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PSYCH5038 – Research Project

Motivation, Experience, and Reward in the Simulation of Eating: Insights from Mixed Methods Investigation

2018-19

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Abstract

This study intended to further inform the Grounded Cognition account of food conceptualisation, through investigating how eating simulations are experienced within participants, and eating simulations are influenced by prior experiences with and motivation towards consuming different foods. This was investigated through a mixed methods study utilising an explanatory sequential design. In the quantitative portion of the experiment, 74 participants completed a feature listing task, in which they were asked to list up to 5 features "typically true" of healthy and unhealthy foods, in order to access how participants conceptually represent different forms of food. As hypothesised, unhealthy foods elicited a larger concentration of eating simulation features compared to healthy foods (20.54% vs 28.20%). Dieting motivation was assessed through the Three factor Eating Questionnaire – Restraint 18, which contains the dimensions of cognitive restraint, emotional eating and uncontrolled eating (FLVS, 2004). Only cognitive restraint was found to predict eating simulation feature production, lowering eating simulation as cognitive restraint increases, as hypothesised. Civil Service measures of socio-economic level were included as predictors of eating simulation feature production (Civil Service, 2018). Of the 5 measures included, only guardian qualification and guardian occupation were found to have an effect on simulation feature production, though in the opposite direction than hypothesised. Interviews were conducted in order to further explain the findings generated in the quantitative portion of the experiment. Following a Theoretical Thematic Analysis approach, the themes "Simulation reflects past experience", "Simuation of reward and action information induces craving", and "Eating simulations make sticking to diet goals difficult" emerged, which proved instrumental in explaining the quantitative findings.

Food provides the nutritional energy humans need to survive. However, food is more to people than just the source of their energy. People can eat in the absence of hunger, can eat food they know is detrimental to their health, and can continue to eat well beyond the satiation of hunger (Lowe & Butryn, 2007., Hollands et al, 2007). Moreover, people can find their consumption of food difficult to control. When dietary restraints are put in place, people can often fail to stick to them, often giving in to the temptation of particularly rewarding foods to the detriment of their health (Meule, Westenhofer, & Kubler, 2011). Motivations behind eating behaviour can be varied, and subject to a variety of factors beyond physiological, which suggests eating and food are represented as more than nutrition and energy intake (Buchanan, Sheffield, & Tan, 2019). To understand a behaviour, it is necessary to understand how that behaviour is conceptually represented, as conceptual representations form mental models of behaviour that both influence and are influenced by the practice of that behaviour in the world (Keijzer, 2001). Understanding the motivations and conceptualisation behind eating behaviour is important in ensuring people have control over their own health, as obesity is increasingly being identified as a global health concern (Centers for Disease Control and Prevention, 2015).

Previous research has attempted to explain the way in which food is conceptually stored in the brain through Grounded Cognition theory (Papies, Best, Gelibter, & Barsalou, 2017., Papies, 2013, Keesman et al, 2016). Grounded Cognition explains stimuli are represented mentally through "situated" conceptualisations, which contain information about the concept from a variety of different modalities (Barsalou, 1999., 2003, 2008). As a situation is experienced, elements of the situation are processed by different neural systems operating in parallel, which are then integrated into a global picture of the situation (Papies, Best, Gelibter & Barsalou, 2017). A situated conceptualisation is essentially a stored pattern of neural activation, and as they are constructed, form associative mechanisms in long term memory, which allows them to be re-activated when an element previously encoded as part of a situated conceptualisation is re-encountered (Barsalou, 2016). This aids the interpretation of the current situation, through projecting information being currently experienced onto stored situated conceptualisations with similar conceptual and perceptual content, which allows a novel concept or situation to be categorised through stored models

based on previous experience (Clark, 2013). For example, a bicycle may be represented in the mind through a series of stored situated conceptualisations which encode details such as how a bicycle might look, the viewpoint experienced while riding one, as well as action information such as how the handlebars might feel, or feelings experienced when riding one. When elements of the external situation are consistent with internal representations, such as when a bicycle is detected in vision, related situated conceptualisations are activated which assist in recognising an object as a bike, predicting what interaction with that bike may be like, and facilitating actions related to riding a bike (Barsalou, 2009)

Situated conceptualisations represent sensory and experiential information through partially re-enacting the pattern of neural activation experienced when interacting with a stimulus, essentially simulating "Being there" with that stimulus in order to represent it conceptually (Kiefer & Barsalou, 2013). When a specific situation occurs repeatedly over time, situated conceptualisations produced from it are integrated, forming a mental "exemplar" of a situation (Nosofsky, 2011). For example, encountering a cue relating to coffee activates simulations of consuming it, simulating information about how it may taste and smell, or the contexts a coffee is normally consumed in. These simulations vary from skeletal to vivid in their level of detail, and are experienced as mental imagery when experienced consciously (Barsalou, 2009). Simulations also facilitate interaction with a stimulus through producing cognitions, bodily states, and actions normally experienced when experiencing the stimulus (Barsalou, 1999, 2003). For example, Chao & Martin (2000) found that simply viewing an image of a hammer was enough to activate neural activity in areas associated with grasping with the dominant hand, suggesting simulation of motor action.

Situated conceptualisations and simulations also assist in prediction and inferencing. Perception of something familiar in the environment or the mind activates situated conceptualisations related to it, which then simulate the situation where that element might appear. While this neural pattern is simulated, pattern completion inferences use components of the pattern activated, but not currently being perceived, to form predictions

about what is likely to occur, as well as actions likely to be needed, and introspections likely to be experienced (Clark, 2013). Simulations occur in the same network used when perceiving a stimuli, performing actions on it, and related affective and semantic information, and so simulations of experience can be compared to what is currently being experienced, allowing related situated conceptualisations adjusted accordingly when discrepancies are detected (Barsalou, 1999, 2003). Grounded Cognition Theory provides a natural account of how conceptualisation of categories and objects vary both between individuals and within the same individual over time, and consequently how predictions related to a stimuli vary between and within individuals (Yeh & Barsalou, 2006).

Upon encountering an appetitive cue, situated conceptualisations use pattern completion inferences to simulate the reward information associated with that food, and simulate experience with that food in order to facilitate interacting with it, which can be seen by the visual attention, salivation, approach responses and positive affect generated in participants when exposed to food cues (Papies et al, 2017., Keesman et al, 2016., Missbach, Florack, & Konig, 2015). This has been supported by neuroimaging evidence, finding that a core eating network of areas in the brain was activated in response to either image or word cues of attractive foods, which included areas associated with gustatory and reward processing , the same areas activated during actual food consumption (Chen, Papies & Barsalou, 2016., Kay, Fudge & Paulus, 2009). The simulation response to food stimuli is more than a simple stimulus-response link as in classical conditioning, and the extent and nature of this response is mediated by a range of factors (Keesman et al, 2016., Papies, 2013). Participants report higher intentions to consume a food when a food cue is made to be consistent with their typical experience of that food, such as when a yogurt us presented with a spoon on the side of their dominant hand (Elder & Krishna, 2012). Foods found to be tempting produce greater salivation than foods found to be untempting, and sour food cues produce the most salivation (Keesman et al, 2016). Feature listing tasks have also found that desire to eat a food correlated with the amount of simulation related features listed for each food, as sensory reward is a more salient feature of a situated conceptualisation for tempting foods, allowing them to be more easily simulated in response to cues (Papies, 2013., 2017, Goldstone et al, 2009). Mental imagery of eating scenarios has been suggested to mediate

the relationship between exposure to food cues and food craving, defined as a strong motivation to seek out and consume specific foods (Harvey, Kemps, & Tiggeman, 2005., Papies, 2013., Papies, Barsalou & Custers, 2012). This suggests that appetitive cues induce mental simulation of food consumption, which then works to produce motivation to consume certain foods through the generation of reward information brought about through pattern completion inferencing.

Given that situated conceptualisations are the result of previous experiences with a food, someone who practices dietary restraint would likely generate different pattern completion inferences than non-dieters in response to an unhealthy food cue, which may include the inhibition of taste, and may experience the activation of situated conceptualisations related to dieting goals and eating restraint (Papies, 2016., Papies et al, 2017). Papies (2013) found that the percentage of eating simulation features listed for tempting foods was negatively correlated with chronic dieting, and suggested that this is due to the incompatibility of the goals of eating this food and maintaining their dieting goals leading to a suppression of food simulation. Neuroimaging has found that dieters and anorexics show activation in areas associated with conflict monitoring, exerting cognitive control, and representing body image in response to food cues (Sanders et al, 2015). However, research evaluating the responses of restrained and unrestrained eaters to food cues suggests the relationship may be more complicated that restrained eaters possessing an ability to "switch off" their thoughts about food (Herman & Polivy, 2017). Compared to unrestrained eaters, restrained eaters show stronger responses to food cues, such as stronger automatic liking responses, increased involuntary memories about food and food related situations, and will eat more candy bars than unrestrained eaters after watching a 30 minute video about food (Veenstra & DeJong, 2010., Van Koningsbruggen, Stroebe, & aarts, 2012., Shimizu & Wansink, 2011).

Individual differences in food conceptualisation are likely to extend past dieting goals. Since situated conceptualisations are the results of our experience with stimuli, growing up in different backgrounds likely results in different situated conceptualisations about foods (Barsalou, 2009). Socio-economic scale factors have been identified as strong predictors of

obesity, with those from lower socio-economic levels consuming more unhealthy foods (Darmon & Drenowski, 2008). When investigating the psychological processes underlying the link between lower socioeconomic status and obesity, Best & Papies (2019) found that participants from more deprived areas intended to consume larger portions of unhealthy food compared to the general population, and attributed this difference to the normalisation of consuming fast food in more deprived communities. If growing up in a context saturated by fast food restaurants results in different eating behaviour towards unhealthy food, it is possible that this is the result of differences in the way people simulate eating unhealthy foods. Simulation of foods play an important role in motivating consumption of those foods, and to understand eating behaviour, it is important to understand how exactly situated conceptualisations of food are impacted by an individual's background (Papies & Barsalou, 2015).

