Introduction

Recent numbers show that American children, aged between 2 and 11 years, watch television on average 3 h and 37 min a day (Nielsen Media Research, 2009). In the Netherlands, as many as 17% of the children between 7 and 12 years of age spend more than 2 h a day watching television (Van Strien, Van Niekerk, & Ouwens, 2009). Children often watch adult programs besides children’s programs (Paik, 2001). While watching television, they are constantly exposed to television commercials. Food represents one of the largest product categories promoted, the industry marketing intensively not only energy-dense foods (Coon & Tucker, 2002; Powell, Szczypka, & Chaloupka, 2007) but also light foods (i.e. light crisps) (Henderson & Kelly, 2005). In the present study, it was examined whether exposure to adult targeted energy-dense food and light food commercials affects children’s food intake. Since mothers were found to play a profound role in the development of eating behaviors and body image of their children (e.g., Abramovitz & Birch, 2000), the moderating role of maternal behaviors was investigated.

Exposure to food commercials may have a direct non-brand effect on food intake. Especially young children might be vulnerable to the effects of external food cues on behavior since their inhibitory system is not yet fully developed (Williams, Ponesse, Schachar, Logan, & Tannock, 1999). Therefore, energy-dense food commercials might trigger eating any available snack food among children, regardless of the brand. Results of a dairy study showed that more frequent exposure to children targeted food commercials was related to higher food intake in children (Buijzen, Schuurman, & Bomhof, 2008). Further, experimental studies showed that children in small groups (Halford, Boyland, Hughes, Oliveira, & Dovey, 2007; Halford et al., 2008; Halford, Gillespie, Brown, Pontin, & Dovey, 2004) ate more after exposure to children’s food commercials in an ad lib eating situation. In one study, young boys showed increased snack food intake while watching television in direct response to children targeted food commercials (Anschutz, Engels, & Van Strien, 2009). However, whether adult targeted food commercials have the same effect on snack food intake in children is yet unknown.

Previous studies found that children, especially girls, at a very early age are already aware of the thin ideal and dieting practices (e.g., Clark & Tiggemann, 2006; Schur, Sanders, & Steiner, 2000) and indicate media as an important source of information about weight loss strategies (Lawrie, Sullivan, Davies, & Hill, 2007). Perhaps, exposure to commercials promoting light food products...
leads to restriction of food intake in children. It is important to improve our understanding of the emergence of dieting because dieting behavior at a young age might predict disturbances (Stice & Agras, 1998) or overweight (Field et al., 2003). However, it is also possible that children are not yet able to distinguish light food commercials from regular food commercials. Qualitative studies showed that children between 7 and 11 years old have a basic understanding of healthy (i.e., vegetables) and unhealthy (i.e., candy) foods, but are highly influenced by taste and food preferences when classifying foods (Gosling, Stanisstreet, & Swami, 2008; Hart, Bishop, & Truby, 2002; Ross, 1995). Further, when foods have complex nutritional compositions or when conflicting information is given (i.e., ‘sugar for energy’ in energy-dense food advertisements), adequate food classification was too complicated for children in this age group.

Since young children spend a lot of time with their family, parents are considered to be important role models for children from whom they incorporate norms, values and behaviors (Collins, Maccoby, Steinberg, Hetherington, & Bornstein, 2000). Regarding their food choices, knowledge and eating behaviors, primary school children are found to be highly influenced by their parents’ food related attitudes and behaviors (see for a review Scaglioni, Salvioni, & Galimberti, 2008). Especially mothers may indirectly influence their children’s eating behavior by promoting their own weight concerns (e.g., Hill, Weaver, & Blundell, 1990; Rutter & Richman, 1993) or directly by actively stressing the importance to be thin and encouraging their child to be thin (Thelen & Cormier, 1995). Both maternal weight concern and maternal encouragement to be thin were found to be associated with higher levels of the child’s restrained eating (Anschutz, Kanters, Van Strien, Vermulst, & Engels, 2009). The way mothers deal with their own and their child’s appearance might as well influence the way children process food messages from their environment (see also Gosling et al., 2008; Hart et al., 2002). Perhaps children who experience maternal weight concern and/or maternal encouragement to be thin react differently to television commercials promoting energy-dense or light foods than those who do not. For example, it is possible that exposure to light food commercials activate the scheme that it is important to be thin in children who experience maternal weight concern or maternal encouragement to be thin, which may subsequently decrease their subsequent snack food intake. The present study was the first to examine the moderating role of maternal behaviors in experimental study on the effect of food commercials exposure on actual food intake in children.

