

# Alternatives to restrictive feeding practices to promote self-regulation in childhood: a developmental perspective

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## Abstract

Intake of energy-dense snack foods is high among US children. Although the use of restrictive feeding practices has been shown to be counterproductive, there is very limited evidence for effective alternatives to restriction that help children moderate their intake of these foods and that facilitate the development of self-regulation in childhood. The developmental literature on parenting and child outcomes may provide insights into alternatives to restrictive feeding practices. This review paper uses a model of parental control from the child development and parenting literatures to (i) operationally define restrictive feeding practices; (ii) summarize current evidence for antecedents and effects of parental restriction use on children's eating behaviours and weight status, and (iii) highlight alternative feeding practices that may facilitate the development of children's self-regulation and moderate children's intake of palatable snack foods. We also discuss recent empirical evidence highlighting the role of child temperament and food motivation related behaviours as factors that prompt parents to use restrictive feeding practices and, yet, may increase children's dysregulated intake of forbidden foods.

**Keywords:** Food intake, parenting, restrictive feeding practices, self-regulation.

## Introduction

Childhood obesity continues to be a major health problem in the United States, with 12.7 million children being overweight or obese (1). According to recent national data (2), 9 in 10 children (2 to 19 years old) in the United States exceeded the maximum discretionary allowance for solid fats and added sugars (SOFAS), which are often consumed in snacks. Parents use a variety of feeding practices in their attempts to control children's consumption of palatable snack foods. However, current evidence indicates that some types of control aimed at reducing children's consumption of snack foods may actually promote children's intake of these foods (3–5). In the current paper, we use a developmental framework proposed by Grolnick and Pomerantz (6) to distinguish between feeding strategies that may exacerbate children's intake of snack foods from practices that foster children's self-regulatory skills and support the consumption of these foods in moderation.

Parental control has long been recognized as an important part of the child socialization process; but, as Grolnick and Pomerantz (6) argue, how 'parental control' has been operationalized in scientific research is often conceptually and empirically inconsistent. They argue that the term 'control' should be limited to power-based, coercive strategies that parents use to manipulate children's behaviours.

They also argue that 'control' differs from 'structure', i.e. strategies used to organize children's environments. Structure includes setting clear and consistent limits that consider the child's perspective, and providing predictable consequences and feedback for the child's actions. Unlike structure, coercive forms of parenting provide children with fewer opportunities to develop regulatory abilities and are associated with poorer self-regulation development (7). In contrast, structure has been associated with greater ability to delay gratification (8), higher behaviour regulation (9) and academic achievement (10) in childhood.

Restrictive feeding is a form of parental control that is coercive, intrusive, and parent-centered. Consistent with the broader literature on parental control, restricting children's food intake has been shown to be counterproductive, increasing children's intake of and attraction to the very foods parents attempt to restrict (3–5), and promoting long-term dysregulated eating (11,12). For this reason, the American Heart Association has recommended that parents avoid using restrictive feeding practices (13); however, there is a lack of evidence for alternatives to restrictive feeding practices that can effectively (i) limit children's intake of palatable foods and (ii) promote the development of self-regulation. Poor self-regulation is a risk factor for the development of obesity (14,15), and

identifying parenting and feeding practices that promote self-regulation could improve children's diet quality and reduce obesity risk.

The aims of the current paper were to review the literature on restrictive feeding practices and use a theory-based framework (6) to outline potential alternatives to restrictive feeding. Specifically, we discuss and provide a clearer definition of restrictive feeding; review the literature on restrictive feeding practices; highlight the role of individual differences on the effects of restriction and its implications for future work; and propose alternatives to restrictive feeding. Note that while 100 + articles have been published on the topic of parental restriction to date, due to limited journal space, we have focused on key publications and recent findings to discuss the evidence on parental restriction use with preschool and school-aged children (2–12 years old).

