Universiteit Leiden

Faculteit der Sociale Wetenschappen

Does driving make you taste less and eat more?

Decreased perceived saltiness and overconsumption due to eating while driving

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Master thesis proposal Psychology, specialization Consumer and Economic Psychology
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Date: 12 juni 2019
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Abstract

A salt intake exceeding 6 grams a day can lead to various health problems, which makes it important to research which factors contribute to this intake. Studies have shown that individuals perceive less taste intensity and consume more under a high cognitive load. A common cognitive load is driving and due to today's busy schedules, people often multitask and eat while driving. This study therefore explored the effect of driving on perceived saltiness and on consumption afterwards. This study also researched the influence of restrained eating on the effect of driving on consumption afterwards. Participants ate chips in a driving simulator. Half of the participants were driving while the other half were not driving. Afterwards all participants were given the opportunity to eat the remainder of the chips. Restrained eating was measured with the Restrained Eating Scale. Our results demonstrated that participants under a high cognitive load (driving), in comparison to those under a low cognitive load (not driving), perceived the salty chips as less intense and consumed more afterwards. The results therefore suggest that a high cognitive load reduces perceived taste intensity and increases consumption afterwards. Restrained eating did not influence the effect of driving on consumption.

Keywords: cognitive load, taste perception, driving, consumption, restrained eating

Does Driving Make You Taste Less and Eat More?

The number of people with obesity in the Netherlands is 2.5 times as high as it was 35 years ago, making obesity an increasing national health problem (Volwassenen morbide obesitas, 2018). Obesity not only increases the risk of various health issues like heart disease and diabetes, but it also influences mental health and decreases life expectancy (Hoeymans, Melse & Schoemaker, 2010; Stunkard & Wadden, 1992; Tukker, Visscher & Picavet, 2009). Studies have found that salt and sugar lead to overconsumption (Bolhuis, Constanzo, Newman & Keast, 2015; Cox, Hendrie, Lease, Rebuli & Barnes, 2018), which could be a contributing factor to obesity. High salt and sugar intake have additional health risks like increased blood pressure, which can lead to both disability and death (Campbell, Lackland, Lui, Zhang, Nilsson & Niebylski, 2015; Nguyen, & Lustig, 2010). Therefore, the Dutch government tries to reduce the amount of salt and sugar in products produced in the Netherlands (Akkoord Verbetering Productsamenstelling, 2018). According to the 'Rijksinstituut voor Volksgezondheid en Milieu' these actions are not enough. People still consume 8.3 grams of salt and 112 grams of sugar daily where it should be 6.0 gram and 90 grams a day respectively, to reduce health risks (van der Staak, 2018).

Salt and sugar are ingredients that partially define the taste of a product and are therefore the primary motive for choosing a product (Sobal, Bisogni, Devine & Jastran, 2006). Besides being the primary motive, salt and sugar are high contributors to energy intake which contributes to overconsumption (Bolhuis, Constanzo, Newmand & Keast, 2015; Cox et al., 2018). A decrease in salt and sugar intake needs to be established. Therefore, it is not only necessary to reduce the amount of salt and sugar in products, but it is equally important to research factors that contribute to the increase of salt and sugar intake such as distraction.

Distracted eating

Van der Wal and van Dillen (2013) hypothesized that when individuals are under a high cognitive load, they perceive a less intense taste due to a limited attentional capacity. They conducted experiments regarding sourness, sweetness and saltiness. Van der Wal and van Dillen (2013) used solutions of grenadine syrup, different in intensity, to examine the effects of cognitive load on perceived sweetness. To induce a high cognitive load, they used a digit-span task. Van der Wal and van Dillen (2013) found that when being under high cognitive load all the syrup solutions were perceived as less intense. They examined perceived saltiness using crackers with salty butter (0.42 grams of salt per 100 gram) and crackers with salt-free butter (0.10 grams of salt per 100 gram). They found that participants perceived the salty buttered crackers as less intense under high cognitive load than under low cognitive load. Additionally, they found that participants in the high cognitive load condition ate more of the salty buttered crackers to get a reliable taste compared to the low cognitive condition (Van der Wal & van Dillen, 2013).

