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CHILDREN CONFORM TO REMOTE CONFEDERATES ON FOOD CHOICE

Using remote peers' influence to promote healthy food choices among preschoolers

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Abstract

Prior studies have demonstrated that social norms or cues of others' eating behaviors serve as powerful guides for one's own eating behaviors. Yet, it remains underexplored whether young children are susceptible to social pressure by remote peers when faced with a conflict between what they prefer and the healthy choices by a group majority. Here we examined whether preschool-aged children conformed to healthy food choices of remote peers. Following a modified Asch conformity paradigm, the present study used videos of remote confederates' food preferences to test whether 89 3- to 6-year-old Singaporean preschoolers conformed to remote peers' healthy food choices (fruits and vegetables). Participants were asked to make a series of food choices when faced with two food options (healthy, unhealthy), both independently and after having viewed remote peers make healthy food choices (fruits, vegetables). Results showed a significant level of conformity, such that participants altered their initially unhealthy food choices to match the healthy choices of remote peers for 29% of trials. Age and BMI z-scores were also associated with rates of food choice conformity. The finding that young children may conform to food-related behaviors of remote peers offers the potential promise of interventions involving remote peers in promoting healthier dietary choices of young children.

Key words: conformity, food choice, preschoolers, peers, social learning

Introduction

Social norms and modeling have been identified to have powerful effects on eating behavior (Cruwys, Bevelander, & Hermans, 2015; Herman, Roth, & Polivy, 2003; Pliner & Mann, 2004). Studies on social modeling of eating behavior have used various paradigms that resemble those used in social psychology research on conformist behavior, typically involving live confederates posing as eating companions or using natural dyads comprised of peers and strangers (see review Robinson, Blissett, & Higgs, 2013). Additionally, even implied behaviors of remote confederates, who are not physically present, can influence eating behavior among adults (Burger et al., 2010; Feeney, Polivy, Pliner, & Sullivan, 2011; Hermans, Larsen, Herman, & Engels, 2012; Roth, Herman, Polivy, & Pliner, 2001), as well as children ranging from 5- to 12-years-old (e.g., Bevelander, Engels, Anshutz, & Wansink, 2013; Horne et al., 2004; Romero, Epstein, & Salvy, 2009; Sharps & Robinson, 2017).

By the time children start preschool, they are already sensitive to peers as a social reference group for domains such as perceptual and moral judgments (e.g., Corriveau & Harris, 2010; Kim, Chen, Smetana & Greenberger, 2016), as well as for eating behavior. Children as young as 2-years-old have been found to accept or reject novel foods when live peer modeling was involved (Birch, 1980; Greenhalgh et al., 2009; Hendy, 2002). Food educational programs that combined peer influence through videos depicting animated and live peers have also increased 4-11-year-olds' vegetable and fruit consumption (e.g., Horne et al., 2004; Horne et al., 2011). Similarly, screen-based peer modeling effects of increased vegetable preference and consumption were found for 3-5-year-olds after a week of exposure to a commercially available film series showing toddlers enthusiastically eating a vegetable (Staiano, Marker, Frelrier, Hsia,

& Martin, 2016). Recent findings show that even remote peers who are not physically present or displayed can influence children's eating behavior as evidenced by 6-11-year-olds who adjusted their vegetable intake to that of previous (fictitious) peers (Sharps & Robinson, 2015).

All previous studies reviewed above, however, were based on either observational or between-subjects designs, so it is unclear whether children's pre-existing preferences actually changed as a result of social influence. One way to test the strength of peer influence is to use a conformity paradigm with a within-subjects design that examines actual changes in preference after exposure to peers' preferences. Moreover, to our knowledge, no study has tested food preference or choice experimentally using a conformity paradigm with remote peers in a preschool age group (3-5-years-old). Preschoolers' conformity to others' food choices is an important decision-making domain to explore, given that children's early food preferences predict food consumption patterns later in life (Skinner, Carruth, Bounds, Ziegler, & Reidy, 2002). Even minor changes in dietary choices can have a major impact on health benefits (Hill, Wyatt, Reed, & Peters, 2003). Another limitation of earlier studies on peer modeling of healthy food eating behavior is their reliance on single foods (i.e. carrots). It is important to examine multiple test foods to see whether conformity to healthy foods can generalize to various healthy food types. Finally, the role of BMI in conformity to others' eating behavior is not well-understood. Some studies found that over-weight children were more sensitive to peer influence than normal-weight children (Bevelander, Anschütz, & Engels, 2012; Salvy, Kieffer, & Epstein, 2008), but other studies did not find an association between BMI and the modeling effect (Sharps & Robinson, 2016; Sharps & Robinson, 2017). Thus, more research is needed to examine the role of BMI in susceptibility to peers' food preferences.

