




Consuming media, consuming food: investigating concurrent TV viewing and eating using a 7-d time use diary survey

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Abstract

Objective: One explanation for the relationship between TV viewing and obesity is that people may (over)eat while watching TV. The current study investigated associations between TV viewing and the time spent on (concurrent) eating in a naturalistic setting among a general population sample.

Design: Preregistered secondary data analyses were performed of a diary survey in which respondents reported their time use in 10-min blocks for 7 d.

Setting: Concurrent TV viewing and eating was operationalised as all blocks in which TV viewing and eating occurred simultaneously. Furthermore, the TV content respondents watched was coded as food-related (i.e. culinary content) or non-food related.

Participants: The sample composed of 2292 adults (58.9% female) in the Netherlands, aged ≥ 20 years, from all educational levels (18.1% low, 29.8% middle and 51.4% high).

Results: More than half of the respondents (51.3%) reported concurrent TV viewing and eating at least once during the 7-d diary period. The average eating occasion was longer in duration while watching TV (*v.* without media use), and the total time spent on eating was longer on days of concurrent TV viewing and eating (*v.* days of eating without media use). The percentage of TV viewing time spent on concurrent eating did not differ between food-related and non-food-related TV content.

Conclusions: Eating while watching TV was related to an increased time spent on eating. Even though energy intake was not assessed, these findings from a naturalistic setting provide further evidence that concurrent TV viewing and eating may contribute to overeating.

Keywords
Food consumption
Television
Distracted eating
Diary
Cooking show
Food cues
Adults

The relationship between screen time and the development of obesity has been widely investigated over the past decades, and particularly TV viewing has been identified as an important contributor to weight gain^(1–3). One plausible explanation for this is that many people may (over)eat while watching TV⁽⁴⁾. First, this may occur because the mere activity of TV viewing triggers the intake of food and beverages (hereafter collectively referred to as eating), for example due to distraction or habit^(5,6). Second, the frequent exposure to food cues on TV, such as in commercial blocks and cooking shows, may elicit cravings for food which may subsequently result in eating^(5,7).

Experimental studies have reported evidence for both of these notions^(6,8–10), but the vast majority of research on concurrent TV viewing and eating has been conducted in controlled laboratory settings and among either children or (predominantly female) student samples. Studying eating while watching TV in daily life, and in the general population of adults, provides a more ecologically valid view on this behaviour. Using a 7-d time use diary survey among a large sample (*n* 2292) of the general population of adults in the Netherlands, the current study provides further understanding of how TV viewing is associated with eating behaviour in daily life.

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Concurrent TV viewing and eating

Prior research has often reported a positive association between the amount of TV viewing and overall energy intake^(1,11,12). It is likely that this relationship may at least be partly explained by eating *while* watching TV^(1,12), but to gain insight into the potential impact of this behaviour, it is important to first examine the extent to which people actually engage in concurrent TV viewing and eating in daily life. Although research on the prevalence of concurrent TV viewing and eating is scarce, some efforts have previously been made to study this behaviour^(13–17). For example, in a sample of obesity-treatment seeking women with overweight, it was found that 46 % of meals were consumed in front of the TV⁽¹⁵⁾. Furthermore, Stroebele and De Castro⁽¹³⁾ found that among (predominantly female) undergraduate students, on average one meal per day was eaten with the TV on. Although these studies provide some indication that combining TV viewing and eating is common, this remained to be studied among the general population of adults. The following research question was therefore posed:

RQ1

What is the time spent on concurrent TV viewing and eating among adults in the Netherlands?

Results from experimental studies typically show that when eating in front of the TV, people eat more – as demonstrated by a higher energy intake – than when eating without watching TV^(6,18–20). This may be the result of several mechanisms, such as distraction^(4–6), learned associations between TV viewing and eating resulting from repeatedly pairing these two behaviours in the past^(6,21) or a positive mood induced by TV viewing^(6,22). Importantly, eating while watching TV likely contributes to an overall increase in (the time spent) eating across the day and is thus not compensated for during another moment. A study by Stroebele and De Castro⁽¹³⁾ showed that on days of eating with the TV on (*v. off*), participants (*i.e.* undergraduate students) ate more meals, resulting in an overall higher energy intake on those days. Furthermore, experimental research showed that consuming a fixed amount of food while watching TV (*v. without watching TV*) resulted in additional eating later on the day, likely because focusing on the TV content impaired one's memory and vividness of the eating episode^(9,23,24) and less reduction in experienced satiety after distracted (*v. non-distracted*) eating⁽²⁵⁾. In line with these findings primarily stemming from research in laboratory contexts, it was expected that eating while watching TV would be positively associated with increased eating, reflected by more time spent on eating. Prior research indicates that the time spent on eating predicts energy intake^(20,26–28) as well as BMI⁽²⁹⁾. For instance, Pliner and colleagues⁽²⁶⁾ experimentally manipulated eating duration and found that a longer