There is a wealth of evidence that eating simulations are important to the conceptualisation of food and their relationship to eating behaviour. Previously, the existence and function of simulations in cognition and behaviour towards food has been demonstrated through primarily quantitative methods (Papies, 2013., Keesman et al, 2016., Shen, Zang, & Krishna, 2016). In one of the first studies to apply Grounded Cognition theory to food, Papies (2013) investigated eating simulation through showing participants word prompts relating to food, with 4 unhealthy/tempting foods (such as ice cream) and 4 neutral/healthy foods (such as cucumber) and asked participants to list 5 features typically true of that food. They found that for the tempting foods, 53% of features listed were related to simulating the experience of eating that food, alluding to the taste, texture, and temperature of the food, the situation in which the food is eaten, or hedonic features of the food, which was only found in 26% of the features listed for the more neutral foods. This finding has been replicated in similar feature listing tasks, suggesting it has efficacy in investigating the presence of simulation in conceptual representation (Keesman et al, 2017, Papies et al, 2017). While the magnitude of the difference between conditions appears to be large in the Papies (2013) study, the finding was obtained from a small sample of 33 participants, with a mean age of 21, and all undergraduates at Utrecht University. Since situated

conceptualisations are highly individualised and based on experience, it is worth investigating generalisability of this finding to a larger sample of a different national context.

Papies (2013) found a small negative correlation between eating restraint and the production of eating simulation. This study's measure of eating restraint, Herman and Polivy's Restraint scale (1980), has been criticised for unknowingly measuring two separate constructs as general restraint. (Blanchard, 1983., Stice et al, 1999). Given the relationship between diet goals and food conceptualisation seems to be unclear, with restrained eaters showing enhanced response to food cues above unrestrained, a multi-dimensional measure of eating restraint may be more useful in further informing how food conceptualisation and dieting behaviour interact (Herman & Polivy, 2017). One measure that may be more appropriate is the Three Factor Eating Questionnaire – Restraint (TFEQ-R), which has been suggested to be more representative of successful dieting restraint through conceptualising it as the independent factors of cognitive restraint, emotional eating, and uncontrolled eating. The Three Factor Eating Questionnaire – Restraint has proven reliable in distinguishing between the eating patterns in the general population (Laessle, Tuschl, Kotthaus, & Prike, 1989., Angle et al, 2009., FLVS, 2004).

While socioeconomic factors have been linked to differences in the way participants view portion size of meals, its potential role in influencing the formation of conceptualisations of food and eating has yet to be directly investigated in the context of eating simulations (Best & Papies, 2019). In the current research, socio-economic influences will be investigated through recording the type of school participants attended, qualifications of guardians, occupation of main income earner, eligibility for free school meals, and a self report of social class, factors found to be reliable indicators of socio-economic class by the Her Majesty's Home Civil Service (Dowden & Heywood, 2018). This should further inform the Grounded Cognition account of food conceptualisation through investigating how factors relating to a participant's background influence their situated conceptualisations of food.

Quantitative based investigations into simulation in food conceptualisation have proven fruitful, but questions remain as to how exactly these simulations occur within individuals. Simulations have been suggested to occur outside of conscious awareness, only sometimes reaching consciousness in the form of mental imagery, though it is currently unclear what factors determine whether a simulation is experienced consciously or unconsciously, or what factors influence the content of these simulations (Barsalou, 2009). It is important to gain understanding of how these simulations are experienced with individuals, as conscious mental imagery food has been suggested to have a variety of effects on eating behaviour, such as an influence on craving, and even reduced food consumption when simulations are repeated to the point of habituation (Missbach, Florack, & Konig, 2015). Papies (2013) found that more simulation features were listed for unhealthy foods over healthy, which correlated with participant's tastiness ratings of the food. While this could be indicative of a qualitative difference in the way these simulations are experienced, research has yet to investigate the Grounded Cognition account of food representation through qualitative methods. Through thematic analysis of 5 focus group discussions, one previous qualitative study helped to identified a wide range of factors determining eating behaviour in university students (Deliens, Clarys, De Bourdeaudhuij, & Deforche, 2014). Qualitative research has also added to the understanding of diet failure through semi structured interviews, highlighting the difficulty of maintaining restrained eating in a world with an omnipresence of tempting fast food outlets and advertising, the role of food as a source of comfort, and the internal battle between multiple "selves" when facing unhealthy food temptation (Green, Larkin, & Sullivan, 2009). Given its past efficacy in uncovering the complex influences on individual eating behaviour, qualitative research could provide a useful avenue for further informing the Grounded Cognition account of eating conceptualisation and behaviour, and how constructs central to it are experienced within an individual.

The influence of simulation on a variety of consuming behaviours is well established, and research into food conceptualisation has suggested that interventions designed to target the simulation process may be an effective strategy to allow individuals greater control over their food intake, and subsequently, their health (Missbach et al, 2015., Papies, 2017., Hagger, Lonsdale, Chatzisarantis, 2011). A mixed methods approach utilising an explanatory

sequential design may be invaluable in ensuring these measures are properly informed, through investigating how exactly eating simulations are experienced within the individual (RQ1), and how they are impacted by an individual's prior experience and motivations (RQ2) (Bryman, 2016). Utilising the feature listing methodology employed in previous research combined with measures of cognitive restraint, uncontrolled eating, and emotional eating provided by the TEFQ-R should allow for detailed analysis of how different facets of eating restraint affect the production of eating simulation related features in response to both unhealthy and healthy food prompts. Based on previous findings, it is hypothesised that unhealthy food prompts will produce a higher percentage of eating simulation related features than healthy food prompts (H1)(Papies, 2013). Given the varied nature of the influence of eating restraint on response to food cues, a two-way hypothesis has been adopted, predicting that eating restraint should have an affect on the amount of eating simulation related features produced in response to healthy and unhealthy food prompts (H2). Measures of socio-economic level should allow for analysis of how the simulation of unhealthy and healthy foods vary according to participant background, allowing us to investigate whether participants from a lower socio-economic position experience greater simulation for unhealthy foods than those from a higher socio-economic position (H3). The qualitative data gathered through semi-structured interviews should be instrumental in explaining how these factors influence a participant's experience of eating simulations.

Method

Participants

Overall, 90 participants took part in the online study, which was reduced to 74 participants once incomplete responses were removed. 27.02% were male, 71.62% were female, and 1.35% preferred not to give a gender. The participants were aged 18-70, with a mean age of 29.19. The sample was composed of 20 different nationalities, 89% of which identified as either British or Scottish. This sample was sufficient, as G*power analysis indicated a sample of 70 participants when set to one-tailed, with an effect size of 0.4, an alpha error

probability set at 0.5, and power level set at 95%. 35 participants indicated interest in taking part in an interview, and 4 male and 4 female participants were selected via Research Randomizer (Urbaniak & Plous, 2013).

Design

Quantitative methods

This study made use of a mixed methods design, with the first part of the experiment using a repeated measures feature listing task, adapted from that used by Papies (2013). The level of healthiness of the foods was manipulated, with the dependent variable being the percentage of eating simulation related features out of the total features the participants listed in response to the food words. Measures of cognitive restraint, emotional eating, and uncontrolled eating afforded by the Three Factor Eating Questionnaire – Restraint 18 were included as interval predictor variables in order to see how participant motivation affects the production of eating simulation related features in response to unhealthy and healthy food prompts. Questions developed by the Civil Service to measure socio-economic class were included as ordinal predictor variables, investigating type of school attended, qualifications of guardians, job of main income earner, eligibility for free school meals, and a subjective self-assessment of social class were included (Dowden & Heywood, 2018).

Qualitative methods

The second part of the study attempted to gain more detail on how individuals experience simulation and their relationship with eating behaviour through a series of qualitative, semi-structured interviews (See appendix A for interview guide).

Materials

<u>Quantitative methods</u>

The feature listing part of the study was created using Experimentum, a website designed in The University of Glasgow for administering experiments online. The first part of the survey contained questions relating to participant demographic information, including their age, gender, and nationality. Socio-economic measures were included investigating type of school attended, qualifications of guardians, household income earner occupation, eligibility for free school meals, and a subjective self-assessment of social class were included (Civil Service, 2018). The feature listing task used materials adapted from Papies (2013) to include foods relevant to a UK context. During the feature listing task, participants were asked to list properties "typically true" of each object. Participants were asked to list at least 5 features, but they were informed there was space for up to 15. Chips, chocolate, crisps, pizza, and biscuits were included as the unhealthy/tempting foods. The healthy/tempting foods were rice, carrots, banana, bread, and salad. The unhealthy/tempting and healthy/untempting distinction came from Papies (2013), distinguished on the basis of calorie content, nutritional value, and sugar and salt content. 10 distractor items were included to disguise the purpose of the study.

The online portion of the study also included the Three-Factor Eating Questionaire-R18 developed by the Fleurbaix Laventie Ville Sante study group, which contained measures of eating restraint, uncontrolled eating, and emotional eating (FLVS, 2004). This questionnaire asked participants to rate their agreement with 18 statements, such as "When I feel blue, I often overeat" on a 4 point scale ranging from "Definitely true" to "Definitely false". The cognitive restraint scale was composed of items 2, 11, 12, 15, 16, and 18, The uncontrolled eating scale consisted of items 1, 4, 5, 7, 8, 9, 13, 14, 17, and emotional eating consisted of items 3, 6, and 10. Cronbach's alpha calculations found the emotional eating scale to be reliable, with an alpha of 0.84. The cognitive restraint scale and uncontrolled eating scale were found to be unreliable, with cronbach's alpha = 0.79 for cognitive restraint, and 0.84 for uncontrolled eating. Participant scores for each dimension were computed, first by summing their responses together into raw scores for each dimension. These raw scores

were then transformed into a 0-100 scale ((Raw score – lowest possible raw score)/possible raw score range) x 100).

The effect of socioeconomic background on simulation feature production was assessed through 5 ordinal predictors. Guardian qualification contained 7 levels, from "at least one degree level qualification" to "No formal education". Occupation of main income earner was represented through the National Statistics Socio-economic Classification, an 8 level scale ranging from "higher managerial occupations" to "Long term unemployed". Eligibility for free school meals contained 5 levels: "Yes", "No", "Not applicable", "Don't know" and "Prefer not to say". Type of school attended contained 8 levels: "State-run or state-funded school - selective on academic, faith or other grounds", "State-run or state-funded school - non-selective", "Independent or fee-paying school – bursary", "Independent or fee-paying school - no bursary", "Attended school outside the UK", "Don't know", "Prefer not to say", and "Other". Subjective assessment of social class was measured through response to the statement "Compared to people in general, would you describe yourself as coming from a lower socio-economic background?", which contained the fixed responses of "Yes", "No", "Don't know" and "Prefer not to say".