Methods

Participants

The sample consisted of 121 children in grades 3–6 from two Dutch primary schools. The response rate on the first school was also very high, 100% of the parents agreed to participate in the study, parents received a letter with detailed information about the study. They were asked to consent or decline their child’s participation (active informed consent). Children who had parental permission to participate were tested during regular school hours.

At the schools, a setting was created that resembled a living room (see also Anschutz, Engels, et al., 2009; Anschutz, Kanters, et al., 2009). That was done in a separate room in which a comfortable chair was placed in front of a large television, next to a side table. The side table was covered by a table cover and a decorating plant was put on it. Further, a glass of water and the pre-weighted bowl with chocolate-coated peanuts were on the side table, which the children could freely drink and eat from. All children were tested individually to avoid any social influences influencing our results. They watched a 20-min movie clip from the movie ‘March of the Penguins.’ To create a rather neutral movie clip, all possible emotionally arousing fragments were removed from the clip (see Anschutz, Engels, et al., 2009; Anschutz, Kanters, et al., 2009). Two 2.5 min commercial breaks interrupted the movie clip after 5 and 12 min. The contents of commercials differed across experimental conditions. A between-subject design with three different commercial conditions was used. In the first commercial condition, the two breaks contained five commercials each. Four commercials promoted energy-dense foods. One was a neutral commercial used as filler. In the second commercial condition, the breaks consisted of five commercials as well. Four commercials promoted energy-dense foods. One was a neutral commercial used as filler. In the second commercial condition, the breaks consisted of five commercials as well. Four commercials promoted energy-dense foods. One was a neutral commercial used as filler.

Design

In the present experimental study, a between-subject design was considered most suitable because this type of design minimizes the risk of a carry-over effect of conditions (Greenwald, 1976) and the influence of demand characteristic (an experimental artifact where participants form an interpretation of the experiment’s purpose and consciously or unconsciously change their behavior accordingly). Furthermore, exposing children to the same neutral movie clip in all three commercial conditions might influence their mood (i.e., cause boredom) and subsequent food intake. When using a between-subject design with a sufficient number of participants (around 20 participants per group are needed to detect a moderate to large effect size; Cohen, 1992), one has enough power to detect differences and can assume that groups are equal on any confounding variables not measured in the study (Maxwell & Delaney, 2004).

Procedure

The ethics committee of the Behavioral Science Institute at the Radboud University in Nijmegen approved this study. Recruitment of the schools started at the beginning of June 2008. After the schools agreed to participate in the study, parents received a letter with detailed information about the study. They were asked to consent or decline their child’s participation (active informed consent). Children who had parental permission to participate were tested during regular school hours.

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nights, which were used as test food, were not included. All commercials used targeted adults.

After children watched the movie clip, one experimenter post-weighted the bowl with chocolate-coated peanuts to establish the total amount of snack food consumed by each child. In the meantime, another experimenter read the questions and response options to children aloud, explained the questions if necessary, and helped children complete several questionnaires. Finally, experimenters weighed and measured all children without their shoes on to compute a body mass index (BMI).

Measures

Hunger

A visual analogue scale (VAS; 14 cm) was used to measure the extent to which the children felt 'satisfied' or 'hungry' before the experiment. To avoid demand characteristics, we did not ask children to refrain from eating before the experiment.