These findings are particularly interesting taking modern day society into account. Nowadays individuals are easily and often distracted by numerous factors. It is not uncommon that individuals engage in more activities during the day which often results in multitasking, like watching television while consuming a meal. This has consequences with regard to food intake. It has been found that children and adults who watch more television have a higher energy intake and consume more food (Blass, Anderson, Kirkorian, Pempek, Price & Koleini, 2006; Crespo, Smit, Troiano, Barlett & Anderson, 2001; Dubois, Farmer, Girard & Peterson, 2008; Moray, Brill & Mayoral, 2007). Besides consuming more food while watching television, Higgs & Woodward (2009) found that participants who ate lunch while watching television consumed more cookies later on the day than participants who ate lunch without watching television. Watching television is not the only factor that was found to influence eating behaviour. Listening to music was found to serve as a distraction that increased food consumption and loud music specifically was found to cause a less intense perceived taste (Spence & Shankar, 2010). Not only food consumption can be influenced by music. Stafford and Dodd (2013) found that the consumption rate and overall consumption of alcohol beverages increases when listening to music.

Boon, Stroebe, Schut and Ijntema (2002) researched the effect of distraction on eating behaviour in restrained female eaters compared to non-restrained female eaters. The participants listened to a radio conversation which served as the distraction. Boon et al. (2002) hypothesized that the restrained eaters would consume more in the distracted condition while the non-restrained eaters would not. Contrary to this hypothesis, they found that both the restrained eaters and the non-restrained eaters consumed more unhealthy food (ice cream) when being distracted. They also found that in the distracted condition, restrained eaters ate more of the unhealthy food compared to the non-restrained eaters. This finding is explained by the Ironic Processing Theory. This theory suggests that when having limited cognitive capacity and therefore less mental control, the opposite of the persons original goal occurs. The goal of restrained eaters is not eating (as much) and the distraction ironically leads to overeating (Boon et al., 2012).

Distracted driving

Individuals in modern day society have busy schedules and engage in many different activities. This can result in multitasking, made possible in part by current market trends and technological developments, like food delivery and increasing on-the-go options (Hirschberg, Rajko, Schumacher & Wrulich, 2016). Consuming meals shift from at home consumption to on-the-go consumption, as convenience driven consumers have less time (FoodShopper Monitor, 2018).

During the last 15 years, both the number of cars and the distance they cover have increased (Verkeersprestaties motorvoertuigen, 2018). With this increase of cars and the increase of on-the-go food services, the probability of individuals eating while driving likely increases as well. Multiple studies found eating while driving to have a negative influence on driving (Dingus, Guo, Lee, Antin, Perez, Buchanan-King & Hankey, 2016; Irwin, Monement & Desbrow, 2015; Young, Mahfoud, Walker, Jenkins & Stanton, 2008). The reverse question however has been rarely addressed, namely: can driving also have a negative influence on eating? Driving requires much attention and is considered to induce a high cognitive load. It is therefore interesting to examine what the consequences of eating while driving are on perceived taste and eating behaviour.

Current study

As mentioned before, in modern day society people have busy schedules and therefore often eat while engaging in other activities, like driving. Van der Wal and van Dillen (2013) take high cognitive load as an important factor with regards to perceived taste and overconsumption of food and thus, excessive salt and sugar intake.

The rational of this study therefore will be to investigate whether driving decreases the intensity of perceived salt and leads to overconsumption afterwards. It is hypothesized that individuals who eat salty food while driving, perceive less intense saltiness than individuals who eat while not driving. Due to experimental limitations, this study only focuses on perceived saltiness and not on perceived sweetness. Previous research has mainly reported effects of cognitive load on taste intensity (Liang, Jiang, Ding, Tang & Roy, 2018; van der Wal & van Dillen, 2013). In addition, Rolls and Grabenhorst (2008) found a different neurological reaction to taste intensity than to taste pleasantness. Taste intensity represents a primary and more objective experience of taste, whereas taste pleasantness represents an affective and more subjective experience of taste. This study will therefore primarily investigate the effects of driving on perceived taste intensity, a direct measurement of saltiness but will additionally explore its effects on more perceived conceptually broad aspects of taste quality.

