

Changing maternal perceptions of healthy feeding: a novel intervention

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Summary

Objective: This study sought to better understand factors influencing mothers' perceptions about healthy feeding. Additionally, a social consensus intervention was used to try to change mothers' likelihood to serve healthy foods.

Methods: Mothers saw photographs of healthy and unhealthy snacks and meals and rated them on several factors that were hypothesized to predict the likelihood of serving the foods. Then, mothers were randomly assigned to the experimental or control condition. Those in the experimental condition received social consensus information about these foods, whereas the control condition did not. The change in perceptions in the control and experimental conditions was examined.

Results: Mothers rated healthy meals and snacks less favourably than unhealthy meals and snacks on factors including cost, preparation time and difficulty, and child preference. Furthermore, mothers' perceptions of foods as liked by their child, easy to prepare and 'kid-friendly' predicted higher likelihood to serve those foods. Finally, mothers were more likely to describe the healthy snack as kid-friendly and indicated being more likely to serve it after receiving favourable social norm information about the food.

Conclusions: The use of social consensus interventions to change parents' perceptions of healthy snacks may be one means of increasing the quality of children's diets.

Keywords: Childhood obesity, feeding behaviour, feeding patterns, social perception.

Introduction

Approximately 32% of US youth are overweight or obese (1), with poor diet being an important cause (2–4). Thus, it is critical that researchers understand factors contributing to parents' food selection for their children. Time (5–7), price (8–10), nutrition (11,12) and child liking (11) all influence parents' food selection. Less examined are parental perceptions of social norms (e.g. which foods are 'kid-friendly'). Food advertising increases child requests and liking for certain foods, likely contributing to perceptions of kid-friendly foods (13). Unfortunately, these kid-friendly foods are often high in sugar, salt and fat, and low in beneficial nutrients (14).

Of these factors, parental perceptions of social norms about foods are amenable to change. As social influence predicts health behaviours, interventions using a social norms approach seek to change health behaviours by providing individuals with information on positive social norms (15,16). In literature on bias, providing social consensus information (e.g. 'most people do not believe the bias') can successfully change attitudes (17). No known

research has used social consensus information to change parents' attitudes about foods. Thus, the current study examined the relative contribution of factors thought to contribute to mothers' likelihood of serving different foods, and sought to change their perceptions of the kid-friendliness of foods and likelihood of serving those foods using a social consensus intervention.

Researchers created photographs of two meals and two snacks, one 'healthy' and one 'unhealthy', that were similar in preparation time and cost but disparate in nutritional content and calories. It was hypothesized that (i) mothers would rate the healthy foods as *more* nutritious, difficult to prepare, time consuming and costly, as well as *less* liked by their child, similar to what other parents feed their children, and kid-friendly. Additionally, (ii) all predictors were examined in relation to mothers' likelihood of feeding their child the foods. Finally, (iii) feedback aimed at changing perceived social norms was given. It was hypothesized that favourable social norm information would increase mothers' ratings of healthy foods as kid-friendly and foods they would serve their child.

Methods

Participants

Mothers ($N = 186$, mean age = 32.2, standard deviation [SD] = 6.5) were recruited from Amazon's Mechanical Turk (MTurk) at time 1, and 53 of these participants completed time 2. Inclusion criteria included having a 3- to 6-year-old child, primary responsibility for feeding this child, fluency in English and US residency. The majority of participants was Caucasian (76%) and had completed at least some college (70%), 36% were homemakers, 28% were employed full time, and the median income was between \$35 000 and \$55 000. Approximately 3% of the mothers were underweight (body mass index [BMI] less than 18.5), 50% were normal weight (BMI = 18.5–24.9), 25% were overweight (BMI = 25.0–29.9) and 21% were obese (BMI over 30.0) (18). Children were, on average, 4.75 years old (SD = 1.22) and had a mean BMI percentile of 67.42 (SD = 37.37).

