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Research report

Television watching and the emotional impact on social modeling of food intake among children ☆

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ABSTRACT

The main goal of this study was to test whether exposure to happy, neutral, or sad media content influences social modeling effects of (snack) food intake in young children. The study was conducted at 14 Dutch urban and suburban primary schools. The participants ($N = 112$) were asked to watch a movie with a same-sex normal-weight confederate who was instructed to eat either nothing or a standardized amount of snack food (10 chocolate-coated peanuts). The study involved a 3 (movie clips: happy, neutral, and sad) × 2 (peer's food intake: no intake versus a standardized intake) between-participants design. A significant interaction between the movie clip condition and intake condition was found ($F_{2,102} = 3.30$, $P = .04$, Cohen's $f^2 = .20$). Positive as well as negative emotions were found to lead to adjustment to the intake of a peer, as compared to that of children in the neutral movie condition. The findings suggest that children eat more mindlessly when watching an emotional movie and, therefore, respond more automatically to a peer's food intake, whereas children may be less susceptible to a peer's intake while watching a neutral movie. As young children are not in the position to choose their food consumption environment yet, parents and schools should provide consumption settings that limit eating in front of the television.

Introduction

Watching television (TV) or video/Digital Versatile Disc (DVD) is the most common leisure activity (approximately 3 h a day) among children in the Netherlands and the United States (CBS, 2011; Crespo et al., 2001). In young children, watching TV is associated with an increased high-fat food intake (Taveras et al., 2006), and meals or snacks are often consumed in front of the TV with family and peers (Feldman, Eisenberg, Neumark-Sztainer, & Story, 2007).

Ample studies have shown the impact of friends, family, and strangers on children's food intake (Bevelander, Anschutz, & Engels, 2012; Salvy, Howard, Read, & Mele, 2009; Salvy, Vartanian, Coelho, Jarrin, & Pliner, 2008). As children mature and spend a lot of time among peers at school, peers become more important role models than parents (Fuligni & Eccles, 1993). Early studies on 'social facilitation' proposed that the presence of others (e.g., co-actors or spectators) may increase the level of arousal that drives our actions (Zajonc, 1965; Zajonc & Sales, 1966). In relation to food intake, this means that one's food intake increases when eating in the presence of others compared to when eating alone (De Castro, Brewer, Elmore, & Orozco, 1990; Herman, Roth, & Polivy, 2003). However, the presence of others is also found to inhibit food intake. It seems that people adjust their intake or 'model' that of their eating companion(s) when they eat a little or a lot. This so-called 'social modeling' occurs in children, adolescents, and adults despite hunger or satiety, during snack situations, and at breakfast, lunch, and dinner meals (Bevelander et al., 2012; De Castro et al., 1990; Goldman, Herman, & Polivy, 1991; Hermans, Herman, Larsen, & Engels, 2010; Romero, Epstein, & Salvy, 2009; Salvy et al., 2009). An inhibited food intake is likely to occur when people want to make a good impression or avoid prejudicial effects regarding their weight status (Bevelander et al., 2012; Herman & Polivy, 2005; Herman et al., 2003). Thus, it is suggested that children use others' food intake as a normative guideline for how much they can eat.

In addition to social guidelines, people's food intake is influenced by their emotions (Canetti, Bachar, & Berry, 2002; Macht & Simons, 2000). Despite that people often consume their meals with others and that their food intake can be influenced by the presence of other people, as well as by emotions, there is limited published research that focuses on the interaction between emotions and social context in relation to food intake. To our knowledge, only one

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study has examined obese women's food intake and emotions while eating alone versus in the presence of others by means of a food diary (Patel & Schlundt, 2001). Generally, the findings revealed that emotions and social context separately affected food intake. Food intake was higher in positive (e.g., excited, happy), high-arousal negative (e.g., fear, anger, stress, upset, irritability), and low-arousal negative (e.g., bored, depressed, sad, tired, weak) emotional states compared to neutral emotional states.

