

# I am What I Eat: Identity & Critical Thinking in an Online Health Forum for Kids

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## ABSTRACT

As kids encounter food advertisements, it is important that they be able to critically evaluate the message's claims, the healthiness of the promoted product and their desire for it. To explore how technology might help kids develop these skills, we created an online forum called TalkBack that encourages children to critically analyze the messaging in food ads and their attitudes towards marketed foods. We evaluated TalkBack with twenty-eight middle school students in a summer camp program. We discuss how participants appeared to project and protect their sense of self through their interaction with TalkBack. We also describe the limited analytic depth of their forum contributions and suggest directions for HCI research that attempts to encourage critical thinking and health promotion in adolescents.

## Author Keywords

CSCW; health; nutrition; kids; identity; online community.

## ACM Classification Keywords

H.5.3. Information interfaces and presentation (e.g., HCI): Collaborative computing.

## INTRODUCTION

Researchers in Human-Computer Interaction (HCI) and related disciplines have increasingly examined how information and communication technologies (ICTs) can address issues of health and wellness. This work has explored how the unique affordances of digital media—such as its potential to uniquely engage users and support collaborative interactions—can help improve children's health [16,23,34,36]. Growing attention has been given to preventive health behaviors, that is, those activities that help stop the onset of health problems such as obesity (e.g., [23,29,36]).

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In the United States (U.S.) reducing childhood obesity has become a national priority [25]. It is a particular concern in low-income communities, where rates of obesity are highest [19,25]. Helping children develop healthy eating skills is one important step towards preventing childhood obesity [1,10]. For example, as kids encounter food advertisements (ads) on television, online, and in the physical world, it is important that they be able to critically appraise the embedded messaging [1]. Such critical analysis involves evaluating the message's claims, the healthiness of the promoted product, and (given these factors), the extent to which they desire that product. Motivated by research showing that online environments can be effective learning and skill building forums for children [5], we explored how ICTs can help kids engage in such critical thinking.

In this paper, we describe TalkBack, an online forum in which children analyze food ads and reflect on their preferences for and consumption of these foods. During a four-day summer camp program we conducted an in-depth, mixed method study to evaluate initial use of TalkBack (Figure 1). Twenty-eight middle school children participated and our findings suggest that their use of TalkBack can be seen as a form of identity work [28]. We will discuss how, as participants asserted their attitudes online and offline, they conveyed part of who they are to others. We further describe the limited analytic depth of this



Figure 1. Participants using TalkBack.

attitude expression and how participants were resistant to the social negotiation of these attitudes.

We contribute to the HCI community in three ways. First, little research has explored how ICTs can help children build their health-related critical thinking skills. Though designed to encourage critical thinking, we describe the limited analytic thinking that occurred in TalkBack, potential reasons for this, and opportunities for future work. Second, our work suggests the value of understanding how identity work happens in tools that help children critically reflect on health topics. This is an important area for future HCI research because understanding and communicating who we are is fundamental to being human, and is particularly salient in adolescence [4,28]. Third, we use our results to discuss broader implications for the design of social health systems for children.

#### RELATED WORK

Our work is motivated by health sciences research advocating media literacy interventions and HCI research exploring how ICTs can address the health of children. Below, we overview each stream of research as well as the notion of identity work, a concept that became salient during our data analysis.

#### Food Marketing

Research has consistently shown a correlation between the frequency of exposure to unhealthy food ads and children's consumption of these foods [12]. Kids in low-income households have higher levels of media exposure than those from affluent homes, for example, because they are more likely to watch television [19]. Furthermore, they are more likely to view content that they see as authoritative [19]. This trend is problematic because the persuasive commercials targeted at children often contain unhealthy foods (e.g., sugary drinks and cereals) and can include nutritional information that is inaccurate or misleading [14]. Because of these trends, we chose to focus our research on children from low-income households.

Researchers have advocated media literacy programs that help kids become more critical appraisers of ads [1]. Such interventions help kids learn to stop taking ads at face value by critically analyzing the embedded messages and reflecting on their attitudes towards these messages. Media literacy programs support critical thinking by helping children recognize that 1) media messages are developed using language that tries to capture interest and attention, 2) people experience the same message differently (there is more than one way to interpret a message), and 3) messages have embedded values and points of view [1,33]. Previous programs have been delivered through classroom lessons and activities [1,20]. Yet, little research has explored how ICTs can uniquely engage kids and connect them to peers and health experts who can scaffold the development and refinement of their healthy eating attitudes. Our work explores this burgeoning area.

