spiders, as a supposedly disliked item. For children who did not like puppies or did like spiders, the experimenter used other liked items such as cats and going to the beach, and disliked items such as germs and going to the dentist. The experimenter then measured the full span of their hands to serve as a baseline.

Then, depending on the experimental condition, the experimenter read a story that either presented the food as instrumental to achieving a health goal or not (table 1). As in study 1, the experimenter then offered all children the opportunity to eat the crackers from the story. After finishing eating, the children returned to the main experiment table, where they were asked to evaluate the crackers on three measures: (1) smiley scale (Birch, Zimmerman, and Hind 1980; Macklin and Machleit 1990), ranging from happy (indicates liking), neutral, and unhappy (indicates dislike); (2) similarity scale: the child places a model of the Wheat Thins crackers on a

scale, where one side was marked with a picture of ice cream (to indicate liking) and another side with a picture of an onion (to indicate disliking). A pretest with 17 moms of children in the relevant age group showed ice cream and onions are the food items children in this age group like and dislike the most, respectively; and (3) hand-opening measure: the experimenter asked the children to indicate by opening their hands how yummy these crackers were, and then measured their open span with a measuring tape.

Results and Discussion

Two children did not want to eat at all (one from each condition), and three children (two from healthy and one from control conditions) were highly distracted (e.g., left in the middle of the experiment), resulting in a valid sample of 44 children. Including everyone in the analysis does not significantly affect the results.

As predicted, children in the healthy condition ate fewer crackers than children in the control condition ($M_{\text{healthy}} = 4.67$, $SD = 5.54$; $M_{\text{control}} = 10.00$, $SD = 5.93$; $t(42) = 3.07$, $p < .005$), extending study 1's results to a younger population.

To assess liking, we first obtained a measure of the hand-opening measure by dividing children's responses to the "how yummy" question by the overall span of their hands, resulting in a score between 0 (no liking) and 1 (highest liking possible). Using this measure, we find that participants in the healthy condition liked the crackers less than those in the control condition ($M_{\text{healthy}} = .76$, $SD = .39$; $M_{\text{control}} = .98$, $SD = .02$; $t(41) = 2.61$, $p = .015$). Liking in turn mediates the effect of the goal manipulation on consumption (Low C.I. = .1123, High C.I. = 2.4323) using the bootstrapping procedure (Preacher and Hayes 2004; Zhao, Lynch, and Chen 2010) with

5,000 resamples and setting a 95% confidence interval, though its direct effect on consumption (when we also include the goal manipulation in the model) is not significant ($t(40) = 1.2, p = .23$). The effects on the other liking variables did not reach significance, probably due to measurement variability with young children (for smiley scale, $M_{\text{healthy}} = 2.67, M_{\text{control}} = 2.8$; for similarity scale, $M_{\text{healthy}} = 2.62, M_{\text{control}} = 2.7; t's < 1$).

To summarize, our second study replicates the effect of health (vs. neutral) message on consumption, such that a health message decreases consumption. Additionally, we find support for the process by which health messages reduce food consumption: presenting food as instrumental to achieving health goals decreases enjoyment of the crackers, such that those in the health-goal condition experienced the crackers as less tasty. The experience of worse taste, in turn, led to decreased consumption.

Our first two studies established that when food is presented as instrumental to achieving a health goal, children three to five years old judge the food as less tasty (study 2) and as a result consume less of it compared to when the food is presented as tasty (study 1) or with no message (studies 1 and 2). We argue this reaction is due to an online-inference process in which these children engage, such that they conclude that if the food is presented as instrumental in achieving one goal (e.g., health), the food cannot be instrumental in achieving another goal (i.e., good taste). However, an alternative account would be that children already consider healthy food to be less tasty, because they learned through experience that the healthy food they are served (e.g., vegetables) is usually less tasty, and often they are convinced through rewards to consume it. To address this alternative, we conducted our studies with young children who had less opportunity to learn about cultural associations between health and taste.

