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Early Adolescents' Food Selection After Evaluating the Healthiness of Remote Peers' Food Choices

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This study investigates whether asking early adolescents to evaluate the food choices of remote peers improves their own food selection. Participants were students from fifth (N = 219, M_{age} = 9.30 years) and sixth grades (N = 248, M_{age} = 10.28 years) of varying nationalities living in the United Arab Emirates (race and ethnicity were not collected). Students saw peers' healthy or unhealthy food choices before picking their own food. In some conditions, students also critically evaluated the healthiness of the peers' choices. Evaluation of peer choices led to healthier decisions (d = .53) to the point that it offsets the negative impact of observing unhealthy peer choices. This effect is larger for sixth graders compared to fifth graders.

According to the World Health Organization, over 340 million children and adolescents (aged 5–19 years) were classified as overweight or obese in 2016. The fraction of children and adolescents classified as overweight and obese has risen dramatically from just 4% in 1975 to just over 18% in 2016. Childhood obesity is associated with a wide range of severe health complications and an increased risk of premature onset of illnesses, including diabetes and heart disease. Without intervention, children and young adolescents classified as obese are likely to remain so throughout adolescence and adulthood. Since dietary habits are established at a young age, it is critical to identify effective public health strategies to address these issues in childhood (Haire-Joshu & Tabak, 2016).

Among the factors driving children's eating behavior (for an extensive review, see DeCosta, Møller, Frøst, & Olsen, 2017), there is ample evidence showing that peer modeling affects eating behavior by providing a norm of appropriate food intake and information on food preferences. This is true for preschool children (Addessi, Galloway, Visalberghi, & Birch, 2005; Duncker, 1938; Hendy, 2002; Hendy & Raudenbush, 2000), school-aged children (Bevelander, Anschütz, Creemers, Kleinjan, & Engels, 2013; Birch, 1980; Salvy, Elmo, Nitecki, Kluczynski, & Roemmich, 2011), and early adolescents (Hutchinson & Rapee, 2007; Oliver & Thelen, 1996; Salvy, Howard, Read, & Mele, 2009; Salvy, Romero, Paluch, & Epstein, 2007). Peer modeling influences eating behavior even when the norm is set by a *remote peer*. Remote peers can take different forms, including fictitious peers (Bevelander, Anschütz, & Engels, 2012; Kim, Chen, & Cheon, 2019a, 2019b; Sharps & Robinson, 2017), remote real people (Bevelander, Engels, Anschütz, & Wansink, 2013), as well as peers in videos, TV shows, or movies (Binder, Naderer, & Matthes, 2019; Horne et al., 2004; Laureati, Bergamaschi, & Pagliarini, 2014; Romero, Epstein, & Salvy, 2009). Moreover, remote peer modeling is observed for both healthy

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and unhealthy foods and for different degrees of the peer's popularity (Bevelander, Anschütz, et al., 2013; Romero et al., 2009; Salvy et al., 2007; Sharps & Robinson, 2015, 2017).

This study goes one step further in the analysis of remote peer effects by investigating whether asking early adolescents to *critically evaluate* the healthiness of the food decisions of remote peers enhances the positive effect of healthy peers and dampens the effect of unhealthy peers on the young adolescents' own food intake.

The mere fact of evaluating the healthiness of peer's choices could lead early adolescents to make healthier food choices by pushing them to think more deliberately and less impulsively. In psychology and behavioral economics, proponents of dual-process theory argue that adult individuals make judgments and decisions based either on intuition or reason (Kahneman, 2003). Intuitive decisions are typically made impulsively based on heuristics, habits, norms, and "gut feelings," while reasoned decisions tend to be made slowly by deliberately considering costs and benefits. Consequently, increasing deliberative thinking promotes positive behaviors in domains where impulsivity has negative consequences—examples include exercising (Gollwitzer, 1999), safe sexual practices (Richard, van der Pligt, & de Vries, 1996), risk avoidance (Tetlock & Boettger, 1994), and environmentally friendly behaviors (Bamberg, 2002).

With food choice, intuitive decision making often results in the consumption of unhealthy foods (Read & van Leeuwen, 1998), while deliberate decision making is more likely to consider long-term health risks and lead to healthier food choices (Just & Gabrielyan, 2018). Since deliberation is effortful and requires both ability and motivation (Chance, Gorlin, & Dhar, 2014), food choices are often made intuitively (Just & Gabrielyan, 2018; Van Kleef & van Trijp, 2018; Vecchio & Cavallo, 2019). This is consistent with the observation that knowledge of the benefits of eating healthy foods, which informs deliberate choice, is not sufficient to ensure consistently healthy food selection (Dudley, Cotton, & Peralta, 2015). This is also consistent with the abovementioned effects of peer choices, as intuitive decision making includes the automatic copying of others' behavior (Schleihauf & Hoehl, 2020). Since evaluating peer choices requires deliberative thought (Small, Loewenstein, & Slovic, 2007), it is plausible that it will prompt individuals to think deliberatively about their own food choices, resulting in more healthy eating.

