



Research report

Effects of restriction on children's intake differ by child temperament, food reinforcement, and parent's chronic use of restriction [☆]



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ABSTRACT

Parents' use of restrictive feeding practices is counterproductive, increasing children's intake of restricted foods and risk for excessive weight gain. The aims of this research were to replicate Fisher and Birch's (1999b) original findings that short-term restriction increases preschool children's (3–5 y) selection, intake, and behavioral response to restricted foods, and to identify characteristics of children who were more susceptible to the negative effects of restriction. The experiment used a within-subjects design; 37 children completed the food reinforcement task and heights/weights were measured. Parents reported on their use of restrictive feeding practices and their child's inhibitory control and approach. Overall, the findings replicated those of Fisher and Birch (1999b) and revealed that the effects of restriction differed by children's regulatory and appetitive tendencies. Greater increases in intake in response to restriction were observed among children lower in inhibitory control, higher in approach, who found the restricted food highly reinforcing, and who had previous experience with parental use of restriction. Results confirm that the use of restriction does not reduce children's consumption of these foods, particularly among children with lower regulatory or higher appetitive tendencies.

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Background

Given the current obesogenic environment where palatable, energy-dense snack foods are readily available and heavily marketed to children, it is not surprising that children's diets are too high in added sugar and fat (Reedy & Krebs-Smith, 2010). In this context, effective approaches to limiting children's intake of palatable snack foods are needed. However, past research has revealed that restrictive feeding practices may heighten the attractiveness and intake of foods that have been previously restricted (Fisher & Birch, 1999a; Fisher & Birch, 1999b). Fisher and Birch (1999b) found that restricting preschooler's access to a palatable snack food increased their intake of that food when it became available, and increased the frequency of positive comments, requests, and attempts to access this food during periods of restriction. A more recent study also suggests that children's temperament (e.g., inhibitory control)

may moderate the negative effects of restriction on children's eating behaviors (Anzman & Birch, 2009). The current study aimed to replicate Fisher and Birch's (1999b) original finding that restriction increases children's eating responses to restricted foods, and to identify child-based characteristics that may increase the negative effects of restriction on children's eating behaviors.

Fisher and Birch (1999b) provided the first experimental evidence that restricting children's access to a palatable food increases their intake, selection, and behavioral response for that food. Children in an ongoing childcare program were served two similar foods at their regularly scheduled snack time. However, one of the foods was kept freely available during the entire snack period while the restricted food was only available for a short period during snack time. The restriction generated an increase in children's behavioral response to the restricted food and restriction itself; children made more comments about the snacks, "I want it!", clapping when access was granted, or pounding their fists on the table when access was no longer available. Children also took more scoops of the restricted food and consumed more of this food when it was briefly made available immediately after the restriction. Despite evidence for the short-term effects of restriction, when children were given unlimited access to the restricted food three weeks following the restriction, long term effects of the restriction were not observed. Since the publication of this seminal work, two other studies have demonstrated that even a

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one-time restriction to candy and fruit immediately increases children's desire for and intake of these foods (Jansen, Mulken, Emond, & Jansen, 2008; Jansen, Mulken, & Jansen, 2007); however, the Fisher and Birch study, in which foods were repeatedly restricted, has yet to be replicated, which was the aim of the current study. In addition, this study aimed to investigate whether the effects of restriction persisted by reassessing children's responses to the restricted snacks one week after the last restriction event.

New research has emerged highlighting the moderating role of regulatory dimensions of temperament on the effects of restriction. Anzman and Birch (2009) found that when 7-year old girls' perceived greater parental restriction and had lower inhibitory control—a self-regulatory dimension of temperament that refers to a child's reduced ability to plan and suppress inappropriate approach responses under instructions to do so, or in novel uncertain situations (Rothbart, Ahadi, & Evans, 2000)—they displayed the greatest weight gain from ages 7 to 15, relative to their counterparts. In general, children lower in self-regulation show greater intakes of palatable, energy-dense foods (Riggs, Spruijt-Metz, Sakuma, Chou, & Pentz, 2010) and it may be that these children are less able to control their intake of forbidden foods when access is given and thus be at greater risk for the negative effects of restriction.

