

## **T. Bettina Cornwell**

Remarks for the Senate regarding Board of Trustees Position (*3-minute limit*)

Good afternoon Senators, President, Vice President and guests.

I am Bettina (with two Ts) from marketing in the business school.

### **Why are you interested in the board position?**

It takes an engaged community to care for an institution. In turn thriving institutions give back to communities. We face challenging times. I want to contribute to the University of Oregon and to make sure that we not only survive but that we thrive post-pandemic.

### **What experience do you have that gives you a campus-wide perspective on a range of academic and university issues?**

A little back story-

As I joined my parents after graduation with my degree in business, my father looked happy but my mother was distressed. She had not been able to find me in the program. That was because I was the only student in business graduating with a BA not a BS. I had fulfilled the humanities, fine art, and language requirements for a BA - I was on a page of my own. I have always been interdisciplinary as many of you know. Much of my research is across disciplines.

I have administrative experience from a number of universities. Here as department head. I was a cluster leader in Australia. I have been on search committees for deans and provosts. The contexts were varied but many of the problems are the same. For example, in Australia, it is Indigenous Australians and Southeast Asians that face discrimination. I will work for inclusion, improved policies, and good governance.

As well, I have held over a million dollars in grants in my career to date. I have been rejected from both NSF and NIH and I understand how hard it can be to secure funds. I value our R1 standing and seek to support it.

### **How would you handle a situation where you are asked to support something that, as a faculty member, to don't agree with?**

I have actually done research regarding this situation. People are able to be true to their sense of self and at the same time recognize what plan of action is best for their institution/employer, and the greater community. And that is what I will do.



March 12, 2021

Governor Kate Brown  
c/o Executive Appointments Office  
900 Court Street, Suite 254  
Salem, OR 97301

Dear Governor Brown,

It is with excitement for the potential and with a healthy dose of respect for the role, that I submit my application for membership on the University of Oregon Board of Trustees. In this letter, I will summarize a bit about myself and my experience, and in the process give emphasis to information not found on my CV or in the application form.

Let me start with the fact that I am a huge believer in education. Hundreds of manuscripts attest to the fact that education reduces inequality and poverty, here and around the world. It is however hard to move from a place of inequality, poverty or simply unknowing to a university degree. I know, I am a first-generation university student. In fact, my mother and father did not even go to high school. Love me as they did, and support me as they could, they had no idea how to advise me. This challenge of not knowing how to go about beginning a university degree and other challenges limit many students. My two-year experience volunteering in one of our Eugene high school career services offices reminded me of my own challenges and made me aware of the new ones that students face. I am keen to support the University of Oregon in helping underrepresented students come here, learn, and depart in good time with a degree.

My academic work is interdisciplinary. I work across marketing, management, consumer behavior, psychology, finance and public policy. For example, my work with others in encouraging environmentally friendly behavior has taught me that people may express preference for the common good (buying eco-friendly) but may not actually behave in this way unless motivated by the value to their own personal well-being. Similarly, in work on healthy eating, people may know what is best for their children but habits and convenience are strong forces against behavioral change. We must puzzle out new ways to help people to do what is in their own best interest. We must learn what actually motivates their actions. I bring this type of understanding to support of our university community. From recruiting and retention of faculty to development and success for students, understanding their true motivations is key.

Despite my work in public policy, health and sustainability, I am best known for my work in marketing and specifically sponsorship-linked marketing. I've published books and manuscripts on the topic. I have held grants and conferences. I have been invited to talk or lecture in dozens of countries. I have been invited to review programs and to serve on dissertation committees. This and my work at other universities has given me exposure to many systems at many universities. From my time at the University of Michigan, I learned that one path to interdisciplinary research is joint-



appointments. At the University of Queensland, I helped to engineer an incentive system that helped catapult their research productivity. My annual work with the Dream Together Master's program in Korea continues to teach me to think about the long-game, supporting those in need may not come with immediate benefits. We have to look into the future. No university has solved all the problems, but we can learn from the success of others, innovate based on their work, and make changes in our own way.

I am delighted to answer any questions you might have and to engage in discussions that would help you learn if I might be your choice for the Board of Trustees at the University of Oregon.

Sincerely

T. Bettina Cornwell  
Philip H. Knight Chair  
Head, Department of Marketing

# Parents, Products, and the Development of Preferences: Child Palate and Food Choice in an Obesogenic Environment

T. Bettina Cornwell, Eric Setten , Sung-Hee W. Paik, and Ravi Pappu

## Abstract

Food systems and the ways food products are formulated, packaged, and marketed contribute to obesogenic environments. The current research focuses on products informally referred to as junk food (foods high in sugar, fat, and salt) and how they function as a mechanism in developing taste preferences in children three to five years old. Across two studies, the authors examine how parents' taste preferences, their lay theories of self-control, and their resulting decisions about foods to provide to their children are associated with their children's taste preferences and consumption of healthy food. Using a parent survey, Study 1 examines how parent preferences and exposure to junk food contribute to the development of child food preferences. Study 2, which is based on a parent survey and observation of child meals out of home, confirms Study 1 findings. Furthermore, Study 2 shows how parental lay theories and parental decisions regarding junk food provided to a child are related to the child's consumption of vegetables. Implications for food brands, policy, and parents are discussed.

## Keywords

children, food choice, lay theory, obesity, self-control

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Obesity is a worldwide public health concern. The rise in global obesity suggests that, despite country-level differences, the global food system has delivered a global obesogenic environment (Swinburn et al. 2011). The term “obesogenic environment” refers to “the sum of influences that the surroundings, opportunities, or conditions of life have on promoting obesity in individuals or populations” (Swinburn, Egger, and Raza 1999, p. 564). Zheng et al. (2016) suggest that policy makers must consider the free will of individuals and, relatedly, their lay beliefs regarding self-control that inform perceptions of appropriate consumption behaviors. Thus, despite mounting evidence of environmental pressure on individual choice, it remains the case that people make day-in-day-out decisions about what and how much to consume.

Swinburn et al. (2011) outline two paths forward. One path is to establish policies to reengineer obesogenic environments, and the other path is to help individual consumers counter obesogenic environments. The first path, to reengineer worldwide food systems, including subsidies, food production, and processing, as well as distribution and acceptance, will take time. The second path, to support consumers in countering obesogenic environments, offers the possibility of more immediate change. Thus, while both remedies are important,

the current work focuses on the latter path, by developing a better understanding of the influence of the obesogenic environment, particularly as it affects children.

With regard to individuals' food choices, overwhelming and consistent evidence shows that food taste is generally more important than nutrition, cost, and convenience (Aggarwal et al. 2016; Glanz et al. 1998). For young children, taste preference and familiarity (through previous exposure) guide choice (Aldridge, Dovey, and Halford 2009; Hursti 1999). For very young children, patterns of consumption are determined by their adult caregivers.

The current research contributes to our understanding about how parental food preferences and lay beliefs about self-control guide early child food exposure and, in turn, how early exposure patterns are associated with children's preferences and

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food consumption. Specifically, this work considers the role of parental lay theories of self-control in the decision to provide children with foods high in sugar, fat, and salt. The following sections detail how food-related behaviors and the food landscape have evolved to become more obesogenic and therefore to provide greater challenges to parents in food choice.

## Contextual Background

### *Food at Home and Away*

**Home-cooked meals.** Home food preparation has drastically declined in the United States, with intake from home-sourced foods decreasing 23% from 1965–1966 to 2007–2008 (Smith, Ng, and Popkin 2013). Food prepared at home is considered more healthful (Campbell et al. 2007; Mills, White, et al. 2017), though this is difficult to confirm (Mills, Brown, et al. 2017). While the value of home cooking in addressing obesity trends is debated, the rise of food eaten away from home and food eaten at home but not prepared there are known contributors to the obesity epidemic.

**Takeout and ready-to-eat meals.** Eating at home is less about home cooking, considering the finding that “less than 60 percent of suppers eaten at home were actually cooked at home [in 2014]” (Ferdman 2015). Importantly, a U.K. study finds that, unless formulated specifically as a healthy offering, takeout and ready-to-eat meals were high in fat and salt (Howard, Adams, and White 2012). The advent of food delivery services such as Grubhub and Uber Eats has made these types of meals even more accessible.

**Food eaten away from home.** Foods eaten in restaurants are high in sugar, fat, and salt and low in terms of fruits and vegetables when compared with nutrition guidelines (Cohen and Bhatia 2012). For the first time, in 2010 food eaten away from home constituted more of the total food expenditure in the United States than food eaten at home (Economic Research Service 2018). In 2017, food eaten away from home represented 53.8% of food expenditure. Restaurant trends find that “today’s dishes are less about which flavors and more about how much,” and in the preparation of restaurant foods, “cooks aren’t afraid to have a heavy hand with the salt shaker” (The French’s Food Company 2016) to enhance taste.

**Highly processed foods.** Soft drinks and processed foods are leading risk factors for chronic, noncommunicable diseases (Stuckler et al. 2012), and ultra-processed, long-shelf-life, and ready-to-eat or ready-to-heat foods are associated with weight gain (Hall et al. 2019). Highly processed foods hold addiction potential, similar to other addictive products such as alcohol and tobacco, because of their hyperpalatable nature (Gearhardt et al. 2011). These products are also packaged such that the container contributes to overconsumption (e.g., “super-sizing,” multiple servings in single packages; Rolls 2003; Zlatevska, Dubelaar, and Holden 2014).

Table 1 compares balanced, convenience, and fast-food meals intended for children. The balanced meals reflect U.S. Child and Adult Care Food Program guidelines. We show the content of each meal in terms of calories and components in absolute terms and report the meals as a group for the percentage of a (moderately active four-year-old) child’s recommended diet. Convenience and fast-food meals are consistently low in fiber and high in sugar, fat (including saturated fat), and salt (sodium). Importantly, inclusion of just one convenience or fast-food meal in a day can exceed the recommendations for an entire day. Moreover, in the analyzed meals we did not include condiments. A single ketchup packet (Heinz brand) has 20 calories, 3 g of sugar, and 170 mg of sodium. Thus, for a guideline child’s meal, adding just two packets of ketchup constitutes approximately 8% of calories, 60% of sodium, and 51% of sugar in daily allowed intake.

