Exploring the role of Effort within the Proximity Effect: A Study Protocol

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Abstract

Obesity prevalence is increasing around the globe, with interventions manipulating the decision environment thought to have a large potential to change behaviour. One such simple yet effective intervention utilises the Proximity Effect, whereby snack consumption is decreased as the physical distance (proximity) between the individual and the snack is increased. Recent studies have suggested that visual salience and physical effort may underpin the effect. The current protocol outlines the first study to experimentally manipulate effort to determine its potential role in the proximity effect.

A sample of 90 university students will be randomly allocated to one of four conditions in a 2 (proximity; 20cm vs 70cm) x 2 (effort; unwrapped vs wrapped) between subjects study. Twenty chocolate brownies will be presented at either 20cm or 70cm, with these brownies being either unwrapped or wrapped in a single layer of clear plastic film (high effort). Participants will also complete self-report measures for potential moderating factors including eating behaviour and perceived visual salience.

Primary outcomes of the study are likelihood of consumption (whether an individual consumed any of the snack), and the actual amount consumed (kCal) according to experimental conditions. Implications of the results may be implemented in food service areas to decrease consumption of unhealthy foods by increasing the physical effort required to attain such foods.

Keywords: Proximity, Effort, Nudge, Choice Architecture, Non-conscious, Consumption

Background

Global obesity is ever-increasing, with the United Kingdom currently having the sixth highest combined overweight and obesity level in the world, and the highest in Western Europe with 63% of the population being overweight or obese (Public Health England, 2017; OECD, 2017). If trends continue, there is ‘virtually zero’ chance of meeting the World Health Organisations target of halting global obesity, with more individuals now overweight than underweight (Di Cesare et al., 2016; World Health Organization, 2013). These statistics reveal that while the population of the world is increasing, so is the average Body-Mass Index (BMI). Many individuals may intend on eating healthier and exercising more, but as intent often does not lead to the corresponding behaviour change (Webb & Sheeran, 2006), intention-to-change methods such as risk educational campaigns may not be sufficient (Marteau et al., 2010). Therefore, alternative methods of intervening may be required to combat the rise in obesity (Marteau, Hollands, & Fletcher, 2012).

A promising method of behaviour change utilises research from behavioural economics (Matjasko, Cawley, Baker-Goering, & Yokum, 2016; Sheeran, Gollwitzer, & Bargh, 2013), such as Nudging (Thaler & Sunstein, 2008). Nudging encompasses a wide range of interventions aimed at influencing people’s behaviour in predictable directions without restricting freedom of choice. These interventions can be effective by altering the choice architecture (i.e., decision environment) where a behaviour is conducted (Thaler & Sunstein, 2008). Many individuals are unaware of the vast quantity of food-related decisions made on a daily basis (14 decisions estimated vs 226 decisions made; Wansink & Sobal, 2007), and so altering the choice architecture can be an effective way to influence these decisions. Indeed, it has been shown that individuals can make healthier decisions and follow more optimal behaviours without being consciously aware of a change in behaviour (Cadario & Chandon, 2017; Hansen, Skov, & Skov, 2016; Hawkes, 2013; Hawkes et al., 2015; Marteau, Hollands, Shemilt, & Jebb, 2015).

While there are multiple non-conscious methods to influence behaviour such as labelling, and altering the size of packaging (Hollands et al., 2013, 2015), a promising yet simple intervention exploits what is known as the Proximity Effect (Bucher et al., 2016). The effect can be defined as the difference in selection or consumption of items based on the physical distance from the individual, with closer items being chosen and consumed more frequently than those located further away. Previous research has shown a difference in

consumption between chocolate snacks located at 20cm and 70cm (Hunter, Hollands, Couturier, & Marteau, 2018; Maas, de Ridder, de Vet, & de Wit, 2012), with other research finding the effect between snack presented at 30cm and 200cm (Privitera & Creary, 2013; Privitera & Zuraikat, 2014).

