

ORIGINAL ARTICLE

Teaching families to manage intake of candy in the home: Results from a feasibility study using multiphase optimization strategy (MOST)

J. S. Savage^{1,2}  | E. L. Adams^{1,2}  | B. Y. Rollins¹  | J. A. Bleser¹  | M. E. Marini¹

¹Center for Childhood Obesity Research, Penn State University, University Park, Pennsylvania, USA

²Department of Nutritional Sciences, Penn State University, University Park, Pennsylvania, USA

Correspondence

Jennifer Savage, Center for Childhood Obesity Research, 129 Noll Laboratory, The Pennsylvania State University, University Park, PA 16802, USA.
Email: jfs195@psu.edu

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Summary

Background: Excess intake of desserts/sweets high in added sugars, such as candy, is linked with greater obesity risk. Parents often limit their childrens' intake of these sweet foods using controlling feeding practices, such as restriction; yet, restrictive feeding practices are counterproductive for childrens' self-regulation of energy intake.

Objective: This study developed a family-based behavioural intervention that taught parents alternatives to restrictive feeding practices and encouraged children to consume candy in moderation.

Methods: Using the multiphase optimization strategy (MOST), parent-child dyads ($N = 37$) were randomized into one of eight conditions that included a combination of intervention components delivered over 4 weeks: home supply, parent shared decision making, child mindfulness and child attention control strategies.

Results: Retention rate at follow-up was high (95%). Among parents who received parent shared decision making, 86.4% reported the structured-based candy routine they set with their child was easy to follow. Most children reported child mindfulness (95%) and attention control (89.5%) strategies were easy to play. Children recalled 4.1 ± 1.8 of the six mindfulness strategies and 2.7 ± 1.6 of the five attention control strategies at follow-up. Eating in the absence of hunger tended to be lower for children who received parent shared decision making and child mindfulness components.

Conclusion: This intervention was feasible and well-implemented in the home environment. Findings will inform future, larger interventions designed to test similar strategies on childrens; eating behaviours and self-regulation.

KEYWORDS

child appetite regulation, controlling feeding practices, food restriction, structure-based parenting

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1 | INTRODUCTION

Snacks provide approximately one-fourth of childrens' daily energy intake.¹ Most 'snack foods' are energy-dense and nutrient-poor, with desserts and sweets as the leading food source of calories from snacks.² These foods provide little nutritional value and can be detrimental to childrens' health when consumed in excess.^{3–5} For example, research has shown that greater consumption of sweets (e.g., desserts, candy and sweetened beverages) is positively associated with having overweight.⁶ Children consume ~14% of daily calories from added sugars,⁷ which exceeds the USDA dietary guidelines for added sugar intake,⁸ and the second largest contributor of added sugar intake among U.S. children comes from candy, sugars and sugary foods.⁹ Americans 2 years of age or above tend to eat candy every 2 and 3 days,¹⁰ with 31% eating candy on a given day.¹¹ Thus, consumption of foods such as candy in moderation is important for childrens' health.

Parents often use overt, coercive feeding practices such as food restriction to control childrens' access and intake of highly palatable, low-nutrient, energy-dense foods.¹² Although well-intended, restrictive feeding has potentially negative and often counterproductive consequences. Restriction of energy-dense foods makes them more attractive and increases consumption when access is granted,^{13–15} even while in the absence of hunger.^{13,16–18} Restrictive feeding practices may also negatively impact the development of childrens' self-regulation by fostering dysregulated eating.¹² Instead of restriction, it is less clear what parents can or should do to effectively moderate their childrens' intake of palatable, energy-dense foods including candy. Structure-based feeding practices may show promise in reducing or moderating childrens' intake of these foods by establishing routines and facilitating the development of self-regulation.^{19,20} Structure-based parenting refers to strategies that structure the home environment, such as setting clear rules and routines while offering supportive guidance and considering the child-perspective.^{21,22} These parenting strategies have been shown to promote childrens' social and emotional regulation.^{21,22} In addition, covert feeding practices that structure the external food environment, such as reducing the visibility and proximity of food or limiting which foods are brought into the home, have been shown to limit childrens' intake of energy-dense foods^{18,23} and reduce overconsumption of snack foods like candy.²⁴