## Defining restrictive feeding practices

Numerous measures have been used to assess restrictive feeding practices (e.g. (16–19)); however, depending on the measure, controlling, intrusive practices may not be distinguished from positive structure-based practices. This makes it difficult to identify clear alternatives to restriction and may have contributed to inconsistent findings in the literature. Using Grolnick and Pomerantz's (6) model of parental control, we argue that the term 'restrictive feeding' be defined as intrusive, coercive and authoritarian feeding practices used to enforce constraints on children's access to and intake of foods. We also argue that restrictive feeding practices differ from structure-oriented practices that parents use to provide routines and guidance, consider the child's perspective, and provide clear expectations and feedback (Table 1). Although parents using one or both approaches (restriction, structure) may share similar intentions, i.e. limiting children's intake of energy-

dense foods and encouraging a healthy diet, the two approaches are qualitatively distinct and appear to have differing effects on children's eating behaviours. In a longitudinal study (20), maternal use of limit setting practices (e.g. limiting how often snack foods were purchased) were predictive of lower disinhibited eating and weight gain in girls over a 2-year period, but only when used in the absence of restriction. In contrast, keeping snack foods out of girls' reach, a restrictive practice, was associated with greater disinhibited eating.

## Adverse effects of restriction

Initial evidence for the adverse effects of restriction on children's food intake was found in an experimental study, where children's access to a snack food was repeatedly restricted for 2 weeks in a preschool setting (5). Results indicated that children made more positive comments, requests, and attempts to obtain the restricted food, and they consumed more of it when it became available. These findings were replicated by others (3,4), suggesting that short-term periods of restriction can increase children's desire for and intake of forbidden foods.

Evidence on the long-term, chronic effects of parental restriction suggests that it may contribute to the development of dysregulated eating behaviours, in particular, eating in the absence of hunger (EAH). EAH is measured in a laboratory setting by giving children free access to a variety of palatable snack foods following a standard lunch (17). Two studies using the same longitudinal sample of girls found that maternal restriction predicted higher EAH intake at age 5 and increases in EAH 2 and 4 years later (11,12). Two cross-sectional studies have corroborated these findings in preschool-aged girls, but no relation was observed among boys (17,21). When EAH was measured in a home setting with parents nearby, no association between restriction and EAH intake among children 7–13

**Table 1** Strategies of restriction and structure in feeding, based on Grolnick and Pomerantz's (6) model of parental control

| Restriction                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | vs. | Structure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Routines around access</p> <ul style="list-style-type: none"> <li>• Provides no access to palatable foods</li> <li>• Hides food</li> <li>• Considers only the parent perspective</li> <li>• Requires obedience with no exceptions</li> <li>• Access is determined by the parent and the child is unclear when access will be available (i.e. inconsistency)</li> </ul> <p>Guidance on how much to eat</p> <ul style="list-style-type: none"> <li>• Serves portions based on the parent perspective</li> <li>• Takes food away</li> <li>• Uses guilt or physiological control ('Mommy will be sad if you eat too much candy')</li> </ul> |     | <p>Routines around access</p> <ul style="list-style-type: none"> <li>• Allows some access to palatable foods, but avoids bringing large amounts into home</li> <li>• Has routines around when children can access palatable foods</li> <li>• Considers the child's perspective when creating and administering routines around access to palatable foods</li> <li>• Consistent in the use of routines, yet flexible</li> </ul> <p>Guidance on how much to eat</p> <ul style="list-style-type: none"> <li>• Serves child-sized amounts, but allows child to determine how much</li> <li>• Considers the child's perspective when deciding how much to serve</li> </ul> |

years old was reported (22); however, the home setting may have inhibited some children from consuming as much as they would have in a laboratory setting.

Few longitudinal studies have investigated associations between restriction and maladaptive eating behaviours using measures other than EAH. In one study, parental restriction did not predict changes in preadolescent children's self-reported overeating over a 6-month period (23). In a separate study, maternal restriction was associated with preschool children's food responsiveness, a parent-report measure of child food motivation, at baseline, but it did not predict change in children's food responsiveness 1 year later. Reverse causality may provide an alternate explanation of these findings in that children's maladaptive eating behaviours may elicit parents' use of restriction. In addition, while parent report measures of child eating behaviours only capture behaviours observable by the parent, EAH measures children's behaviour in the absence of parental supervision. Another study found that the relationship between restrictive feeding and disinhibited eating was stronger when parents had a coercive or chaotic parenting style (24), highlighting that controlling parenting approaches may exacerbate the adverse effects of restriction.