To further rule out this alternative account, in studies 3, 4 and 5 we used goals that children do not spontaneously associate with food: knowing how to read and count. If we still find that making food instrumental to achieving these new goals reduces consumption, we will have support for an online-inference account. Specifically, such a finding will further validate the idea that children conclude that if food serves one goal (helps you know how to read), it cannot serve another goal (e.g., taste good). The learned-associations account will not be able to explain such a result if children do not have preexisting associations between the food and the new goals.

STUDY 3: “HELPS YOU READ” FRAME UNDERMINES PLANNED CONSUMPTION

In study 3, we test whether presenting carrots as instrumental to knowing how to read reduces planned consumption. If children engage in a discounting-type inference, they will conclude that if the carrots are good for one goal (knowing how to read), they cannot be as good in serving another goal (taste good). We used planned (instead of real) consumption, to further establish that the effect of instrumental goals occurs already in the planned-consumption phase, before children actually consume the food.

To verify that children do not have a pre-existing association between eating carrots and knowing how to read, we asked 38 children (age range: 4-5 years, 40% female) whether eating carrots can help them know how to read. We find that even when presented with such a question that implies a carrots-reading association, 66% believed carrots cannot help them know how to read ($X^2(1) = 3.79, p = 0.05$). In the main experiment, we manipulate whether children receive

information about the carrots being instrumental to knowing how to read, the carrots being yummy, or a neutral message, and we measure how many carrots children plan to eat.

Method

We randomly assigned 57 children (age range: 4-5 years, 46% female) to one of three conditions: read, yummy, and control. As in studies 1 and 2, an experimenter, blind to the research hypotheses, read the children a story about Tara, who eats baby carrots for a snack before going out to play. In the read condition, the story read that Tara knows that eating the baby carrots will help her know how to read; in the yummy condition, the story read that Tara knows that the baby carrots will be yummy and fun; and in the control condition, we provided no additional information about the baby carrots (see table 1). Note that we set the message such that we do not directly make a false statement (i.e., eating carrots will help you know how to read). Rather, we present what the girl in story, Tara, thinks about the carrots.

The experimenter then presented the child a bowl with 15 wooden baby carrots and said, “Let’s pretend these are the carrots from the story. Do you want to eat these carrots? How many do you want to eat? Please take out of the bowl the baby carrots you want to eat.” The experimenter then waited for the child to take out of the bowl the baby carrots s/he wanted to eat. This amount served as our dependent variable of planned consumption. The experimenter debriefed children in the read condition that eating baby carrots is indeed good for them but does not help them know how to read.

Results and Discussion

As predicted, children in the read condition said they wanted to eat fewer carrots than children in the yummy and control conditions ($M_{\text{read}} = 3.58, SD = 2.38; M_{\text{yummy}} = 6.53, SD = 4.68; M_{\text{control}} = 7.11, SD = 4.77, F(2, 54) = 4.05, p = .023$). Planned contrasts revealed a significant difference between the read and control conditions ($t(54) = 2.65, p = .01$) and between the read and yummy conditions ($t(54) = 2.22, p = .031$), but not between the yummy and control conditions ($t < 1$).

Using a new food-goal combination and non-neutral food (i.e., carrots), this study extends the results found in study 1, where the children in the instrumental, healthy condition consumed significantly less than children in the yummy and control conditions that did not differ from each other. Thus we are able to generalize our effect to intellectual, non-health goals, such that when food is presented as instrumental, children plan to consume less of it.

STUDY 4: “HELPS YOU COUNT” FRAME UNDERMINES CONSUMPTION

Our fourth study aims to generalize the effect to another non-health goal—knowing to count—among younger children (ages 3.5-4.5). To test our predictions, we ran a study similar to our third study, with several modifications. First, instead of presenting the carrots as instrumental to knowing how to read, we presented them as instrumental to knowing how to count, which, based on interviews with teachers at the daycare, is an age-appropriate goal. Second, because in study 3 yummy and control frames had similar effects on (planned) consumption, we compared only a message containing the counting goal with a control message that did not emphasize any

goals the carrots represent. Finally, in this study, we measured actual consumption of real carrots.