In summary, the evolved food landscape, with limited food prepared at home and with high sugar, salt, and fat found in most foods prepared away from home, puts a greater burden of responsibility on adult choice for family consumption. As parents and guardians make choices for children in terms of foods, snacks, and drinks, they establish lifelong preferences. Compelling evidence comes from a longitudinal study. Rose, Birch, and Savage (2017) show that infants with dietary patterns higher in fruits and vegetables had similar diets at age six. Similarly, infants receiving high-energy density foods (e.g., French fries, sweet desserts) had higher consumption of these foods at age six and a higher instance of being overweight.

## Hypothesis Development

### *Development of Child Food Choice*

To understand a young child’s food choice, it is necessary to understand the role of influential others, particularly parents and guardians. For example, parent modeling of healthy eating leads to reduced child food fussiness and greater interest in food (e.g., Gregory, Paxton, and Brozovic 2010) and can help a child overcome initial dislike of a food (Wardle and Cooke 2008). In a study of elementary school children, Korinek et al. (2015) find that children who have more frequent exposure to fruits and vegetables at home consume a wider variety of these and other fruits and vegetables when at school. Similarly, in terms of strategies to reduce the risk of obesity among preschool children, an important factor is active positive modeling of food behaviors by adults and peers (Gibson et al. 2012).

Parents are seen as the first and strongest influence on most children’s food preferences (Moore, Wilkie, and Desrochers 2017). Moreover, the adult role of modeling food behavior can be powerful in directing a child’s food preferences. To a great extent, parental roles in child food choice have not changed, but they have transitioned from preparing and sharing foods to choosing and providing prepared foods. Children learn to eat what their parents provide and grow accustomed to the flavors presented.

**Table 1.** Balanced, Convenience, and Fast-Food Meals Compared with Nutritional Guidelines.

	<b>Food Weight (g)</b>	<b>Drink (fl. oz.)</b>	<b>Calories</b>	<b>Fiber (g)</b>	<b>Sugar (g)</b>	<b>Fat (g)</b>	<b>Saturated Fat (g)</b>	<b>Sodium (mg)</b>
<b>Balanced Meals</b>								
Meal 1: 3 oz. chicken breast, 2 slices whole grain bread, ½ cup carrots, ½ cup apples, and 1% milk	264	6	431	6.8	20.7	7.3	2.5	478
Meal 2: 3 oz. ground beef, ½ cup whole-grain spaghetti, ¼ cup tomato sauce, ½ cup strawberries, and water	276	6	342	4.8	8.4	14.0	4.6	310
Meal 3: 3 oz. salmon, ½ cup brown rice, ½ cup broccoli, ½ cup oranges, and 1% milk	310	6	419	4.7	17.3	14.0	4.0	148
Meal 4: 3 oz. chicken thigh, 2 corn tortillas, ½ cup mixed vegetables, ½ cup mangoes, and water	306	6	351	6.3	13.3	8.3	2.3	188
Average of balanced meals	289	6	386	5.7	14.9	10.9	3.4	281
% of per meal recommendation			83%	98%	128%	72%	73%	50%
<b>Convenience Meals</b>								
Meal 1: ½ can Campbell's SpaghettiOs w/ Meatballs, 1 oz. Doritos, 3 Oreos, and Juicy Juice 100% Fruit Punch	314	6	630	5.0	43.5	22.0	5.5	960
Meal 2: ½ package (prepared) Nissin Top Ramen Chicken Flavored Noodles, 1 Twinkie, and Sprite	316	6	400	.5	37.0	11.5	6.0	1,063
Meal 3: Lunchables Turkey, Cheddar, & Crackers, 1 oz. Lay's Potato Chips, 1 pouch Welch's Fruit Snacks, and a Capri Sun	268	6	580	4.0	29.0	20.0	6.5	1,035
Meal 4: 1 Pepperoni Pizza Hot Pocket, 1 oz. Cheetos, 1 Vanilla Drumstick, and Mott's 100% Apple Juice	248	6	850	3.5	46.0	39.0	15.5	993
Average of convenient meals	286	6	615	3.3	38.9	23.1	8.4	1,013
% of per meal recommendation			132%	57%	333%	152%	180%	181%
<b>Fast-Food Meals</b>								
McDonald's Happy Meal: hamburger, kid's fries, 1 Go-Gurt strawberry yogurt, and 1% milk	195	8	515	2.0	23.0	17.0	5.0	725
Panda Express Panda Kids: kid's orange chicken, kid's chow mein, fortune cookie, and a small Sprite	277	12	830	3.1	62.6	29.2	5.6	1,222
Burger King Jr Meal: BK Jr cheeseburger, Mott's applesauce, and 1% chocolate milk	222	8	490	2.0	43.0	15.5	7.5	710
KFC Kid's Meal: Popcorn Nuggets, mashed potatoes with gravy, Musselman's applesauce, and a Capri Sun	316	6	535	3.0	28.0	23.0	3.5	1,405
Average of fast-food meals	253	8.5	593	2.5	39.2	21.2	5.4	1,016
% of per meal recommendation			127%	43%	336%	140%	116%	181%

Notes: Recommended amounts are for 1/3 of daily amounts (one meal) for a moderately active four-year-old boy or girl following a 1,400 calorie per day diet, as recommended by MyPlate.gov. The recommended amounts for each category per meal are approximately 467 calories; at least 5.8 g of fiber; and no more than 11.7 g of sugar, 15.2 g of fat, 4.7 g of saturated fat, and 560 mg of sodium. Balanced and convenience meals were designed to be approximately 300 g in food weight and 6 fl. oz. of drink. Fast-food meals represent portion sizes and popular options available on each restaurant's children's menu. Balanced meals reflect the guidelines of the U.S. Child and Adult Care Food Program.

### *The Role of Taste in Food Choice*

Krishna's (2012) review of sensory marketing shows limited research on taste. Taste research in marketing considers two main topics: how marketing influences taste perceptions (Elder and Krishna 2010; Poor, Duhachek, and Krishnan 2013) and how people make taste judgments (e.g., Hoegg and Alba 2007). Table W1 in the Web Appendix presents a summary of research on taste in marketing, nutrition, and food studies. Outside marketing is a fledgling body of research that aims to understand the contribution of taste preference to obesity. Several studies consider tastes, such as salt, and show that adding salt to food (but not ingesting it as a tablet) increases salt preference in food (Bertino, Beauchamp, and Engelman 1986). Taste preferences begin in utero (for a review, see Nehring et al. [2015]) but are immediately influenced by

environment at birth. Children naturally prefer sweet and salty tastes, which makes them vulnerable to an obesogenic food environment pervasively infused with these tastes (see Menella 2014).

Robinson et al. (2007) in their study of the taste preference of preschoolers for branded and unbranded foods find that the presence and awareness of branding increased taste preference among three- to five-year-old children. Importantly, in their work, a parental survey provided information on both the number of televisions in the home and the frequency of eating at McDonald's restaurants (the brand included in the experiment). This work finds that past exposure to junk food holds the potential to influence child taste preference into the future. Research on child food preference also shows that young children develop food and taste preferences that apply pervasively, such that when they are faced with foods and tastes with which

they are not familiar, they tend to add condiments (Cornwell and McAlister 2011). Furthermore, children whose palates favor foods high in sugar, fat, and salt tend to seek “flavor hits,” such that they add flavor to their foods and complain when flavor is not added (Cornwell and McAlister 2011, p. 436).

The work of Cornwell and McAlister (2011) may offer a further clue on the development of child food preference. They had young children (three to five years of age) respond to a brand representation task that required them to sort picture cards to create collages that reflected their brand knowledge. The researchers rated children better able to sort McDonald’s cards from Burger King cards and Coke cards from Pepsi cards as having more extensive brand knowledge. In turn, they argued that brand knowledge (e.g., foods in packaging, location characteristics) had developed through exposure to these foods and drinks. They then included this brand knowledge variable in a structural equation model that predicted child preference for sugar, fat, and salt and found that another variable in the model, a single self-report item from the child’s parent measuring the “number of times eating fast food in a typical week” (Cornwell and McAlister 2011, p. 435), showed a positive relationship to the child’s sugar, fat, and salt preference (as reported by the preschool caregiver).

Against a background of individual variance, research to date has established several consistent findings. First, parental orientation to foods and tastes supports a consumption pattern that favors those foods and tastes. Second, early exposure and consumption patterns strongly influence food and taste preferences. While early exposure patterns may seem an obvious contributor to child preferences, this is an empirical question on which additional hypotheses are built. Thus, we hypothesize the following:

**H<sub>1</sub>:** Child exposure to foods high in sugar, fat, and salt and low in nutritional value (“junk food” hereinafter) partially mediate the positive relationship between parent preference for foods high in sugar, fat, and salt (Parent SFS) and child preference for foods high in sugar, fat, and salt (Child SFS).

### *Moderating Role of Lay Theories*

Implicit theories (known as lay theories) are basic assumptions about people and about how the world works (Dweck 1996). Early work by Dweck and Leggett (1988) considered theories of intelligence and compared entity theorists, who believe intelligence is fixed, with incremental theorists, who believe intelligence is malleable. Their work shows that viewing intelligence as a fixed entity is associated with documenting intelligence, while viewing intelligence as malleable is associated with learning to develop that quality. Importantly, holding an incremental (also referred to as malleable) implicit theory is viewed as a global mindset important in successful goal pursuit.