The majority of studies on emotions have focused on eating in relation to negative emotions among particular groups, such as dieters, emotional eaters, disordered eaters, and overweight/obese individuals (see for review Macht (2008)) with a limited number of studies among children (Goossens, Braet, & Decaluwe, 2007; Marcus & Kalarchian, 2003; Vannucci et al., 2012). As in adults, negative emotions (e.g. sadness, boredom, restlessness) were related to an increased food intake in children and young adolescents (Marcus & Kalarchian, 2003). Some have argued that environmental contexts that activate negative and positive emotions distract people in their cognitive capacity to maintain a restricted diet, which could increase their food intake (Boon, Stroebe, Schut, & Ijntema, 2002; Boon, Stroebe, Schut, & Jansen, 1998). The impact of positive emotions on eating has been less extensively studied (Macht, Roth, & Ellgring, 2002), although there is increasing attention in current commercial research (cf. Garg, Wansink, & Inman, 2007; King & Meiselman, 2010).

The scarce literature on 'normal' eaters (i.e., normal-weight and non-emotional eaters/non-dieters) has yielded divergent findings. It is not as well established as in restrained eaters that negative emotions increase food intake and there is very little research on the influence of positive emotions in eating behavior (Canetti et al., 2002; Garg et al., 2007; Macht, 2008). All together, the influence of emotions on food intake is stronger in restrained eaters than in normal eaters, and it is stronger in overweight or obese than in non-obese people. To date, the majority of studies on emotions and food intake have been conducted among late adolescents and adults. Therefore, the current study particularly focuses on emotions in children.

To our knowledge, the impact of a co-eater's food intake on emotions while watching TV has not been examined (Westerman, Spies, Stahl, & Hesse, 1996). In social situations, emotions are found to affect people's thoughtful actions (i.e., mindful actions) and compliance (Dolinski, 2001). For example, when a negative (e.g., fear) or positive (e.g., happiness) emotion was changed into another feeling (in this case respectively relief or disappointment), people were found to mindlessly engage in unreasonable requests more than people who were not induced with an emotional change (Dolinski, 2001). It is proposed that while people's cognitive capacity deals with changes in the emotional state, it can cause other responses to occur automatically or mindlessly (Baumeister, Vohs, DeWall, & Zhang, 2007; Dolinski, 2001). Mindfulness can be defined as a state of conscious awareness of a context or the content of information whereas mindlessness refers to the opposite (Langer, 1992). Changes in emotional states are induced when people watch TV by means of the story and/or music (Westerman et al., 1996). Additionally, it is assumed that people act with more mindlessness in a routine situation that has repeatedly occurred in the past (Langer, 1992). As a result of the lack of motivation to function mindfully during a routine (such as watching TV) (Hetherington, Anderson, Norton, & Newson, 2006), people can become distracted or mindless, for example, by not paying attention to the amount of food eaten (Hetherington et al., 2006; Wansink, 2006). With regard to the current study, children who experience changes in their positive or negative emotional state (due to the movie content) may become more compliant (i.e., follow a peer in food intake) because their cognitive functioning may become less efficient (Baumeister et al., 2007; Dolinski, 2001; Wansink, 2006).

Children engage in social eating contexts in front of the TV daily. It is essential to examine the impact of emotions on social modeling of food intake because emotions influence people's automatic impulses and emotion regulation is less developed in children compared to adolescents and adults (Cole, Martin, & Dennis, 2004; Gross, 2002). Therefore, the present study investigated the impact of emotions during an animated movie clip (i.e., happy, neutral, sad) on social modeling effects on food intake among children. It was hypothesized that social modeling behavior would be significantly stronger during the sad and happy movie than during the neutral movie.

Methods

Design and participants

A between-participants experimental design included three different movie clips (happy, neutral, and sad) with varied peer food intake (no intake versus standardized intake). The participants and confederates (i.e., instructed peers) were randomly assigned to form a dyad on an ad hoc basis with the criteria that they be the same sex but not classmates. The dyads were randomly assigned to one of the six experimental conditions. The children participated in the study either as a participant or a confederate. To avoid a confederate effect, each confederate was paired with a participant only once. The confederates were normal-weight only. They were instructed to eat nothing (no-intake condition) or 10 chocolate-coated peanuts (standardized intake condition).

A total of 281 children from 14 urban and suburban schools in the Netherlands secured written consent from their caregivers to participate. All schools that participated in this study were schools of which more than 70% of the children had a West-European or Dutch background. Thirty-nine children did not participate because they took sick leave, had other educational obligations, or were excluded due to food allergies. Nine dyads (i.e., 18 children) were excluded from analysis because the confederate (6) or participant (3) did not follow instructions during the experiment. The final sample consisted of 112 dyads in which the children were either the participant or the confederate. This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects/patients were approved by the ethics committee of the Faculty of Social Sciences, Radboud University Nijmegen, the Netherlands. Written informed consent was obtained from all subjects.