Despite the proximity effect being fairly robust and effective at influencing behaviour, little is known about exactly why the proximity effect occurs, as the effect arises regardless of BMI (Meyers & Stunkard, 1980), cognitive resources (Hunter, Hollands, Couturier, & Marteau, 2016, 2018), and food preference (Privitera & Zuraikat, 2014). Wansink et al. (2006) suggested that a relationship between proximity and the visual salience of a food influenced consumption, as the effect was strongest when chocolates were in a transparent proximal container than opaque proximal, distal transparent, or opaque distal containers. However, more recent research from Maas et al. (2012) instead suggests that perceived effort moderates the effect and salience did not. Maas and colleagues found that participants perceived it to take more effort to attain a snack from 70cm than attaining the same snack from 20cm, whereas snacks were judged as equally salient in both conditions. While Knowles, Brown, & Aldrovandi, (2017, 2018) did not find a proximity effect in the conventional sense, higher visual salience was significantly associated with higher snack consumption, but perceived effort did not moderate snack consumption. As the results of the aforementioned studies are mixed, the underpinning mechanism is unclear.

Research exploring the effect of physical effort on snack consumption (Brunner, 2013) illustrates that minimally increasing the effort needed to attain and consume a snack reduces the amount eaten, with opaque wrappers, clear wrappers, and the use of sugar tongs each reducing the consumption of food. This effect of effort has been found to occur regardless of cognitive resources, a term commonly used to express the capacity for regulating thoughts and behaviours (Diamond, 2013). Hunter et al. (2018) similarly found that cognitive resources are unlikely to moderate the proximity effect. Previous research exploring the impact of effort on the proximity effect (Maas et al., 2012) has only measured effort with a five-item questionnaire however, as opposed to experimentally manipulating it. While Mass et al. (2012) identified that participants perceived reaching for the distal (70cm) bowl required more effort than reaching for the proximal (20cm) bowl, these post-hoc (self-report) judgements regarding effort are subject to bias. The current study will be the first to directly manipulate the level of effort in order to explore whether it underpins the proximity effect.

Aims and Hypotheses

The current study aims to explore whether physical effort influences the consumption of chocolate brownies when placed at different distances relative to the consumer. The aims and expected outcomes of the study can be expressed in the following hypotheses:

H1: Likelihood of consumption and actual consumption (kCal) will be higher when brownies are presented at a proximal (20cm) compared to a distal position (70cm).

H2: Likelihood of consumption and actual consumption (kCal) will be higher when brownies are presented unwrapped (low effort) than when brownies are presented with a film wrapper (high effort).

H3: A significant interaction between snack proximity and effort level is hypothesised for both likelihood of consumption and actual consumption, which would indicate that effort is a likely moderator for the proximity effect.

Design

Participants will be randomly assigned through use of a computerised random number sequence to one of 4 conditions, in a 2(Bowl position; 20cm vs 70cm) x 2(Effort; low vs high) between subjects design. Participants in low effort conditions will be presented with unwrapped chocolate brownies, with participants in high effort conditions being presented with chocolate brownies wrapped in a single layer of clear plastic film. The bowl position will be measured from the table edge in front of the participant to the front of the bowl, with a neutral selection of magazines located on the left hand side of the table, participant keyboard and mouse directly in front of the participant, and a computer screen 1 meter in front of the participant, as outlined below (See figure 2). Handedness will be controlled for, as the bowl will be located centrally and thus at an equal distance from each hand.

Figure 2: Layout of Testing Area

Outcomes

Past research has measured consumption in two ways: likelihood of consumption, and actual consumption. Both measures provide valuable insight into behaviour, with studies measuring actual consumption (Langlet, Fagerberg, Glossner, & Ioakimidis, 2017; Meiselman, Hedderley, Staddon, Pierson, & Symonds, 1994; Meyers & Stunkard, 1980; Privitera & Creary, 2013; Privitera & Zuraikat, 2014) exploring how the total consumption can be influenced through manipulating proximity, and studies measuring the likelihood of consumption (Baskin et al., 2016; Hunter et al., 2018; Maas et al., 2012) exploring how likely an individual is to consume any snacks. As previous studies have found varied results based on which outcome has been used, it is useful for the present study to examine both measures.

