



Direct effects of food cues seen during TV viewing on energy intake in young women



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ABSTRACT

Few studies have examined direct effects of food cues presented within television (TV) programs on eating behavior in adults. This research experimentally determined whether exposure to food cues in TV programs affects energy intake during TV viewing among young women, independently from food cues presented in TV advertisements. The experiment involved a 2 (TV program with or without food cues) by 2 (TV advertisements with or without food cues) between-participants design. While watching TV, participants could freely eat peanut chocolate candies and crisps (potato chips). Participants were 121 young women (mean age = 19.6 years; mean BMI = 22.5). Participants who watched a TV program with food cues tended to have a lower total energy intake and ate significantly less peanut chocolate candies than participants who watched the same TV program without food cues. This effect was particularly pronounced among participants with a higher BMI. Food advertisements did not affect energy intake. Findings may indicate that subtle continuous food cues during TV programs could make young females more aware of their own eating and/or weight, leading to reduced intake of particularly sweet snack foods during TV viewing. Considering the non-significant trend for the effect of the TV program with food cues on total energy intake, findings should be replicated to provide possible tools for prevention campaigns using food cue reminders to watch one's intake.

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1. Introduction

Since the obesogenic environment has often been blamed for the rise in overweight and obesity, insights into environmental factors that affect food intake are of utmost public-health importance. The marketing of energy-dense foods and beverages has been identified as a key contributor (Brownell, Schwartz, Puhl, Henderson, & Harris, 2009). Food cues are not only provided in advertisements on television (TV), but also by foods appearing in TV programs. It has been estimated that there are approximately ten references to food in every hour of TV programming (Dickinson, 2000). Given that people are often not aware of factors influencing their food intake (Vartanian, Herman, & Wansink, 2008), food cues presented on TV may influence eating behavior in several ways.

First, food cues during TV viewing may unconsciously prime people to directly consume more food by activating food related

cognitions, food craving and motivation to eat (Harris, Bargh, & Brownell, 2009; Kemps, Tiggemann, & Hollitt, 2014; Volkow et al., 2003). Second, people may unconsciously imitate the food intake of others on TV (Cohen, 2008; Dijksterhuis, Smith, Van Baaren, & Wigboldus, 2005; Hermans, Salvy, Larsen, & Engels, 2012). Previous research has shown that people even 'model' food intake if their eating companion is not physically present, suggesting that TV characters might also provoke food modeling (Feeney, Polivy, Pliner, & Sullivan, 2011). Finally, transportability, the tendency to become engrossed in what one is viewing, may increase further food intake, perhaps by reducing attention to internal cues of hunger and satiety (Ogden et al., 2013). For example, it has been found that distraction (including watching TV and playing a computer game) increased later snack intake (Higgs, 2015; Oldham-Cooper, Hardman, Nicoll, Rogers, & Brunstrom, 2011). It is plausible that these types of influence are relevant for food cues in both TV advertisements as well as TV programs. Because the messages in most TV programs, contrary to advertisements, are not explicit, viewers may be unaware of the information they are processing during TV programs. Viewers are

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perhaps less likely to think about this information consciously. Consequently, they may be more susceptible to potential effects of information presented during TV programs (Wyer & Shrum, 2015). Therefore, we expect that these mechanisms operate more strongly among subtle food cues presented during TV programs compared to food cues presented during advertisements.

To date, studies examining the effects of food cues in advertisements among adults have shown mixed results. Some studies found that food cues in advertisements increased energy intake among women (Anschutz, Engels, Van der Zwaluw, & Van Strien, 2011), obese women (Falciglia & Gussow, 1980), high external eaters (Van Strien, Herman, & Anschutz, 2012) and people high on transportability (Wonderlich-Tierney, Wensel, Vander Wal, & Wang-Hall, 2013), whereas other studies found no effects (Bellisle, Dalix, Airinei, Hercberg, & Péneau, 2009; Martin, Coulon, Markward, Greenway, & Anton, 2009). In contrast, the direct effects of food cues presented within TV programs are not well characterized. To date, only two studies have evaluated effects of food cues in TV programs. The first study, using a taste-test design, found that watching a cooking program increased energy intake from chocolate covered candies compared to a nature program (Bodenlos & Wormuth, 2013). No differences were found for overall intake, cheese curl or carrot consumption. However, the use of a taste-test did not assess eating *while* watching TV and may not represent a typical scenario for eating while watching TV (Anschutz et al., 2011). A second study using an animated comedy program with or without food cues found no overall differences between conditions with regard to energy intake of two types of candy (Shimizu & Wansink, 2011). A subgroup analysis revealed that restrained eaters who watched the program with food cues ate more than those who watched the program without food cues. In that study, however, participants were explicitly asked to eat, which may have altered their typical eating behavior.