To verify that children do not have preexisting associations between eating carrots and knowing how to count, we asked 17 children (age range: 3.5-4.5 years, 47% female) whether eating carrots can help them know how to count better, less, or no difference. We used this multiple-response question to reduce demand effects, where children might just say “yes” regardless of the question. We counterbalanced the order in which the question was asked (i.e., whether “better” or “less” appeared first). The order in which alternatives were presented had no effect. We find that 82% of the children said eating carrots makes no difference when learning how to count, compared to 18% who said eating carrots would help them know how to count ($X^2(1) = 7.118, p < .01$), suggesting children indeed do not have preexisting associations between eating carrots and knowing how to count. In the main experiment, as detailed below, we manipulate whether children receive information about the carrots being instrumental to knowing how to count or not, and measure how much they eat.

Method

We randomly assigned 46 children (age range: 3.5-4.5 years; 50% female) to one of two conditions: count and control. Two experimenters, both blind to the research hypotheses, collected the data. Each participant completed the study individually in a separate classroom. Similar to the procedure in previous studies, the experimenter read the children a story about Tara, who eats baby carrots for a snack before going out to play. In the count condition, the story

read, “Tara knows that eating the baby carrots will help her know how to count to 100.” The control condition provided no additional information about the baby carrots (see table 1).

In both conditions, the experimenter next offered the child baby carrots to eat. As in previous studies, the experimenter invited the child to move to another table labeled as the “eating station,” where a bowl with 42 grams (about 20 units) of petite baby carrots sat. To make consumption easier and faster, we used petite baby carrots that are narrower and shorter than regular baby carrots. The amount of grams the child ate served as our dependent variable to measure consumption. To further minimize interaction with the child, the experimenter read a book to act distracted while the child was at the eating station.

After finishing eating, the child returned to the main experiment table. The experimenter debriefed children in the count condition that eating baby carrots is indeed good for them but does not help them learn how to count.

Results and Discussion

Five children did not want to eat at all (three from the control condition and two from the count condition), resulting in a valid sample of 41 children. Including everyone in the analysis does not significantly affect the results.

As predicted, children in the count condition ate fewer carrots than children in the control condition ($M_{\text{count}} = 7.58$ grams, $SD = 9.7$; $M_{\text{control}} = 17.09$ grams, $SD = 15.55$; $t(39) = 2.33$, $p = .027$). Thus we generalize our effect to another non-health-related goal—knowing how to count—and show that making the carrots instrumental to achieving this goal reduces actual consumption among children 3.5-4.5 years old.

STUDY 5: “HELPS YOU COUNT” FRAME UNDERMINES CONSUMPTION ACROSS DIFFERENT STORIES

We conducted our last study to test for the generality of our effect. In previous studies, we presented a story about Tara, who goes out to play after consuming some snack food. Because playing is an experiential and fun activity that might not match working toward the instrumental benefits (e.g., being strong, knowing to read or count), we modified the story to achieve a better match between the benefits for Tara and her subsequent activity. Specifically, in our modified stories, Tara engaged in either a neutral, not-fun activity (going to bed) or an academic activity (going to school). If the mismatch between the experiential activity (going to play) and the instrumental benefit was the only cause of reduced consumption in our previous studies, we should not find reduced consumption when the food is presented as instrumental to counting and Tara engages in a non-fun, neutral activity (go to bed) or in a non-fun, instrumental activity (go to school). By contrast, we predict that presenting food as instrumental will also decrease consumption when Tara goes to bed or school.

Method

This study used a similar design as study 4 with two modifications: we used crackers instead of carrots (in the eating station sat a bowl with 15 Wheat Thins crackers, as in studies 1 and 2), and the girl in the story (Tara) was either going to bed or going to school (instead of going to play, as in previous studies). We assigned 52 children (age range: 3.5-4.5 years; 45%

female) to a 2 (instrumentality: count vs. control) \times 2 (activity: going to school vs. going to bed) between-subjects design. We recruited the entire class at the daycare, which yielded a relatively small sample, but which was appropriate to test our prediction regarding a main effect for instrumentality and no effect for activity or an interaction involving that variable. Two experimenters, both blind to the research hypotheses, presented the stories (see table 1) and collected the data.