Sample

Based on previous research on both the proximity effect (Study 1, $\eta^2 = .159$) and effort ($\eta^2 = .091$, study 2; Brunner, 2012), setting $\alpha = .05$, $df = 1$, and four conditions, a sample size of 81 is required in order to achieve power = .80. In order to ensure equally sized groups, $N = 84$ participants will be recruited for the main analysis. The study will over-sample to $N = 90$ in order to replace any participants who move the bowl of snacks or withdraw from the study in order to still attain the required sample size of at least 84 participants.

Participants will be invited to participate through an online research scheme based at a West Midlands University. Individuals will be rewarded with 30 minutes-worth of research credits for their participation, with those who have known intolerances, allergies, or food related illnesses (including but not limited to wheat, lactose, nuts, gluten, soy, oats, and dairy products) being excluded from participation. The study will be advertised as a study measuring stress in university students in order to reduce demand characteristics (similarly seen in Hunter et al., 2018; Maas et al., 2012). Participants will be asked to refrain from eating for two hours prior to the study, with any individual wishing to withdraw from the study freely able to do so.

Materials

Transparent, circular (15cm diameter) bowls containing 20 brownies (2.7cm x 2.7cm x 1.5cm, ~11g per unit) will be used for each trial. High effort conditions will have brownies wrapped in a single layer of transparent plastic film. As the layer of wrapping may slightly alter the appearance of the brownies, perceived visual salience will be measured and controlled for in the analyses. All bowls will have the number of brownies counted before and after each trial. To minimise bowl movement, bowls will be fastened to the table with Velcro pads, which will not be visible to participants. Participants' BMI will also be calculated at the end of the study using a Stadiometer (m) and digital weighing scales (kg).

Chocolate brownies were chosen as the study stimuli as a result of a pilot food rating questionnaire ($N = 330$), where individuals rated chocolate brownies as significantly more preferable than chocolate M&M's, the snack most frequently used in proximity studies (see Appendix A).

Questionnaire

For the study, participants will be asked to complete a short questionnaire, separated into two parts (Appendix B). The questionnaire will be presented using Qualtrics (Qualtrics, Provo, UT) on a 27" computer screen presented 1 meter away/with participants using a mouse and keyboard located directly in front of themselves. The following measures will be collected:

Demographics: Age, Gender, Ethnicity, and Socio-Economic Position (using education level and postcode) will be measured to attain an overview of the sample used in the study.

Hunger: Hunger and fullness will be measured using two separate 100-point Visual Analogue Scales (VAS) asking how hungry and how full the participant feels, each anchored with 'Not at All' and 'Very'. The time of the participant's last meal will also be recorded with a multiple choice question, ranging from 0 – 1 hours ago, up to 3+ hours ago.

Stress: In keeping with the cover story, Cohen et al.'s (1983) 10 item Perceived Stress Scale will be used to measure participants stress on a 5 point scale, anchored with Never (0) and Very Often (4).

Handedness: The Edinburgh Handedness Inventory (Veale, 2014) will be used to measure handedness, with a 5-point scale anchored with 'Always Left' and 'Always Right'.

Tiredness: Tiredness will be measured using a two 100-point VAS items asking participants how tired and how awake they currently feel (reversed), anchored from 'Not at All' and 'Very', similar to the tiredness measure in Higgs & Donohoe, (2011).

Visual Salience: Previous research from Wansink et al (2006) found visual salience moderated consumption, with consumption higher when foods were in a clear container opposed to an opaque container. Previous research (Knowles et al, in preparation) found that higher visual salience was associated with a higher consumption of snacks. Maas et al (2012) found that salience was not a moderator for the effect. Due to the mixed findings, visual salience is being measured and included as a covariate, and will be measured using a 5-item, 5-point Likert scale anchored by Completely Disagree (1) and Completely Agree (5), based on the questions used by Maas et al (2012).