It has also been hypothesized that, due to reduced taste intensity of the salty food, individuals who drive will consume more of the salty food afterwards compared to the individuals who do not drive. Boon et al. (2002) found that restrained eaters consumed more than non-restrained eaters when being distracted. Therefore, it is moreover hypothesized that those individuals more considered to be restrained eaters consume more than those less considered to be restrained eaters in the driving condition compared to the non-driving condition.

Method

Participants

The study sample consisted of 122 individuals, who were recruited at public spaces from the Leiden University. Individuals could only participate if they had a driver's license or were currently taking driving lessons. Their participation was compensated with either 1 SONA point (study credit) or a monetary incentive of €3,50. Due to unfulfilled questionnaires 3 participants were excluded from the study. The final number of participants was 119, consisting of 88 female and 31 male participants approximately equally distributed among the conditions. The mean age of the sample was 22.3 years old, *SD* = 4.98. Before conducting the data collection, the study was approved by the Ethical Committee of the Psychological Institute Leiden University.

Materials

Driving. To simulate the situation wherein individuals would eat while driving, a driving simulator was used. The driving simulator consisted of a chair, steering wheel, pedals and a 23-inch flat screen. A PlayStation 3 and the game Gran Turismo (Yamauchi, 2013) were used to simulate driving. The participants sat in a driving chair and it was explained how they could speed up, break and steer. The participants were asked to drive three laps on the Twin Ring Motegi course consisting of two straight sections, a large bend and 2 sharp bends. The participants were told that time was not of essence. The driving simulation was the same for all participants in the experimental condition. The set-up of the driving simulation can be found in Figure 1.

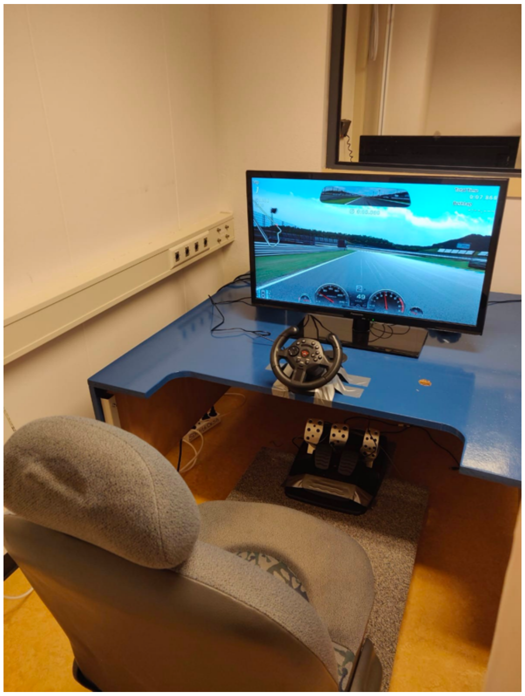

Figure 2. The set-up of the driving simulator used for both the experimental and the control condition. Participants drove (or viewed a recorded video of) 3 laps on the Twin Motegi Course as displayed.

Non-Driving. To create a similar situation as the driving condition wherein individuals would eat without driving, the same driving simulator was used (see Fig. 1) The participants in the control group acted as co-driver/passenger and did not drive themselves. Therefore, participants in the control group sat in the chair while a three-minute recorded video played, showing the same route that the participants drove in the experimental condition.

Restrained Eating. The Restrained Eating Scale (Polivy, Heran & Warsh, 1978) was used to measure the degree of restrained eating amongst the participants. The scale contained 10 questions regarding dieting, weight concerns and eating behaviour like 'Do you give too much time and thought to food?' and 'Do you have feelings of guilt after overeating?' One response regarding diet frequency was given on a scale rating from 0 (never) to 4 (always). Four responses regarding the participant's ideal weight and weight fluctuations were given in kilograms. Five responses were given on a scale rating from 0 (never/not at all) to 3 (always/very much/extremely) (see Appendix) (Polivy, Heran & Warsh, 1978). Therefore, the Restrained Eating scale got a minimum score of 0 and a maximum score of 35. The overall score was calculated by adding up the scores per question. The higher the overall score of the participant, the more this participant was considered to be a restrained eater.