For the evaluation of the healthiness of peer choices to promote healthy eating among early adolescents, not only must they have developed the capacity to reason deliberately, but their deliberative thinking must be easily triggered. Early adolescence represents a developmental period of biological, cognitive, psychological, and social changes (Caskey & Anfara, 2007). Importantly, during early adolescence, there are significant changes in brain development and function, particularly in regions of the cortex that are involved in higher level cognitive processes (Fuhrmann, Knoll, & Blakemore, 2015; Giedd, 2004; Jaworska & MacQueen, 2015; Nagel, 2010). During this stage, children exhibit a wide range of individual intellectual development (Kellough & Kellough, 2008; Manning, 2002), including metacognition and the capacity for abstract thought processes (Elkind, 1981; Flavell, 2011; Piaget, 1952, 1960). These theories of cognitive development suggest that intuitive thinking shifts toward more deliberative thinking as children age. More recent approaches to cognitive development sometimes challenge these relatively unidirectional approaches (Reyna & Brainerd, 2011). In particular, dual-process theories argue that intuitive and deliberative thinking develop independently, which can give rise to varying degrees of reliance on intuitive thinking and developmental reversals as individuals age (Kokis, Macpherson, Toplak, West, & Stanovich, 2002; Schwarzer, Kofer, & Wilkening, 1999). It is worth pointing out, however, that while different approaches to cognitive development differ in their view of intuitive decision making, there is relatively more agreement that deliberative thinking improves during childhood (Klaczynski, 2004).

Based on previous studies on deliberative thinking and food choice, the first hypothesis in this study is that early adolescents who evaluate the healthiness of choices of remote peers will make healthier decisions irrespective of the healthiness of the remote peers' choice. This hypothesis assumes that early adolescents have both basic knowledge about the healthiness of the various food items and value eating healthy foods. Only if these two assumptions are met will more deliberation lead to healthier eating. However, there is support for these assumptions in the literature. First, numerous studies find that young adolescents have an excellent awareness of the nutritional value of the foods they eat (e.g., Chapman, & Maclean, 1993; Croll, Neumark-Sztainer, & Story, 2001; DeVault et al., 2009; Grosso et al., 2012). On the other hand, although the evidence is mixed, there are studies demonstrating that giving young adolescents information about the healthiness of food items can increase their consumption of healthy food (for a meta-analysis, see Dudley et al., 2015). This finding demonstrates that some young adolescents must value healthiness. Otherwise, nutritional information would not have an effect.

The study's second hypothesis is exploratory and is tentatively based on limited evidence from developmental research on childhood and early adolescence. This hypothesis posits that asking young adolescents to evaluate the healthiness of the choices of remote peers will trigger more descriptive decision making among sixth graders compared to fifth graders, and therefore, it will have a higher impact on the healthiness of food choices of the older students compared to the younger ones. Developmentally speaking, the young adolescents in the sample are close in age. Therefore, there is not a lot of evidence to suggest that the evaluation of the healthiness of peer choices differs between fifth and sixth graders. However, since early adolescence represents a highly variable period in terms of behavior and development (Casey, Getz, & Galvan, 2008), and there is evidence that the influence of peers on dietary choices can vary between young adolescents that are only 1 or 2 years apart (Coppinger, Jeanes, Dabinett, Vögele, & Reeves, 2010), it is worth analyzing the effect of age in the sample.

Method

Experimental Design

The experiment builds on the setup introduced by Charness, Cobo-Reyes, Katz, Sánchez, and Sutter (2018). In this setup, participants were presented with four different food trays. Each tray included five different food items of the similar nutritional value as evaluated by a nutritionist at the Burjeel Hospital in Abu Dhabi, United Arab Emirates. The nutritionist evaluated the food items by their overall nutritional value (calories, saturated fats, sugar levels, and nutrient density; see Table A1 in the Appendix S1 for details). The items chosen were well-known to the participants and commonly consumed by families in the United Arab Emirates. Drink options were also included in each of the trays. Each child had to pick four food items from the trays (see Figure 1). Participants could choose one or more items from the same or different trays, and they could select more than one unit of the same item. Before making their decision, all participants were informed that whatever they picked constituted their snack of the day and that they were allowed to consume it. Typically, students bring a snack and lunch to school. To ensure participants would not be full, experimenters asked parents beforehand not to send a snack on the day the experiment took place.