This study was designed to overcome the above limitations and to contribute to the

literature on social influences on young children's eating behavior. Using a conformity paradigm with a within-subjects design, this study tested whether preschool children's initial unhealthy food choices (sweets, fatty-and-salty foods) would change following exposure to remote peers' social pressure for healthy food choices (vegetables, fruits) and whether BMI was correlated with conformity to food preferences of others. Through a series of interviews and video clips, preschoolers were asked to indicate their food preferences between healthy-unhealthy food pairs before and after being shown remote peers on video making healthy food choices between the same food pairs. Based on the findings from prior social modeling and conformity studies involving older age groups, we predicted that there would be significant conformity effects in preschool children's food choices (Hypothesis 1), and that BMI would be negatively associated with conformity to healthy peers' food choices given that children with higher BMI may maintain stronger personal preferences for unhealthy, yet palatable foods (Hypothesis 2).

Methods

Participants

Participants were 89 3-6-year-old Singaporean children ($M = 5;1$ [year;months], range = 3;1–6;9, 54 girls) from neighborhood preschools. Children in Singapore typically attend preschool for three years starting at age 3. Based on the G*Power (Erdfelder, Faul, & Buchner, 1996) analysis of medium effect size (Cohen's $d = 0.5$) and desired statistical power level of 0.8 and probability level of 0.05, a minimum sample size of 54 was needed to reveal conformity effect against zero (two-tailed one-sample t test). To test the correlation between BMI and conformity, a sample of 82 was needed to achieve .80 power at the probability level of .05 (two-tailed) for an expected medium effect of $r = .30$. Fifty-six Singaporean children were of Chinese

descent, 25 of Malay descent, 4 of Indian descent, and 4 as “Other”. The percentage of healthy-weight children was 81% according to World Health Organization (WHO) growth references (WHO Multicentre Growth Reference Study Group, 2006). Four children were dropped due to disinterest in continuing participation. The study was conducted in English, which is the common language of instruction in Singapore schools. The researcher obtained permission from principals. All procedures involving human subjects were approved by the Nanyang Technological University Institutional Review Board; Ref. IRB-2015-05-046 (Project title: “Children's Conformity to Others' Food Preferences”). Parents provided fully informed written consent for their child to participate and children provided verbal assent before the experiment.

Study design and procedure

This study was a within-subjects design with the dependent variable being change measured by whether participants who initially expressed a preference for unhealthy foods would subsequently conform to healthy choices of remote peers.

The testing session took place at the child's preschool. Children were tested individually with the whole session lasting about 15-20 min. Before the experiment, children's height and weight were measured, and their hunger status assessed. Then, participants were asked to play a game where they would be shown some foods and asked some questions about which food they would want. Each child completed a pretest (initial food preference), manipulation (exposure to remote peer influence), and posttest trials (indicating preference food items again). For each trial, the experimenter asked the participant, “See this picture? Here are some [e.g. carrots] and here are some [e.g. chips]. Which one would you like to eat if you can only pick one?”. Participants' verbal responses about which food they preferred were recorded. After the experiment,

participants were given a debriefing in which they were informed that different people have different food preferences and offered a sticker.

Measures

Hunger status assessment. Participants' hunger status was measured on a 3-point scale using images of three child figures with (1) an empty stomach, (2) a half-empty stomach, and (3) a full stomach (Fisher & Birch, 2002).

Food choice judgment. Four 16 x 21 cm still frames of healthy-unhealthy food pairs were presented on a laptop computer. The pairs were: apple-chocolate, banana-cookie, broccoli-super rings (locally available cheese puff snacks), and carrots-potato chips. These prototypically healthy/unhealthy foods were taken from Nguyen and Murphy (2003), a study that found that 4-7 year-olds were able to categorize food into taxonomic (i.e. fruit), evaluative (i.e. healthy foods), and script (i.e. breakfast food) categories. The 10-minute video showed these images followed by a film that featured two peer informants (either both male or both female) that were gender-matched to the participant. A pair of healthy-unhealthy food items was shown in each trial. For each trial, the interviewer in the film (not physically present on the screen; only voice is heard) asked to the children to raise their hands to indicate which of the two foods they wanted to eat (see online supplementary materials for detailed video content and questions for children's food choices). Children in the video always indicated their preference for the healthy foods (i.e. apple, banana, broccoli, carrots) by their raising their hands. They also indicated their dislike for unhealthy foods by leaving their hands down when asked to raise their hand if they preferred the unhealthy foods. The order of the four healthy-unhealthy food pairs was counterbalanced across participants for both pretest and posttest. Conformity was measured by children's shifts in

preference from unhealthy (at pretest) to healthy food choices in agreement with the “healthy” peer groups’ judgments. For example, for each pretest and posttest trial, responses were scored as 0 (unhealthy food) or 1 (healthy food). The count of “unhealthy-to-healthy” responses (0-1) across the 4 trials were summed and averaged out of 4 trials to form the mean proportion of trials on which children conformed. Due to skewed distribution, these rates were arcsine-transformed for parametric data analysis.