Perceived Effort: Maas et al (2012) found that the difference in perceived effort between reaching for M&M's at 20cm and 70cm significantly influenced consumption. More

recently, Knowles et al (2017) found that perceived effort was not a significant moderator for the proximity effect. Again, due to the mixed findings perceived effort will be inputted as a covariate, and is being measured using a 5-item, 5-point Likert scale anchored by Completely Disagree (1) and Completely Agree (5) similar to those used by Maas et al (2012).

Eating Behaviour: The Three Factor Eating Questionnaire - revised 18 (TFEQ-r18, Karlsson et al, 2000) will be used to measure whether participants cognitive restraint, emotional, and uncontrolled eating, as these factors may influence or interact with the effects seen in the study.

Food Liking: Participants will be asked to rate how much they like a short list of commonly eaten snacks and foods on a 100 point VAS.

Recollection of consumption: Individuals will be asked to rate (100 point VAS) how clearly they remember how many brownies they consumed, then asked to enter a numerical value for the number they believe they ate, followed by how confident the consumer feels with this answer (100 point VAS).

Awareness of the Study: A funnelled debrief procedure will be implemented, first asking participants vaguely what they thought the study was investigating, with increasingly specific questions including ‘Did the distance of the bowl influence how many chocolates you ate?’, similar to the Perceived Awareness scale by Rubin, (2016). Responses to these questions are expected to be short written/typed answers which can be assessed for awareness of the study.

BMI: BMI is being measured to attain an overview of the sample, but has not been found to moderate or influence snack selection in proximity effect studies (Meyers & Stunkard, 1980; Bucher et al, 2017), and so is not being included as a covariate unless conditions are significantly different to one another.

The first part of the questionnaire will contain items measuring age, gender, ethnicity, SEP, hunger/fullness, stress, handedness, and tiredness, presented in the stated order. Items measuring hunger, tiredness, and stress will start the second part, followed by items measuring perceived effort, visual salience, recollection of consumption, food liking, food behaviour (TFEQ-r18), study awareness, and BMI, presented in the stated order. The first part of the questionnaire is expected to take around 5 minutes to complete, with the second

half expected to require 10 minutes to complete, due to a higher number of questions in the second part. Participants will be allocated 10 minutes to complete the first part of the questionnaire, and as long as they require for the second part.

Procedure

Participants meeting the required criteria for the study will be asked to attend a single 25 minute laboratory session. After being seated and providing consent, the researcher informs the participant that they have 10 minutes to complete part one of the questionnaire, and can browse the magazines if they finish the questionnaire before the time expires. The researcher will read a prepared script (Appendix C) informing the participant may eat the brownies freely during the 10 minutes of questionnaire completion as a reward for participating. The researcher will excuse themselves from the room for the 10 minute duration to file consent documentation, and will return after the time has elapsed. Upon return, the researcher will ask the participant to complete the second part of the questionnaire, while the researcher removes the bowls from the laboratory into a separate room for counting the remaining brownies, excusing themselves to collect a debrief form for the end of the study. After returning to the laboratory, the researcher assists in conducting the height and weight measurements, before debriefing the participant regarding the true intent of the study.

Analysis

Main Analysis

Any participants who move the bowl, or their consumption is above 2 standard deviations of the mean, will be excluded from the main analysis, but will be included in later sensitivity analysis. Manipulation check analyses will be conducted to ensure the group randomisation was successful and conditions are comparable on tiredness, hunger, BMI, eating behaviour scores, and liking of chocolate brownies. Factorial ANOVAs being conducted for each questionnaire variable (i.e. hunger, BMI, health interest). If conditions are significantly different on any of these variables, these covariates will be included in the main analysis.

Likelihood of Consumption

Participants will be coded on whether or not they consumed any brownies [0 = No, 1 = Yes]. A logistic regression will be conducted to identify whether conditions are significantly different for the likelihood of consumption at both an effort and a proximity level, with visual salience, perceived effort, and any variables different across conditions being inputted as covariates.

Actual Consumption

Further, a 2(Bowl position; 20cm vs 70cm) x 2(Effort; High vs Low) mixed ANCOVA on the quantity of brownies consumed will be conducted, with perceived salience, perceived effort, and any variable which is seen to be different across conditions included as covariates. Planned comparisons will be conducted between the four conditions to examine any possible interaction, in line with hypothesis 3, as the hypothesised interaction between proximity and effort would indicate that effort may moderate the proximity effect.