Another area in which lay theories are important is self-regulation. Self-control is “the exertion of control over the self

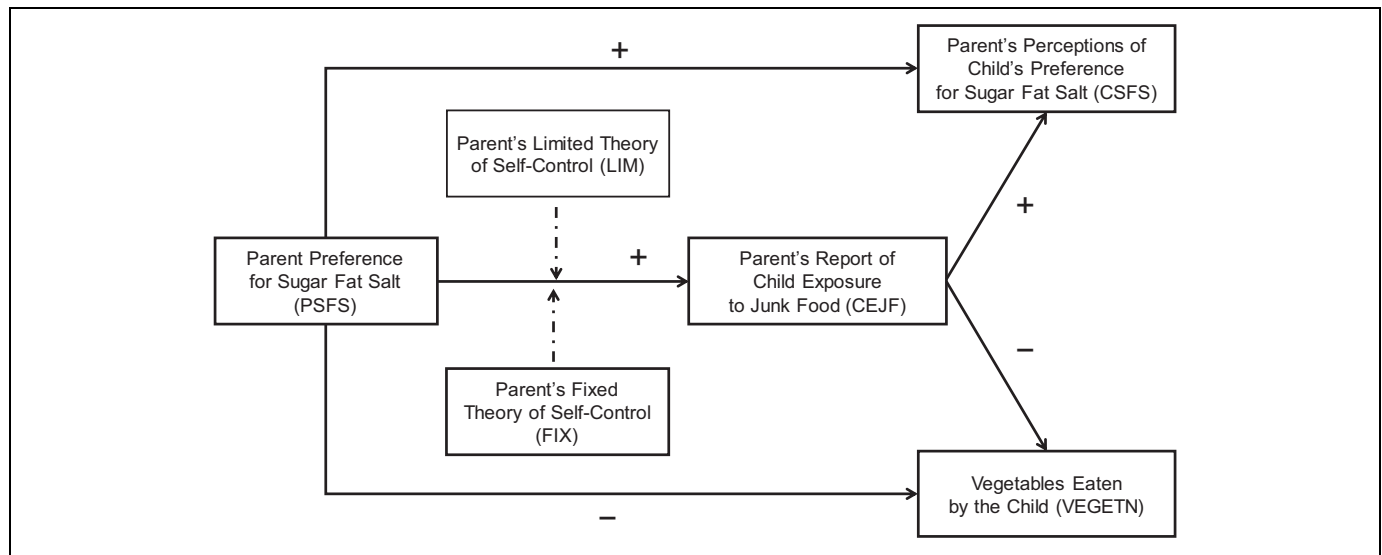
by the self” (Muraven and Baumeister 2000, p. 247). Baumeister and colleagues (Baumeister 2002; Baumeister, Vohs, and Tice 2007) developed the strength model of self-control based on the argument that exhibiting self-control consumes a limited resource and can result in a state of ego depletion in which people are less able to exhibit self-control on subsequent tasks.

Synthesizing early work on lay theories, Mukhopadhyay and Johar (2005) borrowed elements of implicit theories of state self-control depletion and theories of intelligence-oriented trait willpower to measure lay theories of self-control. They characterize lay theories of self-control “in terms of the amount of self-control people are believed to have (unlimited vs. limited) as well as the extent to which this self-control amount can be changed over time (malleable vs. fixed)” (p. 780). Across three studies manipulating lay theories of self-control, the researchers found that lay theories influence goal-directed behavior (e.g., setting a New Year’s resolution).

Mukhopadhyay and Yeung (2010) consider lay theories of self-control in the context of parental decisions about visiting fast-food restaurants and allowing snacks. Following the median-split analysis used by Mukhopadhyay and Johar (2005), Mukhopadhyay and Yeung (2010) argue that these two dimensions of lay theories of self-control are orthogonal, thus resulting in four distinct lay theories of self-control: limited-fixed (small reserves that do not change over time), limited-malleable (small reserves that can change over time), unlimited-fixed (large reserves that do not change over time), and unlimited-malleable (large reserves that can change over time). Mukhopadhyay and Yeung (2010, p. 240) conclude that “people who hold the implicit assumption that self-control is a small resource that can be increased over time (“limited-malleable theorists”) are more likely to engage in behaviors that may benefit children’s self-control. In contrast, people who believe either that self-control is a large resource (“unlimited theorists”) or that it cannot increase over time (“fixed theorists”) are less likely to engage in such behaviors.” Their findings show that limited-malleable theorists regulate their children’s consumption of fast food and snacks, thus providing support for the direct effects of these lay theories on foods offered to children.

In keeping with Mukopadhyay and Yeung (2010), the current work accepts that lay theories may influence parental decisions regarding providing junk foods to children; however, the current work departs from that of Mukopadhyay and Yeung (2010) in two ways. First, we go further to consider not only how parental decisions result in the provision of junk food to children but also how the provision of junk food then influences child palate and consumption. Second, the current work considers belief about the amount of self-control one might have as independent from the extent to which self-control can be changed over time.

We view the two self-control constructs as related but independent. Work considering both willpower beliefs (mindset model) and resource depletion (strength model) in self-control finds that how one thinks about willpower influences the extent of depletion experienced (Job, Dweck, and Walton



**Figure 1.** Conceptual model of parent preferences, parent lay theories, and child exposure to junk food as influential on child's preferences and vegetables eaten.

Notes: The conceptual model is tested in three empirical models. Model A, the partial mediation model (tested in Study 1), predicts that Parent SFS affects Child SFS directly as well as indirectly through CEJF ( $H_1$ ). Model B, the dual partial moderated mediation model (tested in Study 2), predicts that Parent SFS affects Child SFS directly as well as indirectly through CEJF. LIM and FIX moderate the Parent SFS–CEJF path ( $H_2$  and  $H_3$ ). Model C, the dual partial moderated mediation model (tested in Study 2), predicts that Parent SFS affects VEGETN directly, and indirectly through CEJF. LIM and FIX moderate the Parent SFS–CEJF path ( $H_4$ ,  $H_5$ , and  $H_6$ ).

2010). Subsequent recent work examining both types of self-control lay theories found the two theories to be associated with different individual-level variables (Jędrzejczyk and Zajenkowski 2020). Viewing these two self-control constructs as independent allows for a more nuanced analysis of the pattern of associations with other constructs.

Therefore, unlike Mukhopadhyay and Yeung (2010), who examine the joint effects of the malleable/limited and unlimited/limited theories, we examine how each of these lay theories, as moderating variables, influence how Parent SFS affects child exposure to junk food directly and Child SFS indirectly. That one's own food preferences and perceptions of a child's preferences might guide decisions about foods seems obvious, but in terms of junk food that might be unhealthy for the child, we must delve deeper. According to Zheng et al. (2016), convictions held about free will serve as a foundation for the views one holds about the consumption of others. Importantly, Zheng et al. find that belief about the control others have is not monolithic but varies across individuals. We propose the following:

**H<sub>2a</sub>:** Parental lay theories regarding the amount of self-control people have (unlimited/limited) are negatively related to the extent of child junk food exposure. As parental lay theory moves from unlimited self-control to limited self-control, child exposure to junk food decreases.

**H<sub>2b</sub>:** Parental lay theories regarding the amount of self-control people have (unlimited/limited) moderate the positive relationship between Parent SFS and child exposure to junk food by strengthening the impact of Parent SFS on child exposure to junk food.

**H<sub>2c</sub>:** Parental lay theories regarding the amount of self-control people have (unlimited/limited) moderate the positive indirect effect of Parent SFS, through child exposure to junk food, on Child SFS. The indirect effect will be stronger for limited self-control than unlimited self-control.

**H<sub>3a</sub>:** Parental lay theories regarding the amount of fixed self-control (malleable/limited) are positively related to the extent of child junk food exposure. As parental lay theory moves from malleable self-control to fixed self-control, child exposure to junk food increases.

**H<sub>3b</sub>:** Parental lay theories regarding the extent to which self-control can be changed over time (malleable/limited) moderate the positive relationship between Parent SFS and child exposure to junk food by weakening the impact of Parent SFS on child exposure to junk food.

**H<sub>3c</sub>:** Parental lay theories regarding the extent to which self-control can be changed over time (malleable/limited) moderate the positive indirect effect of Parent SFS, through child exposure to junk food, on Child SFS. The indirect effect is stronger for malleable self-control than fixed self-control.

Hypothesized relationships appear in Figure 1, where we propose partial moderated mediation such that Parent SFS is positively related to Child SFS. The child's exposure to junk food, which is afforded by the parent, partially mediates this relationship. Parental lay theories regarding the amount of self-control and the changeability of self-control moderate the relationship between Parent SFS and child exposure to junk food.

## Role of Food Exposure and Familiarity in Child Food Choice

In keeping with the previous discussion, Parent SFS should be negatively associated with child consumption of vegetables (if vegetables are prepared without added sugar, fat, and salt). Child exposure to junk food should have a negative relationship with the child's consumption of vegetables, due in part to the child's limited exposure to vegetables when junk foods are served. Familiarity of food strongly influences children's food acceptance or choice (Birch and Marlin 1982). Repeated exposure to a new food increases liking, and this phenomenon has been examined extensively (e.g., Mennella 2014). Work in child learning, as summarized by Jansen and Tenney (2001), finds that people more readily learn a preference for the taste of foods that are energy rich (carbohydrates or fat) than a preference for low-energy but potentially high-nutrient foods, such as vegetables.

Thus, we theorize that Parent SFS and the exposure to junk food will be negatively associated with child vegetable consumption. Parent taste preferences should hold limited sway over the consumption of vegetables (e.g., Jansen and Tenney 2001), but exposure to junk food both introduces the child to high-processed foods, high calories, and low nutrition and gives limited exposure to vegetables. In line with the work of Mukhopadhyay and Yeung (2010), parental lay theories of self-control should also influence children's consumption of vegetables.

**H<sub>4</sub>:** Child exposure to junk food partially mediates the negative relationship between Parent SFS and vegetables eaten by the child.

**H<sub>5</sub>:** Parental lay theories regarding the amount of self-control people have (unlimited/limited) moderate the indirect effect of Parent SFS, through child exposure to junk food, on vegetables eaten by the child. The indirect effect is stronger for limited than unlimited self-control.

**H<sub>6</sub>:** Parental lay theories regarding the extent to which self-control can be changed over time (malleable/fixed) moderate the indirect effect of Parent SFS, through child exposure to junk food, on vegetables eaten by the child. The indirect effect is stronger for malleable than fixed self-control.

We test the hypotheses in two studies (see Figure 1). In Study 1, we use a parent survey to capture the variables of interest. In Study 2, we use both a parent survey and child observation. Study 1 tests H<sub>1</sub>, and Study 2 tests the remaining hypotheses. We test H<sub>1</sub> using a partial mediation model (Model A) and test H<sub>2</sub> and H<sub>3</sub> using a partial dual moderated mediation model (Model B). We use another partial dual moderated mediation model (Model C) to test H<sub>4</sub>, H<sub>5</sub>, and H<sub>6</sub>. A summary of predictions made in the hypotheses appears in Table W2 of the Web Appendix.