Drivers experience. Five questions regarding the participants' drivers' licence and experience were added to the questionnaire, like 'How many years do you have your driver's licence?' and 'How often do you drive on average per week?'. These questions will not be considered in the analyses for this thesis.

Demographics. Demographic, multiple-choice questions involved age, gender and ethnicity.

Perceived Taste. In both the experimental and control condition participants consumed salty natural ribbed chips as part of a taste test. All participants got the same brand and same amount of weighted chips, namely 10 grams. Every 100 grams of natural ribbed chips contains 1.3 grams of salt. The chips were weighted and placed in the cup to control the amount of chips. The perceived taste was measured with the following questions: 'Rate how salty you found the chips.', 'Rate how sour you found the chips.', 'Rate how sweet you found the chips.', 'Rate what you thought of the quality.', 'Rate how crunchy you found the chips.' and 'Rate how tasty you found the chips.' Questions about perceived sourness and perceived sweetness were added to mask the purpose of the study and were placed second and third. The first question was regarding saltiness, which was the focus of the first hypothesis. The first three questions were followed with the questions regarding quality, crunchiness and tastiness, respectively. The rating scale ranged from 1 (not at all) to 7 (very much) (Elder & Krishna, 2009; van Dillen & van der Wal, 2013). The higher the score, the more intense and the more of quality the participant found the chips.

Stress. Four questions regarding stress were added to the questionnaire, like ‘How relaxed were you during the driving simulation?’ and ‘How rushed did you feel during the driving simulation?’. These questions will not be considered in the analyses for this thesis.

Consumption Afterwards. Chips were weighted (15 grams) and placed in a cup that was presented to the participants. Afterwards, the chips that were left in the cup were weighted. The amount of chips consumed afterwards was calculated by subtracting the weight of the chips left in the cup (X) from the original amount (15 grams) = 15 grams – X grams.

Procedure

Before engaging in the experiment, participants read a short description about the study and filled in an informed consent. Participants were randomly assigned to the experimental condition or the control condition.

The participants were told the research was about multitasking while driving. After providing the informed consent, participants were asked to fill in the first part of the questionnaire regarding restrained eating and driving experience on a laptop. Thereafter participants took place in the driver’s seat and instructions were given about the driving simulator. The participants were told they had to eat all the chips (10 grams) in the cup while driving or while watching the driving video. After the driving simulation or the driving video ended, the participants were moved to another seat and were asked to fill in the rest of the questionnaire regarding taste and stress. The participants were next told they had to wait for a few minutes, as the debriefing forms were not in the room (3 minutes, equal for all participants) and that they could eat the rest of the chips placed beside them if they'd like. After waiting, the participants got the debriefing form and left. Afterwards, the chips that were left in the cup were weighted and noted. The duration of the study was approximately 20 minutes.

Statistical Analyses

All statistical analyses were performed in IBM SPSS (*v*.24 and *v*.25; Heck, Thomas & Tabata, 2012). Cronbach's alpha using item-test correlations and alpha when item deleted were computed to test whether perceived intensity and perceived quality of the chips should be considered as one construct or as separate constructs. Two independent sample t-tests were performed (Field, 2013) to test the first hypothesis. One t-test was conducted primarily to see whether driving influenced perceived intensity, with perceived intensity as the outcome variable and condition as predictor variable. A similar t-test was conducted to find out whether driving influenced perceived quality, with perceived quality, the sum score of taste, quality and crunchiness, as the outcome variable and condition as predictor variable. A third independent sample t-test was performed (Field, 2013) to test the second hypothesis: whether driving influenced consumption afterwards, with consumption as the outcome variable and condition as the predictor variable. Finally, a full-factorial ANCOVA was used to test the third hypothesis to see whether restrained eating would influence the effect of driving on the amount of weighted chips consumed, with consumption as the outcome variable, driving as the predictor variable and restrained eating as the covariate. Values of $p < .05$ were considered significant. Because all hypotheses involved specific directions of effects based on previous findings, but to avoid excluding unpredicted results, both two-tailed and one-tailed tests were performed.