#### Technological Approaches to Child Health Promotion

Our work is further motivated by the growing body of HCI research examining how ICTs can support child health promotion. This work has explored games for health [23,36] and the impact of behavioral monitoring tools and online communities [2,16,29]. For example, researchers have examined how ICTs can improve children's activity levels through behavior documentation and sharing [16,34,36]. In one such project, Xu *et al.* [36] evaluated a pervasive game in which schools competed against one another based upon their physical activity.

Other work has used games to build kids' healthy eating knowledge. For example, MunchCrunch is a collaborative trivia game that teaches adolescents heuristics for choosing healthy foods [23]. This game is played in teams, allowing players to pool their knowledge and learn from one another. The authors found that this game stimulated players' sense of pride as their peers recognized their contributions to the team. While MunchCrunch helped kids learn nutrition facts, our work focuses on developing adolescents' ability to critically deconstruct food messages and analyze their own preferences for these foods.

Finally, there has been a growing interest in how online environments support adolescent health information seeking and identity exploration. Many adolescents turn to the Internet for health information because it allows them to quickly and easily research personal problems and interests such as physical fitness, diet and sexual health [26,37]. Research has also examined how virtual worlds can facilitate identity exploration amongst children with serious health conditions [2]. For example, Zora is a 3D multi-user environment used by hospitalized children undergoing dialysis treatment. In Zora, children build a virtual city by populating it with spaces and characters that interact with other users' characters. Bers *et al.* [2] found that users constructed their worlds to reflect their non-hospitalized self-concept. That is, they deliberately avoided having any references to their disease in the virtual world, and instead had their virtual characters engage in activities that the user does when not under treatment.

In summary, while researchers have examined how ICTs can help children pursue health and wellness, little work has focused on developing their ability to think critically about health messaging.

#### Identity Work

Like Bers *et al.* [2], an emergent theme in our work was the relationship between *identity work* and adolescent health. Identity work is "anything that people do, individually or collectively, to give meaning to themselves or others" [28]. Through identity work we "satisfy our existential need to have a sense of... significance, to know how we relate to others" [28]. There are several elements of identity work, including *attitude expression* (as we convey our opinions, we convey who we are) and *identity enactment* (as we express ourselves in front of others our identities become

more real) [15,28]. In the digital realm, identity work also occurs as we create *symbolic representations*, such as the avatars and online profiles that signify who we are [4]. In this paper, we characterize our participants' exploration of these elements of identity work as they used TalkBack.

### TALKBACK

Writing can encourage children to think critically as they acknowledge and assess their prior beliefs and construct new ones [27]. Online environments that support user-generated posts can motivate writing, as users may feel that their posts are being read by a broader, authentic audience [8,27]. Research has also shown that computer-mediated, collaborative environments can foster "explanation and co-construction of knowledge" [3]. Motivated by these affordances of online writing, we designed TalkBack, a website in which kids write about their reactions to food ads and related nutrition tips.

**Ads & Nutrition Tips:** The research team compiled a database of 32 ad images from magazines and websites. We sought a diverse set of ads, including healthier options with lower amounts of sugar and fat (e.g., oatmeal, whole grain rice and vegetable medley, and frozen fruit bars) and those with a higher sugar and fat content (e.g., chocolate chunk cookies, juice cocktail, and a fast food hamburger). A nutritionist from our university reviewed all 32 ads and developed a short nutrition tip for each one. These tips were brief healthy eating recommendations. For example, for a juice cocktail ad (in which the juice contains added sugar), the nutrition tip was, "*Choose whole fruits rather than juice drinks with added sugar.*" The TalkBack homepage shows the five most recently posted ads, with each ad's associated nutrition tip displayed beneath it (see Figure 2). Clicking "See All Ads" allowed children to view all posted ads.

At the start of the study, participants were given disposable cameras and asked to take photos of any food ads they encountered (e.g., on billboards, in magazines, or at eateries). Nineteen of these photos were posted on the TalkBack site (one per child who submitted usable photos).

**Posts & Replies:** Each ad (including those submitted by the research team and our participants) is displayed with a "TalkBack" button; clicking it allows the user to write a comment critiquing the ad (see Figure 2). Drawing from an established media literacy curriculum [33], comments are scaffolded by four open-ended questions such as, "Is this food something you would want to eat?", "How is this ad trying to get your attention?", and "Are there any important facts or pieces of information that are left out of this ad?"