## Introduction to Empirical Work

This work was part of a larger study that included preschool employees and attending families. Relevant to this work, the

research team sought and gained institutional review board approval for the observation protocols and instruments used. Approved materials included (1) a research plan, including child and parent data collection protocol; (2) participant recruitment documents in Spanish and English; (3) forms for consent to participate in Spanish and English and verbal protocol for children; (4) a parental survey in Spanish and English; and (5) a compensation form.

Before data collection in 2016, we visited four Head Start preschools (three large participating schools and one small nonparticipating) to meet with and learn from parents and administrators about food consumption at the schools and to plan data collection procedures. For Studies 1 and 2, participants were recruited from five Head Start preschool locations in the Pacific Northwest that participate in the federal Child and Adult Care Food Program. Parental consent for participation and parent surveys were solicited on site through flyers, open houses, and in-person hallway table intercepts. Parents were given monetary compensation for participation (\$10). Schools were selected for inclusion based on their size, with data collection during the lunchtime window at large rather than small schools being most efficient.

We invited one parent or guardian playing a parental role for the child (we use the term "parent" herein for brevity) to participate in the study. Parents completed the survey about their own food preferences either on site, when they gave consent for their child to participate, or at home shortly after they gave consent. While it was explained that children would be observed during mealtimes, the specific hypotheses of the study were not communicated. Surveys completed at home were typically returned to the school by the children to their homeroom. In both studies, we recorded child gender in line with school records (authorized by the parents to share). We recorded child age in months and calculated it for each observation by subtracting the child's birthdate from the observation date. Data were collected in 2017 and 2018.

## Study 1

The goal of Study 1 was to assess whether a child's frequency of exposure to junk food helps transmit Parent SFS to the child. Consistent with H<sub>1</sub>, we expected the frequency of exposure to junk food to partially mediate the relationship between Parent SFS and Child SFS.

## Method

**Participants.** Eighty-nine parents of preschool-aged children participated from one of the five largest preschools in the county system. We removed eight participants who did not complete the questionnaire, which left a sample of 81 participants. Participating parents (57% female) were in the 20- to 63-year age group (mean age = 33 years). Children's mean age in Study 1 was 55.2 months.

**Table 2.** Measures Used in Parent Survey.

Construct (Source)
Items/Descriptions
<b>Parent SFS (adapted from Cornwell and McAlister [2011])</b>
Cronbach's alpha (Study 1 = .66; Study 2 = .81)
<ul style="list-style-type: none"> <li>• (Sugar) I prefer sweet food and will choose them over others.</li> <li>• (Sugar) I like sugary or sweet dessert foods.</li> <li>• (Fat) I am concerned about fatty foods (i.e., I do not want to consume them). (R)<sup>a</sup></li> <li>• (Fat) My favorite foods are typically high in fat.</li> <li>• (Salt) My preferred meals are typically high in salt (e.g., pizza, burrito).</li> <li>• (Salt) I do not add salt to my food when eating. (R)<sup>a</sup></li> <li>• (Salt) I like salty foods.</li> </ul>
<b>Child SFS (adapted from Cornwell and McAlister [2011])</b>
Cronbach's alpha (Study 1 = .83; Study 2 = .79)
<ul style="list-style-type: none"> <li>• (Sugar) Child prefers sweet foods and will choose them over others on a plate.</li> <li>• (Sugar) Child likes sugary or sweet foods.</li> <li>• (Salt) Child's preferred meals are typically high in salt (e.g., pizza, burritos).</li> <li>• (Salt) Child likes salty foods.</li> <li>• (Fat) Child's favorite foods are typically high in fat.</li> <li>• (Fat) Child likes foods containing dairy fat (e.g., cream cheese, macaroni &amp; cheese).</li> </ul>
<b>Child Exposure to Junk Food (expanded from the single item capturing fast-food consumption in Cornwell and McAlister [2011] and based on drink research in Cornwell and McAlister [2013])<sup>b</sup></b>
<ul style="list-style-type: none"> <li>• How often does your child ("participating in this study" used throughout) eat fast food (e.g., McDonald's, KFC, Taco Bell)?</li> <li>• How often does your child eat chips (e.g., potato chips, corn chips)?</li> <li>• How often does your child eat convenience meals (e.g., 2-minute noodles, frozen meals)?</li> <li>• How often does your child drink water as the beverage with their evening meal? (R)</li> <li>• How often does your child drink a sweet beverage like soda or juice with their evening meal?</li> <li>• How often does your child have a dessert like cake, cookies or ice cream with an evening meal?</li> </ul>
<b>Parental Lay Theory of Self-Control (Unlimited/Limited) (Mukhopadhyay and Yeung 2010)</b>
Cronbach's alpha (Study 2 = .66)
<ul style="list-style-type: none"> <li>• I believe that people are limited in their ability to control themselves.</li> <li>• I believe that people cannot hold themselves back beyond a point.</li> </ul>
<b>Parental Lay Theory of Self-Control (Malleable/Fixed) (Mukhopadhyay and Yeung 2010)</b>
Cronbach's alpha (Study 2 = .68)
<ul style="list-style-type: none"> <li>• Everyone has a certain amount of self-control, and one can't do much to change this amount.</li> <li>• People can get incentives and disincentives, but they can't really change their basic self-control.</li> </ul>

Notes: (R) = reverse scored. Unless specified otherwise, all items were measured on seven-point scales (1 = "strongly disagree," and 7 = "strongly agree").

<sup>a</sup>Items dropped.

<sup>b</sup>Items answered on a scale of 1 = "never," 2 = "less than once per week," 3 = "1 to 2 times per week," 4 = "3 to 4 times per week," 5 = "more than 4 times per week."

**Measurement.** We used a parent survey to measure the variables of interest. Parent SFS was self-reported using seven items (adapted from Cornwell and McAlister 2011). The Parent SFS scale was adapted to include popular local foods (e.g., burritos). To address the social desirability bias surrounding liking fatty and salty foods, the Parent SFS scale also included two reverse-coded items; however, we ultimately reduced the seven items to a five-item scale for reliability ( $\alpha = .66$ ) by dropping the two reverse-coded items (see Table 2). Child SFS was parent-reported using a six-item scale from Cornwell and McAlister (2011) ( $\alpha = .83$ ). Finally, the parent reported child exposure to junk food using a six-item index based on the work of Cornwell and McAlister (2011, 2013). Both scales and the index appear in Table 2, and the descriptive statistics are available in Table 3.

### Model A: Partial Mediation Model

To test our hypothesis that exposure to junk food mediates the relationship between Parent SFS and Child SFS, we conducted mediation analysis using PROCESS Model 4 (Hayes 2018), with age and gender entered as covariates. Specifically, child exposure to junk food partially mediated the relationship between Parent SFS and Child SFS (see Figure 1). The available sample size ( $N = 81$ ) has sufficient power (.79,  $\alpha = .05$ ) to detect medium-size effects through multiple regression analyses with four predictors.

### Results ( $H_1$ )

While both Parent SFS ( $b = .40, p = .001, 95\%$  confidence interval [CI] = [.158, .636]) and child exposure to junk food

**Table 3.** Descriptive Statistics and Correlation Matrices.

Study 1 (N = 81)									
Variable	M	SD	1	2	3				
1. Parent SFS	3.63	1.09	(.66)						
2. CEJF	2.24	.48	.39**						
3. Child SFS	4.46	1.22	.45**	.34**	(.83)				
4. Child Age <sup>a</sup>	55.2	6.59	-.04 <sup>ns</sup>	.06 <sup>ns</sup>	-.09 <sup>ns</sup>				
Study 2 (N = 122)									
	M	SD	1	2	3	4	5	6	7
1. Parent SFS	3.74	1.20	(.81)						
2. CEJF	2.38	.50	.40**						
3. Child SFS	4.26	1.05	.60**	.44**	(.68)				
4. VEGETN	.64	.94	-.16 <sup>ns</sup>	-.26**	-.19*	N.A.			
5. LIM	3.12	1.40	.08 <sup>ns</sup>	-.02 <sup>ns</sup>	.03 <sup>ns</sup>	.04 <sup>ns</sup>	(.66)		
6. FIX	2.80	1.31	.13 <sup>ns</sup>	-.07 <sup>ns</sup>	.10 <sup>ns</sup>	.05 <sup>ns</sup>	.52**	(.68)	
7. Child Age <sup>a</sup>	55.1	8.45	-.14 <sup>ns</sup>	-.10 <sup>ns</sup>	-.12 <sup>ns</sup>	-.18*	-.04 <sup>ns</sup>	-.06 <sup>ns</sup>	N.A.
8. TAMT	4.05	2.33	<-.01 <sup>ns</sup>	-.03 <sup>ns</sup>	-.12 <sup>ns</sup>	.29**	-.01 <sup>ns</sup>	-.04 <sup>ns</sup>	.11 <sup>ns</sup>

Notes: Two-tailed tests of significance. CEJF = child exposure to junk food; LIM = parental lay theory of self-control (unlimited/limited); FIX = parental lay theory of self-control (malleable/fixed); VEGETN = vegetables eaten by the child; TAMT = total amount eaten by the child. Values in parentheses are Cronbach's alpha values. N.A. = single-item measures.

<sup>a</sup>Child age presented as months.

\*  $p < .05$ .

\*\*  $p < .01$ .

<sup>ns</sup> $p > .05$  level.

( $b = .58, p = .040, 95\% \text{ CI} = [.026, 1.132]$ ) significantly affected Child SFS ( $F(4, 76) = 6.50, p < .001, R^2 = 25.5\%$ ), neither age nor gender significantly did so. Parent SFS also had a significant, positive effect on child exposure to junk food ( $b = .17, p < .001, 95\% \text{ CI} = [.082, .262]$ ), while neither age nor gender significantly predicted child exposure to junk food ( $F(3, 77) = 6.25, p = .001, R^2 = 19.6\%$ ). The indirect effect of Parent SFS on Child SFS, through child exposure to junk food, was positive ( $b = .10$ ), with a 90% CI excluding zero (.009, .215). This suggests that child exposure to junk food is a marginally significant mediator of the relationship between Parent SFS and Child SFS.