(*v. shorter*) eating duration while being distracted increased food intake, most likely due to a prolonged opportunity to eat⁽⁵⁾. The following hypotheses were therefore proposed:

H1a

The average time spent on an eating occasion is longer when eating while watching TV compared with eating without watching TV or using other media.

H1b

The total time spent on eating is longer on days of concurrent TV viewing and eating compared with days of eating without TV viewing or using other media.

The role of exposure to food cues in TV content

In addition to the activity of TV viewing, the content of TV, *i.e.* exposure to food cues, has also been proposed as an important contributor to increased eating and subsequent weight gain^(5,7,30). Food is widely portrayed on TV, for example, in commercial blocks but also in other ways such as in culinary content^(31,32). Such palatable, but often unhealthy food cues on TV may function as external primes that trigger eating, even in the absence of physical hunger⁽³³⁾. Consistent with this, several experimental studies reported that watching food-related (*v. non-food-related*) TV content resulted in increased food intake^(8,10,34), although it should be noted that other research found no evidence for such an effect^(35–37) or reported mixed results within studies, often depending on individual differences^(38,39). In naturalistic settings, there has also been some evidence for a positive association between exposure to food cues on TV and increased eating^(40–42), but these studies assessed overall eating behaviour across the day. To our knowledge, no research in a naturalistic setting has investigated watching food-related TV content and concurrent eating, which would provide insight into the immediate relationship between exposure to food on TV and eating. Based on the discussed research, and consistent with the wider food cue reactivity literature showing that exposure to the sight of food triggers eating (for a review, see⁽⁴³⁾), it was expected that watching food-related (*i.e.* culinary) TV content would be positively associated with increased concurrent eating. Again, increased eating is operationalised as the time spent on eating, this follows from prior research showing that the time spent eating predicts energy intake^(20,26–28).

H2

A longer time is spent on concurrent TV viewing and eating when watching food-related TV content, compared with non-food related TV content, relative to the total viewing time of these content types.

Exploring the influence of demographic characteristics

Even though TV viewing may be associated with increased eating for many people, it has been suggested that some individuals may be more susceptible to environmental cues than others^(4,21,44). In this regard, demographic characteristics have been identified to potentially play an important role, yet the influence of these variables is underexplored^(4,44). The vast majority of research on (concurrent) TV viewing and eating has been conducted among young, highly educated and predominantly female samples, and thus, to date it remained to be studied whether similar results would be obtained for older, less educated and male samples. This is particularly important because a higher age and a lower educational level are (independently) associated with obesity^(45,46) which indicates that for some of these groups concurrent TV viewing and eating may be particularly harmful. To identify populations that may be more prone to (the influences of) concurrent TV viewing and eating, the present study explored the potential role of age, gender and educational level in concurrent TV viewing and eating through the following research question:

RQ2

To what extent do demographic characteristics (i.e. age, gender and educational level) influence the prevalence of concurrent TV viewing and eating (as proposed in RQ1) and the expected relationships between TV viewing and concurrent eating (as proposed in H1a, H1b and H2)?