Figure 1. Food items in each of the food trays.
Note. The trays were ordered from the unhealthiest (Tray 1) to the healthiest (Tray 4). In the experiment, there was more than one unit of each food item. Tray 1: Haribo Gold Bears (gummi bears), Chunko's (chocolate cookies), Lay's (potato chips), Chupa Chup (lollipop), Carrefour Fruit Drink (mixed fruit drink from concentrate); Tray 2: Lacnor Chocolate Milk, Carrefour Fruit Yogurt, Deemah Date Bars (cookie with processed dates), Lu Barni (soft cake with chocolate), Tray 3: Mini Babybel (processed cheese), Saltines (crackers), Sunmaid Raisins, Pear, Arla Organic Full Fat Milk; Tray 4: Al Ain Natural Yogurt, Arwa bottled water, baby carrots, bananas, apples.

Before making their own food choices, participants were informed about the four food items chosen by a (nonpresent) remote peer. The remote peer was another young adolescent who took part in the experiment. This young adolescent belonged to the same grade as our participants but attended a different school. As a consequence, the identity of the remote peer was unknown to our experimental subjects. Participants were simply told, "Another student before you made the following choice." Since the remote peer choices were shown printed on a piece of paper, it was clear to the participants that the peer was not one of the students that immediately preceded them. However, note that participants were not explicitly told that the remote peer was another student in the same grade at a different school, so any further characteristics of the remote peer remained ambiguous.

The 2 × 2 experimental design consisted of the following four treatments:

1. *Healthy Peer*: In this treatment, the remote peer's food items were all relatively healthy: an apple, a banana, a pear, and water.
2. *Unhealthy Peer*: In this treatment, the remote peer's food items were all relatively unhealthy: gummi bears, a lollipop, chips, and chocolate milk.
3. *Healthy Peer with Evaluation*: In this treatment, after receiving the information about the remote peer's choices but before choosing their own food, participants had to evaluate the remote peer's decisions in terms of healthiness and explain their evaluation. The peer's choices were the same as in *Healthy Peer* treatment.
4. *Unhealthy Peer with Evaluation*: This treatment mirrors the *Healthy Peer with Evaluation* treatment but uses the peer's choices of the *Unhealthy Peer* treatment.

The last two treatments differ from the first two in that, before participants made their own choice, they were asked to answer two questions on the same piece of paper where they saw the remote peer's choices. The first question asked participants to evaluate the healthiness of the peer's choices as "very unhealthy," "unhealthy," "healthy," or "very healthy." The second question asked participants to provide a written justification for their evaluation. The evaluation sheet is available as Figure A1 of the Appendix S1.

Participants

Participants consisted of 467 students recruited from three international primary schools in Abu Dhabi, United Arab Emirates. The students were enrolled in the fifth and sixth grades. The sample was 54.51% female. The students' modal age was 9 years for students in fifth grade (M_{age} = 9.30 years, SD_{age} = .55) and 10 years for students in sixth grade (M_{age} = 10.28 years, SD_{age} = .56). The sample was predominantly of middle to high socioeconomic status. Descriptive statistics from these schools indicate that 41.50% of the students' parents have a Bachelor's degree, and 28.50% have some form of graduate education. The median monthly household income falls in the range between \$4,000 to \$5,500. There was a noticeable representation of different races and ethnicities in the student body. However, the schools did not provide us with a precise breakdown.

Procedures

The week before the experiment, an email was sent to parents. They were informed about the experiment and were told that participating students would not need to bring a snack for one of their school breaks on the day of the study. Students have two breaks during their school day, which lasts from 8.00 a.m. to 3.00 p.m. In each participating school, different classes were randomly assigned to one of the four treatments. In other words, all participants from the same class faced the same condition in the experiment. Table 1 shows the number of participants per treatment and grade.

On the day of the experiment, participants belonging to the same class were gathered in a room (Room A). At this point, participants were told that they would participate in an activity in which they would choose food to eat. Then, one by one, each participant was asked to move to another room (Room B). In this second room, participants were asked to go to a separate table away from the experimenter and read the printed information about a remote peer's food selections. In the evaluation treatments, these forms also included instructions asking participants to evaluate the remote peer's food choices (see Figure A1in the Appendix S1). The forms were left on the table. After that, the participants were walked through a short orientation session by an experimenter about how to proceed with their food choice. A script of the instructions given to the students is available in the Appendix S1.