Overall, the results confirm partial mediation. Parent SFS is positively related to Child SFS, both directly and indirectly through child exposure to junk food, in support of  $H_1$ . The total effect of Parent SFS on Child SFS was significant ( $b = .50, p = .001, 95\% \text{ CI} = [.272, .721]$ ).

## Discussion

Study 1 shows that Parent SFS is positively associated with Child SFS. It also reveals that parents having a stronger preference for foods high in sugar, fat, and salt report a higher incidence of their children consuming junk food. In turn, children who consume junk food have a higher preference for foods high in sugar, fat, and salt. Other factors not captured in the model undoubtedly exist; however, the results of this study suggest that child exposure to junk food partially explains how Parent SFS is transmitted to children.

## Study 2

In Study 2, we extend the results of Study 1 by examining the moderating role of parental lay theories of self-control (unlimited/limited and malleable/fixed) in the Parent SFS–child exposure to junk food–Child SFS relationship ( $H_1, H_2$ , and  $H_3$ ). We also examine how the palate transmission mechanism identified in Study 1 can lead children to reject vegetables when offered in the preschool setting. Furthermore, we examine the moderating role of parental lay theories of self-control (unlimited/limited and malleable/fixed) in the Parent SFS–child exposure to junk food–vegetables eaten by the child relationship ( $H_4, H_5$ , and  $H_6$ ). In addition to the parent survey used in Study 1, we observe the children during their midday meal provided by their preschool. This allows us to consider the parents' self-reported preference for foods high in sugar, fat, and salt and their child's exposure to junk food with an observable dependent variable that is not subject to social desirability bias. As such, we can theoretically connect palate development with an important consumption outcome—namely, choosing or refusing to eat vegetables in a non-home setting.

## Method

**Participants.** We recruited 152 parent–child dyads from four Head Start locations in the Pacific Northwest that participate in the federal Child and Adult Care Food Program. Participants from the preschool participating in Study 1 did not participate in Study 2. Participating parents (87% female) were aged between 22 and 68 years (mean age = 33 years). The children

in the sample (42% female) were in the 37 to 68 months age group (mean age = 55.1 months).

**Data collection.** We used a parent survey to collect data on Parent SFS, child exposure to junk food, and the two lay theories of parental self-control used as moderators. We also collected data on one of the dependent variables, Child SFS, in the same survey.

The data for the second dependent variable, vegetables eaten by the child, were collected through observation. We observed child participants in an overt but unobtrusive manner. The research team conducted observations on site during the regularly scheduled lunchtime. Participants were seated with their nonparticipant classmates in their classroom, just as during nonobserved lunches. Each observer typically observed three to five children per lunchtime. During lunchtime, classes were divided and seated at two tables, each headed by a teacher. Teachers served children at their table, either by placing the food on the child's plate or by passing the serving dish around the table so that children served themselves.

Meals included four components: protein, grain, vegetable, and fruit (e.g., roasted chicken, brown rice, steamed broccoli, and apple slices; turkey sandwich on whole-grain bread, baby carrots, and quartered kiwis). Food sourcing and monthly menu planning across locations were centralized so that meals were consistent across all classrooms at all four locations. Milk (or a milk alternative) was served at all meals and water was available. These meals are depicted in Table 1 as balanced meals.

We included all vegetables served in the study except for the sweet potato offering, which was precooked, seasoned, fried, and then reheated on site. All other vegetables were fresh or minimally processed (frozen or canned). Therefore, we excluded from the analysis observations that included this sweet potato offering. This reduced our sample to 130 dyads. We also excluded eight multivariate outliers from the analysis. This left a final usable sample of 122 parent-child dyads. There were no significant differences in the results with the inclusion or exclusion of the multivariate outliers (for both Models B and C). Thus, we report the results with the exclusion of the multivariate outliers.

**Measurement.** We measured Parent SFS ( $\alpha = .81$ ) and child exposure to junk food, using the same measures as in Study 1.

**Moderating variables.** We adopted measures for the variables capturing the two lay theories of self-control (unlimited/limited and malleable/fixed) from Mukhopadhyay and Yeung (2010). The unlimited/limited lay theory ( $\alpha = .66$ ) and malleable/fixed lay theory ( $\alpha = .68$ ) were each assessed using two items (see Table 2).

**Dependent variables.** Child SFS (Model B) and vegetables eaten by the child (Model C) are the two dependent variables in this study. Child SFS ( $\alpha = .79$ ) was measured as in Study 1. Vegetables and other foods eaten were observed during the regularly scheduled lunchtime. Serving sizes were determined by the food preparation staff in keeping with the national guidelines. For example, one serving of a chicken sandwich for a child this age was uniformly a half sandwich, thus containing a serving each of

grain and protein. Other foods, such as quartered kiwi, exhibited some variation in size due to the size of the individual fruit. When they were not systematic across observations, agreement was reached by the researchers on serving size. For example, if kiwi were cut in half rather than quartered, a half was counted as two quarters. We calculated the amount eaten by subtracting the amount left on the child's plate from the amount the child had taken. We calculated the total amount eaten by a child by adding the servings of protein, grain, vegetables, fruit, and milk consumed by the child during the lunch observation.

### Model B: Partial Dual Moderated Mediation Model

To test for the moderating roles of parents' lay theories of self-control (unlimited/limited and malleable/fixed) in the Parent SFS-child exposure to junk food-Child SFS relationship ( $H_2$  and  $H_3$ ), we conducted partial dual moderated mediation analysis using PROCESS Model 9 (Hayes 2018), with age and gender entered as covariates. Specifically, each of the parental lay theories of self-control (unlimited/limited and malleable/fixed) moderated the relationship between Parent SFS and child exposure to junk food, while child exposure to junk food mediated the relationship between Parent SFS and Child SFS (see Figure 1). The available sample size ( $N = 122$ ) has sufficient power (.93,  $\alpha = .05$ ) to detect medium-size effects through multiple regression analyses with four predictors.

**Direct effects results: Child SFS.** Both Parent SFS ( $b = .44$ ,  $p < .001$ , 95% CI = [.302, .578]) and child exposure to junk food ( $b = .49$ ,  $p = .003$ , 95% CI = [.169, .819]) had significant, positive effects on Child SFS ( $F(4, 117) = 19.78$ ,  $p < .001$ ; see Table 4). Age and gender were not significant predictors of Child SFS ( $p > .778$ ). These variables collectively explain the sizable variance ( $R^2 = 40.3\%$ ) in Child SFS.

**Direct effects results: child exposure to junk food.** Parent SFS had a significant, positive effect on child exposure to junk food ( $b = .23$ ,  $p = .016$ , 95% CI = [.045, .425]; see Table 4). While parental lay theories of limited self-control had a negative effect on child exposure to junk food ( $b = -.28$ ,  $p = .014$ , 95% CI = [-.503, -.059]), indicating support for  $H_{2a}$ , parental lay theories of fixed self-control had a positive effect on child exposure to junk food ( $b = .37$ ,  $p = .005$ , 95% CI = [.117, .632]), indicating support for  $H_{3a}$ . That is, when parents believed that the amount of self-control one has is more limited, they offered less junk food to their children, but when they believed that the changeability of self-control is more fixed (less malleable), they provided more junk food to their children. Neither age nor gender significantly affected child exposure to junk food. These variables collectively explain the sizable variance ( $R^2 = 26.4\%$ ) in child exposure to junk food ( $F(7, 114) = 5.84$ ,  $p < .001$ ).

**Interaction effects results: parental lay theories of limited self-control (unlimited vs. limited).** The impact of Parent SFS on child exposure to junk food varied depending on parental lay theories of limited self-control ( $b = .08$ ,  $p = .009$ , 95% CI = [.021, .141],

**Table 4.** Child SFS: Results of Model B from Study 2 (N = 122).

	Outcome					
	CEJF			Child SFS		
	b	p	95% CI	b	p	95% CI
Constant	1.86	<.001	[.940, 2.792]	1.59	.019	[.270, 2.902]
Parent SFS	.23	.016	[.045, .425]	.44	<.001	[.302, .578]
LIM	-.28	.014	[-.503, -.059]			
FIX	.37	.005	[.117, .632]			
Parent SFS × LIM	.08	.009	[.021, .141]			
Parent SFS × FIX	-.12	.001	[-.188, -.049]			
Gender	-.06	.480	[-.225, .107]	-.01	.939	[-.318, .295]
Age	<-.01	.480	[-.013, .006]	<-.01	.779	[-.021, .015]
CEJF				.49	.003	[.169, .819]
	R <sup>2</sup>	26.4%		R <sup>2</sup>	40.3%	

Moderator	Index of Partial Moderated Mediation	95% CI <sup>a</sup>
LIM	.040	[.004, .103]
FIX	-.059	[-.139, -.009]

Notes: CEJF = child exposure to junk food; LIM = parental lay theory of limited self-control (1 = "unlimited," and 7 = "limited"); FIX = parental lay theory of fixed self-control (1 = "malleable," and 7 = "fixed"). The three-way interaction involving Parent SFS and the two lay theories of self-control (LIM and FIX) tested using PROCESS Model 11 (Hayes 2018) was not statistically significant ( $b < -.01$ ,  $p = .918$ , 95% CI = [-.040, .036],  $R^2_{\text{change}} < .01\%$ ).

<sup>a</sup>Percentile bootstrap based on 5,000 bootstrap samples.

$R^2_{\text{Change}} = 4.5\%$ ; see Table 4). Specifically, the impact of Parent SFS on child exposure to junk food became significantly stronger as parents believed that the amount of self-control one has is more limited (see Figure 2, Panel A). Importantly, the impact of parental lay theories of limited self-control on the relationship between Parent SFS and child exposure to junk food did not vary by the level of parental lay theories of fixed self-control (whether self-control is malleable or fixed). These results indicate support for H<sub>2b</sub>.

#### Conditional effects of parental lay theories of limited self-control.

Conditional effects are shown in Figure 2, Panel A. Findings show that for parents with an average level of fixed self-control ( $M_{\text{malleable/fixed}} = 2.5$ ), Parent SFS affected child exposure to junk food for both parents who believed that one's self-control is limited ( $b = .34$ ,  $p < .001$ , 95% CI = [.210, .475]) and parents who believed that one's self-control is unlimited ( $b = .10$ ,  $p = .046$ , 95% CI = [.002, .198]).