The final sample consisted of 112 participants (51.8% boys) of which 11.6% were underweight, 77.7% were normal weight, and 10.7% were overweight or obese (see body mass index (BMI) classifications below). The mean age (±SD) in grade 2 ($n = 55$) was 7.31 (±.51) years and in grade 3 ($n = 57$) 8.23 (±.57) years. Dietary restraint and emotional eating were measured using the Dutch Eating Behavior Questionnaire for children (DEBQ-C)(van Strien & Oosterveld, 2008) with response categories on a 3-point Likert-scale. Restrained eating ($\alpha = .68$) and emotional eating ($\alpha = .59$) were low with a mean score of .64 (SD = .45, min. 0−max. 2)[1] and .40 (SD = .35, min. 0−max. 1.57), respectively. Participants were therefore characterized as normal eaters.

Setting and procedure

The experiments were conducted in the children's primary schools from April through November 2011 with the exception of summer holidays in July and August. All experiments were con-

[1] Two children had a maximum score of 2 on restrained eating. Whether restraint scores affected the main findings was tested, but this was not the case.

ducted within two schooldays between 8:30 AM and 3:30 PM. The experiment took place in a room that was furnished with two chairs next to each other in front of the laptop on a table. The two bowls of chocolate-coated peanuts and glasses of water stood on either side of the laptop. Each of the three movies lasted 11 min and 12 s. A video camera was placed on a tripod at the side of the table to videotape the children. The few children who inquired about the video camera were told that the session was videotaped to capture their reactions during the movie.

Before the participants entered the room, they were told that there would be food and water available and that they could eat as little or as much of the food as they desired. A cover story was delivered to avoid effects that might be triggered by suspicion about the research topic. That is, moviemakers (i.e., the experimenters) had created a new version of Walt Disney's *Bambi*) and they were interested in the children's evaluations of the movie. In addition, the confederates were involved in an extra task: a secret mission which was related to children's skills to carry out a task while keeping it a secret. Each confederate was instructed before the participant entered the room; they were asked to eat a chocolate-coated peanut only when they were signalled by "the buzzer," which was a hidden small vibrating device that could be set off by the experimenter to control the timing and interval of the confederate's food intake (cf. Bevelander, et al. (2012)). The confederates were buzzed immediately after the experiment started and every minute thereafter until a total of 10 chocolate-coated peanuts had been eaten. The confederates in the no-intake condition were asked not to eat the food during the movie. After the movie ended, the confederate was enquired about their accomplishment related to the secret mission while the participant was administered a questionnaire in another room by an experimenter. The participants were assured that their answers would be kept confidential. All children were debriefed in class after the completion of data collection at the school.

Materials and measures

Movie clips

The movie clips were played on a laptop (Hewlett Packet, Compaq 6710b, 15.4-in. screen, 1280 × 800 pixels) with an integrated amplifier and speaker system (Target, TRG-S50, 50 watts power output) on each side of the laptop. A sad, happy, and 'neutral' movie clip of Walt Disney's *Bambi* was created by mixing a renovated version of the old-fashioned movie from 1942 (*Bambi I*) and the modern sequel from 2006 (*Bambi II*) (a detailed description of the movie clips is available from the corresponding author on request). The purpose of the neutral movie was to show a movie clip that contained neither sad nor happy events. In this way, the movie was regarded as 'neutral.' Each movie clip started in a sad, neutral, or cheerful way (e.g., dramatic violin music in combination with scenes of a dark forest, lighter music behind scenes in a light part of the forest, or a very cheerful song with singing birds in a sunny forest, respectively). These scenes were followed by the birth of Bambi which was similar for all three movies, and continued with a different sad, neutral or happy story again. During the movie clips, Disney's original music from *Bambi I* and *II* were used.

Arousal

To test whether the movie conditions differed in emotional arousal, a modernized version of the black and white drawings (i.e., the smiley faces were full color) of the nonverbal scale of emotion (ANSE) (Lay, Waters, & Park, 1989) was assessed by means of a computer task prior to the movie and immediately after the movie. The ANSE includes nine smiley faces that represent high, middle or low degrees of pleasure and arousal. Each child was shown all possible pairs of faces ($N = 36$) and they were asked to chose the face of the pair which resembled their feeling most. If the participants chose the face that showed higher arousal, this would add 1 point to the overall arousal score. The choices between the nine similar face pairs did not contribute to the overall score. Thus, a higher score indicated a higher level of arousal, and the minimum score was 0 and the maximum 27.