Results and Discussion

Four children did not want to eat at all (one from each condition), and one child (from the count-school condition) was highly distracted (i.e., did not sit quietly even to listen to the story), resulting in a valid sample of 47 children. Including everyone in the analysis does not significantly affect the results.

An ANOVA of number of crackers consumed on instrumentality (count vs. control) and activity (school vs. bed) yielded the predicted main effect for instrumentality ($F(3, 43) = 13.64, p < .005$). Those who read that crackers help learning how to count ate less than those in the control condition ($M_{\text{count}} = 5.32, SD = 5.01; M_{\text{control}} = 10.78, SD = 4.8$). Neither the main effect of activity (school vs. bed) nor the interaction between the two factors was significant (p 's $> .6$). See figure 2.

Insert figure 2 about here

These results suggest that the type of activity mentioned in the story does not interact with the effect of making the food instrumental. Moreover, even when the crackers are presented as instrumental to an activity that is relevant to what is in the story (i.e., knowing to count when going to school), children do not seem to consume more of the crackers.

GENERAL DISCUSSION

Across five studies, using various food items, various instrumental messages and various story frames, and measuring planned and actual consumption, we find consistent evidence that making food instrumental in achieving a goal, relative to presenting the food as yummy or with no message, decreases preschoolers' consumption (current and planned) by leading to lower taste ratings. When food is presented as instrumental, children conclude it cannot be as tasty, and therefore they reduce consumption.

Our first study finds that children 4.5-5.5 years old consume less and are less likely to choose the consumed crackers when these crackers are presented as instrumental to being healthy (i.e., "makes you strong"), as compared to when no information is presented or when the crackers are presented as tasty. Our second study extends the effect on consumption to children 3-4 years old, showing also that presenting the food as instrumental leads to perceiving the crackers as less tasty compared to control. Moreover, the reduced liking for the health-framed crackers mediates the effect on consumption. Our third study generalizes the effect to academic, non-health goals and finds that when food is presented as instrumental to knowing how to read, children 4-5 years old report they would consume fewer carrots. Our fourth study extends this

result to another non-health goal and shows that when carrots are presented as instrumental to learning how to count, children 3.5-4.5 years old consume fewer carrots. Our last study extends previous results to stories that do not include a potential mismatch between the food instrumentality and the main character's activity (i.e., going to bed or school, instead of going out to play).

Alternative Explanations and Future Research

Research on over-justification focused on the role of rewards, showing that rewards often undermine intrinsic motivation once removed, especially among young children (e.g., Lepper et al., 1973). Building on this literature, one can think of the goals we associated the food with in our research (i.e., being healthy, knowing how to read, knowing how to count) as rewards, which in turn decrease intrinsic motivation. Against this view, we argue our studies also presented taste benefits (yummy condition, studies 1 and 3), which can be construed as rewards, but had no effect on consumption relative to the no-message condition. Importantly, even if the goals formed a psychological reward, we find a decrease in consumption (i.e., lower intrinsic motivation) while the goal-message is in place and no effect when the goal message is removed (per the second measurement in study 1). These findings are different from research on over-justification, which used a paradigm of introducing a reward and then removing it, and found a decrease in motivation once the reward was removed but not while it was in place.

It is also possible that children this age simply might not value the goals we used (being strong, knowing how to read and count), and therefore they discounted the information presented to them altogether. Yet not caring about these goals would not explain why, across all

studies, children reduced consumption compared to a control or taste-frame condition and also concluded the food was less tasty (study 2). In fact, we would predict goals children do not care about at all would have similar effects on consumption. We nonetheless wanted to test whether children value the goals we have used. In a post-test we conducted with 26 children 3.5-4.5 years old and 27 children 4-5 years old, we asked children to indicate the importance of various goals (e.g., being strong, being handsome/pretty, having a lot of friends, knowing how to read, knowing how to count), using the hand-opening measure described in study 2. We find no difference in the importance these children assign to these various goals, suggesting the goals we used are at least as important as other goals children have, such as being handsome/pretty or having a lot of friends.