Other promising approaches for helping children manage their intake of energy-dense foods such as candy may be to improve child regulatory skills by teaching mindfulness and attention control strategies. Mindfulness is bringing one's attention to the present moment in a nonjudgmental way.²⁵ Mindful-based strategies among adolescents and adults have been associated with reduced caloric consumption,^{26,27} healthier snack choices²⁶ and reduced eating in the absence of hunger (EAH).²⁸ Among the few studies conducted in children, there is evidence that simple mindfulness principles can be taught to children as young as 4 years old^{29,30} and teaching children mindfulness strategies may promote the consumption of energy-dense foods in moderation. Children may also benefit from cognitive and attentional strategies that teach them to delay gratification when

access to candy is desired but not available. Children with lower self-regulatory skills and higher food responsiveness may show greater sensitivity to food cues, which puts them at risk for the overconsumption. Teaching children simple attention strategies that shift their attention away from food cues to other activities may be beneficial. For example, when children were taught simple strategies that shifted their attention away from a palatable food (marshmallow) to another activity (e.g., singing a song), children were able to 'delay gratification' and wait longer for a larger reward.^{31,32} In addition, inhibitory control trainings have been shown to be effective in improving impulse control—a behaviour linked to lower consumption of energy-dense foods.^{33,34}

The current paper presents the design and feasibility of a family-based intervention programme that teaches parents to use structure-based feeding practices, as an alternative to restriction, and teaches children to use mindfulness and attention control strategies for the purpose of effectively moderating childrens' intake and access to candy. The intervention utilizes a multiphase optimization strategy (MOST) framework, which is an innovative strategy for optimizing behavioural interventions that can be used to evaluate which specific components within a multicomponent intervention are effective. More detailed information on each phase of MOST can be found in publications utilizing this method.^{35–38} This study employs the optimization phase using a factorial design to assess which specific components, or combinations of components, are effective on intervention outcomes.³⁵ MOST has tremendous value for informing the future development of multicomponent behavioural interventions that are more effective, scalable and economical. As such, the purpose of this study was to use a factorial design as part of the MOST framework to evaluate the feasibility of a parent-child intervention that teaches alternatives to using restrictive feeding practices around childrens' intake of candy. Preliminary analyses were also conducted to explore the effects of each intervention component on the lab-based measure of EAH,¹⁷ an indicator of disinhibited, unregulated eating behaviour.

2 | PARTICIPANTS AND METHODS

2.1 | Participants

Parent-child dyads residing in central Pennsylvania were recruited through website advertisements and flyers that were posted at local elementary and preschools. Interested parents ($n = 78$) were screened for eligibility by research staff via phone or an electronic questionnaire. Inclusion criteria were that parents had a child 6–9 years of age who consumed candy regularly, defined as 1+ times per month. Parent-child dyads were excluded if the child had a health condition that could affect food intake or known food allergies. Among those screened, 15 were ineligible, 9 declined participation after screening, 13 had scheduling conflicts, and 4 did not complete the baseline survey. This resulted in $N = 37$ families that were randomized to an experimental condition. Parents provided written consent for their family's participation, and children provided verbal assent, before the

study began. All study procedures and consent forms were approved by the Pennsylvania State University Institutional Review Board.

2.2 | Study design

All participants completed one baseline visit, a 4-week intervention with weekly surveys and one follow-up visit. There were three components for the intervention (parent shared decision making, child mindfulness and child attention control), and each component was either 'on' or 'off' to create a 2³ full factorial design³⁹ with eight experimental conditions (Table 1): *on* = received the intervention component or *off* = did not receive the intervention component. Parent-child dyads were randomized into one of these eight experimental conditions. Based on the randomization scheme in Table 1, each 'on' condition for the three components was delivered to half the participants. 'Parenting shared decision making' taught structure-based feeding practices such as setting routines; 'child mindfulness' taught children mindfulness technique specific to candy and 'child attention control' taught children to divert their attention away from candy when it was desired but not available to eat. Each of these components are described more below. In addition to these three components, there was a fourth component titled 'home supply' that aimed to remove restrictive feeding practices around candy in the home and was 'on' for all participants. It was necessary for all participants to receive home supply to test the efficacy of the other intervention components.

2.3 | Intervention components

All intervention components were delivered in-person at baseline by trained research staff. Home supply training was delivered to parents only. Parent shared decision making training consisted of a parent-

TABLE 1 Experimental conditions for 2³ full factorial design with eight experimental conditions (On = component received; Off = component not received)

Experimental condition	Home supply	Parent shared decision making	Child mindfulness (STF)	Child attention control (TAP)
1	On	Off	Off	Off
2	On	Off	Off	On
3	On	Off	On	Off
4	On	Off	On	On
5	On	On	Off	Off
6	On	On	Off	On
7	On	On	On	Off
8	On	On	On	On

Note: Parent-child dyads ($n = 37$) were randomized into one of these eight experimental conditions.

Abbreviations: STF, savour the flavour; TAP, think and play.

only training and a parent-child training. Child mindfulness and child attention control trainings consisted of a child-only, parent-only and parent-child trainings. Weekly booster messages were delivered via text messages to reinforce intervention content throughout the 4-week intervention period.