Follow-up Analysis

Following the main ANCOVA, post hoc analysis will be conducted to break down any possible interactions. Further, sensitivity analysis will be conducted to identify whether the outcomes are different based on the excluded participants (i.e. those who moved the bowl, those who consumed above 2 standard deviations of the condition mean), and whether outcomes differ when only the subsample who consume any snack are analysed.

Discussion

The study will investigate whether the proximity effect is influenced by the level of physical effort it requires to attain and consume a snack from different distances. It is hypothesized that the level of effort will significantly interact with snack proximity, suggesting that effort is a moderator of the proximity effect. This is important for the development of proximity effect literature, as the proximity effect may occur more dramatically when effort is lower. If this is the case, future interventions can incorporate this finding to make healthy foods not only more proximal, but also lower effort, in order to increase consumption, and conversely make consumption of unhealthy foods lower by increasing effort and making foods more distal. The proposed study will add to the associated literature of the proximity effect, physical effort, and wider choice architecture through using a controlled laboratory study with university students. Hunter et al., (2018) recently used a general population sample for their proximity effect study, suggesting that the proximity effect may be less prominent in the general population than a student sample, while also concluding that cognitive resources are unlikely to influence the proximity effect. Previous studies have used a university student sample (Maas et al., 2012; Privitera & Creary, 2013; Privitera & Zuraikat, 2014), and so the use of a student sample in the present study can be seen as following regular practice within the area. Finally, previous proximity effect studies have measured perceived effort with self-report questionnaire items (Knowles et al., 2017; Maas et al., 2012; Wansink, Painter, & Lee, 2006), but the present study will be the first to directly manipulate physical effort within a proximity effect environment, and should allow a more complete examination of the underpinning role of effort on the proximity effect.

Conclusion

Manipulating the distance that food items are located away from an individual to change selection and consumption has been shown to be a generally robust, effective form of choice architecture and behaviour change (Hunter et al., 2018; Maas et al., 2012). However, little is known about the underlying mechanisms and moderating factors which influence the effect, and so the currently proposed study intends to explore one of the two hypothesized mechanisms which may interact or underpin the proximity effect: physical effort. The findings of the study may be able to add depth to the understanding of why the proximity effect works and what mechanisms underpin the effect, as well as provide evidence to be

incorporated in to future dietary behaviour policies. Outcomes of the study may in future be extrapolated from laboratory to field studies to understand the effect in general environments, and explore the effectiveness of proximity-based interventions over prolonged periods of time.

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Appendix

A) Pilot Study data

A computerised questionnaire was completed by 330 participants (89.7% female, 67.6% White British, M Age = 24.72 (SD = 11.13)), asking participants to rate 48 common snacks and drinks on how much they like the item, and how healthy they think the item is on a 100-point Visual Analogue Scale. Each question presented the name of the snack or drink, a visual image of the snack or drink, and the 100-point VAS. Response time was not measured, with participants free to consider their answers. The results of each snack and drink are below (See Table A), ranked from highest to lowest on the snack liking score (1-40 for snacks, 1-8 for drinks).

Table A: Snacks and Drinks Liking and Perceived Healthiness Scores

Snack	Snack Foods			
	Liking		Healthiness	
	M	SD	M	SD
Strawberries	80.66	23.55	85.36	19.02
Dairy Milk Chocolate	77.11	24.88	14.80	21.59
Red Grapes	76.88	24.17	84.81	19.62
Chocolate Brownies	76.22	25.99	11.85	19.82
Lindor Chocolates	73.47	29.39	14.75	20.03
Green Grapes	72.19	25.32	85.41	19.44
Maltesers	71.97	24.90	16.04	20.05
Galaxy Chocolate	71.48	27.87	14.42	20.96
Double Chocolate Cookies	69.64	25.18	12.80	18.63
Milk Chocolate Digestive Biscuits	69.63	27.89	17.88	21.85

