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Supplementary Materials

Snack Intake is Reduced Using an Implicit, High-Level Construal Cue

Price, M., Higgs, S. & Lee, M.

This supplementary material is intended to provide the interested reader with details about the methods and procedures employed in the study named above. This is to facilitate replication of the study and future research.

Participants

Data was collected from 176 participants (59% Female) who were free from food allergies/intolerance. They were recruited from the student and staff populations at Swansea University (87.5%) and from the surrounding community (12.5%). Poster and email advertisements asked for volunteers to take part in a study on ‘Mood, decision-making and taste-perception during television viewing’. Participants were randomly allocated to one of four conditions (High construal, cue present; Low construal, cue present; High construal, cue absent; Low construal, cue absent) and they received £7 upon completion of the session. The characteristics of the sample are presented in Table S1.

Any participants who were vegetarian, pregnant or had limited use of the English language (pre-stated exclusion criteria) were excluded from the analyses ($N = 5$). One further participant was excluded for having a disrupted session (multiple interruptions made it unlikely that the priming task was attended to adequately and control of the environment was compromised) therefore the final number of participants was 170.

This study was granted departmental ethical approval by the Swansea University, Department of Psychology Research Ethics Committee. Written consent was obtained from each participant before commencing the study.

Materials and Procedure

Participants completed the positive and negative affect scale – current state (PANAS: Watson, Clark & Tellegen, 1988). They then rated hunger using a visual analogue scale. Participants were asked to place a mark along a 100mm line from ‘not at all hungry’ to ‘extremely hungry’ in response to the question: ‘How hungry do you feel right now?’ Mood and hunger were assessed because previous research indicates that visceral and mood states can influence impulsive behaviour (e.g. Lowenstein, 1996). The rated hunger and PANAS scores are shown in Table S1.

Construal priming task. Participants completed the priming task which was the ‘How/Why?’ task (Freitas, Gollwitzer & Trope, 2004). In this task, participants are presented with a common goal-statement (in this case ‘Achieve at work/study’) and a series of four blank boxes connected by arrows. For the ‘Why’ task (high construal condition), the goal-statement is presented at the bottom of the page with arrows moving upwards, each arrow is accompanied by the question ‘Why?’ Participants are asked to provide an answer in each box in turn, in reference to the previous box. For example, *Achieve at work/study > To pass my exams > To get a better job > To have a good quality of life > To be happy and provide for my family.* For the ‘How’ task (low construal condition), the procedure is identical, except that the goal-statement is presented at the top of the page with arrows moving downwards, each arrow accompanied by the word ‘How?’ Participants are asked to think about how they would achieve the goal in the previous box, and to focus on practical details and lower order concerns. For example, *Achieve at work/study > Attend lectures and complete work on time > Make a timetable, stick it up and follow it > Get some pens/paper from the shop.* The statement to ‘Achieve at work/study’ was selected in favour of a health related statement (e.g. ‘Maintain good physical health’ as has been previously used; Freitas et al, 2004) because priming health goals may have reduced intake via demand characteristics. The use of a goal

statement that primes abstract thinking allows for a genuine higher-construal prime effect to emerge and has the potential to be generalised to other goal related behaviours (e.g. reducing alcohol consumption).

Within each blank box an identical cue symbol was embedded (see Figure S1). A link-chain design was selected to evoke a sense of ‘linking’ behaviours to the primed thought processes (i.e., either higher or lower construal considerations). The final cue symbol design was selected from several alternatives for evoking appropriate imagery (e.g., link, chain, connections) and clear imagery in a small pilot sample ($N = 8$).

After participants had completed the priming task, imagery measures were taken using a Likert response scale (1-10) to two items: ‘How easy did you find it to imagine each answer on a scale of 1-10? (1 very difficult - 10 very easy)’ and ‘How clear was your imagery in each answer? (1 not at all clear or detailed - 10 extremely clear and detailed)’. Previous studies have shown that imagery scores moderate the effect of a prime and should be controlled for in analysis (Daniel, Stanton and Epstein, 2014).

Manipulation check. Participants completed the Behaviour Identification Form (BIF: Vallacher and Wegner, 1989). This is a 25-item questionnaire that measures an individuals' trait cognitive-construal and was used to check the effectiveness of the construal priming task. The questionnaire requires participants to describe an action (e.g., reading) by choosing one of two options corresponding to either a high-level (e.g., gaining knowledge) or low-level representation of that action (e.g., following lines of print). Answers are coded as 1 if the participant chooses the high-level construal or as 0 if the participant chooses the low-level construal. The total score is then summed for each participant with higher BIF scores indicating a higher cognitive-construal (Hong and Lee, 2010). The Cronbach's alpha for the BIF in the current sample was .86.

The BIF is primarily a trait measure and for this reason ‘abstractness’ scores were also obtained: ‘abstractness’ scores are a useful indicator of the degree of abstract thought generated by the priming task (Hampson, John & Goldberg, 1986). The responses in the ‘How/Why?’ task for each participant were examined and assigned a rating. If the answer described a superordinate response (higher construal interpretation) to the previous box it was coded with a score of +1, if it was deemed a subordinate response (lower construal interpretation) then it was scored with a -1. If it was classified as neither or both, it was scored with 0. For example, the starting box states ‘Achieve at work/study’. If the response generated was ‘*keep to my study timetable*’ a score of -1 would be awarded to indicate a subordinate response. If on the other hand, the response generated was ‘*to succeed in my career*’ then a score of +1 would be awarded to indicate a superordinate response. Ratings for the four answers were summed to give a total ‘abstractness’ score (between -4 and +4) for each participant, with higher scores indicating a higher level of construal.