Liking of test food

We controlled for liking of chocolate-coated peanuts by presenting the children with a VAS (14 cm) to measure the extent to which they liked chocolate-coated peanuts since the amount of food intake might depend on the liking of the test food. One end of the line represented 'I do not like chocolate-coated peanuts at all,' and the other end represented 'I like chocolate-coated peanuts very much.'

Liking of the movie

VAS (14 cm) was also used to measure the extent to which children liked the movie, ranging from 'I disliked the movie very much' to 'I liked the movie very much.'

Liking of the commercials

Another VAS (14 cm) was used to measure the general attitudes of children towards commercials shown, ranging from 'I disliked the commercials very much' to 'I liked the commercials very much.'

Body mass index

For each child, a BMI score (weight [kg]/height$^2$ [m$^2$]) was calculated. Weight was measured in light clothing without shoes to the nearest 0.1 kg. Since BMI in young children highly depends on gender and age, we used international standards to categorize children into four BMI groups, underweight, normal weight, overweight, or obese (Cole, Bellizzi, Flegal, & Dietz, 2000). These categorizations were used to describe the sample, but BMI z-scores were used in the descriptive part of the results and in the analysis that included BMI as a covariate.

Child's perception of maternal weight concern and maternal encouragement to be thin

To measure young children's perceptions of maternal weight concern and maternal encouragement to be thin, we used questionnaires developed by Anschutz, Engels, et al. (2009) and Anschutz, Kanters, et al. (2009) for measuring maternal behaviors regarding appearance. A four-item scale measured children's perceptions of their mothers' weight concerns (Anschutz, Engels, et al., 2009; Anschutz, Kanters, et al., 2009). The items were: (1) 'Is your mother on a diet?' (2) 'Is it important to your mother to be thin?' (3) 'Does your mother exercise to become thinner?' and (4) 'Does your mother say that she is too fat?' Response options were 'no,' 'sometimes,' and 'yes.' Scores on the four-items were summed for each child, since the items all tapped a different aspect of maternal weight concern (i.e. dieting behaviors or exercising). The children were divided into two groups based on a median split. Children in one group perceived low maternal weight concern and children in the second group perceived high maternal weight concern.

Another four-item scale measured children's perceptions of the extent to which their mother encourages them to be thin (Anschutz, Engels, et al., 2009; Anschutz, Kanters, et al., 2009). The items were: (1) 'Does your mother tell you to eat less because you are becoming too fat?' (2) 'Does your mother tell you to exercise to avoid becoming too fat?' (3) 'Does your mother tell you to snack less to be thinner?' and (4) 'Does your mother tell you that you are too fat?' Special care was taken to formulate these questions for

<table>
<thead>
<tr>
<th>Break number/commercial number</th>
<th>Food commercial condition</th>
<th>Light commercial condition</th>
<th>Neutral commercial condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1</td>
<td>Stracciatelli ice cream$^a$</td>
<td>Ice cream light$^a$</td>
<td>Postcode lottery</td>
</tr>
<tr>
<td>1/2</td>
<td>Dutch cheese (full-fat)$^b$</td>
<td>Cheese light (40% less fat)$^c$</td>
<td>Diesel$^d$</td>
</tr>
<tr>
<td>1/3</td>
<td>Travel agency$^e$ (neutral filler)</td>
<td>Travel agency$^e$ (neutral filler)</td>
<td>Camera$^f$</td>
</tr>
<tr>
<td>1/4</td>
<td>Cruesli chocolate$^g$</td>
<td>Cruesli light$^h$</td>
<td>Turkey tourism agency</td>
</tr>
<tr>
<td>1/5</td>
<td>Cola$^i$</td>
<td>Cola light$^i$</td>
<td>Travel agency$^j$</td>
</tr>
<tr>
<td>2/1</td>
<td>Sugar sweetend dessert$^k$</td>
<td>Dessert light$^k$</td>
<td>Dish washer cleaning product$^l$</td>
</tr>
<tr>
<td>2/2</td>
<td>Cream cheese$^m$</td>
<td>Cream cheese light$^m$</td>
<td>Car$^n$</td>
</tr>
<tr>
<td>2/3</td>
<td>Car$^o$ (neutral filler)</td>
<td>Car$^o$ (neutral filler)</td>
<td>Audio system$^p$</td>
</tr>
<tr>
<td>2/4</td>
<td>Crisps$^q$</td>
<td>Crisps light$^q$</td>
<td>Car navigation system$^q$</td>
</tr>
<tr>
<td>2/5</td>
<td>Soda with fruit flavor$^r$</td>
<td>Soda with fruit flavor light$^r$</td>
<td>Online airline ticket shop$^r$</td>
</tr>
</tbody>
</table>