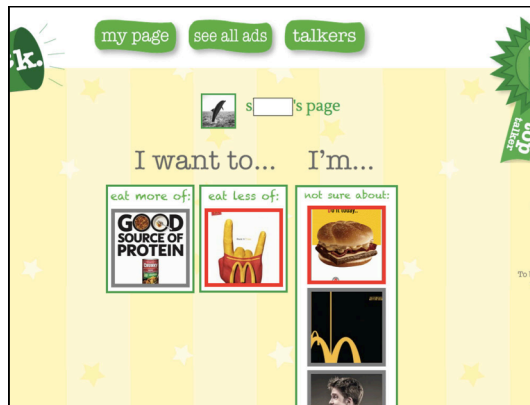
Only after users have written their own post can they see what others have written. This feature works as follows. A comment bubble is displayed next to each ad, indicating how many people have commented on it thus far. If the user has already written a post for that ad, clicking on the comment bubble will allow them to see others' posts. If users have not yet commented on an ad, clicking the comment bubble will prompt them to write their own post. Once they have written their own post, they can see what others have written. With this feature we hoped that, motivated by a desire to see what others' had written, kids would submit their own posts.

**Top Talker:** Friendly competition is encouraged through the "Top Talker" feature: the user that has written the most comments is awarded the Top Talker position and this child's username and avatar image are prominently displayed on the TalkBack homepage. The Top Talker changes dynamically to encourage engagement.

**User Account & Personal Page:** Each user has an account that allows him or her to write posts and see others' posts. Users choose their username and are randomly assigned an avatar (either a land or sea animal). Each user also has a personal page that displays each ad that he or she has commented on (see Figure 3). Ads are listed in one of three columns, depending on whether the child has said they want to 1) eat more of the food promoted in the ad, 2) eat less of it, or 3) are not sure if they want to eat more or less of it. Ads are shown with a red, green, or grey border: a green border indicates that most users have said that they want to



Figure 2. The TalkBack homepage (left) displays ads along with their associated nutrition tips. When a user clicks an ad's 'TalkBack' button, he or she can create a post critiquing the ad. An example post from our study is shown on the right.



**Figure 3.** Each user has a “personal page” that displays all ads that he or she has commented on.

eat the food, a red border indicates that most do not want to eat it, and a grey border indicates that an equal number of people do and do not want to eat it. We hoped that being able to compare food preferences in this way might stimulate discussion amongst users.

#### METHOD

We conducted an exploratory study to examine the following questions: 1) What are the implications of supporting the collaborative analysis of food ads and preferences and 2) To what extent does TalkBack encourage children to think critically about food advertisements and their own preferences for marketed foods? We conducted this study over four days at a summer camp held at our university campus. Our study was one of several activities that children participated in during a camp that engaged them around the topics of technology, health and wellness. Given the particular barriers to healthy eating in low-income contexts, our participants were drawn from a Title 1 middle school, that is, a school that serves a high number of low-income households (at least 40% of students qualify—based on household income—for free or reduced-priced meals). Teachers at the school recruited participants for the study, and were asked to invite a variety of children who were representative of the broader school population.

In the remainder of this section we describe our method in more detail and provide an overview of our participants.

#### Technology Trial

Kids used TalkBack in groups of 7-10 for four days, for approximately 15-30 minutes each day (see Figure 1). Each day, the children gathered into a room where they were given access to a computer displaying the TalkBack website (one computer per child). During this time, children were reminded that their use of TalkBack was not a test and were encouraged to chat with one another as they used the tool.

To obtain a detailed understanding of how participants engaged with and around TalkBack, we used a *concurrent, fully mixed, equal status* study design [22]. That is, we simultaneously utilized both qualitative and quantitative

data gathering and analysis techniques (e.g., we computed descriptive statistics for the survey data to help explain emergent themes in the interview data), giving equal emphasis to each type of data.

Two researchers conducted observations and informal interviews as children used TalkBack. The researchers compiled detailed field notes based upon these observations and interviews. All sessions were audio-recorded and transcribed. This qualitative approach allowed us to obtain a “thick description” of children’s interactions with and around TalkBack, and how they were situated within the broader social context [9]. We complimented this qualitative data with quantitative data. First, participants completed pre- and post-study surveys, in which we asked questions about their technology access and use, nutrition-related attitudes (e.g., interest in learning about healthy eating), and opinions about TalkBack. Second, all interactions with TalkBack were logged.