**Interaction effects: parental lay theories of fixed self-control (malleable vs. fixed).** The impact of Parent SFS on child exposure to junk food varied depending on parents' beliefs about the fixedness or malleability of one's self-control ( $b = -.12$ ,  $p = .001$ , 95% CI = [-.188, -.049],  $R^2_{\text{change}} = 7.4\%$ ; see Table 4). Specifically, the impact of Parent SFS on child exposure to junk food became weaker as parents believed that the amount of self-control one has is more fixed (less malleable) (see Figure 2, Panel B). Importantly, the impact of parental lay theories of fixed self-control on the relationship between Parent SFS and child exposure to junk food did not vary by the level of parental lay theories of limited self-control

(whether self-control is unlimited or limited). These results indicate support for H<sub>3b</sub>.

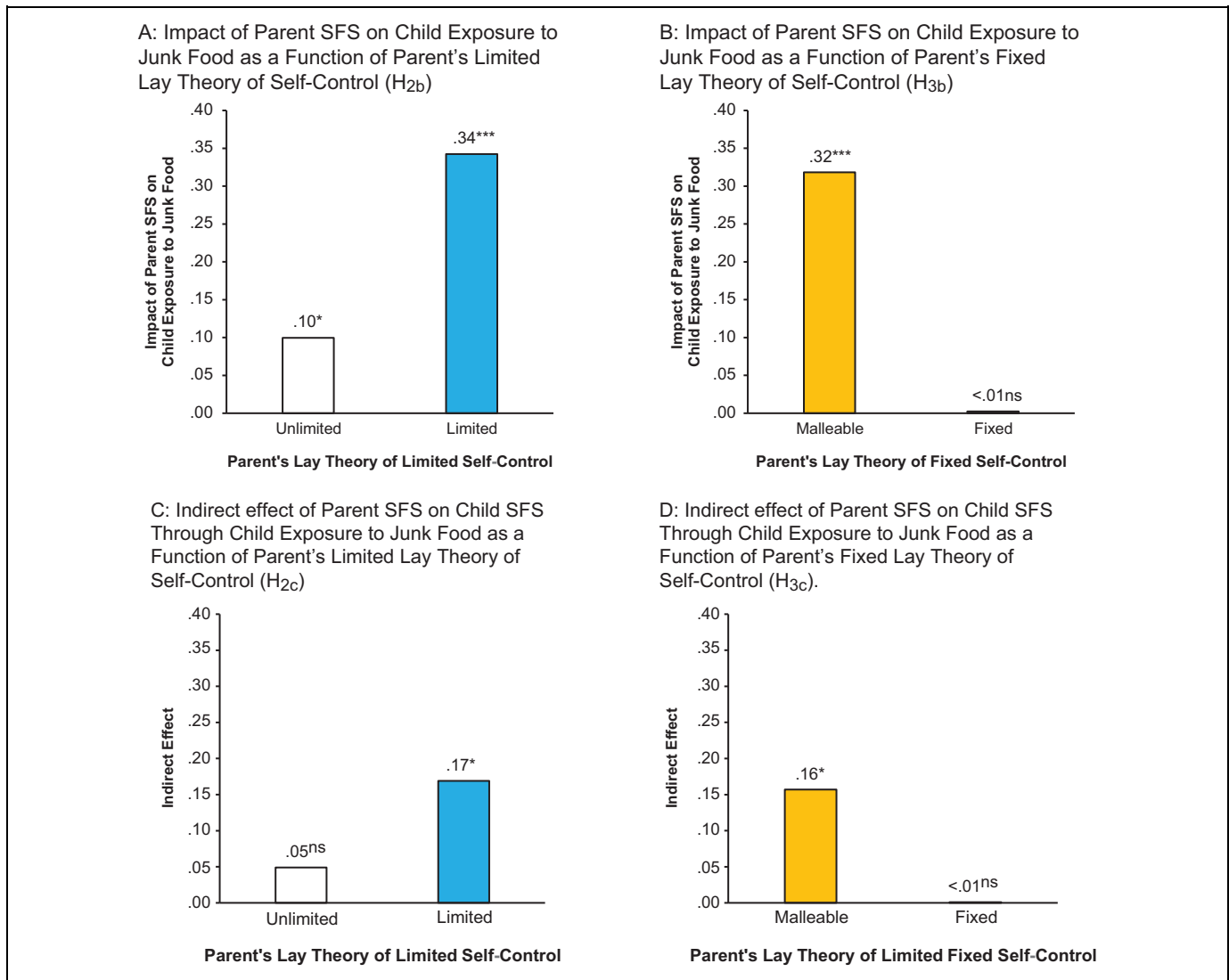
#### Conditional effects of parental lay theories of fixed self-control.

Figure 2, Panel B, illustrates conditional effects. Findings show that for parents with an average level of limited self-control ( $M_{\text{unlimited/limited}} = 3.0$ ), Parent SFS affected child exposure to junk food when parents believed that one's self-control is malleable ( $b = .32$ ,  $p < .001$ , 95% CI = [.207, .430]) but not when they believed that one's self-control is fixed ( $b < .01$ ,  $p = .969$ , 95% CI = [-.118, .123]).

**Indirect effects.** The mean indirect effect of Parent SFS on Child SFS, through child exposure to junk food, was positive ( $b_{\text{Parent SFS} \rightarrow \text{CEJF} \rightarrow \text{Child SFS}} = .09$ ), with a 95% CI excluding zero (.021, .167). This suggests that child exposure to junk food is a statistically significant mediator of the relationship between Parent SFS and Child SFS.

#### Conditional indirect effects of parental lay theories of limited self-control.

The indirect effect of Parent SFS on Child SFS, through child exposure to junk food, varied depending on parental lay theories of limited self-control (index of partial moderated mediation = .04, 95% CI = [.004, .103]; see Table 4). The impact of parental lay theories of limited self-control on the indirect effect did not vary by the level of parental lay theories of fixed self-control. Conditional indirect effects are shown in Figure 2, Panel C. For parents with an average level of fixed self-control ( $M_{\text{malleable/fixed}} = 2.5$ ), Parent SFS had a significant indirect effect on Child SFS for parents who believed that one's self-control is limited ( $b = .17$ ,  $p < .05$ , 95% CI = [.040, .336]) but not for parents who believed that one's self-control is



**Figure 2.** Impact of Parent SFS on child exposure to junk food and Child SFS as a function of the two lay theories of self-control (Model B) from Study 2.

Notes: Unlimited self-control ( $M_{\text{unlimited/limited}} = 2.0$ , 16th percentile), average unlimited–limited self-control ( $M_{\text{unlimited/limited}} = 3.0$ , 50th percentile), limited self-control ( $M_{\text{unlimited/limited}} = 5.0$ , 84th percentile), malleable self-control ( $M_{\text{malleable/fixed}} = 1.34$ , 16th percentile), average malleable–fixed self-control ( $M_{\text{malleable/fixed}} = 2.5$ , 50th percentile), and fixed self-control ( $M_{\text{malleable/fixed}} = 4.0$ , 84th percentile). \*  $p < .05$ ; ns  $p \geq .1$ . The bars in Panels A and B represent direct effects (unstandardized regression coefficients). The bars in Panels C and D of the diagram represent indirect effects.

\* $p < .05$ .

\*\*\* $p < .001$ .

ns  $p \geq .1$ .

unlimited ( $b = .05, p > .05, 95\% \text{ CI} = [-.013, .121]$ ). The indirect effect was stronger for parents who believed that one’s self-control is limited than for parents who believed that one’s self-control is unlimited (95% bootstrapped CI =  $[.013, .310]$ ). These results indicate support for  $H_{2c}$ .

**Conditional indirect effects of parental lay theories of fixed self-control.** The indirect effect of Parent SFS on Child SFS through child exposure to junk food varied depending on parental lay theories of fixed self-control (index of partial moderated mediation =  $-.06, 95\% \text{ CI} = [-.139, -.009]$ ; see Table 4). The impact of parental lay theories of fixed self-control on the

indirect effect did not vary by the level of parental lay theories of limited self-control. Figure 2, Panel D, presents conditional indirect effects. For parents with an average level of limited self-control ( $M_{\text{unlimited/limited}} = 3.0$ ), Parent SFS had a significant indirect effect on Child SFS, through child exposure to junk food, for parents who believed that one’s self-control is malleable ( $b = .16, p < .05, 95\% \text{ CI} = [.037, .299]$ ) but not for parents who believed that one’s self-control is fixed ( $b < .01, p > .05, 95\% \text{ CI} = [-.106, .080]$ ). The indirect effect was stronger for parents who believed that one’s self-control is malleable than for parents who believed that one’s self-control is fixed (95% bootstrapped CI =  $[-.025, -.370]$ ). These results support  $H_{3c}$ .

**Table 5.** Vegetables Eaten by the Child: Results of Model C from Study 2 (N = 122).

	Outcome					
	CEJF			VEGETN		
	b	p	95% CI	b	p	95% CI
Constant	1.88	<.001	[.946, 2.824]	3.11	<.001	[1.76, 4.46]
Parent SFS	.23	.017	[.042, .424]	-.07	.326	[-.211, .071]
LIM	-.28	.014	[-.504, -.058]			
FIX	.37	.005	[.114, .632]			
Parent SFS × LIM	.08	.009	[.020, .142]			
Parent SFS × FIX	-.12	.001	[-.188, -.049]			
Gender	-.06	.474	[-.227, .106]	-.15	.331	[-.467, .158]
Age	<-.01	.504	[-.013, .007]	-.03	.004	[-.046, .009]
TAMT	<-.01	.777	[-.040, .030]	.12	<.001	[.057, .189]
CEJF				-.46	.007	[-.791, -.129]
	R <sup>2</sup>	26.5%		R <sup>2</sup>	22.2%	

Moderator	Index of Partial Moderated Mediation	95% CI <sup>a</sup>
LIM	-.04	[-.079, -.007]
FIX	.05	[.012, .117]

Notes: CEJF = child exposure to junk food; VEGETN = vegetables eaten by the child; LIM = parental lay theory of limited self-control (1 = “unlimited,” and 7 = “limited”); FIX = parental lay theory of fixed self-control (1 = “malleable,” and 7 = “fixed”); TAMT = total amount eaten by the child. The three-way interaction involving Parent SFS and the two lay theories of self-control (LIM and FIX) tested using PROCESS Model 11 (Hayes 2018) was not statistically significant (b < -.01, p = .942, 95% CI = [-.040, .037], R<sup>2</sup><sub>change</sub> < .01%).