Importantly, we believe that any food goal likely undermines other food goals. Consistent with prior research showing the undermining effect of combining intrinsic motivations on interest in the actions (Higgins et al. 1995), we assume an emphasis on the food's taste would lead to a lower health rating, and even an emphasis on the food's intellectual benefits could reduce the perception that the food will make you strong (both instrumental goals). This prediction is consistent with our inference model but not with a learned-associations model. Testing these hypotheses would entail measuring perceived instrumentality which is a different variable than the one we used in our studies (i.e., consumption). The effect of these additional goals on consumption will be determined by whether consumption is driven by these goals more or less than it is driven by taste.

Future research could also test how instrumental messages affect consumption when the child highly values these benefits at the moment of consumption, such that she is willing to forgo taste. Young children do consume food for reasons beyond taste (e.g., a desire to socially

connect, Birch 1981; Shutts et al. 2013), and they understand instrumentality (e.g., they take medicine to feel better or satisfy a demanding parent). Therefore, when a child faces an immediate challenge and believes food consumption is instrumental for that challenge, making the food instrumental might increase (or at least will not decrease) consumption, despite lowering taste perceptions. For example, if children prepare for a counting task, and are told that crackers help them know how to count, they might consume more.

Finally, we studied very young children (3-5.5 years old). Older children, who process information in a more complex manner (John 1999), acquire information differently (Peracchio 1992), and might rely less on taste when making food decisions due to higher self-control, might show different effects on consumption. Moreover, although we know a great deal about the effect of making food instrumental to health goals on adults' consumption, such that in some cases it decreases consumption (Raghunathan, Naylor, and Hoyer 2006) but in other cases it increases consumption (Provencher, Polivy, and Herman 2008; Wansink and Chandon 2006), especially among dieters (Irmak, Vallen, and Robinson 2011), it is not clear how making food instrumental to a non-health goal would affect adults' consumption. To the extent that adults serve food to children and decide how to present the food to them, understanding how adults react to such messages is important. Yet, studying this question empirically is difficult because it requires persuading adults that certain foods provide non-health benefits (i.e., creating new associations, e.g., "carrots make you smart").

Marketing Implications

Using a highly important context—food consumption by preschoolers—with clear practical, medical, and policy implications, we shed light on information processing among young children by testing the effects of health-related and non-health messages on their consumption. With increasing rates of obesity (Brownell and Horgen 2004; Chandon and Wansink 2012; Hill and Peters 1998) and childhood obesity (Hedley et al. 2004; Troiano and Flegal 1998; though see Ogden et al. 2014), understanding how to help children eat healthier is crucial (Birch 1999), especially from a young age (Solveig, Kramer, and Narayan 2014). Prior research suggested several interventions, including increasing the accessibility of certain food items (Hearn et al., 1998; Just and Wansink 2009; Reicks et al. 2012) or using appropriate role models (Birch, 1980). Our research suggests that when encouraging children to eat healthy (or neutral) food, making the food instrumental may backfire. Emphasizing the taste benefits, assuming they are credible, or even not mentioning the benefits at all, is superior to making the food instrumental to achieving certain goals in terms of encouraging consumption and creating a positive experience. This conclusion is consistent with Reicks et al. (2012), who find that merely placing pictures of vegetables on school lunch trays, without any accompanying messages, increased consumption of vegetables.

Marketing food as instrumental in achieving certain goals may still have a positive impact on consumption among children, by influencing caregivers to purchase and serve this food. Caregivers affect children's food choices by making specific foods available and by acting as role models for their children (Young, Fors, and Hayes 2004). Our conclusion refers to marketing pitches directed at the children: we find that when serving food to preschoolers, presenting the food without any instrumental message is best.

DATA COLLECTION INFORMATION

A research assistant and the first author collected the data for study 1 and study 2 in summer 2011 and winter 2012, respectively. A research assistant collected the data for study 3 in winter 2013. Two research assistants collected the data for study 4 in summer 2013. Two research assistants collected the data for study 5 in winter 2014. All data were collected at the McGaw YMCA Children's Center, Evanston, Illinois. The first author analyzed the data while consulting the second author.