The relationship between restrictive feeding and children's food intake and diet quality is unclear. Evidence from cross-sectional studies suggests that restrictive feeding is associated with *greater* intakes of lower energy-dense foods (25,26), such as fruits and vegetables, and *lower* intakes of higher energy-dense foods (25). In other words, during periods of long-term restriction, children show a healthier eating pattern. Other studies, however, have reported contrary findings linking restriction to *lower* intake of low energy foods (27); null findings have been reported as well (28,29). It is possible that these inconsistent findings were in part caused by differences across studies in measures of parental restrictive feeding and children's food intake; however, there is not enough evidence to offer a clear explanation. Yet, it is noteworthy that most of these studies relied on parental reports of children's food intake, making it unlikely that the reports included food intake that occurred in the parents' absence.

Experimental and longitudinal evidence suggests that restrictive feeding practices can result in increased intake of restricted foods in the short-term and EAH intake in the long-term. However, during periods of restrictive feeding, children may consume more foods low in energy density (e.g. fruits and vegetables) and fewer energy-dense foods, suggesting that at least while the child is under the parents' watch, they show positive eating behaviours. However, as suggested by the EAH findings, when children are no longer under their parents' watch, they may overeat these foods.

## Moving beyond a one-size fits all approach

A growing body of evidence suggests that certain child characteristics that increase obesity risk may also increase children's susceptibility to the adverse effects of restrictive

feeding. For example, consider lower inhibitory control – a self-regulatory dimension of temperament referring to a child's ability to plan and suppress inappropriate approach responses under instructions to do so, or in novel uncertain situations (30). In one experimental study (3), children with lower inhibitory control were more likely to show increased intakes of a palatable snack food after it had been restricted. These findings were corroborated in a longitudinal observational study (20), in which girls' level of inhibitory control moderated the effects of maternal restriction on change in girls' EAH from 5 to 7 years old. When mothers reported higher restrictive feeding *and* girls had lower inhibitory control, girls showed greater increases in EAH. Considering that children lower in self-regulation show higher intakes of energy-dense foods (31) and are at greater risk for obesity (14), it may be that these children are less able to control their intake of forbidden foods when access is given.

Similarly, children with greater motivation to consume food, a risk factor for obesity (32), may find it difficult to control their intake of forbidden foods. For example, in an experimental study, children who were more motivated to consume a palatable snack food consumed more of this food after it became restricted than children who were less motivated (3). A similar finding was observed among children with higher levels of approach – a dimension of temperament referring to greater levels of excitement in anticipation of pleasurable activities like such as receiving prizes or food (30). It may be that children with higher approach tendencies or motivation to consume forbidden foods are less able to put on the 'brakes' and regulate their intake of these foods when made available. Findings from another study (33) suggest that the effects of restriction on children's daily food intake may also differ based on child characteristics, with higher vegetable and reduced energy intake being observed among children with more favorable characteristics (non-depressed, low anxiety, non-overweight).

Obesity-related characteristics, such as lower inhibitory control, may also elicit parents' restriction use. For example, low inhibitory control among children has been associated with greater parental restriction use, poor self-regulation of food intake and greater parental concerns about child's weight (34). Some parents may respond to children's poor self-regulation by exerting greater control in feeding. Parents may also use restrictive feeding in response to children's heightened food motivation (35) and approach tendencies (20). However, evidence for causal relations is lacking because all of these data are cross-sectional and measures of both parent and child behaviours have relied on parental reports. The parent-child feeding relationship is bidirectional and it is possible that parents' restriction may influence reports of their child's behaviours.

Restriction may also exacerbate weight gain among children already at risk for obesity. For example, in one study, restriction predicted greater change in children's BMI from age 5 to 7 years, but only among children already at risk for obesity, which was determined by parent weight status (36). In another study (14), when low inhibitory control was

coupled with higher parental restriction at age 7, girls showed larger increases in BMI between ages 7 and 15. Other longitudinal studies that have evaluated the relationship between early restriction use and child BMI have yielded null findings (e.g. (37)); however, these studies did not examine the role of individual differences. It may be that individual differences in self-regulation and obesity risk moderate the effects of restrictive feeding on child weight gain.

Children with characteristics linked to obesity risk may be more likely to experience the adverse effects of restriction and, at the same time, may be more likely to elicit restriction use from their parents. Alternatives to restriction practices may be needed that limit children's intake of energy-dense snack foods, while boosting their self-regulation capabilities, particularly for children with traits linked to obesity risk.