2.4 | Home supply

The home supply component standardized candy as being available in the home. Given that restricting childrens' access to highly palatable food increases their desire to eat this food once it becomes available, this intervention made candy accessible in the home.⁴⁰ Children in this study were already consuming candy on a regular basis, so providing them with candy was not a novelty. Each week during the 4-week intervention, parents picked up a bag containing eight 'fun-size' pieces of candy (two packs of each M&Ms, sweet tarts, gummy bears and skittles). A variety of candies were chosen that were well liked and consumed regularly based on preliminary data from the research team. Each weekly bag of candy totalled ~400 calories. When consumed throughout the week, this averaged ~57 calories per day or 3%–5% of the daily calories required for children this age.

During the 4-week intervention, parents were instructed not to bring other candy into the home or allow their child to share the study candy with family and friends. Parents were also instructed to store the study candy within reach, but out of sight, of their child at home (e.g., in a lower kitchen cabinet). This was done to minimize childrens' perceptions of candy as a forbidden food and to not have a constant visual reminder of the candy they could be eating. Parents also received education that restrictive and/or coercive feeding practices (e.g., hiding candy, using candy as a reward for good behaviour) are counterproductive and ineffective at reducing childrens' intake. Parents were instructed to use nonfood rewards (e.g., physical activity) for good behaviour. If parents and siblings wanted candy, they were provided with their own weekly bag of candy that was clearly labelled for each household member. Parents were instructed to return any uneaten candy each week when they picked up the next week's candy.

2.5 | Parent shared decision making

The parent shared decision making component included education on parents and children working together to establish a routine for childrens' intake of candy. During parent-only training, parents were taught the importance of establishing clear expectations on when and how much candy to make available to their child each day. This included using shared decision making between the parent and child to establish a candy routine. Routines provide structure, consistency and predictability,⁴¹ and by establishing clear expectations, a routine can help children develop self-regulatory skills around eating by reducing unpredictable access to desired foods.¹² Parent-child shared decision making empowers children by considering their perspective

and makes them a part of the decision, which increases children's compliance. There is also evidence to suggest that shared decision making is associated with healthier eating behaviours.⁴¹ During the parent-child training, parents and their child were presented with possible candy consumption routines: (a) one piece of candy every day, (b) two pieces of candy every other day or (c) three pieces of candy every third day. Each parent-child dyad discussed the routines and collectively decided which routine would be implemented for the duration of the intervention. Dyads were also instructed to choose a time of day to eat the candy (e.g., after dinner). Parents and children were told they could change their candy routine partway through the intervention, if they both agreed on this change. Parents who did not receive the shared decision-making component were instructed to allow their child to self-manage their candy intake. All parents and children were reminded that once the candy was gone, it was gone. Henceforth, this component is referred to as the 'parenting'.

2.6 | Child mindfulness—STF

The child mindfulness component taught children strategies on how to slow down, focus and 'savour the flavour (STF)' when eating candy. These strategies originated from adaptations to the raisin eating exercise by Kabat-Zinn,²⁵ which is the most frequently utilized script for mindfulness interventions in children and adults. For the child-only training, a researcher and child watched a 5-min frustration video where a peer model (e.g., child of the same age) consumed candy too quickly and became frustrated when the candy was gone. This video was developed by the research team and used peer models given evidence that peers are more effective agents of change on children's behaviour.⁴² Afterwards, the researcher and child discussed the video and emotions the peer model felt. Child mindfulness STF strategies were then introduced to the child to provide them with a mindfulness eating exercise (Figure 1). Role playing was used to practice and reinforce these strategies, where the child was given a piece of candy and coached through each of the child mindfulness STF strategies. Once done, children were asked if they thought the child mindfulness strategies were easy or hard to implement, and if they would use these strategies at home. After a 30- to 45-min break, children were asked to recall each of the strategies they learned earlier. For the parent-only training, parents watched the same video and were taught the same child mindfulness STF strategies. For the parent-child training, the child and researcher practiced using the strategies, while their parent observed. Then, the parent and child practiced using these strategies together while the researcher observed. Parents were sent home with a handout (shown in Figure 1) and instructed to display it at home where the child could easily see it (e.g., inside the cabinet where the candy was located).

2.7 | Child attention control—TAP

The child attention control component taught children strategies to redirect, refocus and delay gratification when they wanted candy, but