Methods

Data collection and procedure

The study's protocol was preregistered on Open Science Framework (<https://osf.io/vp64a>). Secondary data analyses were conducted based on a time use survey (*Media: Time*) that aims to capture media use among people aged 13 years and older in the Netherlands⁽⁴⁷⁾. The data used for the present study were collected between 10 September and 24 October 2018 by research company GfK Market Research at the request of the Netherlands Institute for Social Research (SCP) and several audience measurement organisations in the Netherlands. Respondents were recruited via e-mail, telephone or mail (after providing their contact details in previous research on media use). They were first asked to complete a questionnaire assessing demographic characteristics and several other individual characteristics. Next, respondents were instructed to register all activities that they engaged in for at least 5 min in an online diary during seven consecutive days (the starting day was randomly assigned), either by completing the diary themselves or via a daily telephone call with an

Table 1 The distribution of demographic characteristics in the sample

| | <i>n</i> of respondents | % of total sample (<i>n</i> 2292) |
|--------------------------|-------------------------|------------------------------------|
| Age | | |
| 20–34 years old | 522 | 22.8 % |
| 35–49 years old | 672 | 29.3 % |
| 50–64 years old | 647 | 28.2 % |
| 65+ years old | 451 | 19.7 % |
| Gender | | |
| Male | 943 | 41.1 % |
| Female | 1349 | 58.9 % |
| Educational level | | |
| Low | 416 | 18.1 % |
| Middle | 683 | 29.8 % |
| High | 1177 | 51.4 % |
| Unknown | 16 | 0.7 % |

interviewer who filled in the diary for them. For every block of 10 min, respondents registered one general activity (e.g. sleeping, working, eating and drinking, household chores and personal care) and if applicable up to three media activities (e.g. TV viewing, reading a book and social media use), all according to pre-defined categories. Respondents who completed the study received a financial compensation of 30 euro.

Respondents

After excluding respondents whose diary did not meet basic requirements (see⁽⁴⁷⁾), the sample consisted of 2655 respondents. For the current study, non-adult respondents were excluded (i.e. respondents in the age group 13–19, *n* 150), as well as respondents who did not complete the survey on all 7 d (*n* 60) and respondents with extreme scores on the dependent variables (see Analyses section; *n* 153) This led to a final sample size of 2292 respondents (see Table 1 for the distribution of demographic characteristics in the sample).

Measures

(Concurrent) TV viewing and eating

TV viewing was operationalised as every 10-min block in which a respondent reported watching TV content. This could be TV content watched at the moment of broadcasting, TV content watched at another moment (e.g. a pre-recorded TV program) or watching other bought, streamed or downloaded content (e.g. via Netflix). Eating was operationalised as every 10-min block in which food and beverage intake was reported, which was defined as consuming meals and snacks, except for going out for food (e.g. in a restaurant). Concurrent TV viewing and eating were operationalised as every 10-min block in which both TV viewing and eating were reported. The total time in minutes spent on (concurrent) TV viewing and eating was computed as the number of blocks in which the activity was reported multiplied by 10 (i.e. the duration of a block in minutes). The time spent on a single eating occasion was



calculated as the number of consecutive blocks of eating multiplied by 10. The total number of occasions (i.e. frequency) of concurrent TV viewing and eating was also counted. For descriptive purposes, the frequencies of eating with other media activities, and without media use, were also computed.

Food-related TV content

For TV content watched at the moment of broadcasting, respondents were asked to specify the title of the content. Content was coded as food-related if the main focus was food and cooking, such as in cooking shows and competitions or documentaries about restaurants and chefs (i.e. culinary content). Content that (potentially) displayed food but not as the main topic (e.g. a sitcom that takes place in a cafeteria) was coded as non-food related, as well as content focusing on the production of food rather than its consumption (e.g. a documentary about vegetable farming). Two coders independently judged all unique content ($n = 922$), which resulted in good interrater reliability ($\kappa = .78$). Discrepancies were solved through discussion with a third coder. In total, 20 programmes were coded as food-related and 885 programmes were coded as non-food related. In addition, some content was coded as missing ($n = 17$) because the title was not correctly specified.

Demographic characteristics

Respondents' age (20–34, 35–49, 50–64, 65+; merged into groups for anonymization reasons), gender (male/female) and educational level were assessed. Educational level was categorised as low (i.e. no education, primary education, lower general secondary education or lower vocational education), middle (higher general secondary education or intermediate vocational education) and high (i.e. higher vocational education or university degree).

Additional variables

For descriptive purposes, the time of the day, day of the week and the location of the respondent were registered for every 10-min block. Respondents also reported the device on which they watched media content.