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Table 1: Text of the Stories Used in Studies 1-5

Study	Condition	Panel 1	Panel 2	Panel 3	Panel 4
Study 1	Healthy	This is Tara. Tara likes to eat a snack before she goes out and play.	Today Tara ate the 'Wheat Thins' crackers for snack.	Tara felt strong and healthy, and	She had all the energy she needed to play outside.
	Yummy	This is Tara. Tara likes to eat a snack before she goes out and play.	Today Tara ate the 'Wheat Thins' crackers for snack.	Tara thought the crackers were yummy,	And she was happy to play outside.
Study 2	Healthy	This is Tara. Tara likes to eat a snack before she goes out and play.	Today Tara ate the 'Wheat Thins' crackers for snack.	Tara felt strong and healthy, and	She had all the energy she needed to play outside.
	Control	This is Tara. Tara likes to eat a snack before she goes out and play.	Today Tara ate the 'Wheat Thins' crackers for snack.	And she went to play outside.	
Study 3	Read	This is Tara. Tara likes to eat a snack before she goes out and play.	Today Tara plans to eat baby carrots for snack	Tara knows that eating the baby carrots will help her know how to read,	So she eats them and goes to play outside.
	Yummy	This is Tara. Tara likes to eat a snack before she goes out and play.	Today Tara plans to eat baby carrots for snack	Tara knows that eating the baby carrots will be yummy and fun,	So she eats them and goes to play outside
	Control	This is Tara. Tara likes to eat a snack before she goes out and play.	Today Tara plans to eat baby carrots for snack	So she eats them and goes to play outside	
Study 4	Count	This is Tara. Tara likes to eat a snack before she goes out and play.	Today Tara plans to eat baby carrots for snack	Tara knows that eating the baby carrots will help her know how to count to 100	So she eats them and goes to play outside
	Control	This is Tara. Tara likes to eat a snack before	Today Tara plans to eat baby carrots for	So she eats them and goes to play outside	

		she goes out and play.	snack		
Study 5	Count School/Bed	This is Tara. Tara likes to eat a snack before she goes to school/bed	Today Tara plans to eat Wheat thins crackers for snack	Tara knows that eating the Wheat thins crackers will help her know how to count to 100	So she eats them and goes to school/bed
	Control School/Bed	This is Tara. Tara likes to eat a snack before she goes to school/bed	Today Tara plans to eat Wheat thins crackers for snack	So she eats them and goes to school/bed	

Table 2: Summary of Results: Mean Consumption (SD in parenthesis)

	Instrumental Conditions	Control Condition	Yummy Condition	Test Statistic
Study 1: Instrumental condition: Health Food: Crackers (max = 15)	3.1 (3.25)	9.07 (5.6)	7.2 (6.13)	$F(2, 54) = 6.94,$ $p < .01$
Study 2: Instrumental condition: Health Food: Crackers (max = 15)	4.67 (5.54)	10.00 (5.93)		$t(42) = 3.07,$ $p < .005$
Study 3: Instrumental condition: Read Food: Wood carrots (planned consumption; max = 15)	3.58 (2.38)	7.11 (4.77)	6.53 (4.68)	$F(2, 54) = 4.05,$ $p = .023$
Study 4: Instrumental condition: Count Food: Carrots (max = 42 grams)	7.58 (9.7)	17.09 (15.55)		$t(39) = 2.33,$ $p = .027$
Study 5: Instrumental condition: Count Food: Crackers (max = 15)	5.32 (5.01)	10.78 (4.8)		$F(3, 43) = 13.64,$ $p < .005$

FIGURE 1: AN EXAMPLE OF THE PICTURE STORY TAKEN FROM THE HEALTHY
CONDITION IN STUDIES 1 AND 2



FIGURE 2: COUNT GOAL DECREASES CONSUMPTION INDEPENDENTLY OF THE
ACTIVITY IN THE STORY (STUDY 5)

