**Memory for meal satisfaction and subsequent food intake: pre-registered protocol**

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***Background***

One factor that could be important in explaining how much food a person eats are feelings of satisfaction. For example, one study found that satisfaction with a meal predicted 30% of the variance in consumption of that meal (Cardello, Schutz, Snow, & Lesher, 2000). Meal satisfaction has also been associated with reasons for stopping eating (Vad Andersen & Hyldig, 2015). Food satisfaction has been described as a ‘generalised appreciation of the food within some broader situational context’ (Cardello et al., 2000), and is therefore likely to be a multifaceted concept that reflects more than just satiety and hedonic liking for food. This makes food satisfaction difficult to measure and manipulate. Research investigating what contributes to satisfaction suggests that sensory experiences during consumption (liking of the taste and appearance of the food) and post-consumption factors (including product performance relative to expectations, reasons for ending intake, and fullness and hunger) both predict overall rated satisfaction with a meal (Vad Andersen & Hyldig, 2015). It seems then that food/meal satisfaction may be associated with consumption of that food/meal, but it is not known how memory for satisfaction with a meal influences subsequent food intake. For example, the amount of food a person eats may be influenced by how satisfying they remember earlier eating episodes to have been.

***Aims***

The current study aims to test the effect of remembered satisfaction on subsequent food intake by experimentally manipulating remembered satisfaction.

***Design and overview***

We will employ a between subjects design. Participants will be randomly allocated to a satisfying rehearsal, dissatisfying rehearsal, or neutral rehearsal condition during a lunchtime session. In a second session we will covertly observe energy consumption using a mock taste test involving biscuits. Participants will be told that they are taking part in two short studies, with one study looking at how personality relates to sensory evaluation of savoury foods (the lunchtime session), and the other looking at how personality relates to sensory evaluation of sweet foods (the second session).

***Sample***

Participants will be men and women aged between 18-60 years old, with fluent English, not taking medication that affects appetite, and no known history of food allergies or disordered eating. The effect of manipulating memory for satisfaction on later food intake has not been investigated before and so the effect size is unknown. We will therefore recruit 40 participants per condition (N = 120) which will power the study to detect a medium to large effect of experimental condition (80% power, *p* < .05). In order to account for having to exclude a small number of participants from analyses (e.g. extreme outliers on dependent variables) we will recruit up to 46 participants per cell (N = 138). Randomisation to condition will be stratified by gender to ensure an equal gender distribution across conditions.

***Test meal***

Participants will be asked to consume a fixed portion of 400 grams of ASDA tomato and basil pasta salad (suitable for vegetarians, ~600 kcal). Participants will be asked to eat their usual breakfast on the day of participation and abstain from eating 2 hours prior to the lunchtime session. During the second session participants will complete a taste-test consisting of three bowls of biscuits broken up to reduce portion monitoring (3 x 50g each of chocolate chip cookies, chocolate fingers and digestives; ~ 742 kcal). Participants will complete a series of taste-ratings to bolster the taste-test cover story (e.g. which cookie is crunchiest, sweetest, etc.) and be left alone for ten minutes. Biscuit consumption will be calculated by subtracting the post taste-test weight from the pre taste-test weight. Grams consumed will be converted to kilocalories and summed across the three biscuit types to produce our main dependent variable of interest (total snack intake in kcals).

***Memory manipulation***

After eating lunch participants will be asked to spend 6 minutes writing about either the satisfying or dissatisfying aspects of the meal, or a neutral aspect. In previous research writing about the enjoyable aspects of a meal successfully increased remembered enjoyment of the meal and increased intake of that food the next day (Robinson, Blissett, & Higgs, 2012). In this study participants will be asked to think about specific during-intake factors that have been identified as important to food satisfaction (Vad Andersen & Hyldig, 2015). In the satisfying rehearsal condition, the instructions will be as follows: ‘Please write down your thoughts on what you found satisfying about the meal you just ate. Consider the following things: what did you like about the taste/flavour, appearance, smell, texture and how the meal made you feel?’ For the dissatisfying condition, the instructions will read ‘Please write down your thoughts on what you found dissatisfying about the meal you just ate. Consider the following things: what did you dislike about the taste/flavour, appearance, smell, texture and how the meal made you feel?’ In the neutral rehearsal condition, participants will be asked to rehearse their journey to the university that day. Instructions to this group will be ‘Please describe your journey to campus today, providing as much detail as possible.’ This condition controls for effects of rehearsing a neutral non-food related recent experience.

***Measures***

In order to characterise our sample we will include measures of age and dietary habits (Three Factor Eating Questionnaire - TFEQ; Stunkard & Messick, 1985). We also include a 24-item personality questionnaire to bolster the cover story (Francis, Brown, & Philipchalk, 1992).