Next, the participant walked to a third room (Room C), where he or she picked the four food items he or she preferred. Note that the food items

Table 1
Descriptive Statistics of the Healthiness of the Children's Food Choices in Each Treatment (1 = Unhealthiest, 4 = Healthiest); p*-Values Correspond to Testing for Equality of Healthiness Ratings Between Conditions With and Without Evaluation. Tests Were Done Using an Ordinary Least Squares Regression of the Participants' Healthiness Rating on the Eight Interactions that Emerge From 2 Peer Conditions × 2 Evaluation Conditions × 2 School Years*

Peer	All		Healthy		Unhealthy	
Evaluation	Without	With	Without	With	Without	With
All						
M	1.85	2.23	2.04	2.31	1.67	2.16
SD	.67	.74	.71	.71	.59	.78
obs.	207	260	103	133	104	127
p-value	.000		.014		.000	
Fifth grade						
M	1.84	2.10	2.11	2.25	1.69	1.95
SD	.66	.70	.69	.67	.61	.70
obs.	62	157	22	80	40	77
p-value	.068		.427		.055	
Sixth grade						
M	1.86	2.44	2.02	2.40	1.65	2.48
SD	.68	.77	.72	.76	.58	.78
obs.	145	103	81	53	64	50
p-value	.000		.002		.000	

picked by each participant were replaced before another student came into Room C. This ensured that all participants faced the same setting when making their decisions and that they would not be able to infer the choices of other classmates by looking at the food trays. Importantly, the food items were placed away from any of the experimenters so that participants could make their decisions without feeling observed. A different member of the research team, sitting at a table in the opposite corner of Room C, recorded the students' dietary choices. The bags used by students to carry the food they picked were transparent so that the experimenter could see what participants picked from afar. This procedure was employed to reduce as much as possible the effects of social desirability, mainly because this is a school environment where students might feel that they are expected to demonstrate their knowledge of the "right" choice. Although these effects cannot be completely ruled out, it should be noted that it is an effect that would be present in all treatments and, therefore, should not impact the treatment comparisons.

Finally, the participant walked to a fourth room (Room D), where he or she joined other classmates who had already completed the task. This procedure ensured that the decisions of classmates did not directly influence the participants' decisions. To measure the participants' knowledge of the healthiness of the food items, in Room D, they were given a questionnaire in which they indicated how they thought parents from their school would rank the different food trays from unhealthiest to healthiest. Figure A2 in the Appendix S1 includes this questionnaire. Participants were not given further information about the purpose of the study.

To avoid communication between participants belonging to different classes in the same school, all sections from the same school participated in the experiment on the same day. Since students in each class went back to their classroom after the experiment was over, students of different classes could not talk to each other about the experiment before participating. The random assignment of classes to conditions was done beforehand and known by the experimenter who placed the forms in Room B but not by experimenters in Rooms A and C.

The experiment was approved by the Research Ethics Committee of Zayed University, which also funded the study. The study's complete plan and design were also submitted and approved by the Ministry of Education of Abu Dhabi, United Arab Emirates. Parents were given the option to have their children opt-out of the study by contacting the research team or informing their child's class teacher. The option to opt-out was described to the parents by email, along with the contact information of the researchers. Only 2 of 469 parents declined to participate. Finally, on the day of the experiment, participants were verbally informed of their rights to refuse participation or withdraw at any point. They were explained that nonparticipation or withdrawal had no adverse consequences and were asked to give their verbal consent. Participants were handed an id number and told that all the information would be treated anonymously using their assigned number.

Analytical Strategy

To analyze the participants' food choices, each food item was given a value according to the healthiness of the tray the item belonged to (from 1 for the unhealthiest tray to 4 for the healthiest tray). Thereafter, participants were assigned the average score of the four food items they chose as their healthiness rating. The analysis of the participants' knowledge about the healthiness of the food items was done with the absolute distance between a participant's four ratings (each child rated the food trays from 1 = unhealthiest to 4 = healthiest) and the nutritionist's ratings. This measure ranges from 0 (when the two ratings coincided) to 8 (when the participant's rating was the inverse of the nutritionist's).

Confirmatory Analysis

The first hypothesis was evaluated with a 2 (peer condition: healthy or unhealthy) × 2 (evaluation condition: with or without) mixed-effects analysis of variance (ANOVA) of the healthiness rating. We use random effects to allow for idiosyncratic classroom effects and cluster standard errors to allow for intra-classroom correlation in the error term. The same type of ANOVA was used to evaluate the participants' knowledge of food healthiness, which was a necessary assumption to arrive at the study hypotheses.

