Appetite 120 (2018) 565–570

Contents lists available at ScienceDirect

Appetite

journal homepage: www.elsevier.com/locate/appet

The longitudinal link between mothers' and adolescents' snacking: The moderating role of television viewing

Nina van den Broek [a, *], Junilla K. Larsen [a], Maaike Verhagen [a], Rob Eisinga [b], William J. Burk [a], Jacqueline M. Vink [a]

[a] Behavioural Science Institute, Radboud University, Nijmegen, The Netherlands
[b] Radboud Social Cultural Research, Radboud University, Nijmegen, The Netherlands

ARTICLE INFO

Article history:
Received 8 March 2017
Received in revised form
25 August 2017
Accepted 6 October 2017
Available online 7 October 2017

Keywords:
Snacking
Adolescence
Mothers
Television viewing
Longitudinal

ABSTRACT

A large proportion of adolescents eats too many energy-dense snacks, which is detrimental for their current and future health. To understand how to promote healthy dietary behaviors in adolescents, we need to identify factors that affect their snacking. While previous cross-sectional work has shown mother-child similarities in eating behavior, longitudinal studies are lacking. Hence, the first aim of this study was to examine whether maternal snacking predicted changes in adolescents' snacking over time. A second aim was to examine whether adolescents' television viewing magnified the strength of this longitudinal association. Television viewing may increase the motivation to eat the snacks consumed by mothers later on, for example through food advertisement exposure and mindless eating. To address both aims, 2051 adolescents (M_{age} baseline = 13.81; 51.5% boys) were asked to report on their snacking and television viewing three times, with intervals of one year. Moreover, a subsample of mothers of adolescents ($N = 1080$) reported on their snacking at baseline as well. The results indicate that maternal snacking indeed predicts adolescents' snacking over time and that this effect is more pronounced among adolescents who watch a great amount of television. These findings attest to the importance of mothers in forming adolescents' snacking, not only concurrently but also prospectively. Additionally, this study highlights the relevance of assessing other home environmental factors that may influence maternal effects on their children's snacking.

In the last decades, adolescents' caloric intake from energy-dense snacks has increased substantially (Larson & Story, 2013). This is alarming, given that energy-dense snacks, such as potato chips, candy, and cookies, tend to be high in sugar and fat, but low in nutritional value. Although some debate still exists, the World Health Organization (WHO, 2003) reported that the existing evidence is convincing enough to state that snacking (i.e., the intake of energy-dense snack foods) promotes weight gain, which has obvious negative health consequences (Daniels, 2006). It is imperative to invert this trend and to establish healthy dietary behaviors in adolescents, given that their dietary habits track into adulthood and become increasingly resistant to change (Lien, Lytle, & Klepp, 2001). To attain this goal, we need to better understand factors that affect adolescents' snacking over time.

The social environment has proven to play a major role in explaining adolescents' snacking (e.g., De la Haye, Robins, Mohr, & Wilson, 2013; Salvy, De la Haye, Bowker, & Hermans, 2012). Specifically, parents are among the most important determinants of adolescents' snacking. Previous studies have mainly focused on the important role mothers play, and have shown that mothers and their children show similarities in snacking (Wang, Beydoun, Li, Liu, & Moreno, 2011). It has been suggested that mothers can set a snack consumption example and that they can establish norms regarding the amount and frequency of snacking (Herman & Polivy, 2005). However, previous studies have been limited by their cross-sectional design (Wang et al., 2011). Studies that include multiple measurement points over time are needed to shed more light on whether maternal snacking affects their children's snacking later on as well. To the best of our knowledge, this study is the first to take this step by assessing whether maternal snacking predicts adolescents' snacking over time.

For future prevention and intervention research, it is also crucial

* Corresponding author. Behavioural Science Institute, Radboud University, P.O. Box 9104, 6500 HE Nijmegen, The Netherlands.
E-mail address: n.vandenbroek@pwo.ru.nl (N. van den Broek).

https://doi.org/10.1016/j.appet.2017.10.010
0195-6663/

to identify factors that magnify the effect of maternal snacking on adolescents' snacking over time. One of the factors that possibly moderates this longitudinal association is adolescents' television viewing. Television viewing is among the most popular leisure-time activities for adolescents all over the world (Currie et al., 2012). Notably, maternal snacking may be more likely to affect adolescents' snacking when adolescents watch television a lot. More specifically, television viewing can lead to exposure to food advertisements (Story & French, 2004), which is related to increased motivations to snack and actual snacking (Buijzen, Schuurman, & Bomhof, 2008; Chernin, 2008), and to mindless eating, in which consumption of available food is increased due to distraction by the viewing content (Ogden et al., 2013). Critically, both effects of television viewing can promote the motivation to eat the unhealthy snacks available through maternal snacking later on. As such, it can be expected that adolescents who watch a great deal of television are more inclined to adopt their mothers' snacking habits.