$^a$ Hertog IJs, Unilever N.V. (Rotterdam, the Netherlands).
$^b$ Maaslander, Westland Kaasspecialiteiten B.V. (Huizen, the Netherlands).
$^c$ Milner, Royal FrieslandCampina (Veenendaal, the Netherlands).
$^d$ Shell V-Power Diesel, Shell (Den Haag, the Netherlands).
$^e$ D-reizen (Hoofddorp, the Netherlands).
$^f$ JVC Corporate (Kanagawa, Japan).
$^g$ Quaker Oats, PepsiCo Inc. (New York, USA).
$^h$ The Coca Cola Company (Atlanta, USA).
$^i$ Monia, Royal FrieslandCampina (Veenendaal, the Netherlands).
$^j$ Calgonit, Reckitt Benckiser (Slough, UK).
$^k$ Paturein, Bongrain Benelux (Viroflay, France).
$^l$ Citroën, PSA Peugeot Citroen (Paris, France).
$^m$ Bose Corporation (Framingham, USA).
$^n$ Labs, Frito-Lay, PepsiCo Inc. (New York, USA).
$^o$ ANWB (Den Haag, the Netherlands).
$^p$ Spa & Fruit, S.A. Spadel N.V. (Brussels, Belgium).
$^q$ Vliegwinkel.nl (Haarlem, the Netherlands).
young children. The children could answer each question with 'no,' 'sometimes,' or 'yes.' The sum of the four scores was computed for each child. Children were divided into two groups. Since 47.1% of the children scored a '0' on this scale, which means that they did not at all perceive maternal encouragement to be thin, these children formed the 'no maternal encouragement to be thin' group. The remaining children formed the other group that experienced maternal encouragement to be thin to some extent.

Because the present measures of children's perceptions of maternal behaviors were each designed as a summary measure of a number of various actions their mother might show concerning weight (talking about it, dieting for it, exercising for it, etc.), it was not anticipated that these items would necessarily show high internal reliability, so Cronbach alpha values were not calculated.

Food intake

The amount of test food eaten while watching the movie clip was measured in grams using a professional balance (Kern 440). The total amount of test food eaten measured to the nearest 0.1 g was our dependent measure. Chocolate-coated peanuts were chosen because they are popular snack foods eaten in front of the television (Anschutz, Van Strien, & Engels, 2008). Sweet and high-fat snack food is highly rewarding (Birch, 1992) especially to young children (Olzsewski & Levine, 2007).

Strategy of analyses

In the present study, stratified random assignment was used to divide children into three experimental conditions. Children in each grade and gender group (4 × 2) were randomly assigned to the conditions. This was done to ensure that age and gender distributions would not substantially differ between conditions, as these variables could be important covariates in our model (see Maxwell & Delaney, 2004; Maxwell, Delaney, & Dill, 1984).