Analyses

The data were first checked on the assumptions for conducting parametric statistical tests. Because the time use data were heavily skewed due to extreme scores, values of -3 SD and $+3$ SD from the mean on the dependent variables were excluded to prevent the influence of these extreme scores. Next, descriptive statistics were calculated on the prevalence of concurrent TV viewing and eating (RQ1), followed by χ^2 tests and an independent-measures ANOVA to examine the influence of age, gender and education on the prevalence of concurrent TV viewing and eating (RQ2). Mixed-design ANOVA were then performed to test whether the average time spent on an eating occasion was longer while watching TV compared with without

media use (H1a), whether the total time spent on eating was longer on days of concurrent TV viewing and eating compared with days of eating without media use (H1b) and whether the percentage of TV viewing time that was spent on concurrent eating was higher for food-related TV content compared with non-food related TV content (H2). Each of these analyses used the independent variable (the type of eating occasion in H1a and H1b, the type of TV content in H2) as within-subject variable. Age, gender and educational level were included as between-subjects variables to explore the role of demographic characteristics (RQ2).

Results

Prevalence of concurrent TV viewing and eating

On average, respondents spent 171.76 min/d watching TV ($SD = 111.19$) and 71.07 min on eating ($SD = 30.96$; Table 2). Food was consumed in 4.1 % of the total TV viewing time. Furthermore, 12.1 % of all eating occasions were with the TV on, 26.9 % while engaging in other media activities (e.g. reading the newspaper, listening to radio and social media use) and 61.0 % of the eating occasions took place without media use.

More than half of the respondents (51.3 %) reported concurrent TV viewing and eating at least 1 time during the 7 d of filling in the diary. On average, these respondents engaged in this behaviour 3.35 times ($SD = 2.66$) for a total of 97.65 min ($SD = 79.49$) during this 7-d period, which is approximately 14 min/d. Concurrent TV viewing and eating occurred on all days of the week, but often during the evening (50.5 % of the time spent on concurrent TV viewing and eating was during the evening), while being at home (97.0 %), using the TV set as device (90.5 %; Table 3).

Next, it was examined whether the prevalence of concurrent TV viewing and eating differed based on demographic characteristics (RQ2). χ^2 tests showed no differences in the number of respondents who did (v. did not) report concurrent TV viewing and eating based on age, $\chi^2 (3, n = 2292) = 3.46, P = 0.325$, gender, $\chi^2 (1, n = 2292) = 0.94, P = 0.332$ or educational level, $\chi^2 (2, n = 2276) = 1.54, P = 0.464$ (Table 4). Furthermore, among respondents who did report concurrent TV viewing and eating at least once, an independent-measures ANOVA showed no differences in the amount of time (in minutes) spent on this behaviour based on age, $F_{3, 1158} = 1.24, P = 0.293$; gender, $F_{1, 1158} = 0.76, P = 0.385$ or educational level, $F_{2, 1158} = 0.12, P = 0.890$. Exploratory, non-preregistered analyses showed that a higher amount of time spent on concurrent TV viewing and eating was associated with a lower household income level, a lower number of household members and a lower average weekly working hours of the respondent (all P s < 0.001). Details regarding these analyses are available from the first author upon request.

Table 2 Descriptive statistics of the prevalence of TV viewing and (concurrent) eating for concurrent TV viewers and eaters and for non-concurrent TV viewers and eaters

| | Concurrent TV viewers and eaters (n = 1175) | SD | Non-concurrent TV viewers and eaters (n = 1117) | SD | Total sample (n = 2292) | SD |
|--------------------------------------|---|-------|---|--------|-------------------------|--------|
| TV viewing in min/d | 130.43 | 84.23 | 211.05 | 119.21 | 171.76 | 111.19 |
| Eating in min/d | 70.85 | 27.97 | 71.30 | 33.84 | 71.07 | 30.96 |
| % of total viewing time spent eating | 7.8 % | | 0 % | | 4.1 % | |
| % of eating occasions . . . : | | | | | | |
| While using TV | 23.3 % | | 0 % | | 12.1 % | |
| While using other media | 27.5 % | | 26.2 % | | 26.9 % | |
| While not using media | 49.2 % | | 73.8 % | | 61.0 % | |