Procedure

Procedures were approved by the university Human Subjects Review Board. Invitations to participate were posted on MTurk. See Buhrmester *et al.*, Paolacci and Chandler and Behrend *et al.* references (19–21) for information on MTurk as a recruitment tool. Participants accepted invitations, providing informed consent prior to completing online surveys. After completing the questionnaire, participants provided email addresses for a follow-up 7–14 days later. Of the 186 participants, 15 were excluded due to patterned responding. Of the participants who provided emails, 53 completed time 2 questionnaires; these individuals were randomly assigned to the social consensus ($n = 28$) or control ($n = 25$) condition. Participants received \$0.75 for completing the first questionnaire and \$0.25 for the second.

Measures

Food photos

A healthy and unhealthy meal and snack were photographed. The healthy meal (Fig. 1) was baked boneless chicken, minute brown rice, frozen green beans and skim milk. The unhealthy meal (Fig. S1) was chicken nuggets with ketchup, frozen buttered corn, French fries and apple juice. The healthy snack was one-third of a red bell pepper, and the unhealthy snack was a serving of Goldfish crackers. Meals were similar in preparation time and cost. The healthy meal (410 calories) had fewer calories and more beneficial nutrients than the unhealthy meal (610 calories). The healthy (15 calories) and unhealthy (140 calories) snacks were also comparable in preparation time, but less similar in cost.

Participants viewed colour photos of meals/snacks in random order and rated several features of each (Table 1 for questions and response options).



Figure 1 Healthy meal.

Social consensus intervention

At time 2, participants saw a photo of the healthy meal or snack (in random order). Participants in the social consensus intervention received information written by the researchers: 'Previous research studies have found that 86% of parents would be extremely likely to serve this meal/snack to their child'. Mothers then rated how likely they would be to serve the food to their child (1 *extremely unlikely* to 10 *extremely likely*). Participants in the social consensus intervention were also told, 'Previous research studies have found that 84% of parents identified this meal/snack as a "kid-friendly" food' and then rated how kid-friendly the food is from 1 (*not at all*) to 10 (*extremely*). The same procedure was followed for the unhealthy meal and snack with low numbers given for likeliness to serve (6%) and identification as a kid-friendly food (11%). The control group rated the items without receiving social consensus information.

Demographics

Mothers self-reported their height and weight as well as that of their child; these were used to calculate mother BMI and child BMI percentile. Mothers also reported other demographic variables.

Statistical analyses

For the first research aim, mean differences in perceptions of healthy vs. unhealthy meals and snacks were examined using paired samples *t*-tests. For the second aim, hierarchical linear regressions were conducted to examine predictors of mothers' likelihood to serve each food. Covariates were entered in the first step, with perceptions of the meals or snacks entered into the second step. In terms of covariates, mothers' education negatively correlated with likelihood to serve the unhealthy meal ($r = -0.24$, $P < 0.01$) and mothers' BMI correlated with likelihood to serve the unhealthy meal ($r = 0.21$, $P < 0.01$) and snack ($r = 0.21$, $P < 0.01$).

Table 1 Mean differences between healthy and unhealthy meal and snack perceptions based on paired samples *t*-tests