All analyses were carried out using SPSS version 15.0 (SPSS Inc., Chicago). First, a randomization check was performed by using one-way ANOVA's to test whether there were any differences between the three experimental groups on gender, age, BMI, hunger, or liking of the test food. Second, we were interested in the differences between the three conditions on liking of the movie or liking of the commercials. Third, two ANCOVA's were performed to test our main research questions. The first ANCOVA tested the moderating effect of maternal weight concern on the relation between maternal encouragement and food intake. The second ANCOVA tested the moderating effect of maternal encouragement on the relation between maternal encouragement and food intake. In all analyses, age, hunger, liking of the test food, and BMI z-scores were controlled for, since these variables correlated significantly with food intake. Although adding covariates can decrease power since more parameters have to be estimated, adding powerful predictors of the dependent variable (when uncorrelated with the independent variables one is interested in) can cause a relatively larger reduction in the error of the model, which increases statistical power (see Maxwell & Delaney, 2004). Therefore, we decided to add possible control variables that correlated significantly with food intake.

Results

Descriptives

No differences were found between the three commercial conditions on gender, age, BMI z-scores, hunger, and liking of the test food. This indicates that randomization was successful. Additionally, no differences were found between the three conditions on liking the movie or liking the commercials. Table 2 shows the correlations between all model variables. It was found that older children had a lower food intake. Further, BMI correlated negatively with food intake. The higher the BMI of a child, the lower the food intake.

Food intake

The first ANCOVA tested the moderating effect of maternal weight concern on the relation between commercial condition and food intake (n = 120). The interaction between commercial condition and maternal weight concern was not significant, F (2,110) = 0.404, P = .691. Age had a significant main effect on food intake, F (1, 110) = 7.198, P = .006, as well as hunger, F (1,110) = 7.925, P = .006, and liking of the test food, F (1,110) = 11.903, P = .001. Food intake decreased with age and increased with higher ratings of hunger and liking of the test food. BMI (z-scores) had no significant effect on food intake, F (1,110) = 0.132, P = .717. Further, commercial condition had no significant main effect on food intake, F (2,110) = 1.614, P = .204, and no main effect was found for maternal encouragement, F (1,110) = 0.001, P = .974. In this analysis, the model explained 27.9% of the variance.

The second ANCOVA tested moderating effect of maternal encouragement on the relation between commercial condition and food intake (n = 120). A significant interaction was found between commercial condition and maternal encouragement to be thin, F (2,110) = 7.939, P = .001. BMI (z-scores) had no significant main effect on food intake, F (1,110) = 0.062, P = .804. Neither commercial condition, F (2,110) = 1.888, P = .156, nor maternal encouragement to be thin had a significant main effect on food intake, F (1,110) = 0.146, P = .703. In this analysis, the model explained 37.1% of the variance.

Table 2

Pearson’s correlations between all model variables (n = 121).

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex (boy = 1, girl = 2)</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>-0.05</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI (z-scores)</td>
<td>-0.11</td>
<td>-0.23</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hunger</td>
<td>-0.05</td>
<td>-</td>
<td>-0.27</td>
<td></td>
<td>-0.26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liking of the test food</td>
<td>-0.01</td>
<td>-0.24</td>
<td>-0.28</td>
<td>-0.31</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perception of maternal weight concern</td>
<td>0.06</td>
<td>-0.17</td>
<td>-0.12</td>
<td>-0.09</td>
<td>0.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perception of maternal encouragement to be thin</td>
<td>0.06</td>
<td>-0.11</td>
<td>0.34</td>
<td>-0.01</td>
<td>-0.07</td>
<td>0.21</td>
<td></td>
</tr>
<tr>
<td>Food intake (in grams)</td>
<td>-0.02</td>
<td>-0.38</td>
<td>-0.23</td>
<td>0.39</td>
<td>0.43</td>
<td>0.13</td>
<td>-0.02</td>
</tr>
</tbody>
</table>

* P < .05.
** P < .01.
*** P < .001.
To clarify the interaction, Table 3 shows the adjusted means and standard errors of food intake in the three commercial conditions by no child maternal encouragement to be thin vs. maternal encouragement to be thin. Children who perceived maternal encouragement to be thin ate slightly more when exposed to light food commercials and especially when exposed to light food commercials than when exposed to neutral commercials. In contrast, children who perceived no maternal encouragement to be thin ate more when exposed to neutral commercials than when exposed to either energy-dense food commercials or light food commercials.\(^1\)