Food intake

The experimenter weighed the bowls of snack food before and after each session using a digital scale (Kern 440, Kern & Sohn, Balingen, Germany). The consumed grams (g) of test food were used as the dependent variable in the analyses.

Body weight

The experimenter measured height and body weight according to standard procedures (without shoes but fully clothed). Height was measured to the nearest of 0.1 cm using a stadiometer (Seca 206, Seca GmbH & Co., Hamburg, Germany) and weight was measured to the nearest of 0.1 kg using a digital scale (Seca Bella 840, Seca GmbH & Co.). The body mass index (BMI) for each child was calculated using the formula: weight [kg]/height^2 [m]. BMI (*z*-score) for boys and girls was determined by means of current *z*-BMI standards and cut off points for Dutch children (StichtingVoedingscentrumNederland., 2011). This study refers to overweight as well as obese children due to the small number of obese children ($n = 4$) in the study sample.

Measurements questionnaire

Sadness and happiness

To indicate how the participants felt after watching the movie clip, they were asked to rate their feelings directly after the movie ended. As people can feel happy and sad at the same time (Larsen, McGraw, & Cacioppo, 2001), the participants had to indicate their feelings on two separate visual analogue scales (VASs) to measure their happiness (0 mm, *neutral*; 145 mm, *happy*) and sadness (0 mm, *neutral*; 145 mm, *sadness*). There was a sad looking face or a smiley face at the ends of the VAS scales to indicate the range of the scale to the children.

Liking of the movie clip

To measure the extent to which the participants liked the movie, a VAS was used (0 mm, *do not like at all*; 150 mm, *like it a lot*) with a sad looking and smiley face at the start and end of the scale, respectively.

Liking of the test food

The participants were asked to indicate how much they liked the test food on a VAS (0 mm, *not at all*; 150 mm, *very much*) (Bevelander et al., 2012) with a sad looking and smiley face at the start and end of the scale, respectively.

Familiarity with the confederate

To measure the extent to which the participants knew the confederates, a VAS was used (0 mm, *do not know him/her at all*; 150 mm, *know him/her very well*) (Bevelander et al., 2012).

Hunger

To conceal the real aim of the study, participants' subjective hunger state was measured after the experiment. The participants indicated their hunger on a VAS (0 mm, *not hungry at all*; 150 mm, *very hungry*) (Bevelander et al., 2012).

Time of day

Afternoons are more common snack times than mornings (Cross, Babicz, & Cushman, 1994). In practice, it was impossible to test the children at the same time of day. In addition to hunger

status, the actual time of day on which the participant started the session was controlled for in the analysis (Bevelander et al., 2012).

Estimation of the peer's food intake

To test whether the participants were conscious of the peer's food intake, the children were asked if they could estimate the peer's food intake after watching the movie clip. Children who could not make an estimation ($n = 10$) were excluded from the analysis.

Analytical strategy

Data were analyzed using SPSS for Windows (version 17.0, 2008, SPSS Inc., Chicago, IL, US). Alpha was set at $P < .05$. First, randomization checks were performed to test whether there were differences between experimental conditions on age, sex, BMI (z-score), hunger, time of day, liking of the test food, liking of the movie clip, and familiarity with the confederate. Also, manipulation checks were performed to determine whether the movie clips had an impact on participants' emotional state by means of independent t-tests with participants' feelings of sadness and happiness compared to the happy, neutral, and sad movie conditions. In addition, it was tested whether arousal was the same for all three movie clip conditions by means of a 3×2 two-way mixed analysis of variance with the between-subjects factor movie clips (happy, neutral, and sad) and the within-subjects factor arousal measurement before and after the movie clip.

Second, Spearman's rank and Pearson's correlations were performed for the model variables on food intake to determine which variables had to be controlled for in the main analyses. An analysis of covariance (ANCOVA) was performed to examine the main effects for the movie conditions (sad, neutral, or happy) and intake conditions (no-intake or intake condition) on the total food intake (gram) and the interaction effect between the movie conditions and the experimental conditions on the total food intake (gram). Additional analyses were performed to test whether participants in the neutral movie clip condition were less distracted by the movie content and had a more accurate estimation of the peeŕs food intake than participants in the sad or happy movie clip condition.