Results

Preliminary analysis

Six questions were used to measure taste perception. Cronbach's alpha was computed to see if these questions all measured the same construct. Cronbach's alpha, .65, would increase to .69 and to .74 when removing the items 'Rate how sour you found the chips.' and 'Rate how sweet you found the chips.', respectively. Cronbach's alpha would further increase to .78 after removing the item 'Rate how salty you found the chips.' This further confirms that our primary dependent variable saltiness should be considered separately. Therefore, perceived taste was split into two separate outcome measures: our focal variable 'perceived intensity' assessed with the item 'Rate how salty you found the chips.' and 'perceived quality', consisting of the sum score of the items regarding taste, quality and crunchiness. Both were interpreted as the higher the score, the more intense and the more of quality the participant found the chips.

Cronbach's alpha was also used to check the reliability of the Restrained Eating scale. The value of Cronbach's alpha, .73, which was good, would not increase further when items would be deleted. Therefore, all items were left in the scale and summed to form one score. The higher the score of the variable, the more the participant was considered to be a restrained eater.

The means and standard errors of all relevant measures as a function of condition can be found in Table 1.

Table 1.
Means and Standard Deviations of the variables Intensity, Tastiness, Consumption and Restrained Eating.

	Intensity	Tastiness	Consumption	Restrained Eating
Mean Driving	4.40	15.23	6.77	12.93
SE Driving	.16	.41	.79	.67
Mean Non-Driving	4.76	14.90	4.29	11.90
SE Non-Driving	.15	.42	.62	.62

Instructions were given to the participants to drive 3 laps on the Twin Montegi Course. Nevertheless, 7 participants drove more than 3 laps. Because there was no clear motivation to remove the 7 participants from the experimental condition, the number of laps will not be considered in the analyses for this thesis.

Main analysis

Taste perception

The variables intensity, tastiness and restrained eating showed little to moderate variability with a small to moderate standard error. As mentioned above, perceived taste was examined with two separate variables: perceived intensity and perceived quality. An independent sample t-test was performed to see whether driving would influence perceived saltiness. The assumptions of the independent t-test were checked. The t-test is robust against violations of normality and homoscedasticity when group sizes are equal and consist of over 15 participants per group (Field, 2013). In addition, independence was assumed, and no outliers were found.

On average, participants in the driving condition did perceive the chips as less salty (*M* = 4.40, *SE* = .16) than the participants in the non-driving condition (*M* = 4.76, *SE* = .15). The difference, -0.36, BCa 95% CI [-0.79, 0.07], was non-significant two-tailed $t(117) = -1.68$, $p = .096$, but significant when tested one-sided. The difference represented a small effect, $r = 0.16$. The confidence interval of the independent sample t-test on perceived intensity, BCa 95% CI [-.79, .07], was very narrow, suggesting that the results are very precise.

A second t-test was performed to test the more exploratory hypothesis: whether driving would influence perceived quality. The difference between the two groups, however, 0.34, BCa 95% CI [-0.82, 1.49], was non-significant $t(117) = 0.58$, $p = .566$, when tested two-tailed or one-tailed. This represented a small effect, $r = 0.05$. On average, participants in the driving condition perceived the chips as having a similar quality (*M* = 15.23, *SE* = .41) as those in the non-driving condition (*M* = 14.90, *SE* = .42).

Taken together these findings partly confirm and partly disconfirm our first hypothesis. When considering taste intensity, a small effect was observed in the expected direction, but no significant differences were observed when considering taste quality.