Following the cooperative inquiry approach [6], we also involved our participants as researchers. Participants conducted *peer interviews* in which they asked each other to describe their reactions to TalkBack in terms of their Likes, Dislikes, and Wishes (things they wish they could have done in the system). This feedback helped focus our observations, post-study survey questions, and analysis on topics of interest and concern to our participants.

#### Analysis

We conducted a grounded theory analysis of our field notes and transcripts to identify emergent themes from the data [32]. Two researchers independently and inductively coded the transcripts. We met periodically to compare and reconcile the codes until 100% agreement was achieved. A final set of 160 codes was arrived at; the team then iteratively clustered these codes into higher-level categories. We conducted axial and selective coding to identify relationships between these categories and arrive at the final theory describing the observed phenomena.

We computed descriptive statistics for the survey data and conducted SQL queries to analyze the system usage log data. (While much of our survey and log analysis is outside of the scope of this paper, we overview the most relevant findings.) To understand what our participants wrote about and to what extent their posts reflected critical thinking, we conducted a content analysis of the TalkBack posts and users’ replies to posts [18]. We chose this approach as opposed to computing pre/post study changes in critical thinking skill as the short study duration made it unlikely that we would observe significant changes in skill level. Instead, we were interested in examining the prevalence of critical thinking in TalkBack comments. We developed 19 codes based on an initial reading of the comments, emergent themes from our grounded theory analysis, and an existing critical thinking framework [24]. Our codes fell into the following categories: health consciousness, food preferences and behaviors, and critical thinking.

Recall that to make a *post*, users are asked to respond to four open-ended questions. As such, our unit of analysis was a *comment*, which we defined as a user's answer to one question. (Each unique post contained up to four such comments). Users could also post a free response reply to existing posts, and we also treated these replies as comments. In total, there were 900 comments across the 271 posts and 55 replies. Two raters independently coded 20% of these comments ( $n=180$ ). To examine inter-rater agreement, we compared our ratings, finding that we applied codes the same way 94% of the time. We also calculated Cohen's Kappa ( $k$ ), a statistical measure of inter-rater agreement. We achieved a Kappa score of  $k = .74$  ( $p < .0001$ ); a Kappa score of .70 or higher is an accepted level of agreement [21]. Having established agreement, the coders split the remaining data, with each coding 360 of the remaining comments.

In summary, our results are based on our triangulation of findings across multiple data sets. While participants used TalkBack over a relatively short time period, our results paint a detailed picture of their interaction with this tool and highlight specific implications for future work.

#### Participant Overview

Twenty-eight children (50% male, 50% female) participated, aged 11-13. Students were recruited from the same middle school. As such, some students knew one another prior to the study, but many did not. Four teachers from the school and two students (one undergraduate and one high school) assisted the research staff by helping children brainstorm during the peer interviews. The research staff trained these helpers by describing the goals of the research and the planned study activities.

Most children (89%) had posted comments online in the past week, suggesting that they were actively creating written content online. In the past week, most children had chosen their own snacks at home (96%), markets and grocery stores (89%), and fast food restaurants (82%). Thus, they were actively making decisions about what snacks they consumed, suggesting that a tool that supports reflection on these foods may be particularly useful.

#### RESULTS

Over four days, our participants wrote 271 posts ( $M=9.7$ ,  $SD=4.8$ ) about 38 food ads (ads that were collected by the research team and participants). Sixteen participants created an additional 55 replies to existing posts ( $M=3.4$ ,  $SD=2.8$ ). Participants' use of TalkBack can be understood as a form of identity work. Below, we unpack how participants appeared to project and protect their sense of self through their 1) reactions to their symbolic representations, 2) aspirations for an evaluated social status, 3) attitude expression and 4) limited social negotiation of these attitudes. We also discuss the limited analytic depth of their attitude expression. To convey the pervasiveness of participants' sentiments, we report descriptive statistics for our survey data. We unpack these trends through our

discussion of themes that arose in our grounded theory analysis. Finally, we provide descriptive statistics from our content analysis to characterize what participants wrote about in TalkBack.

#### Symbolic Representations

TalkBack users are symbolically identified by their username and avatar (a randomly assigned animal photo). Participants were particularly interested in their avatars, appearing to view them as extensions of themselves. While using TalkBack, rather than indicating that they possessed an avatar, they more often said aloud that they "are" their avatar. For example:

P26: I'm a Zebra! Yeah!