Pairwise comparisons with Bonferroni correction were carried out to determine significant differences between the intake conditions. In a between-subjects design, approximately 20 participants per group are required to detect a moderate to large effect size (Cohen, 1992). Cohen's f^2 effects size was calculated to assess the effect size over the conditions and effect sizes .02, .15, and .35 were termed small, medium, and large, respectively (Cohen, 1988). Following a significant interaction, simple contrast comparisons were carried out to determine whether the food intake differed significantly across and between the food intake conditions for the three movies. A simple contrast analysis was used to break down the interaction term and look at the effect of one independent variable at individual levels of another independent variable. The test used the error term and degrees of freedom from the entire design (Field, 2005). In addition, the effect sizes between the intake conditions and movie conditions were calculated with Hedges g, which took into account sample size and accordingly adjusted to the overall effect size (Hedges & Olkin, 1985). Effect sizes .20, .50, and .80 were termed small, medium, and large, respectively.

Results

Randomization checks

Randomization checks were performed by using one-factor analysis of variance and Pearson's χ^2 tests to test for differences among the experimental groups for the variables age, sex, BMI (z-score), hunger, time of day, liking of the test food, liking of the movie clip, familiarity with the confederate, and restrained and emotional eating. Table 1 summarizes the means and SDs for all variables across each condition. The variable time of day was significantly different between groups ($P = .03$). Therefore, time of day was controlled for in the main analyses.

Manipulation checks

Independent t-tests were performed between feelings of happiness and sadness to test whether the movies had the effect of inducing happiness after the happy movie clip and sadness after the sad movie clip. For feelings of happiness, there was a significant difference between the happy ($M = 104.24 \pm$ SD 46.34) and the sad ($M = 82.5 \pm$ SD 42.76) movie ($t_{(77)} = -2.16$, $P = .03$). There were no significant differences between the happy and neutral ($M = 95.24 \pm$ SD 42.44) or the sad and neutral movie conditions ($P > .05$), which indicated that the participants were not feeling more or less happy after seeing the neutral movie clip compared to the happy and sad movie clip. For feelings of sadness, there was a significant difference between the sad ($M = 46.53 \pm$ SD 39.28) and happy ($M = 23.51 \pm$ SD 29.56) movie condition ($t_{(77)} = 2.96$, $P = .004$) as well as the sad and neutral ($M = 25.33 \pm$ SD 31.08) movie condition ($t_{(69)} = 2.49$, $P = .015$). There was no significant difference between the happy and neutral movie condition ($P > .05$). Although the dominant reported feeling was happiness, the participants felt the happiest after watching the happy and neutral movies and the saddest after watching the sad movie.

Repeated ANOVA measures revealed that participants had an average but decreased arousal state after seeing the movie clips (before $M = 14.65 \pm$ SEM .29; after $M = 13.86 \pm$ SEM .33) ($F_{1,108} = 7.65$, $P = .007$, Cohen's $f^2 = .27$), and there were no differences between the movie clips in arousal ($P > .05$). Although the children were more aroused before entering the experiment than afterward, the change was the same for all experimental conditions. This means that any differences in food intake between the movie clip conditions were not caused by differently affected arousal states (e.g., anxiety, stress, excitement).

Main analysis

To determine which variables had to be controlled for in the main analysis, Spearman's rank and Pearson's correlations were performed for the model variables of age, sex, BMI (z-scores), hunger, liking of the test food, liking of the movie clip, familiarity with the confederate, restrained and emotional eating, and food intake. Hunger ($r = .30$, $P = .001$), liking of the test food ($r = .35$, $P < .001$), and familiarity with the confederate ($r = .23$, $P = .02$) were statistically controlled for since these variables correlated significantly with participants' food intake. Time of day was controlled for since manipulation checks showed that there were differences between experimental groups.