Qualitative methods

A semi-structured interview guide based on the Grounded Cognition account of desire was developed by the researcher (Appendix A). This included an intro which explained the purpose of the research, emphasised that answers could not be "right" or "wrong", as well as emphasising the right to withdraw without having to give a reason. The opening section included a question asking participants what they last ate and when they ate it, as well as questions about foods they generally like and dislike. A list of the ten foods included in the experimental task was included in the opening section, of which participants were asked to indicate which one they would like to eat the most right now, and which one they would like to eat the least right now. The first section included questions relating to the participant's preferred food, with questions assessing the reporting of simulations (e.g "Can you name

me some features typically true of this food?"), their experiences with that food ("How often do you eat this food?"), and questions relating to their motivation to eat that food ("Do you ever find this food difficult to resist eating or stop yourself eating?"). The second section asked these same questions about the food they least preferred.The third section of the interview included questions assessing participant eating restraint, with questions about the rules they place on their eating behaviour, and strategies they use to stick to these rules ("Do you ever find yourself failing to stick to eating goals you've set?"). The closing section of the interview, contained questions asking if participants had anything else to add or anything they wanted to ask the researcher, and a question asking again if they consented to their interview transcript being used for the write up of the study.

Procedure

<u>Quantitative methods</u>

Upon clicking the link to the online study, participants were presented with an information sheet and a consent form. Participants then completed the demographic questions, and were then asked to ensure they have no distractions during the task, as well as not to eat after beginning the experiment. Before beginning the feature listing task, participants were introduced to the format of the experiment with an example of a prompt ("Stone"), and 5 features listed that are typically true of that prompt ("Heavy, round, cold, grey, can be thrown"). Participants were then presented with each of the 20 prompts presented in random order (10 distractor items included, farm animals and household objects), with a text box underneath for entering features. Participants were informed that they were to enter 5 features, but there was space for entering more. After completing the feature listing tasks, participants completed the R18 questionnaire. After being shown a de-brief form, participants provided an email address if interested in interview participation.

The features produced by participants were coded following guidelines developed by Papies et al (2019) for the collecting and coding of food and drink features, using a purpose written python script. Each feature was coded into 1 of 30 categories, and then compiled into the overarching categories of simulation related features and simulation independent features. A summary of the categories compiled into "simulation related" is presented, with accompanying examples of features coded into those categories obtained from the experiment (table 1), as well as a summary of categories compiled into "simulation unrelated" (table 2). Examples were drawn from the coding manual if nothing was entered into that category in this study. To compute the dependent variable, the percentage of simulation related features to overall features was calculated for each trial.

Simulation Related Features

Context									
Bodily	Cognitive	Emotional	Physical	Availability	Activity	Social	Time	Non-Consumable object	Consumable object
"Hungry"	"Lazy"	"Treat"	"in pubs"	"fresh"	"good energy source when exercising"	"family"	"breakfast"	"chopstick"	"with custard"

Sensory					
Taste & Flavour	Texture	Temperature	Smell	Auditory	Action
"sweet"	"crunchy"	"piping hot"	"fragrant"	"noisy"	"can be dipped"

Positive Evaluation						
Conformity goals	Social goals	Bodily consequence	Cognitive consequence	Emotional consequence	Hedonic consequence	Coping consequence
"to be liked"	"to have fun with friends"	"relaxing"	"high energy"	"comforting"	"delicious"	"to overcome sadness"

Negative Evaluation						
Conformity goals	Social goals	Bodily consequence	Cognitive consequence	Emotional consequence	Hedonic consequence	Coping consequence
"to no longer be part of the group"	"fight"	"heartburn"	"intoxicating"	"makes me feel sad"	"gross"	"doesn't help overcome sadness"

TABLE 1: FEATURES CATEGORISED AS SIMULATION RELATED

Simulation Unrelated Features

Situation independent								
Ingredients & content	Visual	Long term health consequences (positive)	Long term health consequences (negative)	General positive evaluation	General negative evaluation	Category information	Linguistic	Other uses & facts
"wheat"	"phallic"	"good for you"	"fatty"	"convenient"	"rabbit food"	"fruit"	"chips not crisps"	"dog treat"

Non-consumption Situation				
Origins & production	Package	Purchase & accessibility	Preparation & storage	Cultural embeddedness
"grown"	"tin"	"chip shop"	"toasted"	"Carribean"

Ambiguous			
"stable"	"daddy"	"artistic"	"sand"

TABLE 2: FEATURES CATEGORISED AS SIMULATION UNRELATED

Qualitative methods

Each interviewee was anonymised through the designation of an alias (e.g P, P2, P3). Interviews were audio recorded and transcribed verbatim. A Theoretical Thematic Analysis approach was adopted, following the procedure outlined by Braun & Clarke (2013). Transcripts were reviewed and informal observations were made. Some codes used in the analysis were derived from existing literature and the coding guide used in the quantitative portion of the study (such as *"Simulations include taste and texture information"*), whereas others originated from the data itself (such as *"Preferred form of food used as category example"*)(Papies et al, 2019). Using a complete coding method, codes were used to identify aspects of the data relevant to the research questions. Similar codes were collapsed together, and codes were then grouped into overarching themes, and then sorted into sub-themes in order to clearly present the main recurring issues in the data.

Results

Quantitative Results

Data imported from the Experimentum website was wrangled into a dataframe and tidied using the `tidyverse` package in R, and analysed primarily using the `lme4` package (Wickham, 2017., Bates, Maechler, Bolker, Walker, 2015). Linear models constructed during analysis of the experimental data comprised maximal random effects structure justified by the design (by subjects, $n = 74$, and by items, $n = 10$) (Barr, Levy, Scheepers, & Tily, 2013).

Manipulation checks

To assess whether the foods chosen were seen as healthy and unhealthy, the percentage of long term positive health features out of total features was calculated for both the healthy and unhealthy conditions, and similar percentages calculated for negative long term health features, and hedonic features (both positive and negative). The percentages of each condition in each category is summarised below (table 3). Paired samples t-tests were conducted to check the experiment's manipulations were successful. Healthy foods elicited significantly more positive health related features than unhealthy, $t(739) = -9.57$, $p < .001$, $d = 0.35$, and elicited less negative health features than unhealthy, $t(739) = -7.61$, $p<.001$, $d = 0.28$, suggesting that items selected for the healthy and unhealthy conditions were appropriate. Unhealthy foods elicited more positive hedonic features than healthy, $t(739) = -11.70$, $p < .001$, $d = -0.43$, providing support for the underlying assumption unhealthy foods are more tempting than healthy. However, healthy foods did not elicit a greater amount of negative hedonic features than unhealthy foods, $t(739) = -0.74$, $p = .462$, $d = -0.03$, suggesting that the healthy foods used in this research weren't necessarily seen as un-tempting.

	Healthy foods	Unhealthy foods
Positive long term health features	4.20%	0.03%
Negative long term health features	0.34%	3.29%
Positive Hedonic features	1.61%	3.87%
Negative Hedonic features	1.18%	0.00%

TABLE 3: PERCENTAGE OF SELECTED CATEGORY FEATURES TO OVERALL FEATURES FOR EACH LEVEL OF FOOD. FOR THE PURPOSE OF MANIPULATION CHECKS.

H1: Unhealthy food prompts elicit a greater amount of eating simulation features than healthy food prompts.

Overall, 20.63% of the features listed in response to healthy food words were simulation related, compared to 28.09% for unhealthy foods. This data was found to be normally distributed, $W = 0.94$, $p = < .001$. This difference was found to be significant, $t(739) = -49.94$, $p < .001$, $d = -1.84$, suggesting H1 was supported. Table 4 displays the average simulation feature percentage for each food. The data is visualised in a violin plot below (figure 1)

	Healthy	Unhealthy
Mean	20.54	28.20
Median	30	20
Standard Deviation	12.09	12.45

FIGURE 1: PERCENTAGE OF EATING SIMULATION RELATED FEATURES PRODUCED IN RESPONSE TO HEALTHY AND UNHEALTHY FOOD PROMPTS

TABLE 4: DESCRIPTIVE STATISTICS OF THE PERCENTAGE OF EATING SIMULATION RELATED FEATURES LISTED IN RESPONSE TO HEALTHY AND UNHEALTHY FOOD PROMPTS
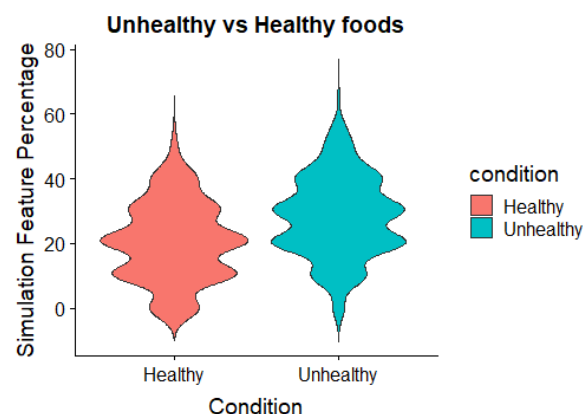
H2: Production of eating simulation features will be affected by participant eating restraint

H2 was tested through analysing percentage of eating simulation features as a function of the cognitive restraint, emotional eating, and uncontrolled eating subscales of the TEFQ-R18. Food type, cognitive restraint, uncontrolled eating, and emotional eating were entered into a Linear Mixed Model as predictors, and percentage of eating simulation features was entered as an outcome variable. The parameter estimates of the Linear Mixed Model with Maximal Random Effects structure are summarised in table 5, including the fixed effects, as well as the interactions of these measures with food type. All predictors were mean centred and deviation coded.

	Estimate	Standard error	*T* value
Food type	-7.726e+00	2.277e+00	-3.393
Emotional eating	6.244e-05	2.525e-02	0.002
Cognitive restraint	-5.715e-02	3.246e-02	-1.761
Uncontrolled eating	2.963e-02	2.720e-02	1.089
Food type X emotional eating	2.418e-02	3.305e-02	0.732
Food type X cognitive restraint	-5.897e-02	4.264e-02	-1.383
Food type X uncontrolled eating	2.393e-02	4.050e-02	0.591

TABLE 5: GENERAL LINEAR MIXED MODEL PARAMETER ESTIMATES OF THE THREE R18 MEASURES OF EATING RESTRAINT. FOOD TYPE HAS BEEN DEVIATION CODED.