### Additional analyses

It was examined whether the effects of commercial condition and maternal encouragement to be thin on food intake was different for boys compared to girls. However, the main effect of gender, two-way interactions between gender and commercial condition and gender and maternal weight concern or encouragement to be thin, or three-way interaction between gender, commercial condition, and maternal weight concern or maternal encouragement to be thin on food intake were not significant.

Additionally, it was examined whether the effects of commercial condition and maternal encouragement to be thin on food intake differed between the younger (8–9) and older children (10–12) in our sample. However all two- or three-way interactions between age group, commercial condition, maternal weight concern and maternal encouragement to be thin were insignificant.

### Discussion

The main finding of this study suggests that perceived maternal encouragement to be thin moderates the relationship between adult targeted food commercial type and food intake. Children who perceived maternal encouragement had a lower snack food intake when they were exposed to the neutral commercials than when exposed to both types of food commercials (energy-dense and light). They consumed much more especially when exposed to the light food commercials than when they were exposed to the neutral commercials. In contrast, children who perceived no maternal encouragement to be thin consumed more only after being triggered by commercials promoting food and especially after seeing commercials promoting light food products. An explanation for their elevated snack food intake when exposed particularly to the commercials that promoted light food products could be that children reporting maternal encouragement to be thin perceived the light products as ‘permitted’ foods, which provided them with the idea that they were allowed to eat more. Recently, it was found that food intake increased when the perceived healthiness of the presented food was high (Provencher, Polivy, & Herman, 2009). One might reason that children of mothers who encourage them to be thin probably also have greater knowledge about diet products. Given the results it is possible that they did translate the message carried out by the light food commercials (to eat light foods) to the test food present, which was actually highly energy-dense. In adult females, it was found that exposure to light food commercials was related to lower food intake in restrained eaters (Anschutz et al., 2008). When we assume that children of mothers who encourage them to be thin are more likely to be dieting (see also Anschutz, Kanters, et al., 2009), one might expect a similar effect of exposure to light food commercials in young children. However, opposite results were found in the present study. This might indicate that young children of mothers who encourage them to be thin perceive the light food commercials different than adult restrained eaters. Since they ate more especially after watching the light food commercials, this might mean that they carry through the permission to eat light foods that might be provided by the light food commercials to the energy-dense foods present in the experimental setting, which disinhibited their food intake. Past research repeatedly demonstrated that environmental food cues can disinhibit the food intake of restrained eaters (see for a review of studies Hawks, Mandanat, & Christly, 2008). Rozendaal, Buijzen, and Valkenburg (2008) found that children at the age of 12 still do not understand advertising intentions at an adult level so they might not adequately process advertising messages. This might suggest that instead of reminding them to restrict their snack food intake, the light food commercials disrupted their original view on snack food abstinence. However, this reasoning remains a speculation and further research is required to verify this explanation.

A remarkable and unexpected finding of the present study was that the children who perceived no maternal encouragement to be

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\(^1\) To test maternal weight concern (with herself as well as her child) as a more general concept we combined the items of maternal weight concern and maternal encouragement to be thin into a new measure. However, when investigating the interaction between condition and this new measure on food intake (controlling for age, liking of the testfood, and hunger), the interaction was no longer significant (F (2,109) = 1.917, P = .152). This might be due to the fact that the scales actually constitute different concepts, with only maternal encouragement to be thin moderating in the relation between commercial exposure and food intake. Therefore, it was decided to keep both scales separate from each other.
thin consumed much more when exposed to the neutral commercials than when exposed to both food commercial conditions. A possible explanation is that they experienced the neutral commercials as slightly boring, because these commercials targeted adults and promoted products that may not be interesting to children in this age group (i.e. cleaning products or travel agencies). Earlier studies found that boredom increased food intake (Abramson & Stinson, 1977). The effect of possible boredom might be absent in children reporting maternal encouragement to be thin because these children restrict their food intake unless they are triggered by food cues. A suggestion for future research might be to include a more detailed measure of how the children experience the commercials and to investigate how this experience affects their food intake.

