Short communication

Exposure to soda commercials affects sugar-sweetened soda consumption in young women. An observational experimental study

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ABSTRACT

The present study examines the direct effects of television commercials advertising soda on actual sugar-sweetened soda consumption among young women. An experimental–observational study design was used, in which 51 female students (ages 18–29) were exposed to a 35-min movie clip, interrupted by two commercial breaks consisting of soda or water commercials. Their actual soda consumption while watching the movie clip was examined. An analysis of variance was used to examine the effects of commercial condition on soda consumption. Thirst and first glass consumed before the first commercial break were added as covariates in the analyses. Results indicated that participants assigned to the commercial condition consumed 1.3 ounces more soda than participants in the water commercial condition. Exposure to soda commercials while watching a movie can have a strong influence on increasing sugar-sweetened soda consumption in young women.

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Consumption of sugar-sweetened soda is assumed to be a key contributor to the obesity epidemic (Bray, Nielsen, & Popkin, 2004; Malik, Schulze, & Hu, 2006). While energy intake from milk declined by 38% between 1977 and 2001, energy intake from soft drinks in the US increased by 135% over the same period (Nielsen & Popkin, 2004). Sugar-sweetened soda is the most popular drink in the United States and accounts for 80% of added sugars in the US diet (Nielsen & Popkin, 2004). In the US, regular soft drinks are consumed at a rate of 35 gallons per person per year (USDA Economic Research Service, 2005) compared to 25 gallons in the Netherlands (CBS, 2009). Drinking soda provides little nutritional benefit and has also been identified as a risk factor for diabetes (Schulze, Manson, & Ludwig, 2004), dental caries (Heller, Burt, & Eklund, 2001), and bone fractures (McGartland, Robinson, & Murray, 2003). Experimental research suggests that soda leads to weight gain because of the low satiety of liquid carbohydrates and the resulting incomplete compensation of energy intake (Dimaggio & Mattes, 2000; Schulze et al., 2004). Because soda consumption contributes to public health problems, identifying the processes that influence soda consumption is imperative (Fig. 1).

Research indicates there is a positive relationship between hours of television (TV) viewing and obesity (Foster, Gore, & Smith West, 2006). One reason is that people tend to eat and drink more while watching TV (Blass et al., 2006). In 2007, TV viewers in the US watched 297 min of television per day compared to 194 in the Netherlands (IP International Marketing Committee, 2007). In the US, food commercials make up 25% of TV commercials viewed by adolescents, with sugar-sweetened soda comprising 6% of the food commercials (Powell, Szczypka, & Chaloupa, 2007). It has been established that television TV viewing increases caloric intake from sodas (Thomson, Spence, Raine, & Laing, 2008; Vereecken, Todd, Roberts, Mulvihill, & Maes, 2005). Hence, while watching TV, people are exposed to advertisements of sodas high in sugar (Boyonnt-Jarrett et al., 2003). There is however no experimental evidence for whether exposure to soda advertising in particular leads to higher soda consumption (Scully, Dixon, & Wakefield, 2008). Some mechanisms might account for the effect of soda commercials on consumption of sodas while watching TV. Processes of imitation might for example affect soda consumption. Research has found that people automatically and unconsciously assume each other’s behaviour. On-screen drinking cues might affect drinking behavior (Hurley & Chater, 2005), thus seeing actors on-screen holding a drink or drinking might provoke imitation of this behaviour (Engels, Hermans, Van Baaren, Hollenstein, & Bot, 2009). Further, particular advertising strategies may also contribute to an increased intake of soda (Anderson, Glantz, & Ling, 2005). Commercials for drinks are focused on psychological and emotional needs rather than thirst (Lewis & Hill, 1998), often containing music, characters, storylines and humor specifically aimed at young adults, persuading them to consume these particular products.

While there is empirical evidence from cross-sectional and longitudinal research revealing the link between sugar-sweetened soda consumption and sedentary behavior (Scully et al., 2008; Vereecken et al., 2005), the direct causal effects of TV commercials
on soda consumption have not been tested experimentally. The present study examines the effects of commercials for sugar-sweetened soda on actual soda consumption among young women in a controlled home setting environment. Exposure to soda commercials was compared to exposure to water commercials as a control condition, so we could verify that found effects cannot be attributed to drinking cues as such, but to soda drinks specifically.

**Methods**

**Participants**

Fifty-one female college students (ages 18–29 years [M = 21.2, SD = 3.2]) participated. Their mean Body Mass Index (BMI = weight/height²) was 21.9 (SD = 2.9), ranging between 17.1 and 29.7. Participants were recruited via an Internet system of Radboud University Nijmegen. Students who volunteered received either $10 (USD) or college course credits. The Institutional Review Board of Radboud University approved the study protocol and participants submitted written informed consents. A randomized between-subject experimental design comparing soda and water intake in Dutch adolescents.

**Observations of soda and water consumption**: The weight of the bottles before and after each session was measured in grams using a Mettler PM3000 to assess soda or water consumption. In addition, it was observed how many glasses of soda and water participants drank before the first break and controlled for this pre-commercial drinking in the analyses.

**Strategy for analyses**

An analysis of variance (ANCOVA) was conducted to examine the effects of commercial condition on soda consumption. Thirst and first glass consumed before the break correlated significantly with soda consumption and were added as covariates in subsequent analyses. Cohen’s d effect size was calculated by dividing the difference between the means by the pooled standard deviation with the effect sizes thus reflecting between-group differences expressed in standard deviation units. Effect sizes between 0 and 0.2 reflect a small effect, effect sizes between 0.3 and 0.5 a moderate effect and effect sizes above 0.5 a large effect (Cohen, 1988).