were told 'no' or candy was not available. These strategies were intended to reduce problematic behaviour from children in response to not receiving candy. The conceptual basis for these strategies originated from the work of Walter Mischel on the delay of gratification task.⁴³ During the child-only training, children engaged in a learning activity that provoked frustration around their access to candy and then taught them alternative attention control strategies. In the activity, each child was given a piece of candy and prompted by a trained researcher to think about, smell and feel the candy. Next, the researcher instructed the child to put the candy in a bowl because it was not time for candy and that he or she could play with toys for 5 min after the researcher left the room. When the researcher re-entered the room, they watched a short (5 min), lab-developed video that showed a peer model eating candy quickly and becoming frustrated when the candy was gone. The child and researcher discussed how the peer model and they themselves felt if they were not allowed to eat the candy. The child was then introduced to the attention control think and play (TAP) strategies (Figure 1). After thoroughly discussing each strategy, the child was asked if they thought attention control TAP strategies were easy or hard to implement and if they would use these strategies at home. After a 30- to 45-min break, children were asked to recall each of the strategies they learned earlier. Similarly, during the parent-only training, parents watched the same video and were trained on each of the same strategies. For the parent-child training, the child and researcher practiced using these strategies while the parent observed, and then the parent and child practiced using these strategies, while the researcher observed. Parents were sent home with a handout (shown in Figure 1) and instructed to display it at home where the child could easily see it.

2.8 | Measures

At the baseline training session, children's anthropometrics were measured, and parents completed a questionnaire that assessed combined family income, marital status and general child health. Both parents and children were then trained on the intervention components. Parents completed a short survey that assessed knowledge and acceptability to intervention messaging, whereas children were asked to recall intervention messages. This baseline training session took 1.5–3 h depending on what components individuals were randomized to receive. During the 4-week intervention, parents completed weekly surveys that asked about parent and child satisfaction, fidelity of intervention implementation in the home, use of control-based feeding practices and parent perception that intervention components moderated child candy intake. Any uneaten candy and wrappers from candy eaten were collected each week. At the follow-up visit, parents and children completed surveys which were the same as those previously completed at the baseline to assess intervention acceptability, implementation fidelity and participant knowledge. Parents self-reported how helpful they found having a candy routine (i.e., parenting) or letting the child manage their own candy (i.e., nonparenting) for managing their child's and their child's sibling(s)



FIGURE 1 Child mindfulness—'savour the flavour' (left) strategies that taught children to slow down and focus when eating candy. Child attention control—'think and play' (right) strategies that taught children to redirect, refocus and delay gratification when they wanted candy, but were told 'no' or candy was not available. These games were intended for children to play at home and with their friends and family during the 4-week intervention period

intake of candy. Child recall of intervention messaging was measured. Lastly, children completed the EAH protocol at the follow-up visit to explore intervention effects on child appetite regulation. The follow-up visit lasted 2 and 3 h.

2.9 | Anthropometrics

At the baseline visit, trained research staff measured childrens' height and weight using standardized procedures.⁴⁴ Body mass index (BMI) was calculated (kg/m^2) and converted to age and sex specific BMI percentiles using Center for Disease Control growth charts.⁴⁵ Children were classified as having overweight if their BMI was ≥ 85 th percentile and obese if their BMI was ≥ 95 th.

2.10 | Eating in the absence of hunger

At the follow-up visit, children completed an EAH behavioural task. To start, children were offered a standard lunch that included a turkey, ham or cheese 6-inch submarine sandwich with mayonnaise, mustard, apple slices and low-fat milk from Subway. Children were given 20 min to eat ad libitum in small groups of three and four children per table. A researcher sat at the table to ensure the conversation did not include a discussion about food. Following lunch, children had a 20-min playtime break. After playtime, each child was paired with a different researcher, where they completed the remainder of the EAH task one-on-one with this researcher. First, children

completed a hunger assessment¹⁴ to measure their level of fullness. In brief, children were read a story about Peter, Peter Pumpkin Eater, and as part of the story, they were shown three figures that depicted a person with an empty stomach, half empty/half full stomach and a full stomach. Each child was then asked how their stomach felt. EAH data were only used for children who responded, 'half empty/half full' or 'full' (97% of participants). Childrens' liking and preferences for 11 different candies (listed below) were then assessed using the Birch liking assessment protocol.⁴⁶ Then, children were shown a variety of age-appropriate toys, as well as open containers that had generous, preweighed portions of the same 11 candies: sweet tarts (Wonka; 50 g), gold-bears gummy candy (Haribo; 100 g), skittles (Wrigley; 75 g), Swedish fish (Cadbury Adams USA LLC; 75 g), M&Ms milk chocolate candies (Mars; 75 g), milk chocolate nuggets (Hershey's; 67 g), snickers miniatures (Mars; 61 g), KitKat miniature milk chocolate wafers (Hershey's; 61 g), Reese's peanut butter cups miniatures (Hershey's; 61 g), caramel creams (Goetze's Candy Co; 71 g) and Dum Dum lollipops (Spangler Candy Co; 28 g). Each child was instructed that they could play with the toys or eat as much of the candy as they wanted while the researcher did work in the adjacent room. The experimenter left the room, closed the door, and the children played and/or ate candy for 7 min. The researcher then re-entered the room and told the child they were done with this task. The energy (kcal) consumed during this free access session was calculated by subtracting the postweights from the preweights for all 11 candies. The manufacturers' information was used to convert gram weight into energy consumed, and childrens' total intake was calculated by summing the energy intake across the 11 foods.