Exploratory Analysis

To evaluate the second hypothesis, the participants' school year was used as a proxy for their cognitive development. The confirmatory analysis was therefore extended to include school year in a 2 (healthy or unhealthy) × 2 (with or without evaluation) × 2 (fifth or sixth grade) mixed-effects ANOVA with classroom random effects and clustered standard errors. The final confirmatory analysis consisted of a linear regression where the dependent variable was the participants' healthiness rating, and the independent variables consisted of the 8 interactions that emerge from 2 Peer Conditions × 2 Evaluation Conditions × 2 School Years. The regression results were used to estimate the marginal mean effects of the evaluation condition (Searle, Speed, & Milliken, 1980) for the pooled peer conditions and then separately healthy and unhealthy peers. The difference between the marginal mean effect of the evaluation condition for fifth and sixth graders was tested using Wald tests. The regression includes classroom random effects and clustered standard errors.

Although the study hypotheses do not consider the participants' sex, previous work has shown that girls tend to eat more healthily than boys (Neumark-Sztainer, Story, Resnick, & Blum, 1998; Roberts et al., 2009). Therefore, another exploratory analysis accounting for the participants' sex was performed with a 2 (healthy or unhealthy) × 2 (with or without evaluation) × 2 (boy or girl) mixed-effects ANOVA and then with linear regression to estimate the marginal mean effects of the evaluation condition depending on the participants' sex. Like before, this analysis includes classroom random effects and clustered standard errors.

Results

Table 1 shows the mean and standard deviation of the healthiness ratings for all participants in each of the four treatments separated according to their school year. Table 1 shows that the remote peer's choices mattered. Participants who saw a healthy peer made healthier choices than participants who saw an unhealthy peer. More importantly, in line with the first hypothesis, Table 1 also shows that evaluating the peer's food choices induced participants to make healthier choices of their own. These results were confirmed by the Peer Condition × Evaluation Condition ANOVA, which showed a main effect for the peer condition ($\chi^2(1) = 6.80$, $p = .009$) as well as the evaluation condition ($\chi^2(1) = 14.02$, $p < .001$). The positive effect of evaluating the peer's food choices is depicted in Figure 2 for all as well as separately for each peer condition. Overall, evaluating peer choices increased the participants' healthiness rating by 0.38 ($d = .53$). The figure also illustrates that the positive effect of evaluation seems to be stronger after observing an unhealthy peer (0.49, $d = .70$) compared to a healthy peer (0.27, $d = .38$). However, the Peer × Evaluation interaction in the ANOVA does not reach statistical significance at conventional levels ($\chi^2(1) = 1.33$, $p = .248$).

The analysis of the participants' knowledge about the healthiness of the food items is reported next. Overall, the participants' ratings were very close to that of the nutritionist. The mean distance between the two was 0.49 in *Healthy Peer*, 0.46 in *Unhealthy Peer*, 0.39 in *Healthy Peer with Evaluation*, and 0.25 in *Unhealthy Peer with Evaluation*. Unlike with food choices, the participants' knowledge of the healthiness of the food was not affected by their peer or by evaluating the peer's choices. The Peer Condition × Evaluation Condition ANOVA found no evidence of a main effect for the peer condition ($\chi^2(1) = 0.49$, $p = .484$), the evaluation condition ($\chi^2(1) = 1.51$, $p = .219$), or the Peer × Evaluation interaction ($\chi^2(1) = 0.17$, $p = .676$).

The analysis of the second hypothesis follows. Table 1 shows that sixth graders made healthier food choices than fifth graders. The Peer Condition × Evaluation Condition × School Year ANOVA confirmed a main effect for school year ($\chi^2(1) = 3.26$, $p = .071$) and a significant interaction