Consumption

An independent t-test was used to test whether participants in the driving condition consumed more of the chips afterwards than participants in the non-driving condition. The assumptions for the independent t-test were checked. The t-test is robust against violations of normality and homoscedasticity when group sizes are equal and consist of over 15 participants per group (Field, 2013). In addition, independence was assumed, and no outliers were found. On average, participants in the driving condition ate more chips afterwards (M = 6.77 grams, SE = .79), than participants in the non-driving condition (M = 4.29 grams, SE = .63). The difference, -2.48, BCa 95% CI [0.47, 4.48], was significant $t(117) = 2.45$, $p = .016$, both when tested two-tailed and one-tailed. This represented a small to moderate effect, $r = 0.22$. This finding confirms the second hypothesis.

Restrained eating

An ANCOVA was used to test whether restrained eating would serve as a covariate in the relationship between condition and consumption. The hypothesis stated that individuals more considered to be restrained eaters, consume more afterwards than individuals less considered to be restrained eaters in the driving condition compared to the non-driving condition. The assumptions for the ANCOVA were checked. The ANCOVA was robust for violations against normality and homoscedasticity as group sizes were equal and consisted over 15 participants per group (Field, 2013). In addition, independence and homogeneity of regression slopes were assumed, and no outliers were found.

Before conducting the ANCOVA, the scores from the Restrained Eating Scale were standardized. Additionally, an ANOVA was performed with restrained eating and condition as dependent variable and independent variable, respectively. There was a non-significant effect of condition on restrained eating, $F(1, 116) = 2.07$, $p = .153$, $\eta^2 = 0.02$. This suggests that restrained eating did not differ between the two conditions.

Results showed that the covariate, restrained eating, was non-significantly related to consumption, $F(1, 114) = 0.48$, $p = .490$, $\eta^2 = 0.00$, and did not interact with the condition, $F(1, 114) = 0.19$, $p = .664$, $\eta^2 = 0.00$, both when tested two-tailed and one-tailed. After correcting for the effect of restrained eating, the difference in consumption between conditions was moreover still significant, $F(1, 114) = 5.90$, $p = .017$, $\eta^2 = 0.05$. Separate linear regressions were performed and showed that there was a non-significant relationship between restrained eating and consumption within the experimental condition, $F(1, 58) = 0.80$, $p = .375$ and within the control condition, $F(1, 57) = 0.04$, $p = .843$. Taken together, the findings disconfirm the third hypothesis.

Discussion

The aim of the current study was to examine whether consuming while driving decreases perceived saltiness and leads to more consumption afterwards compared to non-driving. Results suggest that driving decreases perceived taste intensity but does not influence perceived taste quality. Results did confirm that individuals who drove, ate more salty chips afterwards than those who did not drive. This suggests that a high cognitive load decreases perceived saltiness and leads to overconsumption afterwards. Moreover, conform previous research, the study examined whether restrained eating influenced the effect of driving on consumption afterwards. Results suggest that the extent to which someone is considered to be a restrained eater does not influence the effect of driving on consumption afterwards.

The results showed that participants taste ratings could be distinguished between taste intensity and taste quality. Rolls & Grabenhorst (2008) suggest that this difference is due to the different nature of the two taste aspects. One reflecting a more objective experience regarding the physical properties (saltiness) and the other a more subjective experience (quality). Rolls and Grabenhorst (2008) took odour into consideration when asking and examining pleasantness, while the current study looked at tastiness, crunchiness and quality. Nevertheless, it is shown that perceived pleasantness is also determined by crunchiness which is shown to be positively related to perceived quality (Zampini & Spence, 2004).

As stated, results partly confirmed and partly disconfirmed the first hypothesis. This implies that driving, a high cognitive load, decreases perceived taste intensity but not influences perceived taste quality. Van der Wal and van Dillen (2013) showed that the intensity of saltiness (and also sweetness and sourness) was perceived as less intense under a high cognitive load compared to a low cognitive load. Liang, Jiang, Ding, Tang and Roy (2018), building upon the findings of van der Wal and van Dillen (2013), also showed that the higher the cognitive load, the lesser the taste sensitivity with regards to sweet and bitter food and further confirmed the findings that cognitive load reduces taste intensity perception. A potential explanation for the significant effect of driving on taste intensity but not on taste quality, is the difference in neurological processes between the two. Perceived quality of food is less linked to sensory experience and more linked to learning experience, associations, emotions and context (Rolls & Grabenhorst, 2008), which can be less influenced by a high cognitive load.