2.11 | Statistical analysis

All data were analysed with SAS statistical software, version 9.4 (SAS Institute Inc., Cary, NC, USA). Means \pm standard deviations were calculated for all nondiscrete data; frequencies and distributions of responses were computed for categorical data. Two-sample *t* tests were used to evaluate individual component effects on EAH.

3 | RESULTS

3.1 | Participant characteristics

Participants were predominantly non-Hispanic, White parent-child dyads from middle-income, married families. On average, children were 7.7 ± 1.1 years old with a mean BMI percentile of 45.1 ± 28.5 ; 31% of children were classified as having overweight, and 11% were classified as having obesity. Of the 37 randomized families, all but two attended the follow-up visit, resulting in a retention of 95% of randomized families.

3.2 | Primary aims: study feasibility

3.2.1 | Home supply component

During baseline, all parents identified a location to store the candy that was within their child's reach but out of sight. On average, parents and children took candy home for two adults in the household and three children. No parent reported that he/she or their partner offered candy as a reward for good behaviour; only one parent reported offering candy for eating vegetables or everything on their plate. At follow-up, 14.3% of children reported they had become bored with the study candies. All children reported that they could tell which candy bags belonged to each family member; only 11.4% and 5.7% of study children reported accidentally eating from someone else's bag and sneaking from someone else's bag, respectively. Similarly, only two parents (5.7%) reported their child shared or exchanged candy with their siblings. Most children (80%) reported they could get the candy themselves, and 54.2% reported they did not have to ask their parent(s) to get candy. During any given week, no more than three parents (9.3%) reported that their child ate nonstudy candy inside the home, but up to 43.3% reported that their child ate nonstudy candy outside the home. Table 2 shows that caloric intake of candy decreased from week 1 to week 4 across conditions, with more uneaten packets of candy returned as the intervention progressed.

3.2.2 | Parent shared decision making

Among those who received the parent shared decision making component, 59.1% selected a candy routine that would provide access to one kid-sized pack of candy (~50–70 kcal) every day. The remaining

dyads (40.9%) chose a routine with access to two packs of candy every other day. The majority (63.6%) of families choose to have their candy after dinner, whereas the remaining chose lunch time or during the afternoon. Only five parent-child dyads changed their routines in the first week, one dyad changed in week two, 0 dyads changed in week three and two dyads changed in week four. For the majority of changes, a daily candy routine was selected. Lastly, 86.4% of parents reported that the candy routine they selected was easy to follow. About half of parents reported that their candy routine was successful at moderating children's candy intake, and 81.8% planned on using the same routine in the future to help manage children's access to and intake of candy.

3.2.3 | Child mindfulness STF game

At baseline, 76% of children reported that STF was easy to play, and 95% reported that they would use STF at home. Most (84%) children said that they would also play the game with their friends. One child reported that they disliked the game. When prompted to recall the STF strategies after training at baseline, children recalled 2.9 (SD = 1.4) of the six strategies (see Figure 2A). During the intervention period, 74% of parents reported their child played the child mindfulness STF game at least 3 and 4 days per week.

At intervention follow-up, 88% of the children randomized to receive the mindfulness STF component reported playing the game at home during the intervention. All but one child (94%) reported that STF was easy to use. On average, children accurately recalled 4.1 ± 1.8 of the six STF behavioural strategies at follow-up; 58.8% accurately recalled at least five of the six strategies. The majority of parents reported that the STF game was 'helpful' to 'very helpful' in 'getting their child to slow down while eating candy' (76.5%), 'enjoy his or her candy' (76.5%) and 'make his or her candy last longer' (94.2%). Over half (56.2%) of parents reported that STF was 'somewhat helpful' to 'very helpful' in reducing how often their child asked for candy. Two-thirds of parents agreed that they would continue to use STF at home, and all parents reported that STF could be applied to other foods high in fat and sugar. Seventeen parents reported that their child in the study had siblings between the ages of 3 and 12 years old (mean age: 7.6 years old, SD = 3.5) living in their home; all of these parents reported that their study child taught their siblings to play STF. Although this was not part of the intervention, it suggests participant acceptability of this intervention component.