Fudge Cake	68.82	28.30	11.28	20.95
Red Apple	68.28	25.82	85.44	19.60
Banana	67.72	28.52	85.61	19.28
Orange	67.52	26.89	84.26	19.87
Chocolate Muffin	65.21	27.80	12.06	20.35
Raspberries	64.19	32.06	84.69	21.16
Green Apple	63.27	27.69	86.17	19.05
Chocolate M&M's	61.60	29.16	12.81	19.06
Bourbons	61.50	28.29	17.98	19.59
White Chocolate	61.18	29.69	18.14	21.09
Broccoli (Cooked)	60.06	29.81	88.47	19.75
Cucumber (Raw)	59.24	30.10	88.82	21.75
Jaffa Cakes	59.04	30.94	17.24	19.81
Oreos	57.54	28.71	14.90	18.77
Kiwi	57.45	29.96	86.45	19.82
Cherries	57.37	31.87	84.13	20.94
Carrot (Raw)	55.93	30.29	89.46	19.43
Carrot (Cooked)	55.07	29.02	83.82	20.58
Dark Chocolate Digestives	54.84	32.85	19.88	19.93
Blueberries	54.22	32.68	84.63	21.77
Peanut M&M's	53.55	34.87	15.73	18.36
Salted Popcorn	52.57	32.85	30.92	23.84
Avocado	47.43	37.77	83.25	22.31
Dark Chocolate	47.43	33.68	40.94	24.86

Mixed Nuts	47.00	31.85	71.80	23.53
Caramel Popcorn	45.08	29.04	16.40	20.02
Raisins	40.69	31.24	66.26	24.69
Rice Cakes	39.34	27.01	61.01	25.05
Drinks				
	Liking		Healthiness	
	M	SD	M	SD
Water	75.19	27.54	94.69	19.79
Apple Juice	62.97	31.76	57.81	25.89
Coca Cola	57.79	31.99	10.72	22.10
Sprite	56.81	20.77	14.69	20.83
Fanta	51.84	30.20	13.93	20.70
Cranberry Juice	50.92	31.53	62.74	25.35
Dr Pepper	50.20	35.43	9.42	18.56
Diet Cola	43.53	34.13	19.30	21.78

Analysis

Individual t-tests were conducted between specific snacks which have previously been used in Proximity effect studies (M&M's), and snacks being considered for future studies (Strawberries, Grapes, Brownies, Lindor Chocolate). Analysis of other snack ratings can be performed in future, with only a small number of tests being presented. The tests showed that chocolate M&M's were liked significantly more than Peanut M&M's, $t(273) = 4.206$, $p < .001$, Chocolate Brownies were liked significantly more than chocolate M&M's, $t(317) = 8.149$, $p < .001$, Strawberries were liked significantly more than Lindor chocolates, $t(318) = 3.394$, $p = .001$, and there was no significant difference between red grapes and Lindor chocolates, $t(318) = 1.599$, $p = .111$. Results were consistent regardless of sex, but are limited due to the high proportion of female participants.

B) Questionnaire

Study 2 - Section 1

1. Please enter your RPS/ID code

2. Please state your age (in years)

3. Sex:

Please state your sex

Male ☐

Female ☐

Rather not say/Other ☐

4. Education Level (Dropdown boxes used)

What is the highest qualification you have achieved or are currently working towards?

☐ No qualifications

☐ Up to 4 GCSE's (Including 1-4 O Levels/CSE/GCSEs (any grades), Foundation Diploma, NVQ level 1, Foundation GNVQ or equivalents) (or foreign equivalent)

☐ 5 or more GCSE's or 1 A-level (Including 5+ GCSEs (Grades A*-C), 1 A Level/ 2-3 AS Levels, NVQ level 2, Intermediate GNVQ, City and Guilds Craft, BTEC First/General Diploma, RSA Diploma, Apprenticeship or equivalents) (or foreign equivalent)

☐ 2 or more A-levels (Including 2+ A Levels, 4+ AS Levels, NVQ Level 3, Advanced GNVQ, City and Guilds Advanced Craft, ONC, OND, BTEC National, RSA Advanced Diploma or equivalents) (or foreign equivalent)

☐ Bachelor's degree (Including BA, BSc, NVQ Level 4-5, HNC, HND, RSA Higher Diploma, BTEC Higher level or equivalents) (or foreign equivalent)

☐ Post-Graduate degree or qualification (Including Higher Degrees e.g. MA, PhD, PGCE, Professional qualifications e.g. teaching, nursing, accountancy or equivalents) (or foreign equivalent)

5. Location

What is your postcode (If you are a student, what is the postcode of your non term-time/university address)?