Table 3 Concurrent TV viewing and eating: day of the week, time of the day, location and device

| | Time spent on concurrent TV viewing and eating in minutes, during the 7 d of the diary | | % of the total time spent on concurrent TV viewing and eating |
|----------------------------------|--|-------|---|
| | Mean | SD | |
| Total | 97.65 | 79.49 | 100 % |
| Day | | | |
| Weekdays (Monday – Friday) | 70.46 | 66.37 | 70.2 % |
| Weekend days (Saturday – Sunday) | 27.19 | 33.96 | 29.8 % |
| Time | | | |
| Morning (06:00–11:59) | 24.41 | 42.91 | 25.0 % |
| Afternoon (12:00–17:59) | 23.46 | 37.38 | 24.0 % |
| Evening (18:00–23:59) | 49.28 | 53.81 | 50.5 % |
| Night (00:00–05:59) | 0.50 | 5.49 | 0.5 % |
| Location | | | |
| At home | 94.69 | 79.09 | 97.0 % |
| At someone else's home | 1.62 | 9.61 | 1.6 % |
| Elsewhere | 1.34 | 8.66 | 1.4 % |
| Device | | | |
| TV set | 88.38 | 78.74 | 90.5 % |
| Pc/laptop | 4.61 | 24.22 | 4.7 % |
| Tablet | 2.72 | 16.83 | 2.8 % |
| Smartphone | 1.11 | 13.07 | 1.2 % |
| Other device | 0.70 | 6.26 | 0.7 % |
| Multiple devices | 0.13 | 2.20 | 0.1 % |

Results presented in this table are based on data of the respondents who reported concurrent TV viewing and eating at least once during the 7 d of the diary (51.3 % of the sample).

The activity of TV viewing and the time spent on (concurrent) eating

A mixed-design ANOVA was conducted to examine the average time (in minutes) spent on an eating occasion while watching TV *v.* without media use. Supporting H1a, it was found that the average duration of an eating occasion was significantly longer while watching TV (Mean = 34.38, SD = 16.35) compared with without media use (Mean = 33.30, SD = 14.04; Table 5), $F_{1, 1111} = 3.97$, $P = 0.047$, $\eta^2_p = 0.00$, although the effect size was very small. Investigating RQ2, no interactions were found with regard to age, $F_{3, 1111} = 0.51$, $P = 0.676$, gender,

$F_{1, 1111} = 0.98$, $P = 0.322$ or educational level, $F_{2, 1111} = 0.34$, $P = 0.714$.

Next, a mixed-design ANOVA was conducted on the daily total time (in minutes) spent on eating on days of concurrent TV viewing and eating *v.* days of eating without media use. In support of H1b, it was found that a significantly longer total time was spent on eating on days of concurrent TV viewing and eating (Mean = 78.24, SD = 36.00) compared with days of eating without media use (Mean = 63.37, SD = 31.75), $F_{1, 830} = 93.76$, $P < 0.001$, $\eta^2_p = 0.10$, with a medium effect size. Regarding RQ2, no interactions were found regarding age, $F_{3, 830} = 0.88$,



Table 4 Concurrent TV viewing and eating: demographic characteristics

| | % of sample that reported concurrent TV viewing and eating at least once | Time spent on concurrent TV viewing and eating in minutes among respondents who reported this behaviour at least once | | | |
|-------------------|--|---|-------|-----------|-------|
| | | Total (during the 7 d) | | Average/d | |
| | | Mean | SD | Mean | SD |
| Age | | | | | |
| 20–34 years old | 49.4 % | 96.34 | 82.20 | 13.76 | 11.74 |
| 35–49 years old | 49.4 % | 93.43 | 79.80 | 13.35 | 11.40 |
| 50–64 years old | 53.0 % | 97.02 | 76.63 | 13.86 | 10.95 |
| 65+ years old | 53.7 % | 106.16 | 80.71 | 15.17 | 11.53 |
| Gender | | | | | |
| Male | 50.1 % | 96.00 | 80.05 | 13.71 | 11.44 |
| Female | 52.1 % | 98.85 | 79.41 | 14.12 | 11.34 |
| Educational level | | | | | |
| Low | 53.6 % | 100.85 | 80.05 | 14.41 | 11.44 |
| Middle | 51.5 % | 98.52 | 80.60 | 14.07 | 11.51 |
| High | 50.1 % | 96.03 | 79.00 | 13.72 | 11.29 |