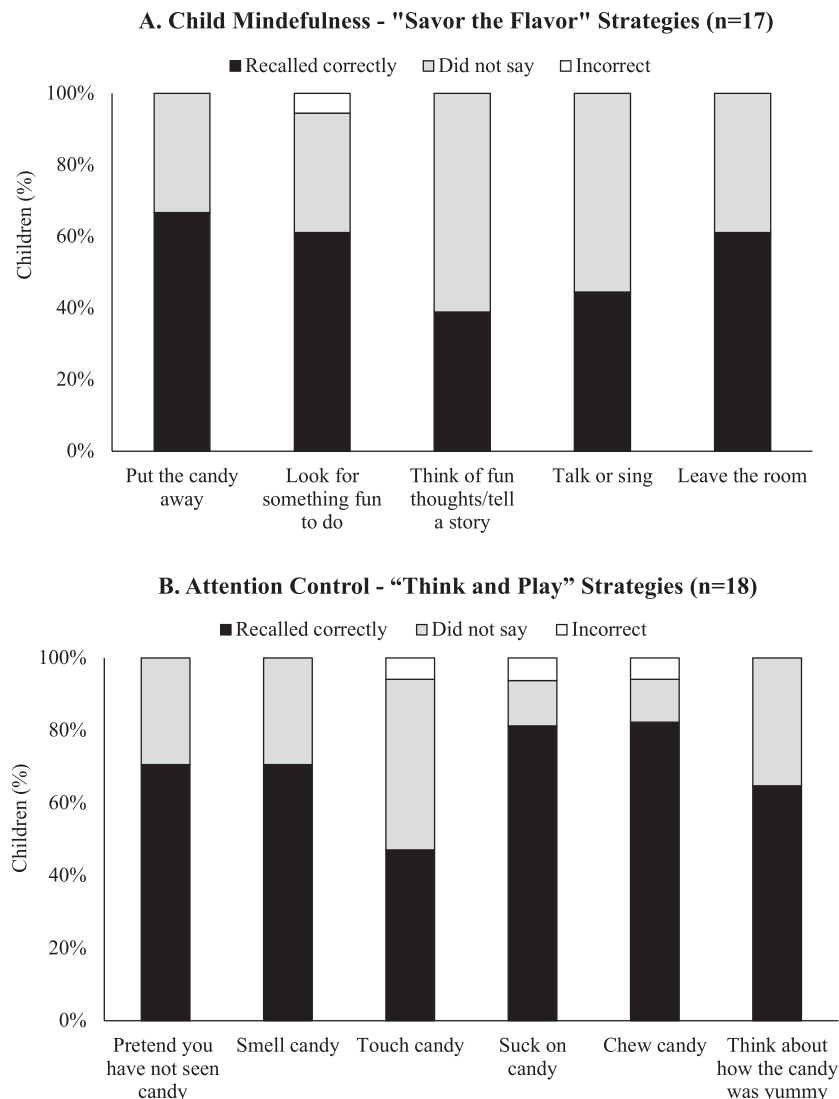
3.2.4 | Attention control TAP game

At baseline, 100% of children randomized to this condition said the attention control TAP game was easy to play, and 89.5% said that they would play this game at home. Most (88.2%) children said that they would also play it with friends. When prompted to recall the five attention control TAP strategies after the training at baseline, children recalled 2.4 ± 1.8 of the five strategies, in particular those strategies

TABLE 2 Children who consumed all of their candy or had candy remaining for each week during the 4-week intervention period

	Total sample (n = 37)	Intervention components					
		Parenting shared decision making		Child mindfulness STF		Attention control TAP	
		On (n = 22)	Off (n = 13)	On (n = 17)	Off (n = 19)	On (n = 17)	Off (n = 20)
Children who ate all of their candy at the end of each week; n (%)							
Week 1	9 (28.1%)	5 (28.6%)	4 (28.6%)	7 (38.9%)	2 (14.3%)	6 (30.0%)	3 (25.0%)
Week 2	4 (14.3%)	2 (11.1%)	2 (20.0%)	2 (14.3%)	2 (14.3%)	3 (15.8%)	1 (11.1%)
Week 3	5 (16.1%)	2 (11.1%)	3 (23.1%)	3 (17.7%)	2 (14.3%)	4 (20.0%)	1 (9.1%)
Week 4	5 (16.7%)	2 (11.8%)	3 (23.1%)	3 (18.8%)	2 (14.3%)	4 (21.1%)	1(9.1%)
Packs of candy remaining at the end of each week (possible range: 1–7); mean (SD)							
Week 1	1.8 (1.8)	1.8 (1.4)	1.9 (2.2)	1.6 (1.9)	2.1 (1.6)	1.6 (1.8)	2.2 (1.8)
Week 2	2.4 (1.7)	2.4 (1.5)	2.3 (2.2)	2.3 (1.9)	2.5 (1.5)	2.4 (1.8)	2.3 (1.5)
Week 3	2.8 (2.1)	2.7 (1.8)	2.8 (2.6)	3.0 (2.5)	2.5 (1.6)	2.5 (2.1)	3.2 (2.1)
Week 4	3.1 (2.5)	3.3 (2.3)	2.9 (2.8)	3.1 (2.6)	3.2 (2.4)	3.2 (2.7)	3.1 (2.2)

Abbreviations: STF, savour the flavour; TAP, think and play.