<sup>a</sup>Percentile bootstrap based on 5,000 bootstrap samples.

**Discussion: Model B**

The results of Model B indicate further support for H<sub>1</sub> and also provide support for H<sub>2</sub> and H<sub>3</sub>. Parent SFS is related to Child SFS both directly and indirectly through child exposure to junk food (H<sub>1</sub>). While parents holding a limited lay theory regulated child exposure to junk food (H<sub>2a</sub>), parents holding a fixed lay theory were disinclined to regulate child exposure to junk food (H<sub>3a</sub>). The positive relationship between Parent SFS and child exposure to junk food becomes (1) stronger as parents believe that the amount of self-control one has is more limited (H<sub>2b</sub>) and (2) weaker as parents believe that the amount of self-control one has is more fixed (less malleable) (H<sub>3b</sub>).

The indirect effects are conditional on the parents’ limited and fixed lay theories of self-control, indicating support for the partial dual moderated mediation. Specifically, the indirect effects are stronger for parents who believe that one’s self-control is limited than for parents who believe that one’s self-control is unlimited, regardless of whether the parents believe that one’s self-control is malleable or fixed (H<sub>2c</sub>). The indirect effects are also stronger for parents who believe that one’s self-control is malleable than for parents who believe that one’s self-control is fixed, regardless of whether the parents believe one’s self-control is limited or unlimited (H<sub>3c</sub>).

**Model C: Partial Dual Moderated Mediation**

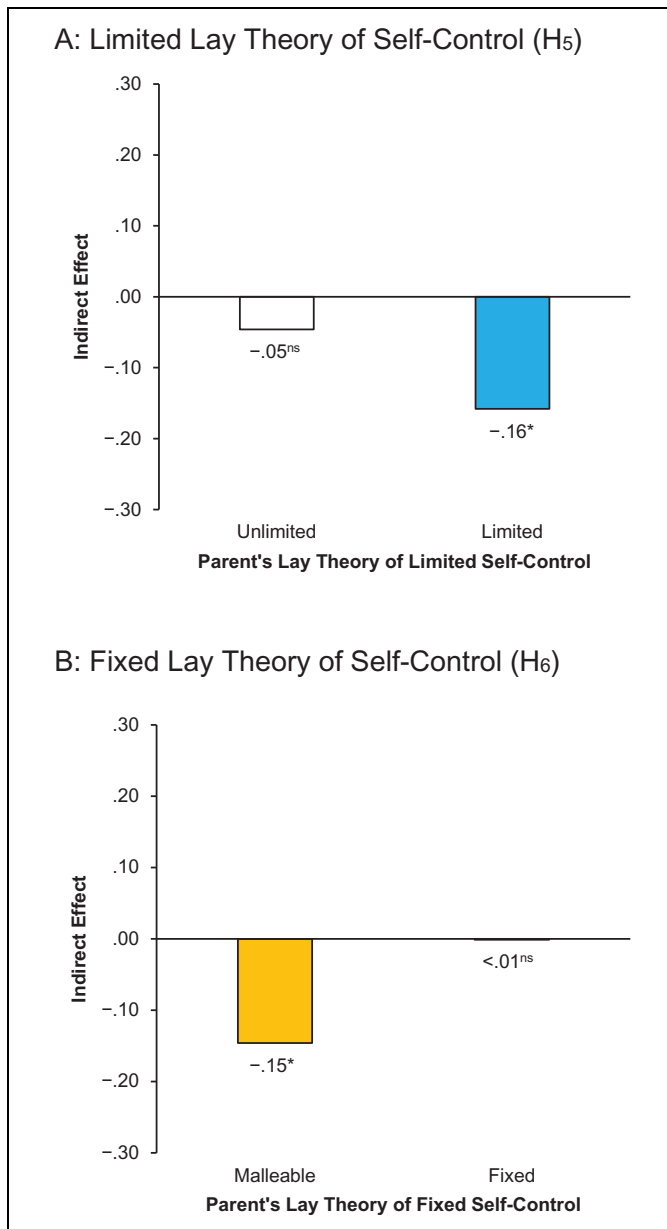
To test for the moderating roles of parental lay theories of limited and fixed self-control, in the Parent SFS–child exposure to junk food–vegetables eaten by the child relationship (H<sub>4</sub>, H<sub>5</sub>,

and H<sub>6</sub>), we conducted another partial dual moderated mediation analysis using PROCESS Model 9 (Hayes 2018), with age, gender, and total amount of food eaten entered as covariates (Model C). Specifically, parental lay theories of limited and fixed self-control moderated the relationship between Parent SFS and child exposure to junk food, while child exposure to junk food mediated the relationship between Parent SFS and vegetables eaten by the child (see Figure 1). The available sample size (N = 122) has sufficient power (.89, alpha = .05) to detect medium-size effects through multiple regression analyses with six predictors.

We also tested Model C by including Child SFS as a covariate. The results were very similar (almost identical) to those presented here. None of the key parameter estimates changed in direction or statistical significance. Importantly, Child SFS was not a significant predictor of vegetables eaten by the child (b = -.03, p = .754, 95% CI = [-.219, .159]), after taking into consideration the impact of Parent SFS, child exposure to junk food, and the two lay theories of parents’ self-control. Hence, we present the results of Model C without Child SFS as a covariate.

**Results: Model C (H<sub>4</sub>, H<sub>5</sub>, and H<sub>6</sub>)**

**Direct effects: vegetables eaten by the child.** Parent SFS did not significantly affect vegetables eaten by the child (b = -.07, p = .326, 95% CI = [-.211, .071]). Child exposure to junk food (b = -.46, p = .007, 95% CI = [-.791, -.129]) had a significant, negative effect on vegetables eaten by the child (F(5, 116) = 6.63, p < .001; see Table 5). Age (b = -.03, p = .004, 95% CI = [-.046, -.009]) and the total amount of



**Figure 3.** Study 2: Indirect effect of Parent SFS on vegetables eaten by the child through child exposure to junk food as a function of lay theories of self-control (Model C).

Notes: Unlimited self-control ( $M_{\text{unlimited/limited}} = 2.0$ , 16th percentile), average unlimited–limited self-control ( $M_{\text{unlimited/limited}} = 3.0$ , 50th percentile), limited self-control ( $M_{\text{unlimited/limited}} = 5.0$ , 84th percentile), malleable self-control ( $M_{\text{malleable/fixed}} = 1.34$ , 16th percentile), average malleable–fixed self-control ( $M_{\text{malleable/fixed}} = 2.5$ , 50th percentile), and fixed self-control ( $M_{\text{malleable/fixed}} = 4.0$ , 84th percentile). The bars in the diagram represent indirect effects.

\* $p < .05$ .

<sup>ns</sup> $p \geq .1$ .

food eaten by the child ( $b = .12$ ,  $p < .001$ , 95% CI = [.057, .189]) were significant predictors of vegetables eaten by the child, while gender did not significantly influence vegetables eaten by the child ( $p = .331$ ). These variables collectively explain the sizable variance ( $R^2 = 22.2\%$ ) in the vegetables eaten by the child.

*Indirect effects.* The mean indirect effect of Parent SFS on vegetables eaten by the child, through child exposure to junk food, was negative ( $b_{\text{Parent SFS} \rightarrow \text{CEJF} \rightarrow \text{vegetables eaten by the child}} = -.10$ ), with a 95% bootstrapped CI excluding zero ( $-.152$ ,  $-.021$ ). This suggests that child exposure to junk food mediates the negative relationship between Parent SFS and vegetables eaten by the child. In conjunction with the lack of support for the direct effect of Parent SFS on vegetables eaten by the child, these results indicate full mediation and provide partial support for H<sub>4</sub>.

*Conditional indirect effects: parental lay theories of limited self-control.* The indirect effect of Parent SFS on vegetables eaten by the child, through child exposure to junk food, varied depending on parental lay theories of limited self-control (index of partial moderated mediation =  $-.04$ , 95% CI =  $[-.079$ ,  $-.007$ ]; see Table 5). The impact of parental lay theories of limited self-control on the indirect effect did not vary by the level of parental lay theories of fixed self-control. Conditional indirect effects are shown in Figure 3, Panel A. For parents with an average level of fixed self-control ( $M_{\text{malleable/fixed}} = 2.5$ ), Parent SFS had a significant indirect effect on vegetables eaten by the child for parents who believed that one's self-control is limited ( $b = -.16$ ,  $p < .05$ , 95% CI =  $[-.280$ ,  $-.055$ ]) but not for parents who believed that one's self-control is unlimited ( $b = -.05$ ,  $p > .05$ , 95% CI =  $[-.135$ ,  $.006$ ]). The indirect effect was stronger for parents who believed that one's self-control is limited than for parents who believed that one's self-control is unlimited (95% bootstrapped CI =  $[-.238$ ,  $-.022$ ]; see Figure 3). This indicates support for H<sub>5</sub>.

*Conditional indirect effects: parental lay theories of fixed self-control.* The indirect effect of Parent SFS on vegetables eaten by the child, through child exposure to junk food, varied depending on parental lay theories of fixed self-control (index of partial moderated mediation =  $.05$ , 95% CI =  $[.012$ ,  $.117$ ]; see Table 5). The impact of parental lay theories of fixed self-control on the indirect effect did not vary by the level of parental lay theories of limited self-control. Figure 3, Panel B, illustrates conditional indirect effects. For parents with an average level of limited self-control ( $M_{\text{unlimited/limited}} = 3.0$ ), Parent SFS had a significant indirect effect on vegetables eaten by the child, through child exposure to junk food, for malleable self-control lay theory parents ( $b = -.15$ ,  $p < .05$ , 95% CI =  $[-.273$ ,  $-.049$ ]) but not for fixed self-control lay theory parents ( $b < .01$ ,  $p > .05$ , 95% CI =  $[-.092$ ,  $.080$ ]). The indirect effect was stronger for parents who believed that one's self-control is malleable than for parents who believed that one's self-control is fixed (95% bootstrapped CI =  $[-.285$ ,  $-.035$ ]). This indicates support for H<sub>6</sub>.