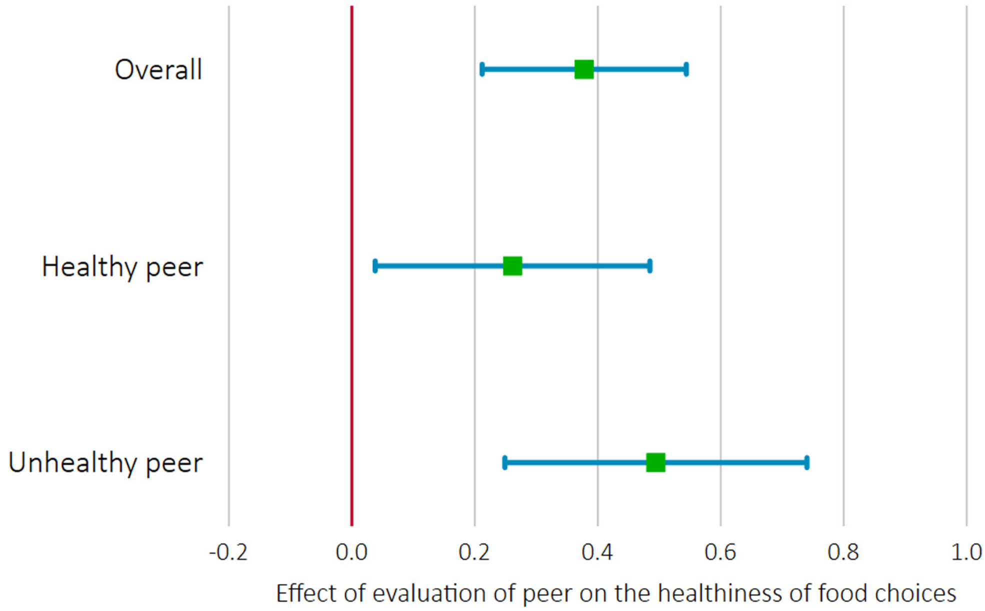

Figure 2. Estimated marginal mean effect of evaluating the peer's food choices depending on the choices of the peer. Food healthiness ratings ranged from 1 (unhealthiest) to 4 (healthiest). Marginal effects are calculated with a 2 (peer condition) × 2 (evaluation condition) mixed effects analysis of variance with classroom random effects and clustered standard errors. Lines correspond to 95% CIs.

between school year and the evaluation condition ($\chi^2(1) = 6.78$, $p = .009$). This interaction is analyzed in more detail by using a linear regression to calculate the marginal mean effects of the evaluation condition for sixth graders and fifth graders. These marginal mean effects are depicted in Figure 3. They are calculated for the overall sample and then separately for healthy and unhealthy remote peers. On average, evaluating the peer's choices improved the food choices of sixth graders more than those of fifth graders. A Wald test confirmed that the evaluation condition was significantly more effective for the average sixth grader compared to the average fifth grader ($\chi^2(1) = 5.75$, $p = .017$). Separating the sample depending on the peer condition revealed that the difference between the estimated marginal mean effect of sixth grades compared to fifth graders was statistically significant in the unhealthy peer condition ($\chi^2(1) = 6.31$, $p = .012$) but not in the healthy peer condition ($\chi^2(1) = 0.93$, $p = .336$).

The exploratory analysis of the results conditioning on sex shows that, consistent with previous studies, girls made healthier food choices than boys ($M_{girl} = 1.90$, $SD_{girl} = .63$, $M_{boy} = 1.81$, $SD_{boy} = .72$ without evaluation and $M_{girl} = 2.35$, $SD_{girl} = .76$, $M_{boy} = 2.14$, $SD_{boy} = .72$ with evaluation). The Peer Condition × Evaluation Condition × Sex ANOVA confirmed a main effect for sex ($\chi^2(1) = 3.65$, $p = .056$) but no significant interactions. Calculating the marginal mean effects of the evaluation condition for each sex using a linear regression shows that, on average, evaluating the peer's choices improved the food choices of girls slightly more than those of boys. However, Wald tests did not find a significant difference between the estimated marginal mean effect for girls compared to that for boys (for the overall sample $\chi^2(1) = 2.55$, $p = .110$, for the healthy peer condition $\chi^2(1) = 1.51$, $p = .220$, and for the unhealthy peer condition $\chi^2(1) = 1.21$, $p = .271$).

Discussion

Childhood obesity is one of the most severe public health challenges of the 21st century (World Health Organization, 2018). Hence, identifying effective public health strategies to address this medical condition is crucial to prevent obesity and other lifestyle diseases in adulthood (Koplan, Liverman, & Kraak, 2005). This study examined whether evaluating food choices made by remote peers affects early adolescents' food selection. The first result is that the mere fact of evaluating the choices of a remote peer led young adolescents to choose significantly healthier food. This effect materializes irrespective of whether the remote peer's choice was healthy or unhealthy.