P13: What am I? I'm a whale.

P15: I am a lion. I'm the king of the jungle.

Previous work has described how ICTs allow youth to explore online identities that differ from their offline identity [4]. Our work shows participants, subtly, acknowledging a continuous sense of self: in their offline discussions, they described their virtual self as an extension of their real-world self. As TalkBack aims to encourage online thinking that will transfer into the real world, observing this continuity was exciting to see. While it does not conclusively show that skills developed online will directly transfer to users' real lives, this finding merits more extensive evaluation in future work.

We also observed participants frequently disclosing their online identities to their co-located peers as they declared aloud which avatar they "were". This finding sets the context for how participants used the system to express their food-related opinions. Their openness to disclosing their identity is in line with their unabashed and resolute declarations regarding their food preferences, which we discuss later.

Our participants had strong opinions about the extent to which each avatar was an appealing or unappealing representation of their identity. For example:

P10: Man, I'm a seal. That's not cool! Could we change my picture... I'm a seal. It's not funny.

Boy: He's a seal!

P10: Shut up. Be quiet.

As this quote shows, children took their online representation seriously and in this example P10 was sensitive to others teasing him about it. In the peer interviews, one of the most frequent "wishes" was the ability to change one's avatar photo: children wanted more control over their online representations. Youth are accustomed to having such control, particularly in their use of social networking sites [4]. As such, in retrospect, automatically assigning animal photos as user avatars was problematic. An alternative interface could allow users to create their own avatar or choose one from a set of options (akin to multi-player games). While dissatisfaction over an avatar is likely a surface-level complaint, this reaction



nevertheless demonstrates how apt children were to associate their online and offline identities.

#### Status: Top Talker

Through competition with others, individuals pursue status, for example as the “winner” or “loser”, and status is one way in which people understand and convey their identity [28]. Previous work has explored how ICTs can leverage competition to encourage adolescent health and wellness. Much of this work has focused on digital games in which peers compete based upon their physical activity [36]. In contrast to this prior work, TalkBack users compete based upon how much they write.

As mentioned previously, the Top Talker position is dynamically awarded to the user who has written the most comments at any given time. By becoming the Top Talker, kids have the opportunity to achieve an elevated social status within the group. This was a desirable social position, with most participants (75%) saying that they wanted to be the Top Talker. Recall that children used TalkBack in small groups. As such, some children seemed to view the Top Talker status as an individual achievement whereas others perceived it as a marker of success for their group. These varied orientations are reflected in this field note excerpt:

There seemed to be some unity with this group. One boy remarked, “we are the best” in reference to achieving the Top Talker status. Other members of the group seemed to acknowledge that they were part of a team effort to oust the other group’s Top Talker and claim the spot for their own group. This was interesting because both of the other groups seemed to think of the Top Talker spot as an individual accomplishment and they appeared to be competing with not only members of other groups, but with members of their own group.

Like Xu *et al.* [36] found in their evaluation of a collaborative physical activity game for children, we found that for some participants, Top Talker was an indicator of their personal identity, while others seemed to view it as a marker of a shared group identity. However, in contrast to this previous work, there was no in-system marker of group identity or progress in TalkBack. Yet, some children still naturally developed this sense of group identity.

While most kids wanted to be the Top Talker, only half were motivated to take the next step and write more posts to obtain this position (56%). We found two barriers to writing posts. First, some participants were frustrated, indicating that the Top Talker position was hard to obtain, for example, because the same person seemed to constantly be achieving this status:

P11: Who’s the Top Talker? P9! I’m getting tired of this. Ugh! I’m fixing to get mad!

The Top Talker was determined by comparing each user’s contributions since the start of the study. As such, if a user wrote a lot up front, it was hard for others to catch up. Future work should carefully design such competitive

elements to ensure that users perceive the elevated in-system status as achievable.

Second, while most participants (74%) at least somewhat enjoyed writing TalkBack comments, many discussed barriers to writing. For example, some disliked the questions, saying that they were too hard, while others found them too easy or boring. In summary, participants wanted to achieve the Top Talker status but were not fully motivated by the behaviors necessary to achieve it. The Top Talker was seen as a desirable identity marker, but was only somewhat effective at motivating participation.