The effectiveness of regulatory dimensions such as inhibitory control to modulate behavior in part depends on children's appetitive tendencies. For example, having high levels of approach—a reactivity-based dimension of temperament that refers to greater levels of excitement or positive affect experienced in anticipation of pleasurable activities like prizes and food (Rothbart et al., 2000)—may make it difficult for children to put on the “brakes” and control their impulses (Rothbart, Derryberry, & Hershey, 2000). Similarly, children who find palatable foods highly reinforcing may find it difficult to control their intake when in the presence of previously forbidden foods. The reinforcing value of food refers to how hard an individual will work to gain access to food (Epstein, Leddy, Temple, & Faith, 2007; Hodos, 1961), and provides a measure of individual differences in approach tendencies towards food by measuring differences in motivation to consume palatable food (Depoortere, Li, Lane, & Emmett-Oglesby, 1993; Roberts, Loh, & Vickers, 1989). The reinforcing value of food has been shown to predict food intake and excessive weight gain in children (Hill, Saxton, Webber, Blundell, & Wardle, 2009; Temple, Legierski, Giacomelli, Salvy, & Epstein, 2008). When viewed as an obesogenic profile, characterized by lower inhibitory control, higher reinforcing value of energy-dense foods, and greater approach or reward sensitivity (Davis et al., 2007), obese or overweight children may be at higher risk for the negative effects of restriction. In the current experimental study, we aimed to extend the work of Anzman and Birch (2009) by investigating whether individual differences in children's inhibitory control, approach, reinforcing value of the restricted food, and BMI percentiles were related to the effects of a short-term restriction on children's eating responses.

Lastly, having a history of parental restriction may also amplify the negative effects of future restriction events on children's eating behaviors. For example, in Fisher and Birch's (1999b) original work, mothers who reported repeated chronic use of restriction at home had children who selected a more palatable snack food immediately after its short-term restriction in a preschool setting. Given that restriction has been shown to increase children's responsiveness to external cues for palatable foods (Birch, Fisher, & Davison, 2003) and focus on restricted foods (Fisher & Birch, 1999b), children with past restriction experience may be more sensitive to future restriction events than children with less experience with restriction.

In summary, the current study had two aims. The first aim was to replicate Fisher and Birch (1999b) and show that a repeated

restriction increases children's eating responses immediately following short intervals of restricted access, and to evaluate whether the effects of restricted access persist 1-week after the last restriction event. The second aim was to evaluate whether individual differences in inhibitory control, approach, the reinforcing value of the restricted food, weight status, and past experience with parental restriction predict change in children's eating responses to the restricted food, immediately after the restriction and 1-week after the last restriction event. For the purpose of this study, the reinforcing value of the restricted food was assessed using the relative reinforcing value (RRV) of food task developed by Epstein and colleagues (Epstein et al., 2004; Temple et al., 2008) and adapted for use in the current preschool sample (Rollins, Loken, Savage, & Birch, 2014). We hypothesized that children with lower inhibitory control would show greater increases in their behavioral response to, and intake and selection of the restricted food immediately after the restriction and 1-week after the last restriction event. Similarly, we expected greater change in eating responses among children with higher levels of approach, RRV of the restricted food, BMI percentile, and history with parental restriction.

Methods

Participants

Subjects were 42 children (ages 3–5) and parents attending a full-day daycare in central Pennsylvania. Exclusion criteria included having a health condition that could impact food intake and known food allergies. Children were recruited via letters addressed to parents; parents provided consent for their family's participation. Upon providing their consent, parents completed two brief surveys; mothers completed the majority of surveys (80%). In the current paper, we excluded children with behavioral difficulties and who could not complete the procedures ($n = 2$), were frequently absent during snack intake sessions ($n = 2$), and had missing baseline data ($n = 1$). This reduced the sample size to 37.

Design and procedural overview

The experimental design included a series of procedures and measures organized into brief sessions before and after a 2-week restriction period (Fig. 1). Measures hypothesized to be more trait-like (e.g., inhibitory control) were assessed once before the 2-week period. All sessions and restriction events were completed between 2:30 pm and 4:30 pm (2.5 to 3 h after a standard school-served lunch) in the preschool setting, lasted ≤ 35 min, and replaced the school-served afternoon snack.

Baseline

Children were first familiarized with our trained staff members and the liking task (Fig. 1). The liking task was administered using six sweet snack foods marketed to children (e.g. graham crackers) and, in separate session, using eight savory snack foods (e.g. cheese crackers). Based on children's liking, Scooby Doo™ graham crackers (Kellogg, Battle Creek, MI) and Sponge Bob™ graham crackers (Kraft, Northfield, IL) were selected to be the restricted or unrestricted foods because they were moderately liked (rank: 4.6 vs. 3.5, respectively; range 1–6), and did not differ in energy density (kcal/g; 4.5 vs. 4.5) and macronutrient composition. The two types of graham crackers were counterbalanced to be the restricted and unrestricted food by classroom. In a third session, the child version of the Child Feeding Question (KCFQ) was administered by research staff.

In the fourth and fifth sessions, children were given free access to generous portions of the unrestricted and restricted foods

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