## Who is likely to use restriction?

The majority of studies on the antecedents of restriction have been cross-sectional in design. Although cross-sectional studies are limited and do not allow inferences regarding causality, findings to date are consistent with Contanzo and Woody's model of obesity proneness (38). Costanzo and Woody argue that parents are more likely to use restrictive feeding if they themselves have higher BMIs (39), are preoccupied with their own weight and eating issues (40,41), are also concerned about their child's weight (42), and if their child has a higher BMI (43,44) and displays maladaptive eating behaviours (24,45), such as disinhibited or emotional eating. Similarly, evidence from longitudinal studies suggests that parents are more likely to use restriction in response to their own preoccupation with weight and eating issues (46), and their child's weight gain in early childhood (47).

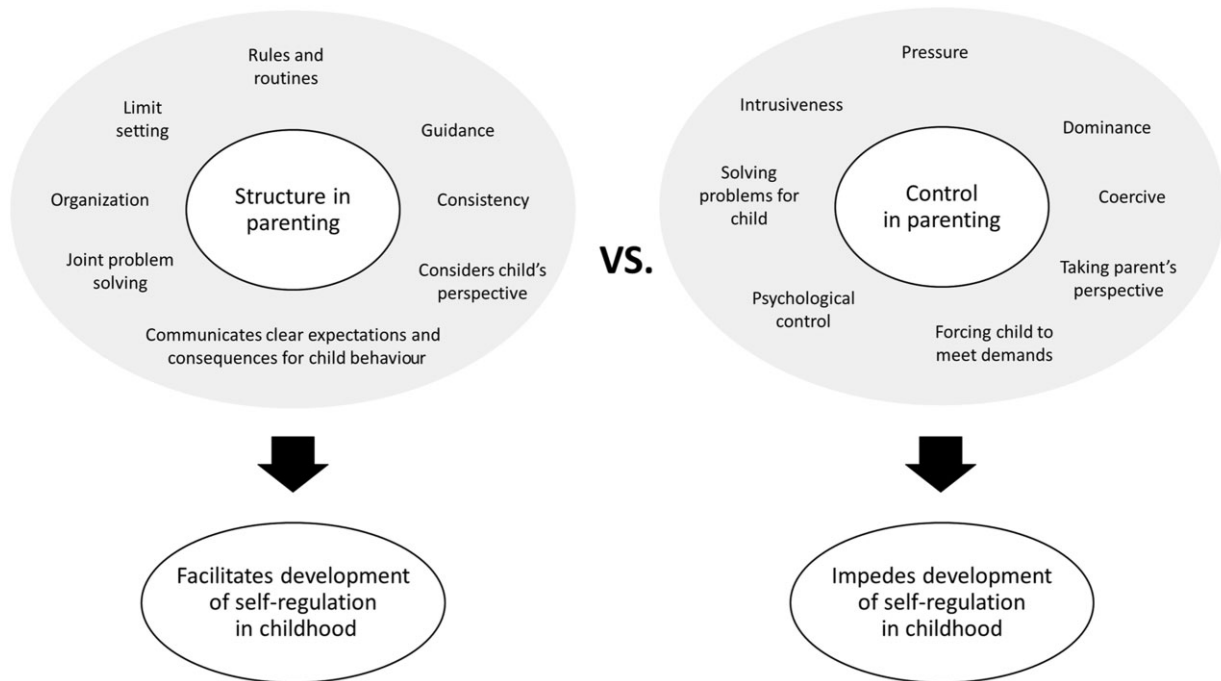
It is noteworthy that some studies, mostly cross-sectional, have reported null findings regarding the relation between restrictive feeding and parent BMI (48), parent preoccupation with weight and eating issues (49), and child weight status (50). It is worth considering other parent or child characteristics that may influence why parents use coercive restrictive feeding practices, including the match between parent and child gender (e.g. mother to son, mother to daughter), or parental ethnicity. For example, mothers may show greater concern about their daughters' weight, relative to sons' (51), and be more likely to use restriction with their daughters (52). There is also evidence to suggest that the associations between restriction and parents' preoccupation with eating, and child BMI may be present in white families, but not in other ethnic groups (44). Inconsistencies in the literature may also be due to the variety of measures that have been used to assess restrictive feeding practices.