BMI. Child’s weight and height were measured using a scale and a measuring tape affixed to a wall in the beginning of the experiment. Their age-adjusted BMI z-scores were calculated based on the WHO norms.

Parenting Questionnaires. Parents were asked to complete a demographic information survey and a Comprehensive Feeding Practices Questionnaire (Musher-Eizenman & Holub, 2007). Details and results for this measure can be found in online supplementary materials.

Analytical Strategy

One-sample *t*-tests were used to determine conformity (i.e., whether mean conformity to peers’ healthy food choices was significantly different from zero [no change in preference after exclusion of prescreened trials]). Pearson correlations were used to examine the relationships between conformity and BMI as well as other child characteristics.

Results

Prescreening

Participants who indicated preference for healthy food choice for all 4 pretest trials (leaving no opportunity for later conformity to healthy foods, $N = 20$) were excluded from the conformity analysis but included in a comparison analysis (see below). The total number of

participants for conformity analyses was 69. Additionally, trials in which a child selected the healthy option at pretest were excluded from analyses, given that the corresponding posttest trial would not provide an opportunity for conformity to healthy food preferences of peers.

Mean conformity levels

Following the analysis procedures of past studies of preschoolers' conformity (Corriveau, Kim, Song, & Harris, 2013; Kim et al., 2016), mean conformity was calculated as mean proportions of trials on which children conformed. Separate variables for conformity were computed based on *overall conformity to peers' choices for all foods* ($N = 69$), *conformity to peers' fruit choices* ($N = 44$), and *conformity to peers' vegetable choices* ($N = 60$). Like previous studies, dichotomous dependent variables were also created indicating whether the participant conformed at least once out of 4 trials was also created (*conformed at least once to all foods*, *conformed at least once to fruits*, *conformed at least once to vegetables*). Preliminary analyses indicated no gender differences in mean conformity to peers' food choice, so gender was not included in subsequent analyses.

One-sample t -tests were run to examine whether mean conformity to peers' healthy food choices was significantly different from zero (i.e. after exclusion of prescreened trials, children made zero healthy food choices at posttest). Preschoolers' overall conformity to others' healthy food preferences was significant, $t(68) = 5.7$, $p < .001$, $d = .686$; children who initially picked unhealthy food choice switched to healthy food choice on 29% of the trials (arcsine-transformed score was .901; See Table 1). When examining fruits and vegetables separately, children's conformity was significant for fruits, $t(43) = 3.52$, $p = .001$, $d = .531$, and vegetables, $t(59) = 5.33$, $p < .001$, $d = .688$. The mean conformity rates were .18 for fruits (arcsine-transformed

score was .571) and .31 for vegetables (arcsine-transformed score was .995). Finally, a paired-samples *t*-test showed no significant differences between conformity to peers' vegetable and fruit food choices, $t(34) = -.50, p = .624$.

To check whether the evidence for children's conformity may have been due to children changing their answers randomly or due to demand characteristics, we calculated the mean "conformity" rate for the 20 children who initially chose healthy foods in pretest trials and then changed to unhealthy foods at posttest trials. If the conformity to healthy choices were a result of demand characteristics rather than the intended peer influence, mean conformity would be similar for the two groups of children. A *t*-test showed that the mean conformity from unhealthy to healthy food choices (29%) was significantly greater than the mean conformity from healthy foods to unhealthy food choices (8.4%), $t(68) = 4.81, p < .001$, suggesting that children did not change their preferences randomly or because of demand characteristics.

Table 1

Means, standard deviations, and bivariate correlations of variables

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5	6
1. Overall Conformity Rate	.29	.42	—					
2. Fruit Conformity Rate	.18	.34	.94**	—				
3. Vegetable Conformity Rate	.31	.46	.93**	.60**	—			
4. Age	59.51	12.02	.23	-.04	.34**	—		
5. BMI z-score	-.05	1.23	-.22 [†]	-.14	-.23 [†]	-.11	—	

6. Hunger Status	.41	0.50	.04	-.11	.07	.11	.17	–
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Note. Age is by months; Body Mass Index (BMI); Hunger status was coded: 0=hungry, 1=half-full, 2= full