**FIGURE 2** Percent of children who recalled the (A) child mindfulness ('savour the flavour') and (B) child attention control ('think and play') strategies at the end of the 4-week intervention period

related to finding something fun to do (76.5%) or talking and singing to themselves (70.6%).

At follow-up, 52.6% of children reported playing TAP at home, and most children (89.5%) reported that it was easy to play. On average, children recalled 2.7 ± 1.6 of the five TAP strategies from memory; 33.3% recalled at least four of the five strategies (see Figure 2B). On average, parents reported that TAP was 'somewhat helpful' in getting their child to not focus on the candy, think of a fun activity to do and reduce how often their child asked them for candy. Only four children reported that they disliked not being able to eat the candy; no other dislikes were reported. The majority of parents (66.7%) reported that attention control TAP strategies were somewhat to very helpful in reducing their child's focus on candy. Two-third (66.7%) of parents 'agreed' or 'somewhat agreed' that they would continue to use TAP, and all parents agreed that TAP could be applied to other foods high in fat and sugar. Three quarters (75%) of parents reported that their child taught their sibling to play TAP at home; however, parents reported that their child's sibling 'rarely' used TAP.

3.3 | Exploratory analyses: intervention effects on child eating behaviours

3.3.1 | Eating in the absence of hunger

Although the study was not powered to test intervention efficacy, exploratory analyses examined whether intervention components tended to influence disinhibited, dysregulated eating in this sample. On average children consumed 158.7 ± 123.8 (SD) calories during the EAH task. As shown in Table 3, children randomized to receive parent shared decision making consumed 61 fewer calories in EAH than children who did not receive this component ($p = 0.14$). Although not approaching significance, children receiving child mindfulness STF consumed 27 fewer EAH calories compared to children who did not receive this training. In contrast to what was expected, children

randomized to receive the attention control TAP component consumed more EAH calories than those who did not.

4 | DISCUSSION

In this study, an innovative MOST approach was used to assess the feasibility of different parent and child behavioural strategies, derived from the structure-based parenting literature, that were intended to teach parents alternatives to restrictive feeding practices and encourage children to consume candy in moderation. Process evaluation revealed that each intervention component was well received by both parents and children. Participants remained engaged in the research project, reflected by a low dropout rate. Data also indicate that at follow-up, children were able to recall more than half of the child mindfulness and attention control strategies that were taught by research assistants and then practiced these strategies throughout the intervention. Although not powered to detect effects on appetite regulation, families who received the parent shared decision making and child mindfulness components had children who consumed fewer calories in the EAH task. Consideration of how these results can inform future interventions designed to promote child appetite regulation warrants discussion.

Candy and other snack foods high in added sugar are abundant and readily available in the current obesogenic environment.^{47,48} Thus, it is important to provide parents and children with effective strategies for managing intake of these foods in moderation instead of restrictive, controlling food practices. The current findings, in addition to a growing body of work,^{17,21} suggest that structure-based parenting may be an alternative. In this study, it was observed that the shared-decision making component of the intervention might have been the most helpful component for moderating children's intake of candy. Although the current study was not powered to evaluate differences in eating outcomes, a trend for children exposed to this component was observed for consuming less in the EAH protocol than children who were not taught this component. Evidence suggests that

TABLE 3 Total calorie consumption (kcal) and mean difference in caloric intake during the 'eating in the absence of hunger' protocol when each intervention component was turned on vs. off ($n = 35$ children)

	Intervention components		
	Parent shared decision making M (SD)	Child mindfulness STF M (SD)	Child attention control TAP M (SD)
Treatment status			
Off (kcal)	197.1 (137.4)	171.8 (108.5)	142.9 (117.5)
On (kcal)	136.1 (112.3)	144.9 (140.3)	170.6 (130.1)
Difference of mean EAH caloric intake (kcal)	-61.1	-26.9	27.7
<i>p</i> value	0.16	0.53	0.52

Note: Full factorial design of three components with two levels each ($2^3 =$ eight experimental conditions). The home supply intervention component was turned on for all participants and is thus not illustrated. A two-sample *t* test was calculated for each intervention component. This study was not powered to examine effects; therefore, results are exploratory. Results are presented as mean (M) and standard deviation (SD). Difference of mean EAH caloric intake was calculated as treatment on – treatment off.

Abbreviations: EAH, eating in the absence of hunger; STF, savour the flavour; TAP, think and play.

the best strategy for preventing intake of certain foods is keeping those foods out of the home;⁴⁸ however, energy dense foods, including candy, are commonly available in the home.⁴⁹ Data from this study suggest that if those foods are going to be in the home, shared decision making between parents and children may be an effective strategy to prevent overeating.