## Alternatives to restriction

Based on Pomerantz and Grolnick's (6) framework and evidence to date, structure-based feeding practices may

be an alternative to restrictive feeding. As shown in Fig. 1, structure-based feeding practices include structuring the home food environment to provide moderate levels of access to palatable foods, while setting limits and establishing predictable routines around children's access to these foods that take into account the child's perspective. Two recent studies provide evidence for the positive effects of structure-based feeding on children's intake of palatable foods. In one study (20), the authors identified four profiles of maternal control over girls' snack food intake that differed in use of limit setting strategies (e.g. limiting how often snack foods were purchased) and restrictive practices (e.g. keeping foods out of reach). Limit-setting practices were associated with lower EAH and less BMI change over a 2-year period, but only when used in the absence of restriction. In another paper (19), the authors found that overt control in feeding (i.e. strategies perceived by the child) differed conceptually from the more structure-based practice of covert control (i.e. strategies not perceived by the child; e.g. 'How often do you avoid buying certain foods and bringing them into the house?'). Only covert control was related to children's reduced intake of snack foods. Although these findings are promising, more work is needed to evaluate the effects of structure-based feeding on children's intake of snack foods, both while at home and in environments where snacks are freely available. Future studies should also consider the moderating role of child temperament and weight-related characteristics on the effects of structure-based feeding practices. Identifying and teaching strategies to parents that successfully limit children's intake of snack foods *while* providing children with opportunities to build self-regulation are necessary, particularly for children with traits linked to obesity risk.

To date, the Child Feeding Questionnaire (16) is the most frequently used measurement of parental restrictive feeding practices. This measure has proven useful in understanding the effects of overt control in feeding on young children, but as we move towards identifying positive forms of control (e.g. structured-based feeding), additional measures are needed. A measure that shows promise is Ogden and colleagues' (19) measure of covert control. Other measures are also needed to assess additional dimensions of structure in feeding, including food routines, limit setting, consistency, considering the child's perspective and setting clear behavioural expectations. Of note, direct observations of parental feeding practices at mealtimes are another way to assess parent-child interactions around food. However, restriction is less likely to be observed at mealtimes (53), which may in part be due to restriction being used more often with snack foods (54). In addition, practices used to structure the home food environment are often covert and occur outside of mealtimes. Nevertheless, compared with surveys, mealtime observations do offer a more objective, direct assessment of parents' feeding practices as they provide direct measures of parental behaviour rather than parents' intentions or attitudes, thus, future work is warranted to develop direct measures of restriction and structure-based feeding.



**Figure 1** Based on Grolnick and Pomerantz's (6) model of parental control, depicting that parents' use of structure and control in parenting may have differing effects on the development of self-regulation in childhood. On the left side of the figure are structure-based parenting practices (e.g. rules and routines) hypothesized to facilitate the development of children's self-regulation. On the right side are types of controlling parenting practices (e.g. pressure, dominance) hypothesized to have negative effects on children's self-regulation development.

## Conclusion

In the current obesogenic environment where energy-dense, palatable snack foods are widely available and the majority of children exceed the maximum discretionary allowance for SOFAs (2), some parental control is likely needed to moderate children's intake of these foods. However, restrictive feeding practices are counterproductive, and children with lower self-regulation and children at risk for obesity show greater susceptibility to the negative effects of restrictive feeding. Parents need effective alternatives to restriction to help moderate children's intake of energy-dense foods and promote self-regulation skills. Other researchers have argued that authoritative feeding and parenting styles, in which parents use moderate levels of control, may promote children's diet quality and reduce obesity risk (55,56). In this paper, we make a similar claim. Based on developmental framework proposed by Grolnick and Pomerantz (6), we argue that structure-based feeding in which parents provide guidance and routines, set limits, and consider the child's perspective is a form of moderate control that may help parents to manage children's access to energy-dense snacks and support the development of self-regulation in childhood; however, more work in these areas is needed. Although this paper suggests that structure-based feeding may be an alternative approach to restriction, there is little empirical evidence for how and when structure-based routines and limits should be imple-

mented within the home, and more work is needed to evaluate the effects of these practices on children's intake of palatable snack foods.

## Conflict of Interest Statement

Dr. Rollins reports grants and personal fees from the National Confectioners' Association, during the conduct of the study; Dr. Savage reports grants from National Confectioners' Association, during the conduct of the study; Dr. Fisher reports personal fees from International Life Sciences Institute, outside the submitted work; Dr. Birch reports grants and personal fees from National Confectioners' Association, during the conduct of the study.

## Author contributions

All authors were involved in writing the paper and had final approval of the submitted and published versions.

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