Main effects of each predictor were assessed using Likelihood Ration Chi square model comparisons using `anova()`. The main effect of food type on simulation feature percentage was found to be significant, LRX^2 = 93.144, DF = 12, p = <0.001, so that when food prompts are unhealthy, more eating simulation features are listed than healthy food prompts, suggesting further support for hypothesis 1. The main effect of cognitive restraint was also found to be significant, LRX^2 = 34.023, DF = 9, p = < 0.001, so that as cognitive restraint increases, the production of eating simulation features decreases. No main effect was found with emotional eating, LRX^2 = 3.2119, DF = 9, p = < 0.9553, or uncontrolled eating, LRX^2 = 6.2329, DF = 9, p =<0.7164. No interaction between food type and any of the R18 measures was found, LRX = 13.018, DF = 24, p = 0.9658.

To further explore the effect of cognitive restraint on the production of simulations, the simple effect of cognitive restraint on the simulation features produced for unhealthy foods was assessed through entering food type into the model with dummy coding. The effect was

not found to be significant when only examining unhealthy foods, LRX^2 = 31.71, df = 9, p = 0.938. The same thing was found when applied to only the healthy foods, LRX^2 = 5.3893, DF = 9, p = 0.7991. This suggests support for hypothesis 2.The key relationships examined in the model are visualised in figure 2. Table 6 provides a summary of how the model's fit varies with the removal of each predictor.

	Akaike Information Criterion (AIC)
All predictors included	5718.71
Food type removed	5790.399
Cognitive Restraint removed	5722.011
Emotional Eating removed	5698.062
Uncontroled eating removed	5704.625
Interactions removed	5669.117

TABLE 6: AIC VALUES VARYING ACCORDING TO THE ADDING AND REMOVAL OF PREDICTOR VARIABLES.

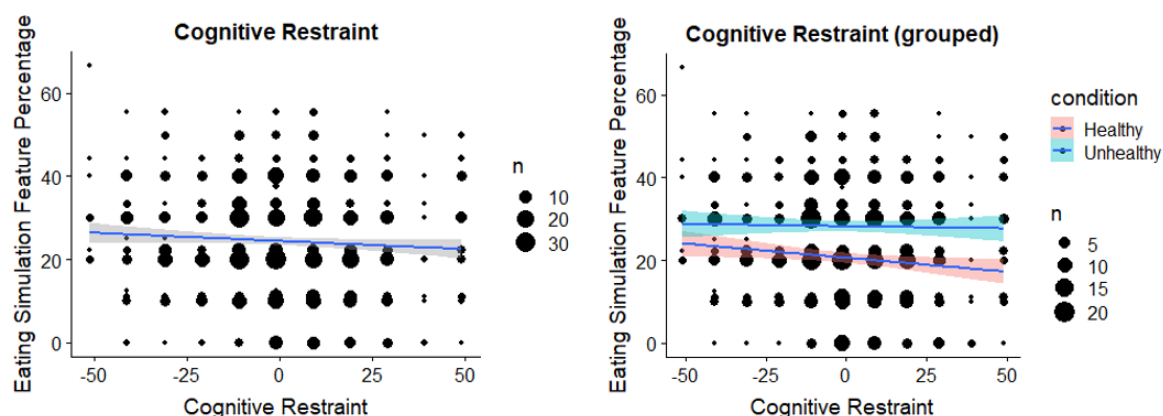FIGURE 2: VISUALISING THE RELATIONSHIP BETWEEN COGNITIVE RESTRAINT AND SIMULATION FEATURE PRODUCTION. DATAPOINT SIZE CORRESPONDS TO THE COUNT OF THAT VALUE IN THE DATA. PLOT ON THE LEFT IS SHOWN WITH A REGRESSION LINE, THE PLOT ON THE RIGHT SPLIT THE REGRESSION LINE INTO ONE FOR EACH LEVEL OF FOOD TYPE TO VISUALISE HOW THE PREDICTORS MAY HAVE DIFFERENCES IN EFFECT SIZE BETWEEN THE LEVELS OF FOOD TYPE.

H3: Production of eating simulation features for unhealthy foods will have a negative relationship with participant socio-economic class

H3 was analysed through a General Linear model featuring type of school attended, qualification of parental guardian, NS-SEC score of guardian's occupation, eligibility for school meals, and a self assessment of socio-economic class as ordinal predictors, food type as a categorical predictor, and simulation feature percentage as the dependent variable. The main effects of each socio-economic predictor were assessed through anova model comparisons.

No main effect of type of school attended was found on the production of simulation related features, $F(5, 680) = 1.476$, $p = 0.195$. Similarly no main effect was detected for school meal eligibility, $F(3, 680) = 1.389$, $p = 0.245$. The subjective assessment of socioeconomic class also failed to show a main effect on eating simulation feature production, $F(2, 680) = 2.213$, $p = 0.110$. No interaction was detected between any of the predictors and food type, $F(19, 680) = 0.863$, $p = 0.630$. This suggests the null hypothesis should be accepted in regards to the role of socio-economic condition and food simulation.

Anova model comparison found the main effect of guardian qualification on simulation production to be significant, $F(3, 680) = 3.50$, $p = 0.015$, suggesting that lower parental qualification produces lower eating simulation features. To test H3, follow up tests were conducted with food type dummy coded, in order to see the effects of guardian qualification at each level of food type. No simple effect was found when examined at the level of unhealthy foods, $F(-3, 683) = 2.36$, $p = 0.070$, or at the level of healthy foods, $F(-3, 683) = 1.362$, $p = 0.253$. The parameter estimates of guardian qualification on eating simulation feature production are detailed below (table 7), along with a violin plot detailing distribution of eating simulation percentage for each level of guardian qualification (figure 3). While this suggests that guardian qualification has an influence on eating simulation

features, the direction is in the opposite direction than hypothesised, suggesting hypothesis 3 should be rejected.

Guardian Qualification Parameter Estimates

	Estimate	Standard Error	T value	P value
Qualifications below degree level	3.4902	1.1780	2.963	0.00315 **
No formal qualifications	-3.8446	1.6658	-2.308	0.02130 *
Don't know	3.6159	4.1336	0.875	0.38201

TABLE 7: QUALIFICATIONS OF PRIMARY GUARDIAN AND SIMULATION FEATURE PERCENTAGE. EACH CATEGORY IS COMPARED TO THE REFERENCE CATEGORY "AT LEAST ONE DEGREE LEVEL QUALIFICATION"
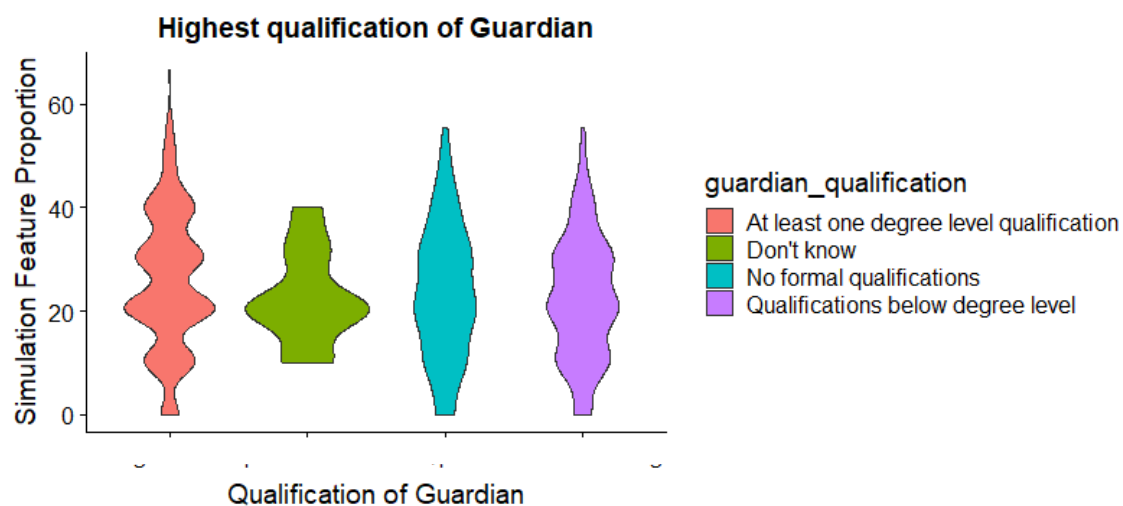
FIGURE 3: HIGHEST QUALIFICATION OF GUARDIAN AND SIMULATION FEATURE PRODUCTION

Anova model comparisons revealed a main effect of guardian occupation on simulation feature production, $F(6, 680) = 4.587$, $p = < 0.001$, so that as NS-SEC ranking gets higher (and therefore socio-economic position gets lower), the amount of eating simulation features produced decreases. Follow up analysis revealed a simple effect of NS-SEC class on the simulation percentage produced for unhealthy foods, $F(6, 680) = 2.385$, $p = 0.027$, as well as a simple effect of NS-SEC class on healthy foods, $F(6, 680) = 3.5882$, $p = 0.002$. The

parameter estimates of guardian occupation on eating simulation feature production are detailed below (table 8), along with a violin plot detailing distribution of eating simulation percentage for each level of guardian occupation NS-SEC class (figure 4). Again, this suggests that socio-economic background influences the production of eating simulation features in the opposite direction than hypothesised, suggesting H3 should be rejected.