#### Attitude Expression

In addition to status and symbolic representations, identity is constructed and expressed through one’s attitudes. Attitudes are ego-expressive because as we state our opinions, we communicate who we are [15]. Indeed, one aspect of identity work is the enactment (*e.g.*, through verbal assertion) and affirmation of one’s identity in the presence of others [28]. Accordingly, we saw participants project their identity as they expressed their attitudes both online and offline. The majority of our participants (75%) said that they enjoyed having the chance to share their opinion in TalkBack. And, in the peer interviews, this was one of the most commonly described “likes”.

Most participants (75%) said that viewing ads was at least somewhat fun. The ads were stirring as they often caused participants to not only write about them, but also to verbalize aspects of the ad or state their opinions aloud. Participants most frequently discussed their thoughts about two ad elements: foods and brands. Their reactions were often polarized, conveying pleasure and disgust. For example, the following offline exchange exemplifies the negative visceral reaction that children had to some ads:

P2: It tastes like throw up! I’m not kidding, it tastes so disgusting.

P29: Is it oily?

P2: No, it’s like you make it and it tastes like throw up. It tastes bad.

Participants also reacted positively to many of the foods shown in TalkBack. For example, when seeing an ad for hot cakes (pancakes), P13 said aloud:

P13: Ohhh that looks good! I like that one. “[reading the ad text] New holiday hot cakes.” Yum. Hot cakes. Hot cakes.

The expression of identity in the presence of others is an important part of moving one’s self-concept from an ephemeral notion to a socially acknowledged reality [28]. As participants asserted their opinions, they did not just present viewpoints; they also had the opportunity to enact their identity. Particularly because they were such strongly held positions, these viewpoints helped to convey an aspect of who they are to other participants. Professing which foods one enjoys and dislikes helps children construct a desired self image to their peers [31] and TalkBack was a vehicle for them to do this identity work.

Characteristic of Critical Thinking	Frequency	Exemplars
Describing specific details of an ad	23%	<i>“the fruit look good but some of them look nasty like the bannanas”</i>
Providing justification for/rationale behind one’s opinions	21%	<i>“[the ad is] using bad grammar to catch your attention or to be cute”</i>
Referencing outside knowledge/experience	20%	<i>“it does not make me want to go and get some pizza when they don’t even have a picture of... but i have heard that there pasta is good”</i>
Mentioning health and/or nutrition	13%	<i>“[the company] could like add like how much sugar that there really is because most people don’t really see that you can get sick or high blood sugar”</i>
Acknowledging/articulating others’ viewpoints	13%	<i>“MY MOM THINKS THIS IS GROSS AND UNHEALTHY. MY MOM SAID I CAN ONLY BUY THIS FOOD IF I WANT TO BE ON THE BIGGEST LOSER”</i>

**Table 1. Analysis of Critical Thinking.** We conducted a content analysis to look for characteristics of critical thinking in TalkBack comments. We list each characteristic, how frequently we observed it, and an exemplar from our data set.

### Critical Thinking & Self-Awareness

Our results also highlight the impact of stating opinions on self-reflection and critical analysis. First, one purpose of the TalkBack questions is to encourage users to be more self-aware of their preferences for, and attitudes toward, marketed foods. 56% of our participants said that writing posts made them think about what they eat. Second, in our content analysis we interrogated TalkBack comments to find evidence of critical thinking, or lack thereof. Adapting the method used by [24], we specifically coded for the following indicators of critical thinking: 1) describing specific details of an ad (not just speaking in general about it), 2) acknowledging or articulating others’ viewpoints, 3) providing justification for/rationale behind one’s opinions, 4) referencing outside knowledge/experience, and 5) mentioning health and/or nutrition (see Table 1 for a summary). In the remainder of this section, we focus our discussion on indicators 4 and 5.

50% of comments contained at least one of the four indicators of critical thinking that we studied. While this trend suggests that our system was moderately successful at encouraging analytic thinking, deeper analysis shows the limitations of the system. First, while participants justified their opinions in 20% of their comments (e.g., discussing why it is they like certain foods), they asserted unjustified opinions in 43%. As such, they were frequently describing their attitudes, but rarely backing up those assertions. Furthermore, we more specifically examined participants’ discussions of their own food-related behaviors (e.g., what they do and do not eat). While they discussed these behaviors in 25% of the comments, only 6% included deeper reflection upon these behaviors (e.g., stating why it is that they choose to eat certain foods).