Table 5 Results of the hypotheses tests (means and SD's)

| | Main analyses | | Additional analyses | |
|---|---------------|------------|---------------------|----------------|
| | Mean | SD | Mean | SD |
| Time spent on average eating occasion (H1a) | | | | |
| TV | 34.38 | 16.35†,* | 34.15 | 16.06†,** |
| Other media | | | 33.45 | 14.66 |
| No media | 33.30 | 14.04 | 32.45 | 13.18 |
| Time spent on total (daily) eating (H1b) | | | | |
| TV | 78.24 | 36.00†,*** | 81.21 | 36.74†,***,‡,* |
| Other media | | | 75.86 | 33.42†,*** |
| No media | 63.37 | 31.75 | 63.33 | 32.23 |
| Percentage of TV viewing time spent on concurrent eating (H2) | | | | |
| Food-related TV content | 5.49 | 15.40 | | |
| Non-food-related TV content | 4.20 | 6.59 | | |

†Significantly different from no media.

‡Significantly different from other media.

* $P < 0.05$.

** $P < 0.01$.

*** $P < 0.001$.

The means and SD's differ slightly between the main analyses and the additional analyses, because the additional analyses only include respondents who engaged in all three activities (i.e. eating while watching TV, while using other media and while using no media).

$P = 0.450$, gender, $F_{1, 830} = 0.13$, $P = 0.723$ or educational level, $F_{2, 830} = 0.84$, $P = 0.431$.

Exploratory, non-preregistered analyses were conducted to investigate the possibility that the longer total time spent on eating on days of concurrent TV viewing and eating (*v.* days of eating without media use, H1b) was merely explained by differences in the amount of TV viewing between those days, instead of eating while watching TV per se. The analysis for H1b was therefore re-run in a subsample of respondents ($n = 161$) who showed an approximately similar total time spent on TV viewing on days of concurrent TV viewing and eating and on days of eating without media use (i.e. a maximum difference of 30 min, Mean = -00.04, SD = 1.83). With this subsample, similar results were obtained for H1b, $F_{1, 153} = 18.23$, $P < 0.001$, $\eta^2_p = 0.11$. It is therefore deemed implausible

that the amount of TV viewing in general accounted for the findings reported for H1b.

Additional analyses on other media activities

Additional analyses were conducted to explore whether these findings were specific for TV viewing, or also held true for media activities other than TV viewing (e.g. reading, social media use). To test this, the time spent on an eating occasion was compared for three types of activities: while watching TV, while engaging in other media activities and without using media. The overall test was significant, $F_{1.96, 1806.08} = 4.61$, $P = 0.011$, $\eta^2_p = 0.01$. Bonferroni-corrected post hoc tests showed that only the difference between TV *v.* no media was significant ($P = 0.007$, $M_{diff} = 1.79$, $SE = 0.59$; Table 5). There was no significant difference between other media *v.* no media ($P = 0.301$, $M_{diff} = 0.92$,

SE = 0.56), nor between TV *v.* other media ($P = 0.487$, $M_{\text{diff}} = 0.88$, SE = 0.63). Similar analyses were conducted for the total time spent on eating. The overall test was significant, $F_{1,98, 1128.05} = 47.07$, $P < 0.001$, $\eta^2_p = 0.08$. Bonferroni-corrected post hoc tests showed that all means were significantly different from each other. Compared with days of eating without media use, the total time spent on eating was longer on days of eating while using other media ($P < 0.001$, $M_{\text{diff}} = 12.58$, SE = 1.75), and even longer on days of eating while watching TV (compared with no media: $P < 0.001$, $M_{\text{diff}} = 17.39$, SE = 1.88; compared with other media: $P = 0.037$, $M_{\text{diff}} = 4.81$, SE = 1.92). Altogether, these additional findings show that even though eating while using media may generally be associated with an increased time spent eating, this is particularly the case for TV viewing.

Food-related TV content and concurrent eating

In total, 162 respondents (7.1%) reported watching food-related TV content at least once, and on average, these respondents watched such content for 90.62 min during the 7 d (SD = 97.97), or approximately 13 min/d. A mixed-design ANOVA on the percentage of TV viewing time that was spent on concurrent eating showed, in contrast to H2, no differences between food-related (Mean = 5.49, SD = 15.40) and non-food-related TV content (Mean = 4.20, SD = 6.59; Table 5), $F_{1, 151} = 0.59$, $P = 0.445$. Regarding RQ2, no interactions were found regarding age, $F_{3, 151} = 0.53$, $P = 0.664$, gender $F_{1, 151} = 0.13$, $P = 0.724$ or educational level, $F_{2, 151} = 0.95$, $P = 0.388$.