Participants were then asked to move to an adjacent room in order to complete the delay discounting task and the ‘taste-test’. This was to control for any context cues being conflated with the effect of the cue reminder. Participants were randomly assigned to a cue present or cue absent condition. The cue symbol was either present or absent on the bottom of the monitor for the discounting task and on each food label for the taste-test.

Delay discounting task. To measure the tendency to accept short-term rewards over longer-term gain, a computer-based monetary delay discounting task was administered (McHugh and Wood, 2008). Participants were randomly presented with nine different delays ranging from one day to one year along with a hypothetical choice between a larger, later amount of money (£100) and a smaller, immediately available amount of money (the value of this amount varied using a random adjusting procedure to the nearest penny). An indifference point (IP) was calculated for each delay and plotted as an indicator of the subjective value of

that reward over time. The IP is the point at which the participant became indifferent to receiving the reward now or later. The IPs were then used to calculate Area Under the Curve (AUC) with smaller AUC values indicating greater impulsivity for short term reward. A detailed description of the task can be found in McHugh and Wood (2008).

Taste test. Six high energy dense snacks were presented on a tray, labelled A-F respectively (Bitsa Wispa (Cadbury, Mondelez, Birmingham, UK); Minstrels (Freepost, Mars, UK); Haribo star mix (HARIBO Dunhills (Pontefract), West Yorkshire, UK); Pringles Original (Wimble Manufacturing Belgium, Mechelen, Belgium); Ritz Mini Cheddars (Jacob's Bakery, Leicestershire, UK); Salted popcorn (Tesco Stores Ltd., Cheshunt, U.K)). Participants were asked to sample each of the snacks while watching a television clip. The clip was a BBC nature programme about whales, which lasted for approximately seven minutes. It had previously pilot tested and rated as interesting yet neutral in affect. Participants were told that there would be some questions about both the clip and snacks afterwards. The television clip was included to support the cover story and to create an environment in which snacking is common place. The cue symbol was placed on the bottom of the television monitor for the cue present condition and for the cue absent condition there was blank white rectangle in the same position. Participants were informed that they may eat as many of the snacks as they wish as any leftovers would be disposed of for health and safety reasons. Each participant indicated on a Likert scale (1-10) how healthy they believed each snack to be. This rating was embedded among 'filler' questions that supported the cover story ('How clear is your memory of eating this snack?' and 'How often do you consume this type of snack?').

Self-report Questionnaires. After the tray was removed, the participants completed the Dutch Eating Behaviour Questionnaire (DEBQ; van Strien, Frijter, Bergers and Defares, 1986) as an indicator of trait eating behaviour. The Cronbach's alpha scores for the sub-

scales dietary restraint, external eating and emotional eating were .91, .82 and .91 respectively.

Background demographic information including gender and age was collected. Height and weight were then recorded by the researcher using the SECA laboratory scales (SECA United Kingdom, Birmingham, UK) in order to calculate body mass index (BMI) using the standard formula (kg/m^2). Mean (SD) DEBQ scores, age and BMI are included in Table S1.

Before the study debrief, participants were asked what they believed the study to be about, and if they had any questions or comments. During debriefing, the presence of the cue and the purpose of the study were described. However, none of the participants indicated that they had been aware of the cue symbols' presence or the purpose of the study. All snacks were weighed covertly before and after the session and grams (g) consumed were calculated.

Pre-Treatment of Data

One-way ANOVA, for continuous variables, or Chi-squared analysis, for categorical variables, was used to determine whether the experimental groups differed in demographic and self-report characteristics (age, gender, BMI, PANAS mood ratings, subjective hunger and DEBQ restraint, external and emotional eating sub-scale scores). There were no significant effects of group ($p > .05$) indicating successful randomisation.

For the delay discounting data, $N = 23$ participants were excluded from the analysis as they failed to meet the criteria used by Johnson and Bickel (2008) for systematic responding. This algorithm identifies responding patterns that indicate the task was misunderstood, not attended to or responded to idiosyncratically with regard to personal circumstances (for example, when ones rent is due). Therefore, $N = 137$ for the delay discounting analysis. Including the excluded participants in the analysis did not change the non-significant outcome and so the paper reports findings after exclusions based on Johnson and Bickel (2008).

Finally, for the intake analysis, a three-way interaction between construal condition (high or low), cue condition (present or absent) and dietary restraint (high or low) was tested. The dietary restraint groups were based on a median split. The median for the group DEBQ restraint scores was 2.5. Therefore all those scoring < 2.5 were classed as low in restraint and all those scoring ≥ 2.5 were classed as high in restraint.

Supplementary References

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Table S1: Participant Characteristics

Characteristic	Mean (SD)
Age (Years)	27.79 (10.54)
BMI	24.02 (4.38)
DEBQ restraint	2.67 (.85)
DEBQ external	3.06 (.79)
DEBQ emotional	2.49 (.78)
Hunger	38.93 (20.0)
PANAS positive	30.87 (6.92)
PANAS negative	12.66 (2.92)

Note: BMI (Body Mass Index); DEBQ (Dutch Eating Behaviour Questionnaire); PANAS (Positive and Negative Affect Scale).



Figure S1: Cue symbol