Results confirmed the second hypothesis which stated that individuals who drive consume more salty food afterwards, than individuals who do not drive. This finding corresponds to the finding of Higgs and Woodward (2009) who found that participants, who consume while being distracted, consume more afterwards than those who consume without being distracted. The finding also corresponds to the finding of Van der Wal and Van Dillen (2013) who showed that participants ate more salty crackers when placed under high cognitive load. There are two differences between the study of Higgs and Woodward (2009) and van der Wal and van Dillen (2013), and the current study. Higgs and Woodward (2009) used television time and van der Wal and van Dillen (2013) a digit-span task, whereas the current study used a driving simulator to induce cognitive load. This suggests that different types of distraction reduce the perception of taste intensity. Secondly, the current study only focussed on salty chips when measuring taste perception and consumption, while Higgs and Woodward (2009) focussed on sweet food and van der Wal and van Dillen (2013) focussed on sour, sweet and salty food. This shows that a reduction in taste intensity perception and overconsumption due to a high cognitive load is not limited to only one basic flavour.

As mentioned before, results disconfirmed the third hypothesis and thereby suggest that the extent to which someone is considered to be a restrained eater does not influence the effect of driving on consumption afterwards. The result does not conform to the findings of Boon et al. (2002) as they found that female restrained eaters, consumed even more than female non-restrained eaters while being distracted. Both the current study as the study of Boon et al. (2002) used the Restrained Eating Scale ranging from 0 to 35. However, the overall mean of the current sample, $M = 12.42$, $SE = .46$, markedly lower than the one observed in the research of Boon et al. (2002), $M = 15.40$, $SE = .40$. Ogden, Oikonomou and Alemany (2017) found that individuals more considered to be restrained eaters consumed more during a taste test later on that day when eating a cereal bar while walking (on-the-go) than those less considered to be restrained eaters. They used the Dutch Eating Behaviour Questionnaire ranging from 10 till 50 and the overall mean of the walking sample was 30.5, $SE = .20$. Therefore, a possible explanation for the current result can be that the current sample consisted of individuals who are too little considered to be restrained eaters. The Ironic Processing Theory suggests that the high cognitive load can ironically cause overconsumption among restrained eaters as their goal is not eating (as much) (Boon et al., 2012). The current sample did not show this effect as the participants might not have been as much restrained.

Limitations and future directions

The current study created a high cognitively demanding driving condition and compared this with a passive viewing control condition. Still, effects observed were small to medium-sized. This could be due to the simulation's particular characteristics. The driving condition represented an automatic car and not a stick shift car, which is mostly driven in the Netherlands and which adds cognitive load to the condition. In addition, the game used in the driving simulator represented a race track without real life traffic situations like pedestrians or passing cars. These encounters would also have added to the cognitive load. Also, participants in the non-driving condition observed the same race track route as participants in the driving condition. This in itself may have induced somewhat of a cognitive load, somewhat similar to watching television, which was used as the high cognitive load in the studies of Blass et al. (2006) and Dubois et al. (2008). These notions suggest that the high cognitive load used in the current study might have been less demanding as expected, which could explain the small to medium-sized effects found. Further research should explore whether a replication of the current study, with a more demanding driving simulation and a more passive control condition, would yield further evidence for driving decreasing the perceived intensity of salty food. Moreover, even though this study focussed solemnly on saltiness, it would be interesting to replicate the current study with sweet, sour and bitter foods, thus extending the findings of van der Wal and van Dillen (2013) and Liang et al. (2018) who found that individuals under a high cognitive load perceived sweetness, sourness and bitterness as less intense.