After the taste-test, we will ask participants the following questions on 100-point visual analogue scales (anchors: not at all, extremely).

*‘Overall, how satisfying did you find the lunchtime meal?’*

*‘Overall, how dissatisfying did you find the lunchtime meal?’*

*‘How satisfied were you with how filling the lunchtime meal was?’*

*‘How dissatisfied were you with how filling the lunchtime meal was?’*

*‘How satisfied were you with the taste of the lunchtime meal?’*

*‘How dissatisfied were you with the taste of the lunchtime meal?’*

*‘I liked the lunchtime meal’*

We expect these questions to measure the same construct (meal satisfaction) and hence be correlated. If this is the case, we will collapse across the items to form a single measure (after reverse coding the ‘dissatisfaction’ questions). These will act as a manipulation check to see whether remembered satisfaction significantly differs between the three conditions.

***Procedure***

After being screened for eligibility over email, participants will attend the lunchtime session (‘study 1’; at 11.50, 12.30, 1.10 or 1.50). Participants will first complete a medical history questionnaire to ensure they do not have any food-related allergies and a brief English language test to ensure they are fluent in English. Next they will complete the first 12 items from the personality questionnaire (in line with the cover story) and a set of 100-point visual analogue scales (anchors: ‘not at all’ to ‘extremely’) to measure hunger, fullness (e.g. ‘how hungry do you feel right now?’) and various mood dimensions. The mood questions will act as a further distraction from the real aims of the study. Next, the researcher will bring the fixed lunch and a glass of water. Participants will be told that they have 10 minutes to eat the meal. After the lunch, participants will be asked to complete the 6 minute memory manipulation task, followed by the appetite and mood ratings. At the end of this session participants will be asked to not consume any calorie containing food or drink between the two studies. Since this may suggest there is a link between the first and second sessions, we will explain to participants that we ask them not to eat/drink prior to the second study because it may affect taste perception, which will be measured in study 2.

When returning for the second session (‘study 2’) three hours from the start of their first session participants will first be asked to sign a second fake consent form. They will then complete the same appetite and mood rating scales as before, and then the last 12 items from the personality questionnaire. After this, they will complete the taste-test, followed by the same appetite and mood ratings again and the memory for satisfaction questions.

Participants will then complete the participant information questionnaire. This consists of: the 21 item TFEQ, demographic questions, record the last time they ate during the study day (to check compliance) and write down what they think the study hypotheses were, using a funnelled debrief in order to test for potential demand characteristics. Participants will then be weighed and measured in order to calculate BMI, before being debriefed, reimbursed and thanked for their time.

***Data collection***

Data collection will start on August 4th 2017 and completion date will be determined by rate of recruitment. Although we plan to complete data collection by the end of April 2017.

***Planned a-priori analyses***

Participants will be excluded from the main analyses if they did not comply with study instructions (e.g. ate between the two sessions, did not attend the second session, did not comply with instructions during the sessions).

***Ad-lib snack intake***

Differences between groups on biscuit intake will be assessed with one-way ANOVA (condition: satisfying rehearsal, dissatisfying rehearsal, neutral rehearsal). We predict a significant effect of condition, where biscuit intake is significantly less in the satisfying rehearsal condition compared to the dissatisfying and neutral rehearsal conditions.

***Hunger***

We will use a one-way ANOVA (condition: satisfying rehearsal, dissatisfying rehearsal, neutral rehearsal) to assess differences in hunger at each time-point across conditions.

***Memory for satisfaction***

Differences between groups on memory for satisfaction will be assessed with one-way ANOVA (condition: satisfying rehearsal, dissatisfying rehearsal, neutral rehearsal).

Where one-way ANOVA is the analysis approach, significant effects of condition will be broken down using LSD pairwise t-tests.

***Sensitivity analyses***

We will examine the effect of excluding the following participants on the results: biscuit consumption 2.5 SD away from the sample mean and participants who guessed the exact aims of the study. Participants will be coded (independently by two researchers) as having guessed the study hypotheses if they report that we expected writing about the satisfying (or dissatisfying) aspects of the lunchtime meal to result in them eating less (or more) of the biscuits in the afternoon session. Any disagreements between researchers will be resolved through discussion.

We will not conduct any formal tests of baseline group differences (since this is generally not recommended, see de Boer, Waterlander, Kuijper, Steenhuis, & Twisk, 2015). Therefore, as part of the sensitivity analyses we will examine the effect on the results of including factors as covariates that we believe may predict the primary outcome measure (biscuit intake). Specifically, we will include BMI, dietary restraint and uncontrolled eating as covariates. Doing this can improve the precision of the estimate of effect even when groups do not differ on these characteristics (de Boer et al., 2015).

**References**

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