In the present study, there was no main effect of exposure to the food commercials on food intake. Previous studies found that exposure to food commercials was related to increased food intake in children (Buijzen et al., 2008; Halford et al., 2004, 2007, 2008). The fact that the commercials used in earlier studies were directed at children whereas the commercials used in the present study were aimed at adults might explain the difference between previous findings and our results. Perhaps food commercials aimed at adults use different techniques. For example, they often feature adult actors whose children may not identify with, use ‘love’ or even ‘sex’ cues, or provide nutritional facts that children do not yet understand or process adequately. Adult commercials are designed to get adults to purchase and consume promoted products, which might explain why children were generally not affected by the food commercials used in the present study. Furthermore, no moderating effect was found for maternal weight concern. Perhaps, maternal encouragement to be thin relates more strongly to children’s eating behavior than to maternal weight concern because verbal reinforcement has a stronger effect on actual behavior than observational learning (Wertheim, Mee, & Paxton, 1999). In addition, the effects of the type of commercials on food intake did not differ between boys and girls. Previously, Anschutz, Engels, et al. (2009) and Anschutz, Kanters, et al. (2009) found that boys ate more when exposed to food commercials than when exposed to neutral commercials. This might have occurred because food commercials aimed at children tend to focus on boys (Brownie, 1998; Childs & Maher, 2003) whereas food commercials aimed at adults might rather target women. Since women manage the food supply at home more often than men do (Harnack, Story, Martinson, Neumark-Sztainer, & Stang, 1998; Lake et al., 2006), advertisers might primarily focus on women when promoting foods.

Some limitations of the present study should be mentioned. First, although great effort was taken to conduct this research in a semi-naturalistic setting, it is possible that children still behaved in a different manner than when watching television at their homes. For example, their parents might control their access to snack food at home. A suggestion for further research would be to perform a similar experiment in children’s homes and observe their snacking behavior in a truly naturalistic setting. It could then be tested whether our results would be replicated when using observational data of structured mother-child interactions (see also Moens, Braet, & Soetens, 2007) instead of child (or mother) reports on maternal behaviors, investigating the actual interaction between children and their mothers. Further, it may be interesting to investigate longer-term effects of daily life exposure to food commercials on food intake as well as weight status of young children to investigate the actual consequences of exposure to food advertising over time. In the present study, the effects of maternal encouragement to be thin on the relation between food commercial exposure and food intake did not differ between the normal weight and overweight children. However, over time, normal weight children might become overweight since in their daily lives they are probably very often exposed to external food cues through advertising on television. It would be very important to examine this in future studies. Lastly, the interaction found between maternal encouragement to be thin and commercial condition on food intake clearly needs replication before it can be generally accepted. Future studies should further examine the role of maternal encouragement to be thin in relation to televised food cues and food intake. For example, it would be interesting to examine the influence of maternal encouragement to be thin when testing the effects of food commercials targeted at children.

In conclusion, the present study was the first study to examine the non-brand (side-) effects of exposure to adult food commercials promoting energy-dense and light food products on actual food intake in young children. The results suggest that maternal encouragement to be thin makes children more vulnerable to the effects of food cues in television commercials, especially ‘light’ food cues that seem to increase concurrent snack food intake. In Western societies, where childhood overweight and obesity is currently a major and urgent concern, mothers might think that they can prevent their children from becoming overweight by stressing the importance to be thin. However, the current findings indicate that mothers should be careful with communicating the importance to be thin to their children, since this can have adverse effects on snack food intake when children are exposed to television commercials containing food cues.

References