Discussion

The current study investigated concurrent TV viewing and eating in a naturalistic setting among a sample of the general population of adults in the Netherlands. Secondary data analyses were conducted of a 7-d time use survey to examine the prevalence of concurrent TV viewing and eating, as well two potential explanations for increased eating associated with TV viewing: the general activity of TV viewing and exposure to food on TV. Further, to gain insight into whom might be particularly susceptible to (the influences of) concurrent TV viewing and eating, the role of demographic characteristics was also explored. Results showed that eating while watching TV is relatively common. More than half of the respondents (51.3%) reported concurrent TV viewing and eating at least once – but on average 3.35 times – during the 7-d diary period. Furthermore, the amount of concurrent TV viewing and eating was not related to age, gender and educational level. To date, knowledge on the prevalence of concurrent TV viewing and eating was largely absent in the general population of adults. The current study provides evidence that TV viewing and eating frequently co-occur, irrespective of demographic characteristics. This suggests that eating while watching TV could indeed play a role in

explaining the association between TV viewing and increased eating^(1,12). Further findings from the current study emphasise this potential impact of eating while watching TV, as it was found that the average time spent on an eating occasion was longer when food was consumed in front of the TV than when food was consumed without using media. In addition, it appeared that this longer duration was not compensated for at another moment during the day, as the total time spent on eating was longer on days of concurrent TV viewing and eating compared with days of eating without simultaneously using media. Taken together with findings from prior research in laboratory settings and among student samples that reported increased energy intake resulting from concurrent TV viewing and eating^(9,13,23,24), and other research showing that the time spent eating predicts energy intake^(20,26–28), it seems likely that concurrent TV viewing and eating contribute to increased food consumption. It should be noted that the effect size for the time spent on an eating occasion was very small. In absolute terms, the average eating occasion took just more than 1 min longer while watching TV compared with without media use. However, when this occurs on a frequent basis – as shown by the data on the prevalence of concurrent TV viewing and eating – this could have a significant impact on overall eating behaviour, especially given the finding that eating in front of the TV does not appear to be compensated for but is rather associated with an overall increased time spent eating during the day. No differences were observed in the time spent on eating while watching food-related (i.e. culinary) compared with non-food-related TV content. This finding contrasts with the notion that exposure to food on TV may be an important explanation for increased eating associated with TV viewing^(5,7,40) and is further inconsistent with several experimental studies empirically supporting this notion^(8,10,34). Moreover, it was found that relatively few respondents (7.1% of the sample) watched culinary TV content. This may appear to indicate the small influence of exposure to food cues on TV, but on a daily basis people are likely also exposed to a range of other food cues on TV (e.g. in commercials or in movies). The joint impact of exposure to this variety of food cues on people's eating behaviour could therefore be stronger than the current study seems to suggest and should therefore be further investigated. However, it should also be noted that other studies did not find evidence for the influence of food-related TV content on eating behaviour either^(35–37,48). It is therefore also possible that exposure to food cues may not have a strong direct impact on (concurrent) eating. However, such (often unhealthy) food cues may still communicate norms about eating as form of entertainment rather than focusing on its nutritional value, which could subsequently impact one's overall diet^(5,31). The impact of this – and perhaps other – indirect influences is worth investigating.

Together, results from the present study suggest that associations between TV viewing and increased (concurrent) eating may be explained by the activity of TV viewing, and not