	Healthy meal Mean (SD)	Unhealthy meal Mean (SD)	Healthy snack Mean (SD)	Unhealthy snack Mean (SD)
Preparation time ^{††}	25.72 (13.39) (<i>n</i> = 170)	16.02 (13.37)	2.80 (1.99) (<i>n</i> = 135)	1.42 (5.11)
Cost ^{††}	4.32 (3.58) (<i>n</i> = 128)	3.85 (3.28)	0.68 (0.48) (<i>n</i> = 102)	0.97 (0.94)
Child like ^{††}	4.03 (1.05) (<i>n</i> = 167)	4.49 (0.81)	2.44 (1.44) (<i>n</i> = 136)	4.72 (0.64)
Hard to prepare [*]	2.18 (0.82) (<i>n</i> = 169)	1.72 (0.82)	1.27 (0.59) (<i>n</i> = 137)	1.16 (0.63)
Nutrition ^{††}	4.65 (0.61) (<i>n</i> = 168)	2.33 (1.06)	4.63 (0.77) (<i>n</i> = 139)	2.76 (0.95)
Likelihood to serve ^{††}	8.12 (2.00) (<i>n</i> = 170)	6.10 (2.63)	5.00 (3.23) (<i>n</i> = 137)	7.50 (2.39)
Planning ^{††}	2.28 (0.66) (<i>n</i> = 170)	1.74 (0.69)	1.45 (0.66) (<i>n</i> = 138)	1.20 (0.57)
Similar to other parents ^{††}	3.32 (1.10) (<i>n</i> = 169)	4.23 (0.80)	2.15 (1.09) (<i>n</i> = 136)	4.51 (0.82)
Kid-friendly ^{††}	6.94 (2.10) (<i>n</i> = 170)	8.37 (1.94)	5.12 (2.76) (<i>n</i> = 140)	8.89 (1.75)

Although many foods can be a part of a healthful diet, here the terms 'healthy' and 'unhealthy' are used to reflect differences between foods in calories and nutrient content. Preparation time: participants estimated how long it would take to prepare meal/snack (in minutes). Cost: participants estimated how much per person it would cost to prepare this food (in dollars). Child-like: how much their child would like it (1 *dislike very much* to 5 *like very much*). Hard to prepare: how hard it would be to prepare (1 *very easy* to 5 *very hard*). Nutrition: how nutritious it was (1 *very unhealthy* to 5 *very healthy*). Likelihood to serve: how likely they were to serve it to their child (1 *extremely unlikely* to 10 *extremely likely*). Planning: how much planning ahead it would take to serve it (1 *none* to 4 *a lot*). Similar to other parents: how similar the meal/snack is to what other parents serve their children (1 *completely different* to 5 *completely similar*). Kid-friendly: how much the meal/snack is a kid-friendly food (1 *not at all* to 10 *extremely*). *Means different between healthy and unhealthy meals at $P < 0.01$. †Means different between healthy and unhealthy snacks at $P < 0.01$. ††Means different between healthy and unhealthy meals at $P < 0.05$. SD, standard deviation.

For the third research aim, multivariate analyses of variance and covariance (MANOVA and MANCOVA) were conducted. The likelihood to serve and kid-friendliness of the healthy meal and snack at time 2 were dependent variables in the MANOVA, and the likelihood to serve and kid-friendliness of the unhealthy meal and snack at time 2 were dependent variables in the MANCOVA. Participants' ratings of likelihood to serve and kid-friendliness at times 1 and 2 were within subjects and condition was between subjects. There was a correlation between mothers' BMI and likelihood to serve the unhealthy snack at both time points ($r = 0.21$, $P < 0.01$; $r = 0.25$, $P < 0.05$, respectively). Thus, mothers' BMI was entered as a covariate in the MANCOVA. Analyses were conducted using SPSS 18 (SPSS Inc., Chicago, IL, USA).

Results

Differences in perceptions of meals and snacks

Consistent with hypothesis 1, mean differences in perceptions of healthy vs. unhealthy foods were found in expected directions. Mothers rated the healthy meal as more nutritious ($t[167] = 25.88$, $P < 0.01$), less liked by the child ($t[166] = -4.56$, $P < 0.01$), more difficult to prepare ($t[168] = 6.95$, $P < 0.01$), more costly ($t[127] = 2.54$, $P < 0.05$), required more time to prepare ($t[169] = 9.05$, $P < 0.01$) and required more planning ($t[169] = 9.18$, $P < 0.01$), less similar to what other parents feed their children ($t[168] = -9.02$, $P < 0.01$) and less kid-friendly ($t[169] = -6.57$, $P < 0.01$) than the unhealthy meal (Table 1). A similar pattern of results was found for the snacks (Table 1).