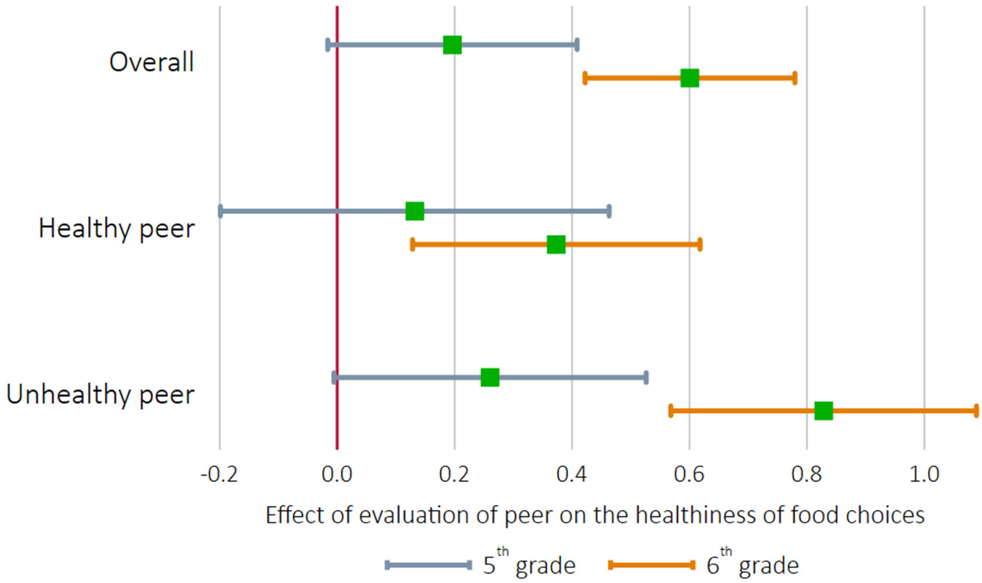

Figure 3. Estimated marginal mean effect of evaluating the peer's food choices depending on the students' school year. Food healthiness ratings ranged from 1 (unhealthiest) to 4 (healthiest). Marginal effects are calculated with a linear regression where the dependent variable was the students' healthiness rating, and the independent variables consisted of the 8 interactions that emerge from 2 Peer Conditions × 2 Evaluation Conditions × 2 School Years. Lines correspond to 95% CIs.

These findings reinforce the idea that making individuals think more deliberately affects their decision making (Bamberg, 2002; Gollwitzer, 1999; Richard et al., 1996; Tetlock & Boettger, 1994). This study contributes to this literature in two ways. First, while the research on the effects of more deliberative thinking has mainly focused on adults, the results in this study demonstrate that more deliberative thinking also improved the decisions of early adolescents. Second, while previous studies have asked primary-school children about their perceptions regarding food choice (Fitzgerald, Bunde-Birouste, & Webster, 2009; Hesketh, Waters, Green, Salmon, & Williams, 2005; Ludvigsen & Scott, 2009; Varela & Salvador, 2014), this study is the first to ask early adolescents to evaluate the food choices of a remote peer *before* they select their own food items. Interestingly, this sequence significantly increased the healthiness of the participants' food choices.

This study also finds that despite the small age difference between grades, evaluating the peer's choices improved the healthiness of the food choices of sixth graders more than those of fifth graders. This finding is consistent with dual-process theories of cognitive development, which posit that it is easier to prompt older adolescents to think more deliberately about their choices than younger adolescents (Klaczynski, 2004; Reyna & Brainerd, 2011). Although this research does not provide sufficient evidence to conclude that a 1-year age difference is large enough to trigger noticeable changes in the tendency to think deliberatively, it should be noted that this is not the only study that finds significant changes in healthy behaviors for young adolescents that are close in age. For example, a study investigating the influence of peers on the physical activity of young adolescents aged 9–11 years found that the effect of peers on physical activity varied by age (Coppinger et al., 2010).

There are potentially other explanations for why older adolescents make better choices than younger adolescents. For example, older adolescents have been found to know more about food (Hart, Bishop, & Truby, 2002) and to have higher attention spans (Hamel & Pelphrey, 2009) than younger adolescents. In addition, there is evidence that the tendency by young adolescents to provide socially desirable answers also varies with age (Crandall, 1966). However, these explanations do not provide an obvious reason for the interaction between age and the impact of the evaluation condition. Similarly, there is evidence suggesting that the influence of peers commences during childhood (Coppinger et al., 2010; Knoll, Magis-Weinberg, Speekenbrink, & Blakemore, 2015; Sumter, Bokhorst, Steinberg, & Westenberg, 2009) and varies as children age (Walker & Andrade, 1996; Steinberg & Monahan, 2007 and Sumter et al., 2009). Therefore, an alternative explanation is that evaluation of the healthiness of peer choices triggers deliberative thinking equally in students of both grades, but it has a higher impact on the behavior of sixth graders because it needs to overcome a weaker peer effect. Although this explanation cannot be completely ruled out, it is less consistent with the data in that the difference induced by observing a healthy instead of an unhealthy peer in the no-evaluation condition does not vary between fifth and sixth graders. More generally, these findings contribute to the literature on adolescents' age and their food choices (e.g., Leon, Marcuz, Couronne, & Koster, 1999; Liem, Mars, & de Graaf, 2004; Liem, Zandstra, & Thomas, 2010).