1. The current study

Taken together, the current study had two innovative aims. The first aim was to examine whether maternal snacking predicted changes in adolescents' snacking one and two years later. It was hypothesized that maternal snacking at baseline was positively related to adolescents' snacking one and two years later. The second aim was to examine whether adolescents' television viewing moderated the longitudinal link between maternal and adolescents' snacking. While research has provided evidence for direct effects of television viewing on adolescents' snacking (Barr-Anderson, Larson, Nelson, Neumark-Sztainer, & Story, 2009; Pearson, Ball, & Crawford, 2011), its interaction with maternal snacking has not been assessed yet. It was hypothesized that the longitudinal mother-child association in snacking was magnified among adolescents with a high level of television viewing.

2. Method

2.1. Participants and procedure

The adolescents in the present study were part of the large-scale Dutch longitudinal project "Mental Health and Health Habits" (Larsen et al., 2012). In this longitudinal cohort study, three waves of data were collected with one-year intervals (2007–2009). Participants were recruited from seven randomly selected secondary schools in rural ($n = 3$) and urban ($n = 4$) areas in the south-east of the Netherlands. A total of 90 classrooms (on average 13 classrooms per school; $SD = 4.81$) participated, with an average of 23 students per classroom ($SD = 4.40$). A flowchart of adolescents' participation in the three waves is presented in Fig. 1. Reasons for drop-out were parents or children denying permission to participate in the study, moving away to another school, or being absent on the day of testing. At Time 1, boys ($n = 1056$) and girls ($n = 995$) were approximately equally represented. Most participants were born in the Netherlands (95.9%), had at least one parent born in the Netherlands (94.1%), and were living with both parents in intact, non-divorced families (89.2%). All participants attended regular secondary education and were in their first or second year (i.e., Grades 7 and 8) at Time 1 ($M_{age} = 13.81$; $SD_{age} = 0.72$; age range = 11.41 to 16.85).

The study protocol was approved by the Institutional Review Board of the Radboud University, Nijmegen, The Netherlands. A passive parental consent procedure was used in which a letter describing the prospective study with three measurement waves was mailed to 2216 parents. The parents were asked to return an e-mail or make a phone call if they did not want their child to participate. Before participation in the study, students were informed that participation was voluntary and that answers would be confidential and anonymous. At all time points, adolescents completed a 10-page survey during classroom hours, and height and weight were measured out of sight of classmates. A numeric code was used to identify adolescents at all time points.

Parents were additionally asked to fill out a short questionnaire on their own health behavior and well-being at Time 1. Of the 2051 students who participated at Time 1, 1237 of their parents (87.4% was mothers) completed and returned the questionnaire. In the current study, we only used the information on mothers' snacking.

2.2. Measures

Adolescents' and mothers' snacking. Snacking was defined as the consumption of sweet or savory palatable food products. It was measured with five questions of the Fat list (a brief food frequency questionnaire) that refer to the consumption of energy-dense snacks (Van Assema, Brug, Ronda, & Steenhuis, 2001). The questions assess participants' intake of (1) (pea)nuts, (2) chips, cheese, and sausages, (3) pastry, cake, and large cookies, (4) candy bars, and (5) chocolate. The Fat list has proven to be a valid instrument in assessing differences in total and saturated fat (Van Assema et al., 2001), and both the total list and the current selection of items have been used frequently (e.g., Wouters, Larsen, Kremers, Dagnelie, & Geenen, 2010). For all five items, the frequency of intake during a regular week was reported on an 8-point scale ranging from 1 (*never or less than one day a week)* to 8 (*seven days a week*), with each score in between (scores 2 till 7) reflecting intake on one to six days a week. To obtain a single sum score for snacking, the five items were averaged and multiplied by five. Only responses of participants that contributed at least four items to this sum score were considered valid. Adolescents completed the list at all three time points and their mothers completed the list only at the first time point.

Television viewing. To assess television viewing, adolescents were asked to rate the amount of television viewing on a regular school day and weekend day separately on an 8-point scale. Adolescents were asked whether they watched television (almost) never, less than 30 min, 30 min to an hour, one to two hours, two to three hours, three to four hours, four to five hours, or more than five hours per day. Similar scales have been used previously and have proven to be a reliable and valid way to measure television viewing in large cohort studies (Barr-Anderson et al., 2009). In order to obtain a single score for television viewing, first the mean amount of minutes was calculated per response category to estimate the mean amount of television in minutes on school days and weekend days. For instance, the third response category (30 min to an hour) was scored as 45 min of television viewing. Second, the average amount of minutes watched on school days was multiplied by 5 and on weekend days by 2. Third, the total amount of minutes viewing per week was calculated and divided by 7 to obtain a single score for average daily amount of television viewing. Adolescents completed these items at all three time points.

Covariates. Several covariates were assessed at Time 1. As unhealthy food consumption seems to be more frequent in older, in lower educated, and in overweight youth (Hill et al., 2008; Reedy & Krebs-Smith, 2010; Wouters et al., 2010), adolescents' age (as derived from date of birth and date of measurement), education (1 and 2 = pre-vocational education; 3 and 4 = intermediate education; 5 = intermediate-to-high education; 6 = pre-university education) and age- and gender-specific Body Mass Index (zBMI; scores calculated using CDC 2000 growth charts (Kuczmarski et al., 2002)) were included as covariates. Moreover, since food