Behavioural techniques taught in the child mindfulness component of this intervention were well-liked and utilized frequently by children at home. Most parents and children reported that these strategies were easy to use; after the intervention, children were able to recall most of the mindfulness strategies, and on average reported using the strategies 3 and 4 times per week. Additionally, a trend was observed for children trained in the mindfulness component to consume less candy in the EAH protocol than children who did not receive this training. Although this finding was not statistically significant, the direction of the finding is consistent with previous work showing that mindfulness techniques are associated with lower EAH in adolescents²⁸ and reduced caloric consumption in adults.²⁴ Thus, mindfulness may be an effective tool for teaching children to eat palatable, high-desirable foods in moderation, which in turn would promote healthier eating behaviours.⁵⁰ Given that eating behaviours track over time, mindfulness techniques may be a beneficial intervention tool for weight regulation and/or obesity prevention across childhood.⁵¹

Contrary to the research hypothesis, the child attention control strategies did not appear to influence childrens' dysregulated eating as much as the other intervention components. One reason for this could be that the TAP game was more appropriate for a younger population, as children anecdotally reported the game was a bit childish. The TAP game was based on early evidence from Mischela and Ebbsen and Yates and Mischel^{31,32} from preschool children (ages 3 to 5) in a delay of gratification task. Because this sample of children were older (ages 5 to 8), it is possible that they already knew these attention control strategies but did not associate them with the task. It is also important to note that the attention control component might have been helpful to children who found it difficult to delay gratification. Because childrens' ability to delay gratification or impulse control was not measured, this study cannot assess if the task was most helpful for child low in regulation ability. However, given the influence of external food cues on food intake across the life span, teaching food-related attention control strategies early in life is of utmost importance.

It is noteworthy that despite making candy available in the home as a part of the home supply component, childrens' intake of the candy actually decreased over time. In this component, parents were taught to avoid using restrictive feeding practices and candy as a reward. As a result, the intervention may have normalized candy in the home to where it lost some of its novelty or attractiveness. According to reactance theory,⁵² when access to an object (or food) becomes restricted, and the individual feels that they should have free access to this object, their motivation to obtain this item increases; in contrast, when the object becomes freely available, it loses some of its attractiveness. Nevertheless, it is important to note that solely

making candy or palatable foods available may not be sufficient to moderating childrens' intake of these foods and teaching them to self-regulate intake. Rather, making palatable foods available in moderation and teaching parents and children strategies that successfully limit childrens' intake of palatable foods may provide children with opportunities to build practice and acquire self-regulation skills around consuming these foods.¹¹

The greatest strength of this study was the use of the MOST framework to assess the effects of individual intervention components, rather than being restricted to evaluating a multicomponent intervention package (as a whole) against a control condition. This study is undoubtedly limited by the small sample size with insufficient power to test the efficacy of each intervention component and interactions between intervention components; however, the factorial design used in this study maximized the potential of this limited sample and pilot study. Families in this study tended to be White, middle-income and married; therefore, modifications to this intervention may be needed in subsequent trials to address the unique needs of racial/ethnic minority, lower income and single-parent households, as well as families experiencing food insecurity. Future studies should utilize the knowledge provided here to design interventions that promote structure-based feeding practices around a variety of snack foods high in solid fats and added sugar and evaluate the individual intervention components in a larger, more diverse sample. Another limitation of this study was that EAH data was obtained at follow-up, but not at baseline; therefore, this study could not assess the change in EAH consumption, before and after the intervention period. Also, because this study was not powered to evaluate differences in eating outcomes, the EAH results should be interpreted as exploratory findings that inform the future development of larger studies targeting childrens' intake of energy-dense, desirable palatable foods and parenting around food.

5 | CONCLUSION

This family-based intervention, designed to promote childrens' intake of candy in moderation, taught parents and children alternatives to restrictive feeding practices that were feasible and well-implemented in the home environment. The strategies that appeared most widely accepted and utilized were parent shared decision making and child mindfulness techniques, whereas child attention control strategies warrant further refinement for this population. These findings can be used to inform future, larger scale interventions that are powered to test the effects similar intervention strategies on childrens' self-regulation and eating behaviours of candy and other energy-dense foods.

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CONFLICT OF INTEREST

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AUTHOR CONTRIBUTIONS

Conceptualization: JSS and BYR; data collection: JAB; analyses: MEM and BYR; interpretation of analyses: JSS, MEM, ELA, JAB, and BYR; writing—original draft preparation: BYR; writing—review and editing: JSS, ELA, MEM, and JAB. All authors participated in critical revision of the manuscript and approved the final manuscript as submitted.

ORCID

J. S. Savage  <https://orcid.org/0000-0002-2912-8687>

E. L. Adams  <https://orcid.org/0000-0002-5602-8470>

B. Y. Rollins  <https://orcid.org/0000-0003-1077-3886>

J. A. Bleser  <https://orcid.org/0000-0002-7787-6225>

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