The main goal of this study was to test whether exposure to happy, neutral, or sad media content influences social modeling effects of (snack) food intake in young children. ANCOVA revealed that the covariates hunger ($F_{1,102} = 13.37$, $P < .001$, Cohen's $f^2 = .33$), liking of the test food ($F_{1,102} = 9.12$, $P = .003$, Cohen's $f^2 = .27$), and familiarity with the confederate ($F_{1,102} = 8.55$, $P = .004$, Cohen's $f^2 = .26$) had a significant effect on food intake, but not time of day ($P = .17$). A significant main effect was found for the intake condition on the food intake ($F_{1,102} = 3.94$, $P = .05$, Cohen's $f^2 = .16$) with a significant difference between the no-intake ($M = 28.28 \pm$ SEM 3.23 g) and standardized intake condition ($M = 37.44 \pm$ SEM 3.11 g) ($P = .05$, $g = .38$). There was no main effect

Table 1
Randomization checks for variables of age, sex, BMI (*z*-score), hunger, time of day, liking of the test food, liking of the movie clip and familiarity with the confederate measured by confederate intake and movie condition.[a,b]

Variables	Confederate no-intake condition			Confederate standardized intake condition			*P* value[b]
	Sad (*n* = 19)	Neutral (*n* = 15)	Happy (*n* = 20)	Sad (*n* = 19)	Neutral (*n* = 18)	Happy (*n* = 21)	
Age	7.89 (.86) 7–9	7.67 (.62) 7–9	7.65 (.67) 7–9	7.79 (.85) 7–10	7.78 (.55) 7–9	7.86 (.79) 7–9	.88
Sex (boy/girl) (*n*/*n*)	10/9	9/6	10/10	8/11	10/8	11/10	.94
BMI (*z*-score)	.19 (1.12) −2.01–1.92	.34 (1.30) −2.00–2.97	.19 (.98) −1.68–2.03	.47 (1.15) −1.38–3.00	.20 (1.00) −1.37–2.02	.26 (1.30) −2.70–3.95	.96
Hunger	48.68 (39.70) 0–121	37.53 (42.53) 0–145	51.60 (42.23) 0–126	30.89 (37.45) 0–131	62.94 (43.12) 0–144	47.43 (45.47) 0–145	.27
Time of day	12:06 (1:59) 8:45–14:45	10:53 (2:12) 8:40–14:45	11:46 (2:11) 8:45–15:10	10:35 (1:54) 8:50–14:45	10:22 (1:22) 8:45–13:10	10:40 (1:42) 8:40–15:15	.03
Liking test food	98.58 (44.39) 11–145	117.07 (32.49) 37–145	116.05 (29.28) 45–145	90.89 (38.50) 2–145	104.89 (44.04) 1–145	106.05 (49.15) 2–145	.35
Liking of the movie clip	109.84 (33.35) 7–145	108.40 (32.07) 55–145	124.15 (23.62) 70–145	108.21 (32.64) 33–145	121.89 (20.30) 78–145	136 (13.63) 96–145	.28
Familiarity confederate	94.00 (42.03) 6–145	108.00 (28.33) 55–145	99.95 (42.30) 3–145	80.84 (53.36) 0–145	98.11 (35.29) 18–145	95.48 (35.68) 10–145	.52

[a] All values are in means (SD), minimum – maximum.
[b] Reflects the differences in total means between intake conditions by single factor ANOVA or Pearson's χ^2 test.

of movie condition ($P = .64$) on food intake. Moreover, a significant interaction was found between the intake condition and the movie condition on food intake ($F_{2,102} = 3.30$, $P = .04$, Cohen's $f^2 = .20$). In this analysis, the model explained 31.1% of the variance in food intake. The model was also tested with BMI *z*-score as an additional covariate, but this had no effect on food intake ($P = .59$) or on the main findings (interaction between intake condition and movie clip $F_{2,101} = 3.21$, $P = .045$).

Figure 1 shows the number of grams consumed for the different movies, adjusted for hunger, liking of the test food, time of day, and familiarity with the confederate. The intake condition affected children differently based on the movie they watched. Simple contrast comparisons across the intake conditions showed a significant difference between the confederate's no-intake ($M = 22.35 \pm$ SEM 5.42 g) and the standardized intake condition ($M = 38.47 \pm$ SEM 5.50 g) in the sad movie condition ($P = .04$, $g = .66$) and between the no-intake ($M = 25.99 \pm$ SEM 5.24 g) and the standardized intake condition ($M = 44.81 \pm$ SEM 5.02 g) of the happy movie condition ($P = .01$, $g = .80$). The participants' food intake in the neutral movie condition did not differ significantly between the no-intake ($M = 36.53 \pm$ SEM 6.01 g) and standardized intake condition ($M = 29.05 \pm$ SEM 5.51 g) ($P = .36$, $g = .31$). Within the standardized condition, there was a significant difference between the intake in the happy movie condition ($M = 44.81 \pm$ SEM 5.02 g) and the neutral movie condition ($M = 29.05 \pm$ SEM 5.51 g) ($P = .04$, $g = .67$). This means that participants' food intake was affected by the food intake of a peer in the happy and sad movie clips, but not in the neutral movie clip.