Guardian Qualification

	Estimate	Standard Error	T value	P value
Lower managerial and professional occupations	-2.5146	1.2869	-1.954	0.05112
Intermediate occupations	-0.1991	2.0522	-0.097	0.92276
Small employers & own account workers	0.5192	2.4652	0.211	0.83326
Lower supervisory and technical occupations	-1.2775	2.3619	-0.541	0.58877
Semi-routine occupations	-2.1673	2.7709	-0.782	0.43439
Routine occupations	14.1402	3.4332	4.119	4.28e-05 ***

TABLE 8: NS-SEC OCCUPATION OF GUARDIAN AND SIMULATION FEATURE PERCENTAGE. EACH CATEGORY IS COMPARED TO THE REFERENCE CATEGORY "HIGH MANAGERIAL AND PROFESSIONAL OCCUPATIONS"

NS-SEC Class of Guardian Occupation

NS_SEC_char
- Higher managerial & professional occupations
- Intermediate occupations
- Lower managerial & professional occupations
- Lower supervisory & technical occupations
- Routine occupations
- Semi-routine occupations
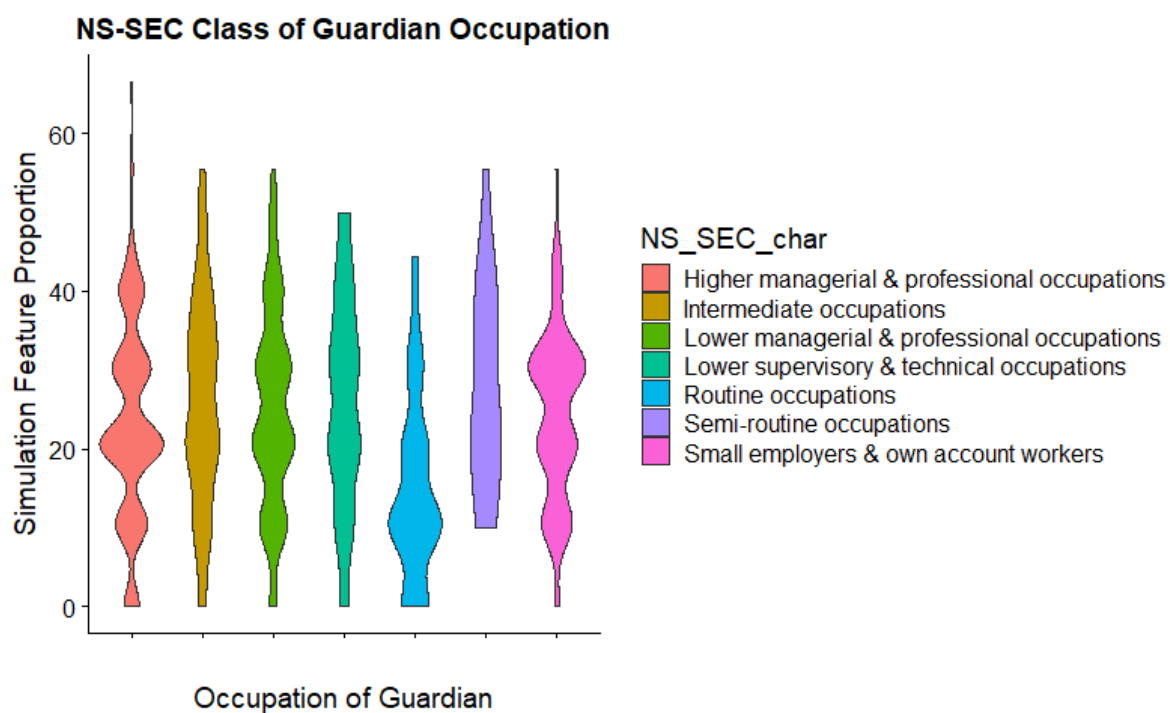- Small employers & own account workers

FIGURE 4: OCCUPATION CLASS OF PARENTAL OCCUPATION AND SIMULATION FEATURE PRODUCTION

The relative contributions of each predictor to the model's overall fit are summarised in table 9.

	AIC
All predictors included	5660.988
Type of school attended removed	5658.761
Guardian qualification removed	5666.025
NS-SEC removed	5677.554
Eligibility for school meals removed	5659.389
Self-report of SES removed	5661.66
Interactions removed	5640.143

TABLE 9: AIC VALUES AFTER THE REMOVAL OF DIFFERENT PREDICTORS

Qualitative Results

Qualitative data generated in the interview portion of the study was analysed following a Theoretical Thematic Analysis approach as appropriate for the explanatory sequential approach adopted for this study (Braun & Clarke, 2013., Bryman, 2016). The themes that emerged during the analysis of the interview data are presented and discussed below, with corresponding tables outlining sub-themes and a collection of quotes used to illustrate each sub-theme. Analysis of the interview data revealed three overarching themes in the data: simulation reflects past experience, simulation of reward and action information induces craving, and dieting goals affect the simulation of food. Each theme and sub-theme are discussed below.

<u>Simulation reflects past experience</u>

The way participants conceptualise a food is reflective of the way in which they typically consume that food. While describing details of a food participants would recall details to do with memories associated with consuming a certain food, the physical and mental context the food is consumed in, foods typically eaten alongside it, and the preferred form of that food. Definitions of each sub-theme and illustrative quotes are supplied in table 10.

Theme	Simulation reflects past experience			
Sub-Theme	Food simulation activates specific memories	Foods are simulated in the context in which they are consumed	Food is simulated as part of a meal	Preferred form of food used as category example
Definition	Food conceptualisation primes the recall of memories and contexts associated with the consumption of that food.	Conceptualising a food involves activating details of the physical, mental, and temporal context the food is consumed in.	Conceptualising a food activates information relating to other foods it is consumed alongside.	Conceptualising food elicits details about preferences to do with that food.
Illustrative quotes	**1.1:** "P4: yeah em (.) dominoes or being in Italy and getting them like when they throw it up and cook it for you (.) they'll just do it for you and turn it in to a really nice fresh pizza so like (.) shit pizza or good pizza ((laughter))" **1.2:** "P3: oh actually another one like one time I was really stoned and I (.) made like a chocolate chee- like Nutella cheese toastie (.) and it was funky you know I wouldn't do it again **1.3:** P3: when I read banana (.) I remember it (.) like cos [sister] she has like a wee (.) a blender…and at one point when I was going to the gym I had like a protein shake (.) and one morning I just put some milk in the blender and I put like a banana in (.) and I was drinking it and really felt like I was going to be sick (.) like the banana taste was really prominent just (.) overwhelmed everything else and I didn't finish it"	**1.4:** (on discussing contexts associated with pizza) "P5: emm (.) in my bed…oh yeah oh yeah if I'm getting a pizza from dominoes I'm eating it in my bed" **1.5:** "P4: oh yeah definitely (.) like especially dominoes we always get that in the flat when we're hungover so it reminds me of being hungover and then that helping the hangover" **1.6:** (discussing times associated with snacking) "P3: usually in the evening yeah"	**1.7:** (What comes to mind when they thought of bananas) P5: emm Weetabix those little Overnight's oats…em I sometimes cut it up and put like (.) oats yoghurt milk fruit so I like it in them (.) with Weetabix" **1.8:** "P6: em (.) I mean I do crave the food rice is typically served with like I said probably my favourite food is mexican and there's always rice with mexican (.) well tex-mex at least (.) em (.) but it's just like it's there" **1.9:** "P7: uh huh I'm thinking about it in a meal I'm not thinking about it by itself so it's quite appealing if I'm thinking about it as part of a meal (.) because it would then be flavoured seasoned and it would have something to accompany it but (.) rice by itself doesn't appeal to me at all"	**1.10:** "P6: the texture's always very (.) smooth like (.) like (.) you're really feeling it kind of come apart in your mouth the cheese and the sauce really does just like (.) it all just kind of (.) yeah I guess the texture's quite (.) smooth like you're never crunching it really are you…and to put it in perspective I never get a really thin and crispy pizza I always get like a (.) I try and make pizza soft and like deep dish (.) that's my preference in terms of pizza (asked if this was representative of their conceptualisation of pizza as a whole) P6: yeah (.) definitely" **1.11:** (describing features typical of a pizza) "P7: em okay I like a thin crust pizza …typically homemade (.) em so not particularly doughy…em (.) with a tomato sauce base…and not a lot of toppings on it" **1.12:** P4: emm (.) it's round (.) it has lots of cheese on it (.) and tomato base but that's fine I like that (.) em I really like stuffed crust pizza (.) emm (.) some kind if topping (.)…like chicken or (.) something spicy" **1.13:** (describing what they saw when they experienced conscious imagery of pizza)"P6: it's always a pepperoni pizza"

TABLE 10: OUTLINE OF THE STRUCTURE OF THE THEME "SIMULATION REFLECTS PAST EXPERIENCE" INCLUDING THEMES, SUB-THEMES, AND SUPPORTING QUOTATIONS

Food simulation activates specific memories

Participants frequently described memories they had associated with the target foods after describing the properties of that food. The memories activated varied, often reflecting a positive experience with the food (quote 1.1), a particularly novel experience (quote 1.2), or a particularly negative one (quote 1.3).

Foods are simulated in the context in which they are consumed

When conceptualising a food, participants often described contextual details reflectice of each participants typical way of experiencing that food. Participants described physical contexts (quote 1.4), cognitive contexts (quote 1.5) and times (quote 1.6) that came to mind when they conceptualised the target food.

Foods are simulated as part of a meal

When describing associations with target foods, participants frequently described meals containing the target food. This was reflective of meals frequently eaten containing those foods (quote 1.7). Foods typically part of a larger meal (such as rice) that were perceived as having low flavour value on their own elicited details of the meals they are consumed as a part of, which reflected participant preferences and experiences (quote 1.8, quote 1.9).

Preferred form of food used as category example

Details elicited during description of target foods were often reflective of participant preferences with that food (quote 1.10). When describing features typically true of a target food, participants would often spontaneously describe their preferred form of that food rather than features generally true of that food (quote 1.11, 1.12). When simulating food consciously, the food is typically visualised in its preferred form (quote 1.13).

Simulation of reward and action information induces craving

In response to a food cue, situated conceptualisations of that food activated simulate the sensory and bodily information related to the reward value of that food, as well as actions associated with interacting with that food, which works to induce a state of craving in participants. The reward value is more salient for certain foods over others, and these simulations are not always experienced consciously. Definitions of each sub-theme and illustrative quotes are supplied in table 11.