Additionally, the current study did not investigate whether a reduction in perceived taste intensity could be the underlying mechanism of consumption afterwards. The between-subject design of the current study made it difficult to examine associations between perceived taste intensity and consumption. To address this, future research could extend the findings in a within-subjects setting in which participants both engage in a high – and a low cognitive load driving simulation followed by a consumption assessment. This would give a better insight into the possible relationship between perceived taste intensity and overconsumption, and therefore the possible underlying mechanism of overconsumption when being under high cognitive load.

This study researched the difference between a high – and low cognitive load on consumption afterwards, as to disentangle its effects on taste perception and consumption. However, multiple studies showed that individuals who ate while being distracted consumed more than those who ate without being distracted (Dubois et al., 2008, Stafford & Dodd, 2013). Future research could extend these findings by conducting the current study but measure the amount of consumption during the conditions instead of afterwards. Given the importance of finding all kinds of factors that contribute to a higher salt intake and therefore to higher health risks, this could give additional insight into the influence of driving, a high cognitive load, on multiple aspects of eating behaviour; taste perception, direct consumption and consumption afterwards.

Finally, as mentioned, the current sample possibly consisted of individuals too little considered to be restrained eaters which likely yielded to little variation to examine its role in distracted consumption. Therefore, it would be interesting to see whether significant findings would be found when replicating the current study with a sample consisting of non-restrained eaters and clinical anorexic or binge-purging individuals. Based on the Ironic Processing Theory, a clinical sample of anorexic or binge-purging individuals, who show dietary restraints and have the goal to lose weight and/or not eat (that) much, would overeat when being distracted (DeJong, Oldershaw, Sternheim, Samarawickrema, Kenyon, Broadbent, Lavender, Startup, Tresure & Schmidt, 2013). Comparing a clinical sample of restrained eaters with non-restrained eaters could give a better insight into the influence of restrained eating on consumption afterwards.

Conclusion

As mentioned, the current daily salt intake is still 2.3 grams more than the recommended maximum daily intake of 6.0 grams (Van der Staak, 2018). Knowing that a high salt intake has various health risks like increased blood pressure and obesity, it is important to research which factors contribute to this too high salt intake (Cox et al., 2018; Campbell et al., 2015).

One activity most people engage in is driving and it has been documented that eating is a common distraction while driving (Dingus et al., 2016). However, this research is the first to examine the effect of driving on taste perception and eating behaviour. This research contributes to both consumer behaviour and taste perception literature as it showed that eating while driving reduces perceived taste intensity and that individuals consume more after eating while driving compared to not driving. The findings suggest that the extent to which someone is considered to be a restrained eater does not influence the effect of driving on consumption afterwards.

These results are highly relevant in modern day society, wherein people are extremely busy and therefore often eat while engaging in other activities, like driving. Therefore, it is good to keep in mind: driving makes you taste less and eat more!

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Appendix

Restrained Eating Habits Questionnaire

1. How often are you dieting? (Circle one)

Never	Rarely	Sometimes	Usually	Always	(Score 0-4)

2. What is the maximum amount of weight (in kilograms) you have ever lost within one month? (Circle one)

0-2	2-4	4-6	7-9	9+	(Score 0-4)

3. What is your maximum weight gain (in kilograms) within a week?

0-0.5	0.5-1	1-1.5	1.5-2	2+	(Score 0-4)

4. In a typical week, how much does your weight fluctuate (in kilograms)?

0-0.5	0.5-1	1-1.5	1.5-2	2+	(Score 0-4)

5. Would a weight fluctuation of 2 kilograms affect the way you live your life?

Not at all	Slightly	Moderately	Very much		(Score 0-3)

6. Do you eat sensibly in front of others and splurge alone?

Never	Rarely	Often	Always		(Score 0-3)

7. Do you give too much time and thought to food?

Never	Rarely	Often	Always		(Score 0-3)

8. Do you have feelings of guilt after overeating?

Never	Rarely	Often	Always		(Score 0-3)

9. How conscious are you of what you're eating?

Not at all	Slightly	Moderately	Extremely		(Score 0-3)

10. How many kilograms over your desired weight were you at your maximum weight?

0 -0.5	0.5-2	3-5	5-9	10+	(Score 0-4)