Second, while participants discussed various aspects of ads and their health behaviors, they rarely wrote about health and/or nutrition. Comments almost never referred (directly or indirectly) to the nutrition tips (these tips were only referenced in 2% of messages). Furthermore, only 13% of comments included references to health and/or nutrition

more broadly. At the start of the study, our participants did not view health-related thinking as normative within their peer group: only 18% believed kids their age think about healthy eating. As such, participants may have thought that others would not care to read comments discussing healthy eating. Alternatively, assessing the healthiness of the ads may not have been something they cared to do.

These findings show that while TalkBack stimulated reflection on food preferences and elements of advertisements, children did not always critically assess their opinions. Indeed, participants often appeared to write as little as possible—just enough detail to answer the question. This behavior may have been a side effect of requiring users to write a comment before they were able to see others’ comments. Engaging in outward signs of critical thinking not only has implications for the speaker/writer, but for other users as well. To support effective learning in groups, it is critical for children to “explain and justify their opinions, articulate their reasoning, and elaborate and reflect upon their knowledge” [30]. We reflect upon these results later in this paper.

### Social Negotiation of Food Attitudes

Previous work has shown that beyond independent knowledge pursuits, engaging in dialogue with others can facilitate learning around the discussed topic [17]. As such, we were excited to see that TalkBack did not just catalyze the assertion of opinions, but that users also engaged in discussions with one another online and offline.

### Interest in Others’ Thoughts & Behaviors

We examined participants’ level of interest in learning about attitudes and perspectives other than their own—perspectives that could help them think about their own food preferences and question the messaging in advertisements. Specifically, we studied their reactions to the nutritionist’s tips and their peer’s comments. First, less than half of our participants (44%) said they enjoyed reading the nutritionist’s healthy eating tips. And, as previously mentioned only 2% of comments included

references to these tips. At the end of the study, only 16% of participants were able to recall even a portion of the tips. These findings suggest that the tips had very limited effectiveness in terms of capturing participants' interest and helping them retain basic recommendations. This is an important finding as having a healthy eating knowledgebase is one contributor to an individual's ability to engage in healthier behaviors [11]. Future work should continue to explore how to make this information more appealing.

In contrast, we found that most children were interested in learning about their peers' behaviors: 70% said it was interesting to see what others wanted to eat in TalkBack. Similarly, our system log analysis showed that 76% viewed others' personal pages (see Figure 3). Children were mainly interested in reading comments from those in their existing, real-world social network: our survey analysis showed that 73% enjoyed reading their friends' comments, while only 41% enjoyed reading comments from users they did not know. Our participants enjoyed reading these comments even though they were often contrary to their own opinions: 50% said they read comments that they disagreed with. These results suggests that 1) kids are somewhat willing to engage in opinion sharing with their peers, even if they have opposing viewpoints, and 2) the potential acceptability of systems supporting health-related peer discussions.

#### *Social Influence*

Even given this interest in what their peers had to say, we rarely saw outward evidence that participants were influenced by one another. Debates rarely ended with one side acquiescing; on the contrary, our participants firmly held onto their attitudes. For example, in the following excerpt children debate the goodness of McDonald's fries:

P13: I eat McDonald's a lot.

P9: It's fake food.

P13: I know but their fries are amazing.

P11: Eew.

P13: Don't even lie. You know they're good.

P11: No.

As this exchange shows, P13 describes a brand that she enjoys, and though P9 presents a counterargument, P13 is not willing to change her opinion. Instead, she provides another argument supporting her opinion of McDonald's. Some participants may have been holding onto their opinions to maintain their sense of self. Agreeing with an opposing viewpoint, when it came to their food preferences, may have been akin to losing something that made them who they are. Indeed, previous work has shown that identification with foods is quite strong for adolescents, and that through the rejection or acceptance of certain foods youth express their identity [31]. Alternatively, children may actually have been influenced, but attempting to save face—not wanting to show that they were backing down.

Further work is needed to understand why we saw children holding so resolutely to their opinions. To facilitate

collaborative learning environments, kids need to be willing and able to thoughtfully consider the points raised by their peers. As such, tools that attempt to facilitate such environments will have to identify ways of encouraging such consideration.

#### **LIMITATIONS**

Longitudinal study is needed to confirm our findings. In addition, our analysis does not characterize the accuracy of participants' health-related comments. To better understand the quality of information propagated in our system, such an analysis is needed. Finally, to assess the level of critical thinking in TalkBack we adapted the framework in [24]. Similar to our work, that research examined critical thinking in a collaborative computer-mediated environment. However, the framework was originally used in research with college-aged students. As we worked with younger students, we took a generous approach in our code application. For example, the "Providing justification for/rationale behind one's opinions" code was applied if the child provided *any* reasoning behind their opinion (even if it was simplistic). This being said, researchers should identify even more useful, age-appropriate ways of assessing critical thinking in systems that support health-related reflection and dialogue.