Additional analyses

Additional analyses were performed to test whether participants in the neutral movie clip condition may have been less distracted by the movie content and had a more accurate estimation of the peeŕs food intake than participants in the sad or happy movie clip condition. Analysis of variance with intake condition and movie clip condition on the estimated peer's food intake showed a significant interaction between the movie clip and intake condition on the estimated amount of food consumed by the peer ($F_{2,94} = 3.23$, $P = .04$, Cohen's $f^2 = .22$). Post hoc analysis with Bonferroni correction revealed that children who watched the neutral movie clip indeed estimated the peeŕs food intake more accurately than children in the sad ($P = .02$) or happy (although not significant ($P = .10$)) movie clip condition.

Discussion

The present study is the first to report the role of emotions on social modeling of food intake among 7- to 10-year-olds by combining a social modeling experiment with emotions induced by means of happy, neutral, or sad movie clips. The presence of an

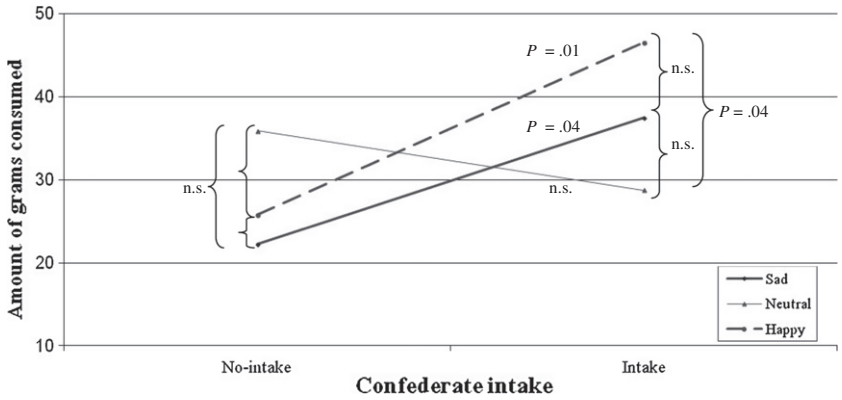

Fig. 1. Food intake in movie clips by intake condition.

eating peer in combination with exposure to movie clips affected the children's food intake differently. Watching positive and negative movie clips led to adjustment to the intake of a peer, as compared to that of children who watched a neutral movie clip.

As expected, social modeling of food intake occurred in the sad as well as the happy movie clip condition; however, it did not occur in the neutral condition. An explanation can be found in the literature which has shown that people become less thoughtful (or 'mindful') and respond more automatically as their cognitive functioning decreases due to coping with changes in their emotional state and routine (Baumeister et al., 2007; Dolinski, 2001; Langer, 1992; Wansink, 2006). It is possible that the children mindlessly followed the peer's food intake because they were more emotionally engaged in the sad or happy movie clips compared to the neutral movie clip. The sad movie clip told a story of cheerless, pitiful, and disappointing events and the happy movie clip was a story with a series of humorous, entertaining, and joyful happenings. As the movies cannot maintain the same sad or happy affective tone for 10 min, the children had to deal with emotional changes throughout the stories which might have made other processes (such as eating or not) more automatic. In contrast, the neutral movie content might have been entertaining to watch but less profound to deal with as there were no strong affective events in the story. Speculatively, the children who were watching the neutral movie clip may have been in a less mindless state than children who were watching the happy or sad movie clip which could have affected their susceptibility to the intake of the peer. Findings on the accuracy of the estimation of how much their peer ate support this line of reasoning; that is, children who were watching the neutral movie had a better estimation of their peer's food intake than children who watched the sad or happy movie clip.