Predicting likelihood to serve meals and snacks

For the second aim, predictors of serving each food were examined. In the regression predicting mothers' likelihood to serve the healthy meal, 47% of the variance was explained by participants' perceptions of the meal (Table 2). Significant predictors included child liking, difficulty of preparation, nutrition and kid-friendliness. Similarly, 47% of the variance in likelihood to serve the unhealthy meal was explained by covariates and participants' perceptions.

Similar regressions were conducted to evaluate the likelihood to serve the snacks. In the regression predicting likelihood to serve the healthy snack, 69% of the variance was explained by mothers' BMI and perceptions of the healthy snack, including child liking, difficulty of preparation and kid-friendliness (Table 2). In the regression predicting likelihood to serve the unhealthy snack, predictors including mothers' BMI, child liking, nutrition and kid-friendliness explained 60% of the variance. Contrary to expectations, cost and time were not significant predictors in any of the regressions.

Influence of a social consensus intervention

Changes in perception of kid-friendliness and likelihood to serve from time 1 to time 2 in the social consensus condition were compared with changes in the control condition. There were no significant demographic differences between groups.

Table 2 Hierarchical multiple regression analyses predicting likelihood to serve healthy and unhealthy meals and snacks

Food photo	Healthy meal (n = 122)		Unhealthy meal (n = 122)		Healthy snack (n = 92)		Unhealthy snack (n = 109)	
	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β
Predictor Step 1	0.00		0.13**		0.07*		0.04	
Maternal education		-0.07		-0.26**		0.20***		0.07
Maternal BMI		-0.02		0.24**		-0.17***		0.18***
F (step)	F (2, 119) = 0.34		F (2, 119) = 8.89**		F (2, 89) = 3.24*		F (2, 106) = 2.07	
Step 2	0.47**		0.34**		0.62**		0.56**	
Preparation time		0.02		-0.04		0.06		-0.13
Cost		0.01		0.02		0.00		0.06
Child-like		0.28**		0.22**		0.60**		0.42**
Hard to prepare		-0.24**		-0.12		-0.18*		-0.01
Nutrition		0.35**		0.42**		0.07		0.46**
Planning		0.07		0.12		0.18*		-0.03
Similar to other parents		-0.02		0.02		0.00		0.04
Kid-friendly		0.27**		0.16***		0.26**		0.20*
F (Step)	F (10, 111) = 9.93**		F (10, 111) = 9.77**		F (10, 81) = 17.88**		F (10, 98) = 14.61**	

*** $P < 0.01$, ** $P < 0.05$, * $P < 0.10$. BMI, body mass index.

The effect of condition on time 2 ratings of healthy foods

The MANOVA indicated a significant condition effect ($F[4, 48] = 2.90, P < 0.05$), a within-subject effect of time ($F[4, 48] = 3.39, P < 0.05$) and a time \times condition interaction ($F[4, 48] = 3.42, P < 0.05$) in the multivariate test. Univariate tests indicated a significant condition effect on likelihood to serve the healthy meal ($F[1, 51] = 8.76, P < 0.01$) and a within-subject effect of time for serving the healthy snack ($F[1, 51] = 7.12, P < 0.05$) and how kid-friendly the participants rated the healthy snack ($F[1, 51] = 5.57, P < 0.05$). Univariate analyses revealed a significant time \times condition effect on likelihood to serve the healthy snack ($F[1, 51] = 4.43, P < 0.05$) and how kid-friendly the healthy snack was perceived to be ($F[1, 51] = 4.77, P < 0.05$). Individuals in the social consensus group reported a greater change in likelihood to serve the healthy snack from time 1 ($M = 5.32, SD = 3.50$) to time 2 ($M = 6.68, SD = 2.74$) than individuals in the control condition (time 1: $M = 4.68, SD = 3.20$; time 2: $M = 4.84, SD = 3.10$). Similarly, individuals in the social consensus group reported a greater change in their perceptions of the healthy snack as kid-friendly from time 1 ($M = 5.07, SD = 3.23$) to time 2 ($M = 6.11, SD = 2.57$) than individuals in the control condition (time 1: $M = 5.44, SD = 2.79$; time 2: $M = 5.48, SD = 2.73$). This condition by time effect was not found for the healthy meals.