Theme	Simulation of reward and action information induces craving				
Sub-Theme	*Simulations not always experienced consciously*	*Simulations include taste and texture information*	*Simulations include bodily and cognitive consequences of consumption.*	*Unhealthy foods are more satisfying than healthy*	*Simulating tempting foods induces craving*
Definition	Not all participants reported consciously imagining eating foods during conceptualising them, whereas others described vivid imagery of the process of eating that food.	Details to do with a food's taste and texture are activated when describing a food, making the reward value of it salient in the mind	As well as simulating information to do with the way a food tastes, the immediate bodily and cognitive consequences of consuming that food are activated.	Unhealthy foods activate feelings of appetite satisfaction, as well as emotional satisfaction. Healthy or neutral foods are seen as bland or unsatisfying	The conceptualisation of tempting foods induces craving of that food, due to the reward value of that food being salient after being activated. This is not found for food the participant does not find tempting, probably due to taste and texture being a less salient part of their situated conceptualisation.
Illustrative quotes	**2.1:** (Asked if they ever imagine themselves eating pizza) "P7: I am now when you're asking me to describe what it's like…I'm having to imagine (.) myself eating it (.) like I'm having to take myself (.) through eating it to be able to describe what it's like… I have a piece of pizza on a plate…I'm eating it you know I lift it up and put it in my mouth I'm chewing I'm enjoying it" **2.2:** (asked if they ever imagine themselves eating pizza) "P5: ((laughter)) oh yeah defo… picking up the slice and you're holding it and it's all dropping down and you're like tilting your head to get it	**2.5:** "P3: I'm a big fan of pizzas actually…not the fast not the (.) not the aldi ones for example in [restaurant] they make pretty good pizzas…like the sourdough and the actual wooden fire you know you can taste actually the wee bits of (.) not charcoal but you know when it's been like flamed" **2.6:** (Describing features typical of chocolate) "P: ((pause)) uhh gets a bit (.) pasty (.) like when it melts (.) it's too sweet" **2.65:** (Asked why they dislike celery) "P5: it's so the taste just minging it like burns or something	**2.7:** (Describing why they wanted to eat chocolate least) P: just that really like it's not (.) you eat it then you're like 'oof'" **2.8:** "P5: I had overnight's oats this morning and I've just found (.) I think I need to eat something (.) that's actually gonna give me some energy" **2.9:** (Asked why they like burritos) "P6: em (.) well (.) I find it's just a good mix of like protein fat and carbs it feels really optimal for me… just in terms of how like it makes you feel (.) because I mean if something's too carby you're gonna feel like shit after… but like (.) when there's a great mix of like a lot of chicken a bit	**2.10:** "P3: first of all yeah the effort thing I just can't be assed (.) like when you just stick a pizza in the oven that's it done but also (.) some like healthy foods for example chicken you have to like chew it a lot and just can't be bothered doing that (.) also (.) it's not as satisfying I dunno how to put my finger on it for example (.) I dunno maybe with chips because they have so much salt and you're like "aw yeah this is amazing I love it" same with like gravy or something it just satisfies you (.) where with like healthy foods although they're good like I love healthy foods as well when you're drunk they're just (.) way too boring and can't be bothered" **2.11:** (Asked about the taste and texture of pizza) "P4: happiness ((laughter))" **2.12:** "I	**2.13:** (Describing how appealing a pizza is after discussing it) "P5: oh so appealing I was just thinking in my head "oh I really fancy a pizza after this" **2.14:** (Describing how appealing chocolate is after discussing it) "P3: yeah I'd love a wee bar yeah…actually gonna (.) actually gonna get one on the way back like a wee oreo Cadbury you know" **2.15:** (Describing how appealing a banana is after discussing it) P5: ((pause)) mm about a three out of ten" **2.16:** (Describing how appealing rice is after discussing it) "P6: not really at all even though I'm starving"

and dipping the crust in"	I don't know it's just awful"	of cheese and a tortilla I just feel like it gives me the energy now (.) because I've had a lot of chicken I'll have energy later (.) "	can give up the bananas anytime"
2.3: (Asked if they ever experience imagery of eating pizza when thinking about it) "P2: ehhm (.) I wouldn't really say I imagine myself eating any food…I just (.) eat it ((laughter)) I don't really think about eating I just do it"			
2.4: (asked if they ever imagine themselves eating rice) "P7: no…not really (.) it's not it's not a meal by itself em (.) and it's not something (.) that I ever crave really so"			

TABLE 11: OUTLINE OF THE STRUCTURE OF THE THEME "SIMULATION OF REWARD AND ACTION INFORMATION INDUCES CRAVING" INCLUDING THEMES, SUB-THEMES, AND SUPPORTING QUOTATIONS.

Simulations not always experienced consciously

Some participants reported vivid imagery experienced when conceptualising food, which included actions associated with eating the food. This imagery was particularly vivid for enjoyable foods (quote 2.1, quote 2.2). Some participants reported no conscious imagination of eating foods (quote 2.3). No such imagery was reported for foods deemed lacking in reward value (quote 2.4).

Simulations include taste and texture information

When describing the properties of a food, sensory details relating to the taste and texture of the food are activated, allowing simulation of the reward value of that food. The taste and texture details listed by participants were relative to their evaluations of the target foods. When the food represented is enjoyable, details relating to taste and texture are particularly salient (quote 2.5). Foods found to be particularly aversive by participants elicited strong taste and texture information of a negative valence (quote 2.6, 2.65)

Simulations include bodily and cognitive consequences of consumption

Participants frequently described details relating to the bodily and cognitive consequences of consuming a food, including how consuming that food would make their stomach feel (quote 2.7), and the energy they expect that food to provide (quote 2.8). These consequences were given as a motivation to consume or not consume different foods (quote 2.9, 2.7)

Unhealthy foods are more satisfying than healthy

When describing the experience of eating different target foods, unhealthy foods were described as being more satisfying than healthy foods (quote 2.10, 2.11). Healthier foods tended to be viewed as less appealing (quote 2.10, 2.12).

Simulating tempting foods induces craving

Participants frequently reported that thinking about a food leads to craving that food. Foods seen as tempting elicited strong cravings, likely due to the simulation of the reward value associated with such foods (quote 2.13). Some participants reported the specific form of the food they were craving (quote 2.14). Simulating untempting food was not reported to lead to craving (quote 2.15, 2.16)

Eating simulations make sticking to dieting goals difficult

Participants attempting to reach dieting goals can still experience vividly, which causes them to crave food inconsistent with their goals. The structure of this theme and accompanying sub-themes are detailed in table 12, along with supporting quotes.

Theme	Eating simulations make sticking to diet goals difficult					
Sub-Theme	Unhealthy food can still elicit simulation in restrained eaters	Rules and planning are needed to maintain a healthy diet	Unhealthy foods are to be avoided	Unhealthy food is a treat or reward	Unhealthy food consumption comes with guilt	Diet goal information is activated in response to unhealthy food temptation
Definition	People who practice dieting still experience vivid simulation of food inconsistent with their diet goals, despite limiting the consumption of that food. Some dieters report that when in a dieting mindset, they crave healthy foods more.	Participants report self enforced rules and strategies they use in order to keep control of their eating	The presence of unhealthy food elicits strong cravings, and the best way to avoid consumption is minimising exposure to these foods and food cues.	Unhealthy food can only be consumed when it is deserved or earned	Consumption of unhealthy food is seen as a setback towards their dieting goals, and giving in to temptation comes with guilt, as this setback has to be neutralised through exercise or even further restriction	Participants report having to remind themselves of their dieting goals in response to temptation.
Illustrative quotes	3.1: (Talking about times they felt craving for pizza) "P4: yeah like all the time ((laughter))…cos it's just I always I never really eat it as much as I want it cos it's so unhealthy and I'd have to go to the gym like twenty times more a week but yeah so I always want it cos I know I shouldn't eat it all the time" (Discussing when these cravings are felt) P4: emm (.) definitely being hungover seeing adverts for pizza anywhere which is just like all the time and my phone definitely knows I like pizza because it gives me adverts for it all the time (.) em (.) yeah see just if I ever come into contact with pizza or see pizza I'm gonna want it"

3.2: (Asked if they craved unhealthy food when dieting) P5: ehh not so much actually like | 3.3: "P6: and like (.) I find if I don't have rules (.)I just go it just gets crazy (.) like seven sugars in your cup of tea or something"

3.4: "P2: ehm no I think I (.) just (.) I binged a lot so if I wanted to go eat nice food I'd just go and do it without thinking about it… and then I could gain a lot of weight" | 3.5: "P4: yeah like yeah (.) if you put some food in front of me I can always eat it. (To stop myself) I take myself like out of that situation where'd I'd be in front of food that I want"

3.6: "P5: I love bread but I try not eat it loads… I love bread and I love cheese (.) but I try not eat them cos (.) can't have bread or cheese I the house because I'll just eat through them"

3.7: "P8: em instead of em (.) buying as much chocolate I probably would buy more fruit…or buy like a protein bar instead…so it's a bit healthier and still getting the protein in but (.) with loads less sugar and stuff"

3.8: "P6: well like I mean (.) say if I go to the shop and I see there's cakes that I want (.) I pick them up and put them back down | 3.9: "P5: well yeah I've like (.) if I've ate healthy for a while I'm like right (.) treat night and I'd get a pizza maybe (.) or maybe a Chinese or something but (.) I'd eat pizza when I'm hungover I like a pizza"

3.10: "P6: yeah it's just I'll only (.) it's just I don't feel great about myself if I'm having an oven pizza for dinner (.) but like (.) it's just easy and it's good…pizza is the kind of thing where (.) you know it's a treat (.) you can't have it every day (.) and like if I'm gonna eat pizza it's kind of like doing anything bad I like to have a reason for doing it" | 3.11: "P6: yeah just because I know after I have it I'll just look at the e-like I'd look at the empty plate and just feel like "that's gone" and like it was so many calories"

3.12: "P4: yeah maybe but I'd feel yeah I'd still feel guilty like if I said I wanted to lose this much weight and I ate a pizza during that time I would be so unhappy I'd be like 'you're such a fanny'…well I'd just have to go to the gym so much more (.) like to get over it if I'd eaten two thousand calories of pizza I'd need to then burn two thousand extra"

3.13: "P4: …I'm like "aw I've been really good this week | 3.14: "P6: you've always got a little voice in the back of your head that says like "oh like it won't matter if you have a kinder bueno today"… but I mean (.) you just have to learn to recognise when you're doing that. I realise that I'm doing it and realise the rules are there in place so like (.) you could have a kinder bueno today but you can't do it every day it's like a Kantian way of looking at it if you did it every day would it be sustainable"

3.15: "P6: just remind myself ((exhale)) it's such a it's such an awful thing when I hear other people say it (.) but em (.) you've probably heard |

see when I'm like really driven when I'm going to the gym and stuff when I'm getting up and eating healthy if I start the day eating healthy I usually just want to keep eating healthy and if I'm once I'm in the routine of eating like more fruit more veg and like less starchy foods that are full of like (.) em carbs em (.) I tend to like want more of that"	and I go home I know I didn't buy them (.) so I know I'm not gonna think about them anymore"	I've been to the gym four times like four or five times I'm like "aw I'll just have this bit of cake" (.) but I'll still feel guilty for eating it if I'm wanting to like lose weight"	the mantra "nothing tastes as good as skinny feels"…and I just think (.) do I want to break this rule enough that I don't care that it's gonna make me a little more fat"

TABLE 12: OUTLINE OF THE STRUCTURE OF THE THEME "FOOD SIMULATION MAKES STICKING TO DIET GOALS DIFFICULT" INCLUDING THEMES, SUB-THEMES, AND SUPPORTING QUOTATIONS

Unhealthy food can still elicit simulation in restrained eaters

Participants who emphasised exercising strict control in their food intake still reported vividly imagining the reward value of foods inconsistent with their dieting goals, which leads to craving of those foods in response to cues (quote 3.1). Some participants' answers suggest while they still experience simulation of unhealthy foods (quote 2.2), practising dieting has lead them to experiencing greater cravings and appreciation towards healthy food (quote 3.2).