The main aim of the current study was to determine the influence of food cues provided in TV programs on energy intake while watching TV, over and above the effects of food advertisements. An experimental design was used in which food cues were systematically manipulated in a TV program (program with or without food cues) and in advertisements (advertisements with or without food cues). To maximize ecological validity, the current study examined direct effects of food cues when people were not explicitly asked to eat, as this may reflect more natural eating behavior. A reality TV series with unscripted interactions between real individuals was used to provide realistic scenarios involving foods/eating. It was hypothesized that food intake would be higher in the condition in which food cues were presented within TV programs over and above the effects of food cues during TV advertisements. No effects were expected for food cues presented during TV advertisements over and above those presented during TV programs. It was expected that energy intake would be most strongly affected by the combination of exposure to food advertisements and food cues seen during the TV program.

2. Method

2.1. Design

A between-subjects, 2×2 experimental design was used to create 4 experimental conditions that systematically varied in food cues during the TV program (with food cues vs. without) and advertisements (with food cues vs. without). Participants were randomly assigned to experimental conditions. The TV program consisted of 26 min segments from the Dutch TV show 'Boer zoekt vrouw'. In this popular Dutch TV program, farmers look for a potential romantic partner. In the food cue TV program condition,

food cues lasted approximately 7 min and included both food cues and neutral scenarios, for example people eating pie and having a romantic dinner. In the no food cue TV program condition, the same neutral segments from the condition involving the TV program with food cues were used, supplemented with approximately 7 min of other neutral segments.

Eight, 30-s advertisements were shown during two commercial breaks (at 10 and 20 min) for a total duration of 4 min. To disguise the emphasis of food, the food cue TV advertisement condition included five neutral advertisements and three food advertisements, for example Dr. Oetker pizza and Magnum ice cream (Anschutz et al., 2011; Van Strien et al., 2012; Wonderlich-Tierney et al., 2013). The condition with neutral advertisements consisted solely of eight neutral advertisements without food cues, for example promotion of a camera and glasses. The same neutral advertisements from the condition with food advertisements were used, supplemented with three other neutral advertisements.

2.2. Participants

A total of 153 female students participated in exchange for course credits (for educational requirements) or money (20 participants). All participants were recruited through an Internet sign-up program of the Behavioural Science Institute (BSI) of the Radboud University Nijmegen. Registration for the study was restricted to female students. Participants were told that the purpose of the study was to examine social interactions between people. Since awareness of monitoring of food intake during a study can change food intake of participants (Robinson, Kersbergen, Brunstrom, & Field, 2014), we excluded 32 participants from analyses who correctly perceived the purpose of the study as involving food intake. The final sample size consisted of 121 female students. The age of participants ranged from 17 to 25 years with a mean age of 19.6 ($SD = 1.48$). The mean body mass index ($BMI = \text{weight}/\text{height}^2$) was 22.5 ($SD = 2.83$).

2.3. Procedure

Data were collected during the months February–November 2013. Participants were individually tested and signed up for the experiment that was held at 10:45 AM and between 1:45 and 5:45 PM. All sessions took about 60 min in total. Asking participants to refrain from eating for a certain period of time prior to being observed is often used to reduce variability in hunger (Polivy, Heatherton, & Herman, 1988). This instruction, however, was not given to avoid the suggestion of a focus on food intake and potentially altered eating behavior (Anschutz, Engels, Becker, & Van Strien, 2008; Hermans, Larsen, Herman, & Engels, 2009). The experiment took place in an interaction room at the Behavioural Science Institute (BSI) laboratory of the Radboud University Nijmegen. The room contained a sofa, side table, and was decorated with plants and paintings to increase ecological validity of the setting (Anschutz, Engels, et al., 2008; Anschutz, Van Strien, & Engels, 2008).

After entering the laboratory and providing consent, the study purpose and procedures were explained to each participant. Next, the participant was told that she would be watching a TV program and asked to pay particular attention to interactions between the persons in that TV program in order to complete a questionnaire about those interactions following the program. Participants were instructed to make themselves as comfortable as they would at home and eat or drink as much as they liked while watching TV. Two pre-weighed bowls with crisps and peanut chocolate candies were placed on a table between the participant and TV, along with a glass of water. The foods offered to the participants differed from

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