Additionally, 'emotional contagion' might have added to the social modeling effect in the sad and happy movie clips (Neumann & Strack, 2000). People are found to respond compassionately and unconsciously to other people's emotional states (Neumann & Strack, 2000; Van Baaren, Fockenberg, Holland, Janssen, & Van Knippenberg, 2006). As the children watched the movie together, it is possible that they have shared the same emotions, which made the experience of watching the sad or happy movie more intense, whereas this was not the case during the neutral movie condition (Iacoboni, 2009). Similar to findings in adults, consuming large amounts of foods or 'loss of control' has been related to both emotional and external eating (e.g., eating in response to food-related stimuli) in children (Braet & Van Strien, 1997; Tanofsky-Kraff et al., 2007). Loss of control is viewed as a problem with affect regulation; children who eat large amounts of food try to regulate and reduce their negative feelings through the consumption of food (Goossens et al., 2007). A study of Tanofsky-Kraff et al. (2007) found that children also ate in response to positive feelings when palatable food was available. Given that the children in the current sample were primarily categorized as 'normal eaters,' the experience of watching the movie together with a peer might have increased their emotional engagement.

Furthermore, the current findings provide more insight into eating behavior while watching TV. Ample studies have shown the effect of watching TV on children's (increase in) weight due to reduced physical activity and increase in food intake (see for review Coon & Tucker, 2002). It has been argued that watching TV exposes people to food-related stimuli (e.g., food advertisements or eating actors) which increase food intake. In the current study, however, the children were not exposed to any food-related stimuli on TV. Therefore, the findings support an additional explanation that individuals may overeat when watching TV in general because they are distracted and not aware of their consumption (Bellisle, Dalix, & Slama, 2004; Hetherington et al., 2006; Wansink, 2006). The current findings broaden this scope by providing evidence that food intake is influenced by experiencing negative or positive emotions while watching TV with someone else. Future studies in mindless eating and (cognitive) distraction factors (such as watching TV) that include the social context are warranted.

Some limitations should be noted. First, inducing emotions in children might be more complicated than in adolescents and adults. Exposing children to an emotion induction of the same intensity or severity as in older individuals would be unethical (Brenner, 2000). Although the children reported to feel most happy after seeing the happy movie compared to the sad movie and most sad after the sad movie compared to the happy and neutral movies, it might seem ambiguous that they felt mainly happy after watching the movie clips. Nonetheless, this is in line with several diary studies in early adolescents and adults which show that people experience positive affect in general (Larson & Lampman-Petraitis, 1989; Schneiders et al., 2006). Negative events were found to lower positive affect but do not rule out positive feelings because people are capable of feeling sad and happy at the same time (e.g., joyful memories and sadness at a funeral) (Larsen et al., 2001). In addition, the young children might have reported in 'naïve superlatives' even though they have considerable understanding of negative and positive emotions (Brenner, 2000; Larson and Lampman-Petraitis, 1989). Second, our assessment indicated that children were more aroused before than after the movie clip. Qualitative impressions indicated that the children were thrilled to participate in the study. Children might have experienced their participation as more exciting than adolescents or adults who participate in a study. During the movie, they might have calmed down and became more relaxed. It is also possible that watching TV dampened cognitive activity which decreased the children's arousal state. Nevertheless, they did not differ in baseline or post-measurement due to the different movie clips, which means that the movies caused similar low arousal. As children watch movies at home that might indeed induce high arousal states (e.g., fear, tension), future research should investigate the impact on food intake in combination with high-arousal emotions. Third, the study did not include measurement of the confederate's feelings after watching the movie clip. As people's emotional state can be contagious, it is suggested to measure the peer's feelings in future research. Fourth, the children's subjective hunger status was measured only after the movie to conceal the aim of the study. Another strategy might be to measure the children's subjective hunger before the study or assess when (or how much) they ate (during) their last meal. Fifth, we concentrated on palatable food intake. It would be interesting to test whether emotions in social modeling also apply to different kinds of food, such as low energy-dense foods or meals. Finally, the study sample included young normal eaters and did not account for normal, restrained, or emotional adolescent or adult eaters. To enhance the generalizability of the current findings, it would be interesting to replicate this study to examine the effects on these groups as well.

In conclusion, this study has extended previous research as it shows the combined influence of emotions and peers on food intake. The research area related to emotions and food intake should broaden its scope and pay more attention to the impact of peers in eating situations. The findings demonstrate further evidence of the need for recommendations to reduce eating in front of the TV and might be of value to the development of intervention programs aimed at mindful eating contexts. Given that people often watch eventful TV programs together during meal time or have movie nights with snack foods, it is important to educate people about the joint impact of peers and watching TV on food intake. Moreover, as young children are not in the position to choose their food consumption environment yet, parents and schools should provide consumption settings that limit eating in front of the television.

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