#### **DISCUSSION**

Our findings highlight participants' sociotechnical engagement with TalkBack, online and offline. We saw identity work mediating their expression and negotiation of attitudes, and found little analytic depth in their assertion of these opinions. Based on our findings we now suggest opportunities for future work on collaborative systems that encourage health and wellness in children.

#### **Hybrid Social Systems**

In contrast to traditional media literacy interventions [1,14], TalkBack users interacted with others online and through their offline discussions as well. This hybrid online and offline use yielded unique opportunities. For example, the online component of TalkBack allowed kids to create content that is seen by a broader audience, which previous work has shown to be valuable [8,27]. Furthermore, as participants used TalkBack in small co-located groups, their online activities were available for discussion offline. This allowed children to immediately engage in further dialogue about the ads and their opinions.

Future work should further explore the potential for hybrid environments that facilitate health and wellness in offline and online interactions. Such systems may be particularly useful in school and after school environments, contexts that HCI researchers are increasingly exploring [36]. However, hybrid systems may be effective in other environments as well. For example, one extension to TalkBack would be to provide parents with a high level sense (*e.g.*, through updates on their mobile phone) of what topics are being discussed in the system. Such a tool could describe trends (*e.g.*, what foods users are most frequently



liking or citing as unhealthy) as a way to stimulate dialogue between the child and parent.

Obvious privacy concerns arise in such a scenario, and care should be taken to ensure kids do not feel they are under surveillance. However, this example helps illustrate how health systems might further combine online and offline social interaction. In the context of health management, that bridge is critical for facilitating improvements to children's real world behaviors. Future work should explore the open questions in this space; for example, to what extent do children view their online self in such environments as a continuation of their offline self, and what implications does this have for knowledge and attitude change transfers from the virtual to the real world? To what extent do children experiment with their online identities over time and how does this experimentation impact the development of health-related skills such as critical thinking?

Of course, such hybrid offline and online environments will not always be feasible. Future work might examine, for example, how an online-only environment could approximate some of the benefits afforded in hybrid environments. For example, an online-only version of TalkBack could support synchronous communication to help spark some of the offline discussions we saw in our study. A challenge would be supporting a balance of on-topic discussions and more playful chatter that might increase the authenticity of interaction.

#### Catalyzing Critical Reflection

Finally, our findings suggest that future health systems should scaffold children in engaging in deeper critical reflection. In TalkBack, we leveraged questions from an existing media literacy curriculum [33], however participants' responses rarely contained analytic depth. There is a great opportunity for future work to examine how ICTs can better encourage kids to think critically about health-related topics.

While our participants engaged in debates about their food preferences, they rarely seemed to seriously consider others' viewpoints; instead they stood resolutely behind their opinions. One potential reason for this finding is that a complex mix of personal, social, and cultural factors influences people's attitudes towards food. HCI researchers are increasingly designing systems that appreciate these food-related values [13]. As future work attempts to help kids develop healthy food preferences, it will be important to similarly attend to these values.

Social comparison theory postulates that people tend not to compare their opinions to those whose opinions are too dissimilar [7]. For example, a person who hates junk food may not seriously compare his food attitudes to those of someone who eats it daily. Thus, if our participants felt others' opinions as too different, this could also explain their limited consideration of others' viewpoints. Future work could examine this hypothesis and the impact of a

system that 1) helps kids identify when they agree with a user, and then 2) slowly scaffolds discussions about divergent opinions. Such a tool might compellingly spark more analytical thinking. CSCW and educational technology literature can provide useful ideas for designing effective incentive structures and system prompts. For example, following [35], a new version of TalkBack could more systematically guide kids through the development of critical arguments. In collaborative environments such as TalkBack, supporting critical reflection is important for the writer, but also for helping other system users learn [30].

#### CONCLUSION

In this paper we describe TalkBack, a collaborative tool designed to help kids acquire health-related critical thinking skills. Our findings highlight how participants' use of TalkBack can be seen as a form of identity work. We encourage future work that further examines how identity work mediates kids' use of collaborative health promotion systems. In particular, we suggest the design of innovative, hybrid social tools (stimulating online and offline interaction) that help kids develop health-related critical thinking skills.

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