[†] $p < .10$ * $p < .05$ ** $p < .01$

Correlates of conformity

For correlates of conformity (see Table 1), BMI z-score was marginally negatively correlated with overall food conformity, $r(66) = -.22$, $p = .066$, and conformity to others' vegetable preferences, $r(57) = -.23$, $p = .08$. Specifically, children with higher BMIs are somewhat less likely to conform to the overall healthy choices and vegetable preferences of the remote peers. Age was significantly positively correlated with conformity to others' vegetable choices, $r(58) = .34$, $p = .008$, indicating that older children were more likely to conform to peers' vegetable food choices than younger children. Child's hunger status was not associated with conformity, $r(61) = .04$, $p = .75$. Additionally, no variables were significantly correlated with conformity to peers' fruit choices, including age, $r(42) = -.04$, $p = .78$, and BMI z-score, $r(42) = -.14$, $p = .37$.

Discussion

Humans have been adapted to readily learn what is safe or nutritious to eat not only based on personal experience (i.e., trial and error), but also through efficient social learning mechanisms (Higgs, 2015). The current study built on previous research on peer modeling of food eating behavior in several ways: (1) by testing children's rate of conformity to peers' healthy food choices using remote peer models on video, (2) testing children younger than 6-years-old in conformity to others' food choice, (3) using multiple test foods, and (4) examining BMI effects on children's conformity to others' healthy food choices. Supporting our

Hypothesis 1, this study revealed that preschoolers who initially chose unhealthy food preferences conformed to their healthy peers at a significant rate. The rate of conformity to peers' healthy food choices in the current study is comparable to conformity rates to remote peer decisions observed in other domains using a similar conformity paradigm with remote peers (Corriveau et al., 2013; Corriveau & Harris, 2010; Kim et al., 2016). While food choice is much more subjective than a visual or moral judgment, it seems to be similarly susceptible to conformity. Although children may prefer high-energy-dense foods over low-energy dense foods (Bevelander et al., 2013), peer influence seem to also guide these preferences, even in early childhood (ages 3 to 6).

The prediction that conformity effect would be negatively associated with BMI was partially supported (Hypothesis 2), although this relationship was not robust. This finding suggests earlier studies on weight status and food choice conformity (e.g., Bevelander et al., 2012; Salvy et al., 2008; Sharps & Robinson, 2016; Sharps & Robinson, 2017) may also extend to a very young age. This association was modest, which may be due to this study being somewhat under-powered for this analysis because we had to exclude/prescreen participants. Future research should investigate mechanisms involved in this association and how interventions for healthy eating relying on peer influence could potentially be more sensitive to children with higher BMI.

In addition to BMI, age had a significant positive correlation with conformity for vegetable choices. This result is inconsistent with prior studies in the visual (Corriveau & Harris, 2010; Corriveau et al., 2013; Walker & Andrade, 1996) and moral domains (Kim et al., 2016; Smetana & Braeges, 1990; Smetana et al., 2012), suggesting that the food preferences may be a unique domain in which children become more reliant on their peers' behaviors with

age, especially given strong personal desires for palatable (and potentially unhealthy) foods at younger ages (Birch, 1992; Johnson, McPhee, & Birch, 1991). It should be noted, however, that in this study, age was associated only with vegetable choices, which happened to be popular vegetables. Thus, this finding may not be generalizable to all types of vegetables, especially less familiar ones. Furthermore, age was not associated with conformity to fruits. One possible explanation might be that since young children are predisposed to prefer sweet and salty foods and reject sour and bitter foods (Birch, 1999), peer preferences may have less influence on selection of fruits, which tend to be sweeter and less bitter than vegetables. Future studies should replicate our results using a broader range of foods. Future studies should also consider exploring conformity to food choices in wider ages of children (including adolescents) to determine transitional ages when peer influences most outweighs personal preferences, as well as peer influences on health compliance behavior (Krasnegor, Epstein, Johnson, & Yaffe, 1992). Furthermore, researchers should further explore whether this age-related finding was due to increasing confidence in other's food choice judgments (i.e. clearer group affiliation or social information) or merely decreasing willingness to resist social pressure (i.e. more deference) or a combination of both mechanisms.

One major limitation of this study is that children were making food choices, but did not consume any foods. Thus, it is unclear whether children would change their actual behavior. Future studies should address this by including ad libitum intake procedures. Another limitation was despite the analysis that we presented showing that children did not seem to change their answers randomly or just because they were asked twice, the design of study does not fully exclude possibility of demand characteristics. Future research should not only systematically examine the effects of repeated stimuli and questioning on conformity

(Adair, 1972), but also consider designs that incorporate a neutral control condition (no social influence present) or comparison conditions involving peers selecting unhealthy options to further rule out the influence of demand characteristics on conformity to remote peers' healthy food choices. Investigating how these insights could be applied to promote healthier food choices among young children will be an important next step for researchers.

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