Rules and planning are needed to maintain a healthy diet

In order to resist the cravings that come with the simulation of unhealthy foods, participants report that they employ various rules and strategies, which play an important role in maintaining self-discipline in food consumption and avoiding uncontrolled consumption (quote 3.3, 3.4).

Unhealthy foods are to be avoided

Participants frequently reported minimising exposure to unhealthy and tempting foods to help stick to their dieting goals was (quote 3.5). Frequent strategies involve avoiding stocking such foods at home (quote 3.6), and replacing unhealthy snacks with healthy alternatives (quote 3.7). Participants report that avoidance strategies such as this are successful in reducing their cravings (quotes 3.8).

Unhealthy food is a treat or reward

Participants who practiced eating restraint reported allowing themselves to eat unhealthy food as a treat for when they feel they deserve it (quote 3.9). Participants describe needing a clear motivation for consuming food inconsistent with dieting goals (quote 3.10).

Unhealthy food consumption comes with guilt

As a result of their internalised dieting rules, participants report feelings of guilt that typically accompany the consumption of unhealthy food (quote 3.11). Some participants explain this guilt as viewing the consumption of unhealthy food as a setback toward their dieting goals (quote 3.12). This guilt has been described to persist even when consuming unhealthy food as a reward (quote 3.13)

Dieting goal information is activated in response to unhealthy food temptation

When experiencing temptation for foods inconsistent with dieting goals, participants report the activation of dieting goal information, which is experienced consciously as an internal struggle between goals (quote 3.14). Through activating diet goal information, participant can be reminded of their motivations for dieting in the first place, such as dissatisfaction with body image (quote 3.15)

Results Summary

Participants listed significantly more eating simulation features for unhealthy foods than healthy. Manipulation checks revealed that unhealthy foods elicited more positive hedonic information than healthy foods, suggesting this is due to the salience of the reward value of these foods, which is simulated in response to unhealthy food prompts. Evidence from the qualitative data further supports the simulation account of food conceptualisation, as discussion of food items frequently elicited details relating to contexts they had eaten a target food in, and details relating to preferred forms of that food, which was reflective of their personal experiences with that food. The finding of this study that cognitive eating restraint reduced overall simulation for both unhealthy and healthy foods may be explained by the integration of guilt and diet goals information in eating simulations of unhealthy foods, which may work to reduce the reward value of foods. While socio-economic indicators appeared to have negatable or negative influence on the production of eating simulation features, qualitative data suggests that eating simulations are highly reflective of individual experiences with food, though social class may not be as important as factors such as eating restraint in influencing eating simulations.

Discussion

This research was intended to investigate how the individual experiences simulations of eating experience, and how they are impacted by an individual's previous experience with and motivation to consume different foods. The results of each hypothesis test, their relation to previous research, and insights gained from the qualitative portion of the study are discussed below in relation to key parts of the study's research questions.

The experience of eating simulations

It was hypothesised that unhealthy food prompts would elicit greater eating simulation than healthy foods, due to the salience of the reward value of such foods in participant's situated conceptualisations of them. 28.09% of the total features listed in response to unhealthy food prompts were related to consumption situation, compared to 20.63% for healthy foods, a difference that was found to be statistically significant, confirming the first hypothesis**.** Similar to this study, previous research has found evidence to suggest that tempting/unhealthy foods elicit greater simulation of eating experience than healthy/untempting foods (Papies, 2013., Papies, Barsalou, & Custers, 2012., Keesman et al, 2016, 2017). This effect has been explained through Grounded Cognition principles, claiming that the consumption and reward value associated with unhealthy foods are more salient parts of situated conceptualisations held towards those foods, which allows them to be simulated more easily when a prompt relating to those foods is encountered (Papies, 2017). This is supported by checking of the assumption that unhealthy foods were seen as more tempting than healthy, which found unhealthy food prompts elicited significantly more features that related to the pleasure gained from eating them when compared to healthy foods. Interview data found that tempting foods elicited positive aspects of their taste and texture, while foods found to be untempting produced less features related to their consumption, or elicited negative taste and texture information. Interview data also suggests that the association of eating simulation features with unhealthy foods is related to

simulation rather than semantic association, as enjoyable foods frequently elicited details about the situation they are consumed in.

As well as simulating the reward value such foods have in taste, bodily and cognitive consequences of consuming different foods were often given when explaining their preference out of the target food items. Conversely, participants listed negative bodily feelings experienced after consuming a food as a reason for avoiding certain foods, such as chocolate. Grounded Cognition theory explains that simulations of experience are used to predict and infer consequences of actions and events likely to occur relating to a stimulus, and current evidence suggests bodily and cognitive consequences of consumption are simulated as part of eating experience, which plays a role in determining food preference (Barsalou, 2009).

Insights generated from the qualitative part of this research suggest that simulations of foods may be experienced differently by participants, both in their content, and in the extent to which they are experienced consciously. Interview data re-enforced previous assertions that simulations of experience used in conceptualisation are not always experienced consciously, as not all participants reported conscious imagery of the process of eating food (Barsalou, 2009). Some participants reported experiencing vivid mental imagery of eating experience when feeling tempted by unhealthy food, though these same participants reported no such imagery for foods found to be untempting. Some participants reported relying on mental imagery of food items in order to describe features of the food. Previously, attractiveness of a food has been suggested to mediate the relationship between food cues and consumption simulation, with attractive foods increasing the salience of reward value, which then increases the vividness of a simulation (Keesman, 2016). It is possible as simulations become more orientated towards a foods reward value, this can influence whether a simulation reaches conscious awareness, supported by the fact that previous research has found vividness of a food image correlated with the intensity of craving felt for it (Tiggeman & Kemps, 2005).

Participants reported that food they experienced craving of food they found enjoyable after several minutes of discussion, even reporting motivation to purchase the target food after the conclusion of the interview, whereas no craving was experienced after discussion of food items they found to be less enjoyable. Given that mental imagery has previously been suggested to underpin food cravings, cravings likely arise as a result of vividly simulating the reward characteristics of a particular food (Harvey et al, 2005., Papies, 2017).

The finding that food prompts activate information related to the sensory reward experience of eating that food, as well as the bodily and cognitive consequences of consuming that food, supports the Grounded Cognition account of the role of simulations as a source of prediction. As a familiar food cue is encountered, they are interpreted via comparison with stored situated conceptualisations, and elements of those stored situated conceptualisations not currently perceived are predicted as likely to occur, accomplished though pattern completion mechanisms which simulate these predictions(Barsalou, 2009). The finding that some participants reported requiring conscious imagination of a target food to describe features of it also suggests support for the role of simulation in conceptual processing as outlined in the Grounded Cognition account of conceptualisation (Barsalou, 2009).

Eating simulations reflect participant experiences

It was also hypothesised that a greater concentration of eating simulation features listed in response to unhealthy foods by participants from the lower end of the socio-economic spectrum compared to those at the higher end. 5 measures were utilised as an approximation of participant socio-economic class. Qualification of guardian was found to influence eating simulation features produced, decreasing the production of these features at lower levels of guardian qualification, though this was not found to interact with food type. Occupation of guardian was also found to have a main effect on eating simulation features, with simulation feature production decreasing at the higher levels of NS-SEC class,

which corresponded to jobs related to lower socio-economic condition. No effect was detected for type of school attended, eligibility for free school meals, or a self-report of socioeconomic level on percentage of eating simulation features produced. This suggests that the third hypothesis should be rejected, as socio-economic class influenced eating simulation in the opposite direction than hypothesised.

Research has long found that diets among the middle class tend to be more congruent with dietary recommendations than diets in lower classes (Hupkens, Knibbe, & Drop, 2000). Previously, socio-economic background has been found to influence participant perceptions of appropriate portion size, particularly in regard to unhealthy foods and snack foods. Given that this research found that measures of social class either didn't increase simulation of either healthy or unhealthy foods, suggesting that differences in quality of food consumption between social classes is likely due to influences outside eating simulation, such as differences in the perception of appropriate portion sizes, or the saturation of fast food outlets in more deprived areas (Best & Papies, 2019). The findings of this study that lower socio-economic classes simulate eating less runs counter to previous findings that participants from lower socio-economic backgrounds consume more unhealthy food (Best & Papies, 2019., Darmon & Drenowski, 2008., Cheon & Hong, 2016). This may be due to the fact the sample comprised of primarily university students, which consist of higher concentrations of upper and middle class participants than the general population, and so may not be reflective of the distribution of social classes in the general population (Crawford, 2014)

Socio-economic condition is just one of the ways in which differences in participant experiences influence their conceptualisations of different kinds of foods. Analysis of the interview data revealed that the content of a participant's eating simulations were reflective of their experiences with each food. Participants reported that contexts they associated with different foods were relative to the physical, mental, and temporal context they normally consumed that food in. These contexts differed within participants when conceptualising different foods, and differed between participants when conceptualising the

same food. Conceptualising a food also activated specific memories a participant has with a food, and enjoyable foods seemed to elicit these memories more freely than un-enjoyable foods. This finding suggests that conceptualising a food activates details regarding the context they are consumed in suggests that simulation of eating experience is grounded in previous experience with that food.

Furthermore, when describing details of a food, participants often spontaneously started describing their typical way of consuming that food. Participants often explicitly named their preferred form of a food during description, and features they listed as belonging to that food were often reflective of this preference. For example, pizza was described as being either "soft" or "crispy" depending on whether the participant preferred a deep pan pizza over a more traditional Italian pizza. Evidence of participant's consumption habits influencing their conceptualisation of foods was also seen in the fact that foods often elicited details of other foods they are consumed alongside as part of a meal. For example, rice elicited details about Mexican dishes in a participant with an affinity for Mexican food, whereas other participants described meals such as curry that came to mind when conceptualising rice. This suggests that an individual's typical experience of consuming a food is simulated in response to cues about that food.

Eating Simulations and diet motivation

The second hypothesis of the experimental stage of this research was that participant eating restraint would have an effect on the level of eating simulation related features produced in response to the food prompts. This was examined through the Three Factor Eating Questionnaire – Restraint 18, which conceptualises eating restraint as consisting of the independent scales of cognitive restraint, uncontrolled eating, and emotional eating. This hypothesis was partially supported, as out of these predictors, only cognitive restraint was found to have a significant influence on the production of eating simulation related features, decreasing simulation feature production as cognitive restraint increases. This suggests that in restraining their eating behaviour, participants suppress their simulation

response to foods. This is largely in line with previous investigations into the relationship between eating simulation and diet restraint, which has found that neural areas associated with self control and body image are activated in response to tempting foods, and that simulation feature production in response to unhealthy foods negatively correlates with measures of eating restraint (Papies, 2013., Sanders et al,2015). However, this study differs from previous research in the fact that no effect of cognitive restraint was detected at the levels of healthy and unhealthy foods, cognitive restraint was only found to have an effect on the overall level of eating simulation features produced (Papies, 2013).