### Discussion: Model C

Parent SFS is related to vegetables eaten by the child indirectly, through child exposure to junk food. Findings show full

mediation rather than the partial mediation expected in H<sub>4</sub>. Results confirm moderated mediation and show that each of the parental lay theories of self-control moderates the negative impact of Parent SFS on vegetables eaten by the child through child exposure to junk food. The negative indirect effects are conditional on the parents' limited and fixed lay theories of self-control. Specifically, the negative indirect effects are stronger for parents who believe that self-control is limited than for parents who believe that self-control is unlimited, regardless of whether the parents believe that one's self-control is malleable or fixed (H<sub>5</sub>). The negative indirect effects are stronger for parents who believe that one's self-control is malleable than for parents who believe that one's self-control is fixed, regardless of whether the parents believe that one's self-control is limited or unlimited (H<sub>6</sub>). A summary of results is provided in Table W3 of the Web Appendix.

## General Discussion

In summary, we have four central findings. First, parental preference for sugar, fat, and salt is positively related to child exposure to junk foods, which is dependent on parental lay theories. Specifically, this effect of lay theories is stronger as we move from unlimited perceptions of self-control to limited (see Figure 2, Panel A) and becomes weaker as we move from malleable to fixed perceptions of the potential to change self-control over time (see Figure 2, Panel B).

Second, there is a positive indirect effect of parental preference for sugar, fat, and salt on child preferences through child exposure to junk foods, which is also dependent on parental lay theories. This effect of lay theories is also stronger as we move from unlimited perceptions of self-control to limited (see Figure 2, Panel C) and becomes weaker as we move from malleable to fixed perceptions of the potential to change self-control over time (see Figure 2, Panel D).

Third, there is a negative indirect effect of parental preference for sugar, fat, and salt on vegetables eaten by the child through child exposure to junk food. This is moderated by parental lay theories of self-control in a similar fashion, becoming stronger as we move from unlimited to limited (see Figure 3, Panel A) and weaker as we move from malleable to fixed (see Figure 3, Panel B).

Fourth, importantly, indirect effects are only observed when self-control amount is perceived as limited but not when perceived as unlimited (see Figure 2, Panel C, and Figure 3, Panel A). Independently, indirect effects are only observed when self-control change is perceived to be malleable but not when perceived as fixed (see Figure 2, Panel D, and Figure 3, Panel B).

Across two studies, we offer evidence that an obesogenic environment, where junk foods are served to young children, contributes to the formation of their food preferences. Parents play an obvious role in providing young children with food but in keeping with previous work, lay theories were shown to guide decisions about what food is provided to the child. Importantly, in this work parental decisions to provide junk

food to children are then shown to influence the child's preferences and consumption. The role of junk food in development of a child's palate that favors sugar, fat, and salt holds profound implications for marketers, policy makers, and consumers.

## Implications for Marketers

As brands face increasing pressure to address their role in the obesity epidemic, the current work offers two suggestions for change. First, it is a choice to eat foods from restaurants such as McDonald's, KFC, and Taco Bell and foods such as packaged noodles, frozen meals, juice, and soda. Nonetheless, brand managers and corporate decision makers should want to know that increased consumption of their offerings, high in sugar, fat, and salt, is associated with an increased preference for sugar, fat, and salt and a disinclination for vegetables in children. While food brands, and in particular fast-food restaurants, have responded to social pressure by lowering calorie content in foods, there is a need for corporations to consider the hyperpalatable nature of their foods as a social concern.

Second, the work here suggests that brands offering prepared foods, especially those specifically for children, should formulate meals that are in keeping with recommended guidelines regarding sugar, fat, and salt. When contrasting the balanced meal recommended by the U.S. Child and Adult Care Food Program (featured in Table 1) with typical convenience and fast-food meals, it is evident that these foods, as currently formulated, cannot be consumed within the guidelines for children.

## Implications for Public Health Policy Makers and Consumers

Around the world, government and nongovernment programs, such as the U.S. Department of Agriculture's Child Nutrition Programs and the World Bank Group "Investing in Early Years Program," aim to support early child nutrition. Elmslie et al. (2012) characterize the vast array of highly processed foods high in sugar, fat, and salt that health practitioners suggest that people avoid as "NEEDNT foods" (nonessential, energy-dense, nutritionally deficient foods). The United Nations focuses on reducing "HFSS foods," or foods high in saturated fat, salt, and/or free sugars (WHO Regional Office for Europe 2016).

There is widespread agreement that the failure of people to choose and consume healthy foods is not about lack of information or understanding (e.g., Swinburn et al. 2011); rather, many other variables can intervene between knowing what one should eat and eating it (e.g., Allen, Gupta, and Monnier 2008; Drewnowski 1997; Vennerød et al. 2017). In terms of providing food to children, we find that lay theories of self-control play a contributing role in parents' poor choices. We also show that for children, taste preference, associated with exposure to junk food, is a determinant of food choice. Family-based interventions that try to enhance understanding of the potential of self-control and programs that emphasize the role of taste in

choice could help people better navigate the obesogenic environment until food offerings and food policies change.

Head Start, as a program of the U.S. Department of Health and Human Services, already offers programs designed to help families make better food choices. This existing delivery system could provide training to parents on how to reconsider their own lay theories to better serve their families. Our research suggests that the combination of reducing parent sugar, fat, and salt preference together with developing an understanding of influential lay theories would be most beneficial. Furthermore, bodies such as the U.S. Food and Drug Administration's Center for Food Safety and Applied Nutrition might expand their ambit to include examination of the hyperpalatability and potential addictive nature of processed foods.

When enacting policy, why focus on children? Swinburn and Egger (2002, p. 289) argue that to address obesity, "children should be the priority population for interventions, and improving the general socio-economic conditions for disadvantaged, marginalized or poor population sectors is also a central strategy for obesity prevention." Children should also be a focus because weight loss is difficult for adults. Wing and Hill (2001) find that only 20% of adults are able to keep off a loss of 10% of weight for more than a year. Early established food consumption patterns are important for their immediate and downstream consequences. For example, concerns with and actions to improve the quality of school lunch programs are extensive. Relatedly, a plethora of research has examined plate waste from school lunch programs (for a review, see Shanks, Banna, and Serrano [2017]), with the main issue being that children do not eat the healthy foods provided. For example, in a study of 743 sixth graders, food waste was exacerbated by the availability of competitive foods (sweet snacks, salty snacks, and beverages) from vending machines (Marlette, Templeton, and Panemangalore 2005). This implies that established taste preferences may guide food choice of school-age children.

### *Implications for Researchers*

This research corroborates prior findings in terms of the potential influence of parental lay theories on child exposure to junk food (e.g., Mukhopadhyay and Yeung 2010), though our findings differ in establishing both limited and fixed lay theories of self-control as independent contributors to child regulation. That is to say, we examine the moderating role of each of the lay theories of parental self-control, whereas Mukhopadhyay and Yeung examined their joint influence. This is important in future studies that might seek to use either variable independently. Because each construct is associated with different personality traits (Jędrzejczyk and Zajenkowski 2020) and each may be associated with other unique individual difference variables, differences between the self-control theories and their associates offer different possible policy levers. Furthermore, in the current work, we find both direct effects of parental lay theories on children's exposure to junk food and indirect effects on their palate and consumption of

vegetables. Thus, we confirm prior research that finds lay theories to be important influences on parental decision making on behalf of children, but we find more nuanced roles for each lay theory of self-control.

The findings extend the work of Cornwell and McAlister (2011), who did not examine child food behavior, by showing that children's exposure to junk food is indeed associated with their food preferences and actual consumption. Our research is also consistent with other findings. For example, Leonard, Campbell, and Manning (2019) find that food liking (potentially taste preference but not measured as such), not on-package licensed characters, exerts the greatest influence on children's choices and consumption of a food.

Nutrition research, a historically low priority at the National Institutes of Health, should receive greater funding. Meanwhile, the outcome of a poor diet, including Type 2 diabetes, hypertension, and heart disease, receive funding (Boudreau and Evich 2019). The hyperpalatability of food and the proposed addictive tendencies of these foods is unfortunately not a governmental research priority, but it should be.

### *Limitations and Future Research Directions*

We collected the sample in a single region of the United States; thus, it may include regional orientations to food. Any potential bias could be addressed by national or international studies with broad-based samples. Self-reports of one's own taste preferences and those of one's child and the extent to which junk food is provided to a child are all open to social desirability bias. Thus, it is possible that actual exposure of all these variables was underreported. Future research might include a measurement of a person's sensitivity to self-presentation (see Nederhof 1985). Furthermore, the current work utilized a self-report of junk food provided to children as has other work (e.g., Mukhopadhyay and Yeung 2010; Robinson et al. 2007). Future work could take a longitudinal approach to monitoring actual food provided.

In Study 2, stated food preferences and reports of junk foods provided to children precede the child's consumption of vegetables, thus suggesting an association of junk food with child vegetable preference; however, we cannot show causality. In field studies such as this, there can be many factors at work. Because participation in Head Start programs is means-tested, study participants were similar in terms of socioeconomic standing but may have varied in other factors such as education or cultural background. In this context, with these variables, experimentation could not be utilized, but experimental work, as the gold standard of causal inference, is encouraged in future work. Another limitation of the current work is that surveying the parents before children were observed may have resulted in the parent influencing their child's exhibited preferences in the preschool environment. One way to control for this in future studies would be to observe a matched sample of children whose parents did not participate in the survey.

## Conclusion

This research has forwarded our understanding of the relationship between parents' preferences, their lay theories, and early food exposure on their children's preferences and food consumption. The overarching goal of this work is to bring taste preferences into central consideration in the development of obesity; however, this cannot be done without examining, at least for very young children, the role parents hold in deciding the foods children will eat. Marketing, in the form of product formulation, packaging, and promotion, is deeply implicated in the development of our obesogenic environment. Early taste preference developed through the consumption of hyperpalatable foods that are calorie dense and nutrient poor influences a lifelong trajectory favoring these foods. Subsequent interventions by individual consumers, policies, or programs have a lower probability of success than does starting on the right path.

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