**Randomization**

Randomization checks demonstrated no differences between the conditions concerning participant’s BMI, thirst, first glass before the break, outside temperature, or time of the experiment (p > 0.05). Females with BMI values lower than 16 and exceeding 30 were excluded (n = 3) since obese and underweight individuals possess different intake patterns than normal weight individuals (Bray et al., 2004). A total of six participants rightly guessed the aim of the study. Additional analysis showed that the findings were similar when leaving out the six participants. Therefore, these participants were included in subsequent analysis. Table 1 shows the means and standard deviations of the model variables for the total sample and the soda, and water commercial condition.

**Fig. 1.** Total soda consumption in the two commercial conditions.
Soda consumption

There was no main effect of thirst on the amount of soda consumed, F(1, 50) = 2.37, p = 0.131. Drinking soda first predicted drinking soda later during the experiment, F(1, 50) = 15.90, p < 0.001. There was a significant main effect of condition on the amount of soda consumed, F(1, 50) = 5.20, p = 0.027. The Cohen’s effect size was medium: 0.31. The total model explained 37% of the variance in total soda intake. In the soda commercial condition participants consumed 1.29 ounces more soda than participants in the water commercial condition. This amount is comparable to 1/3 of a glass (5 oz).

Water consumption

There was no main effect of thirst on the amount of water consumed, F(1, 50) = 0.96, p = 0.333. Drinking water first did not predict drinking water later during the experiment, F(1, 50) = 0.03, p < 0.875. There was no significant effect of condition on the amounts of water consumed, F(1, 50) = 1.80, p = 0.187. The total model explained 6% of the variance in total water intake. The mean amount of water consumed in ounces was 7.38 (SD = 4.87) in the SC condition, and 7.13 (SD = 5.23) in the WC condition.

There was no direct effect of BMI, restrained eating, and usual consumption of soda on short-term soda consumption. In addition, these variables had no impact on the relation between commercial and soda consumption.

Discussion

The main finding of the present study was that young women consumed more sugar-sweetened soda when exposed to soda commercials than when exposed to water commercials. The results confirmed outcomes of various studies, which showed that students who report watching more television are more likely to consume sugar-sweetened soda on a daily basis (Thomson et al., 2008; Vereecken et al., 2005). The present study added to current knowledge by showing that viewing soda commercials directly affected soda consumption in front of the television.

The study results indicate that drinking cues themselves in the commercials were of little importance, since no increase of soda intake was seen in the water commercial condition, where drinking cues were also present. The perception of a liquid-filled bottle or someone drinking did not trigger the women to drink more soda, suggesting that other factors than imitation of on-screen behavior explain the effects of soda commercials on soda intake. First, marketing research demonstrates that acceptance of a commercial is attributable to elements such as characters (Atkin & Block, 1983), action, storyline, music, and visual aspects (Chen, Grube, Bersamin, Waiters, & Keefe, 2005). Most soda commercials are designed to be attractive to youth. Characters in these soda commercials share demographics with the participants, possibly enhancing participant identification. Identification with a model often elicits imitation of the model’s behavior (Van Baaren, Horgan, Chartrand, & Dijkmans, 2004). Furthermore, the music in this study’s soda commercials was appealing to youth. Music has been shown to be an important factor in the attractiveness of alcohol commercials (Chen et al., 2005). In contrast, the water commercials were focused on health, serenity, and purity, containing older characters. Overall, the soda commercials were specifically designed to be attractive to young people, possibly persuading them to consume soda.

Second, soda is often portrayed in commercials as a reward, providing the energy needed to achieve something and possibly influencing a desire for consumption. If soda commercials trigger someone to initiate drinking soda, people might continue to drink soda because of the high reward value of the sugar (Olszewski & Levine, 2007). However, further research is needed to test the underlying mechanisms in the relationship between soda commercial exposure and soda intake.

This study has some limitations. The present results are restricted to the specific sample and design used in this study. Only a Dutch female student population was studied. Future studies should examine other samples, such as males, adolescents or young children. For example, children were found to be more vulnerable to food advertising (Halford et al., 2007). Further, the experiment should be replicated in the US and other countries. Apart from the sample, a specific setting was used in this study. It is important to test the effects of soda commercials in other types of environments (e.g., cinemas). In addition, solely the effects of sugar-sweetened soda commercials were tested. It is recommended to investigate the effects of diet soda commercials as well because of the popularity of diet soda among young females (Nielsen & Popkin, 2004) and the unestablished correlation with obesity (Malik et al., 2006; Schulze et al., 2004). Another limitation is that soda was more available (3 bottles) than water (1 bottle), which might explain the larger intake of soda. It could be that there was a greater chance of choosing soda compared to water. We decided to provide only one bottle of water in the home setting, since we considered it to be more naturalistic than providing three bottles of water and it would probably lead to more awareness of the real aim of the research. However, since the offer of drinks was equal in both conditions the findings can be attributed to the difference in commercials. Further, it could be that the effects are observed when drinks are easily available but less obvious when the drink are not directly at hand (i.e. home setting). A suggestion could be to test whether our results would be replicated in a truly naturalistic setting, for example at the homes of participants. Finally, merely short-term effects were tested. Future research should examine the effects of prolonged exposure to soda commercials on soda consumption and weight status over time.

The results of this study suggest that young women consume more sugar-sweetened soda when exposed to soda commercials while watching a movie. Since one extra soda per day could lead to weight gain (Apovian, 2004), increased soda consumption as a result of exposure to soda commercials might eventually...
Contribute to the epidemic of obesity (Bray et al., 2004). Therefore, efforts to convey information about the effects of soda commercials on soda consumption are important for increasing consumer consciousness. Furthermore, several national governments already regulate food advertising (Hawkes, 2007). If replicated, the implication of the findings may be to place restrictions on TV soda commercials as well.

References