necessarily by exposure to food cues in TV content. A plausible explanation for these findings is distraction. Distracted eating, for example during TV viewing, reduces the availability of attentional resources for internal signals that normally regulate the end of the meal, such as satiety^(5,6,49). Instead, one may use external signals to a greater extent (e.g. the end of a TV show), which could explain the longer duration of an eating occasion in front of the TV relative to no use of media⁽²⁰⁾. Distraction may further explain an increased overall time spent on eating. Previous laboratory research found that eating with (*v.* without) the TV on resulted in an underestimation of the amount eaten, as well as in a less vividly experienced eating episode, and this subsequently resulted in a higher energy intake during a second eating session later on the day^(9,23,24). Distracted eating has also been found to result in smaller decreases in satiety compared with non-distracted eating, which may similarly contribute to increased eating later⁽²⁵⁾. The higher overall time spent on eating on days of concurrent TV viewing and eating (*v.* days of no concurrent TV viewing and eating) suggests that distraction could be a plausible explanation for the findings in the current study. Moreover, additional findings of the current study showed that eating while engaging in other media activities (e.g. reading, social media use) was also related to an increased time spent on eating, but not as much as TV viewing. This finding, also reported in previous experimental research^(19,50), is further in line with this explanation of distraction. TV content is often narrative-based, and narrative media content more easily facilitates transportation (the experience of immersion in another world) compared with other, non-narrative media content⁽⁵¹⁾. TV viewing may therefore be particularly distracting⁽⁵⁰⁾. Investigating differences in the distractive potential between other types of media activities (i.e. reading a newspaper *v.* checking social media updates) was beyond the scope of the present research but is worthy of future investigation. Although distraction seems a plausible explanation for the findings of the current study, other potential mechanisms may account for the relationship between TV viewing and increased (concurrent) eating as well, such as learned associations between these two behaviours resulting from repeatedly pairing TV viewing and eating in the past^(4,21) and a positive mood induced by TV viewing^(6,22). Future research should investigate to what extent the findings of the current study can be explained by distraction, and/or potential other mechanisms.

Limitations

Because the data were collected as part of a more general study on time use, the current study is limited with regard to some of the measurements. First, the measure of eating was limited to the duration of eating, and no information was obtained on the amount and type of food consumed. This limits the strength of the conclusions, because energy intake is ultimately most relevant in terms of implications for overweight and obesity, and a longer time spent on eating

does not necessarily reflect a higher energy intake. Although prior research indicates that more time spent on eating is related to increased energy intake^(20,26,27), this cannot be verified with the current data. In addition, only activities that lasted at least 5 min were reported, thus likely not all eating occasions (e.g. eating one cookie) were registered. More generally, the use of (partially) retrospective diaries could have caused some misreporting of behaviour. Future research should aim to measure food intake (and TV viewing) more precisely and in the moment, for example by using Ecological Momentary Assessment⁽⁵²⁾, to improve understanding of the potential impact of concurrent TV viewing and eating in relation to weight gain. Second, the assessment of exposure to food cues in TV content was limited to TV programmes related to food and cooking. However, food cues also appear in TV commercials, or more subtly in non-food-related TV content (e.g. in an episode of a sitcom that takes place in a restaurant). In future research, exposure to food on TV should be measured more precisely, by taking into account various types of food cues on TV. Third, although the current study explored the influence of individual differences in demographic variables (i.e. age, gender and educational level), other potentially important individual difference variables were not assessed. For instance, BMI and eating restraint (i.e. chronic dieting) have previously been found to influence eating behaviour in response to food cues in lab settings^(53,54). There is also evidence that the amount of attention allocated to TV content is positively associated with BMI⁽⁵⁵⁾, which suggests that if increased eating associated with TV viewing is a result of distraction, this might be particularly problematic for individuals with overweight. The influence of these and other potential individual differences could be further explored in future research. Even though the cross-sectional design is a strength of the current study as respondents were free to follow their natural behavioural patterns of TV viewing and eating, it may also be considered a limitation as no causal conclusions can be drawn. The use of within-subjects measures did allow to rule out some alternative explanations, for instance that individuals who frequently eat in front of the TV are more inclined towards living a less healthy lifestyle and therefore spend much time on eating⁽⁵⁶⁾. However, a third, intra-individual variable might still account for the associations between TV viewing and eating (e.g. variations in the amount of leisure time, eating alone *v.* with others). A suggestion for future research would be to adopt an intervention study (including a control group) aimed at reducing eating in front of the TV. Such a study could causally test the observed relationships in a naturalistic setting.

Conclusions

Concurrent TV viewing and eating were relatively commonly reported, and this behaviour was associated with a longer time spent on a single occasion of eating, as well as with a

longer total time spent on eating during the day. Watching food-related (i.e. culinary) TV content was not related to the time spent on concurrent eating. Extending prior research conducted in laboratory contexts, the current findings from a naturalistic setting suggest that eating while watching TV may contribute to increased immediate and overall food intake, possibly by drawing attention away from eating. The current study therefore provides further evidence that eating while watching TV is a relevant factor to take into account in the battle against obesity.

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