The effect of condition on time 2 ratings of unhealthy foods

The MANCOVA indicated no significant condition, time or interaction effect in the multivariate or univariate tests ($P_s > 0.05$). Individuals in the social consensus group did not report a lower likelihood to serve or perception of kid-friendliness of the unhealthy foods at time 2 compared with time 1, relative to the control condition.

Discussion

In this study, we examined how mothers' perceptions of healthy and unhealthy meals and snacks predicted likelihood to serve those foods to their children. Cost and time did not predict mothers' reports that they would feed their child the foods. This is particularly interesting given previous research citing these variables as barriers to feeding children healthier diets (5–10). By focusing on cost and time, researchers may overlook other salient barriers to healthy feeding. Notably, the more that mothers perceived the healthy foods to be difficult to prepare, the less likely they were to serve them. Thus, increasing mothers' cooking self-efficacy may be one means of improving children's diets.

Mothers also indicated that the healthy meal was less kid-friendly, was less similar to what other mothers feed their children and would be less liked by their child. Furthermore, child liking and kid-friendliness significantly predicted mothers' likelihood to feed their child the foods, with mothers more likely to feed the healthy food to their child if

they thought it was kid-friendly. Thus, future interventions aimed at altering mothers' perceptions of kid-friendliness of foods may play a role in increasing child consumption of healthy foods.

The social consensus intervention did not change mothers' reports of whether they would serve their child the healthy *meal*. However, it did increase the likeliness of serving the healthy *snack* and the perceived kid-friendliness of the healthy snack. It may be that the healthy snack (red pepper) is a novel children's food, and perceptions are more amenable to change. It may also be that mothers' perceptions about snacks are more dependent on social norms than are their perceptions of meals. As children on average do not get enough fruits and vegetables (22), increasing acceptance of vegetables as snacks (via a social consensus intervention) may increase children's daily consumption. Finally, it might be that healthy behaviours are more impacted by social norms than unhealthy behaviours; however, additional support would be needed to verify this possibility.

Limitations of this study are that only one example of healthy and unhealthy meals and snacks were used, limiting generalizability of findings; only self-reported attitudes were included; and only a subset of the sample completed both time 1 and time 2. Follow-up studies examining actual changes in behaviours following this type of social consensus intervention would be especially useful. Additionally, as the majority of mothers were Caucasian and college educated and there was a higher representation of normal weight women compared with national norms, future research should consider BMI, educational level and racial/ethnic group differences. For example, research has shown that parental education is associated with health consciousness in food choice (7). Furthermore, socioeconomic status impacts parents' feeding behaviours (23), and unhealthy feeding mediates the relationship between socioeconomic status and obesity in infancy (24). Although time and price were not significant contributors in this sample, they may be more salient for mothers of lower socioeconomic status.

Nonetheless, this study offers a significant contribution to the research literature on parents' healthy feeding practices. Just as using social priming with an admirable character (e.g. Batman) increases children's healthy food selection (25), social consensus interventions may also be helpful in encouraging healthier feeding practices.

Conflict of Interest Statement

The authors have no conflicts of interest or financial interest in the work presented here.

Author contributions

All authors contributed to designing and implementing the study and writing the paper. The first author conducted the literature search, coordinated the writing and integrated

contributions and revisions. The second author analysed and interpreted the data, providing assistance in making revisions.

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

Figure S1. Unhealthy meal.