Analysis of the interview data suggests that the effect of eating restraint on simulation of eating experience varies between participants. Some participants who indicated they adhered to strict dieting behaviour reported that they regularly experienced vivid simulation of unhealthy foods in response to cues, such as adverts, despite eating unhealthy foods infrequently. Even when practicing dietary restraint, participants reported simulation of unhealthy foods caused them to experience craving, which forced them to obey by strict rules in order to keep control of their eating. Participants reported that due to strong cravings induced by food cues via simulation, one of the only ways to stick to dieting goals was minimising exposure to tempting unhealthy foods. However, some participants reported that when they were motivated to practice dietary restraint, they started craving foods consistent with their diet goals, suggesting that dieting motivation influenced their situated conceptualisations of those foods.

As part of maintaining dietary restraint, participants reported allowing themselves to eat unhealthy foods only when they felt like they had earned it. Consequently, they reported feelings of guilt that accompanied the consumption of unhealthy foods. Feelings of guilt and dieting goals associated with it were reported by some participants as occurring spontaneously when experiencing temptation to consume unhealthy foods, which was experienced as an internal struggle between immediate sensory reward and greater goals of achieving satisfactory body image. The internal struggle of temptation and diet goals has been highlighted by previous research into the experience of dieting (Green et al, 2009).

Neuroimaging research has also suggested that areas associated with self control, and conflict monitoring were activated in response to tempting food cues (Sanders et al, 2005). It is possible that dieting goals and guilt associated with failing to maintain them become entrenched in situated conceptualisations relating to unhealthy food, which are then simulated when a food cue is encountered, potentially reducing the reward value information simulated in response to food cues.

Limitations

One limitation of the current research is dependencies created by the choice of the target items. Items were largely selected based on their nutritional value, which manipulation checks suggest were perceived as intended by participants. However, during the interview process, some participants indicated they chose pizza as it was the only target item which constituted a full meal. Differences in portion size have previously been suggested to mediate the relationship between simulation and motivated consumption, and so future research should attempt to make sure foods are relatively matched in terms of quantity, while still being appropriately distinguished in quality (Petit et al, 2017).

When coding the features generated in the feature-listing portion of the study, words generated were often ambiguous, e.g the word "salty" could refer to both a health property and a taste property of a food. In order to minimise the influence of researcher freedom in coding, the coding manual was strictly adhered to, and ambiguities were coded consistently (Papies et al, 2019). By adhering to a standardised coding manual, future research could also help minimise variance in the data caused by researcher interpretation of features.

The participant sample consisted of 74 participants, and was dominated primarily by university students from the UK, which may be a limitation to the generalisability of the findings. Given that simulations are based on previous experiences with foods, it is likely the culinary context a participant originates from may influence their situated

conceptualisations of different foods. Future research could further investigate the role of background in determining the content of simulations through utilising a more diverse sample

Conclusion

This research was intended to investigate the role of previous experience and motivations in forming simulations, and to highlight how these simulations are experienced by participants. Cognitive eating restraint was found to reduce overall eating simulation in regards to foods, rather than reducing simulation of just unhealthy foods. Qualitative data suggests that for participants with motivation to practice dieting restraint, simulation of food activated dieting goal information, which may have reduced the saliency of the reward value of foods. Interventions designed to promote diet control should therefore emphasise the importance of thinking of diet information when experiencing unhealthy food consumption or temptation. By integrating this information into their experience of these foods, diet information may be activated during simulation, which may help combatting unhealthy food temptation. This role of dieting in determining food conceptualisation is part of the larger influence of previous experience on the conceptualisation of food. Two socio-economic predictors, namely occupation and qualifications of primary guardian, were found to significantly predict simulation of food consumption, though in the opposite direction hypothesised (Dowden & Heywood, 2018). Qualitative analysis suggests that individual experiences with a food are important in determining the quality of an eating simulation, as they are typically reflective of a participant's individualised experiences with that food. Eating simulations are experienced as an activation of information encoded during previous experience, which includes information on the context a food has been previously consumed in, as well as the activation of associated reward information. Unhealthy foods therefore elicit greater eating simulation features than healthy foods, due to the reward information of these foods being more salient in participant's situated conceptualisations. Essentially, simulations are experienced as an activation of information experienced at the time of encoding, which is reflective of participant introspections, environment, and reward information previously experienced when consuming a food. Future research could further

investigate the role of previous experience in the formation of simulations through investigating a sample of participants from diverse culinary contexts, as well as from a wider range of social classes.

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<u>Appendix A</u>

Interview Schedule

<u>Intro</u>

- My name is Ryan Smith, I'm enrolled in the Research Methods in Psychological Science MSc program.
- As part of my course, I'm working on a project supervised by Dr Maxine Swingler investigating the way in which people think about different types of food. As part of this project, I gathered some quantitative information from the online study you completed.
- Now, I'm just looking to follow up on that information through hearing about people's own experiences and thoughts about food. So I'm just hoping to ask you a few questions relating to your thoughts and experiences with some different foods, as well as a little on your eating behaviour. I'd also like to record the interview so I can analyse it later.
- There's no right or wrong answers, I'm just interested in hearing what you have to say.
- There's no scary questions, and if you find you don't want answer anything I ask then you can just decline to answer, and we'll move on. Or if for any reason you want to stop the interview just let me know and we can stop there, and I'll delete anything I have recorded. If you'd like to take a break or anything, then that's fine too.
- Is there anything you'd like to ask me before we begin?
- So if you're happy to proceed, I'll turn on the recorder, and we can get started.

<u>Opening</u>

- So to begin, I'd just like to ask, when was the last time you ate something and what did you have?
  - o How did It taste?
  - o Did you enjoy it?
  - o Why did you choose this food?
- More generally speaking, what kind of foods do you enjoy?
  - o Do you have any favourite foods
  - o What can you tell me about the taste and texture of these foods?
  - o What is it you like about these foods?
- Are there any foods you dislike

- o What can you tell me about the taste and texture of these foods?
        - o Why is it you dislike these foods?
- I have here a list of ten different foods, which you might recognise from the online task. I'd just like you to have a look, and let me know which one you'd like to eat most right now, and which one you'd like to eat least right now.
    - o Chips
    - o Chocolate
    - o Crisps
    - o Pizza
    - o Biscuits
    - o Rice
    - o Carrots
    - o Salad
    - o Bread
    - o Banana

Preferred food

- **Simulation reporting:**
    - o Can you name some features that are typically true of this food?
        - What can you tell me about the taste of the food?
        - What can you tell me about the texture of the food?
    - o What made you choose this food as the one you'd like to eat most?
    - o Do you ever find yourself imagining eating this food?
        - What is it you imagine when this happens?
        - Is there any situation where you find this happens?

- **Experiences**
    - o What comes to mind when you think of this food?
        - Do you enjoy eating this food?
        - What can you tell me about the taste of the food? (assuming this didn't come up before)
        - What can you tell me about the texture of the food? (assuming this didn't come up before)
    - o How often do you eat this food?

- Why (this often)
- (if yes) would you say you consume this food as part of a routine?
- Do you ever eat this food as a reward?

o Are there any times, places, or contexts that come to mind when you think of this food

o Are there any specific memories that come to mind?

- **Motivation**
  o Can you think of any time when you've found yourself craving this food?
    - How often?
    - Is there any specific situation where you find yourself experiencing these cravings?
  o Do you ever find this food difficult to resist eating or stop yourself eating?
    - Why?
    - What makes it difficult to resist?
  o How appealing is this food to you right now?

Least Preferred food:

- **Simulation reporting:**
  o Can you name some features that are typically true of this food?
    - What can you tell me about the taste of the food?
    - What can you tell me about the texture of the food?
  o What made you choose this food as the one you'd like to eat least?
  o Do you ever find yourself imagining eating this food?
    - What is it you imagine when this happens?
    - Is there any situation where you find this happens?
- **Experiences**
  o What comes to mind when you think of this food?
    - Do you enjoy eating this food?
    - What can you tell me about the taste of the food? (assuming this didn't come up before)
    - What can you tell me about the texture of the food? (assuming this didn't come up before)
  o How often do you eat this food?
    - Why (this often)
    - (if yes) would you say you consume this food as part of a routine?

- Do you ever eat this food as a reward? For what?
        - (if no) what puts you off consuming this food?
    - Are there any times, places, or contexts that come to mind when you think of this food
    - Are there any specific memories that come to mind?

- **Motivation**
    - Can you think of any time when you've found yourself craving this food?
        - How often?
        - Is there any specific situation where you find yourself experiencing these cravings?
    - Do you ever find this food difficult to resist eating or stop yourself eating?
        - Why/why not?
        - What makes it difficult to resist?
    - How appealing is this food to you right now?

Eating Restraint

- To what extent would you say you attempt to restrain or regulate your eating behaviour?
    - In what ways do you regulate your eating behaviour?
    - Do you place any rules on your eating behaviour?
- Do you ever find yourself failing to stick to eating goals you set?
    - What makes this happen?
- Is there any strategy you use to help yourself stick to your goals?

Closing section

- That was everything I had planned to ask, before we finish, is there anything else you'd like to say about this topic?
- Do you have any questions for me?
- Just to double check, is it okay with you for me to use this interview as material for my project?
- Thank you for your time, your input's been a great help today

Appendix B

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Glasgow, February 21, 2019

Ethical approval for:

Application Number: 300180113

Project Title: Investigating The Conceptual Representation of Food in Eating Simulations: A Mixed Methods Investigation

Lead Researcher: Dr Maxine Swingler

This is to confirm that the above application has been reviewed by the College of Science and Engineering Ethics Committee and **approved.** Please refer to the collated reviews on the system for additional comments and suggestions. Good luck with your research.

Sincerely,

Dr Christoph Scheepers
Ethics Officer
College of Science and Engineering
University of Glasgow

Did you know? For projects requiring the use of an online questionnaire, the University has an Online Surveys account for research. To request access, see the University's application procedure at https://www.gla.ac.uk/research/strategy/ourpolicies/useofonlinesurveystoolforresearch/.

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