Lastly, this study also reports exploratory findings concerning the early adolescents' sex and the influence of remote peers on food choices (Kim, Chen, & Cheon, 2019a, 2019b; Romero et al., 2009; Sharps & Robinson, 2015, 2017). Previous research on school-aged children and young adolescents reported that: (a) girls tended to choose healthier food than boys (Ragelienė & Grønhøj, 2020), (b) remote peers had a stronger influence on boys than girls (Giese, Juhász, Schupp, & Renner, 2013), and (c) there was no interaction of sex and age on food choices (Caine-Bish, & Scheule, 2009; Cooke, & Wardle, 2005; Larson, Neumark-Sztainer, Hannan, Stat, & Story, 2007; Vereecken et al., 2015). In this study, girls chose significantly healthier food than boys, but there were no significant sex differences in the influence of peers (in line with Kim, Chen, & Cheon, 2019b; Sharps & Robinson, 2015, 2017). Similarly, there were no significant differences by sex on the impact of evaluating peer choices.

To not overgeneralize these findings, it is important to point out the specific characteristics of the study that might affect the results. First, early adolescents in this study made their decisions in a private room without social interaction. In contrast, early adolescents' food choices are frequently made in a social context, where deliberative thinking might be harder to trigger. Second, the food items in the healthiest trays contained foods that young adolescents are predisposed to readily accept, such as fruits, and did not include less attractive taste profiles, such as green vegetables. Future studies could measure the liking of the different foods to explore whether it moderates the impact of remote peers and the evaluation of the healthiness of their choices on the early adolescents' food selections. Third, participants were familiar with the food items used in this experiment. However, it remains an open question whether the proposed method could help encourage the selection of healthy foods unfamiliar to young adolescents. Fourth, the young adolescents in the sample are largely from relatively affluent and educated families. Parents in these families are likely to have been emphasized the benefits of healthy eating, which is consistent with the high congruence between the healthiness ratings of the nutritionist and the young adolescents. Among less knowledgeable participants, triggering deliberative thinking might not lead to healthier food choices. Finally, these findings are based on specific age cohorts and might not generalize to younger adolescents for which deliberative thinking is less developed.

Another limitation of this study is that it evaluates short-term effects. One of the main challenges in improving eating habits is finding effects that persist over time. Experimental evidence on the long-term effect of interventions on the healthy eating behavior of children and young adolescents is scarce. Studies using monetary incentives find that improvements in healthy behaviors disappear once an intervention is removed (e.g., Belot, James, & Nolen, 2016; List & Samek, 2015; Loewenstein, Price, & Volpp, 2016). By contrast, Charness et al. (2018) find persistent effects after an intervention with nonmonetary incentives. In this sense, it would be interesting to observe the long-term effect of evaluating others' actions on adolescents' behavior.

From a public health perspective, having a better understanding of how young adolescents develop, evaluate, and subsequently make food choices can help us design efficient strategies to improve the eating habits of people while they are young (Shepherd & Dennison, 1996). Early adolescence is also an important age to influence food choice since it is the age at which obesity starts to have a strong negative impact on self-esteem and social relationships (Esposito, Fisher, Mennella, Hoelscher, & Huang, 2009; Lemeshow et al., 2008).

This study suggests that incorporating evaluations of the healthiness of the food choices of others to generate greater awareness of one's decision making can be an important tool to fight unhealthy eating lifestyles. Simple interventions that give people information about what others do have been shown to be a cost-effective way of affecting food choices (e.g., Cai, Chen, & Fang, 2009; Stok, De Ridder, De Vet, & De Wit, 2014). This study complements this research in two ways. First, it demonstrates that the impact of these interventions can be enhanced if deliberative thinking is triggered. Second, it also demonstrates that to apply these interventions to the eating behavior of young adolescents, it is crucial to consider the stage of their cognitive development. Interventions meant to trigger deliberative thinking appear to work well among early adolescents.

Since people model their peers, even if they are remote, societies with poor eating habits can fall into a negative self-perpetuating dynamic. This research reports a way to potentially counteract this adverse dynamic. By asking children to evaluate the healthiness of others' food choices, the negative impact of seeing an unhealthy peer was wholly counteracted.

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Supporting Information

Additional supporting information may be found in the online version of this article at the publisher's website:

Appendix S1. Supplementary information.