6. Hunger

On a scale of 0 (Not at all) to 100 (Very), how hungry do you feel currently?

100 point scale

On a scale of 0 (Not at all) to 100 (Very), how full do you feel currently?

100 point scale

7. Stress – PSS-10

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate *how often* you felt or thought a certain way. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer each questions fairly quickly. That is, don't try to count up the number of times you felt a particular way, but rather indicate the option that seems like a reasonable estimate. For each question, choose from the following options:

0 Never

1 Almost Never

2 Sometimes

3 Fairly Often

4 Very Often

1. In the last month, how often have you been upset because of something that happened unexpectedly?   0 1 2 3 4

2. In the last month, how often have you felt that you were unable to control the important things in your life?   0 1 2 3 4

3. In the last month, how often have you felt nervous and "stressed"?
0 1 2 3 4

4. In the last month, how often have you felt confident about your ability to handle your personal problems?   0 1 2 3 4

5. In the last month, how often have you felt that things were going your way?

0 1 2 3 4

6. In the last month, how often have you found that you could not cope with all the things that you had to do?

0 1 2 3 4

7. In the last month, how often have you been able to control irritations in your life?

0 1 2 3 4

8. In the last month, how often have you felt that you were on top of things?

0 1 2 3 4

9. In the last month, how often have you been angered because of things that were outside of your control?

0 1 2 3 4

10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

0 1 2 3 4

8. Handedness

Please answer the following questions on a scale of 1 to 5, with 1 being always left, and 5 being always right.

Which hand do you commonly use to write?

Left	1	2	3	4	5	Right

Which hand do you commonly use to throw an object?

Left	1	2	3	4	5	Right

Which hand do you commonly use to brush your teeth?

Left	1	2	3	4	5	Right

Which hand do you commonly use to eat with a spoon?

Left	1	2	3	4	5	Right

9. Tiredness

On a scale of 1 (Not at all) to 7 (Very), how tired do you currently feel?

1 2 3 4 5 6 7

On a scale of 1 (Not at all) to 7 (Very), how awake do you currently feel?

1 2 3 4 5 6 7

Study 2 – Section 2

10. On a scale of 0 (Not at all) to 100 (Very), how hungry do you feel currently?

100 point Scale

On a scale of 0 (Not at all) to 100 (Very), how full do you feel currently?

100 point scale

11. Follow up Stress

PSS-10

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate *how often* you felt or thought a certain way. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer each questions fairly quickly. That is, don't try to count up the number of times you felt a particular way, but rather indicate the option that seems like a reasonable estimate. For each question, choose from the following options:

- 0 Never
- 1 Almost Never
- 2 Sometimes
- 3 Fairly Often
- 4 Very Often

1. In the last month, how often have you been upset because of something that happened unexpectedly?   0 1 2 3 4

2. In the last month, how often have you felt that you were unable to control the important things in your life?   0 1 2 3 4

3. In the last month, how often have you felt nervous and "stressed"?   0 1 2 3 4

4. In the last month, how often have you felt confident about your ability to handle your personal problems?   0 1 2 3 4

5. In the last month, how often have you felt that things were going your way?   0 1 2 3 4

6. In the last month, how often have you found that you could not cope with all the things that you had to do?   0 1 2 3 4

7. In the last month, how often have you been able to control irritations in your life?

0 1 2 3 4

8. In the last month, how often have you felt that you were on top of things?

0 1 2 3 4

9. In the last month, how often have you been angered because of things that were outside of your control?

0 1 2 3 4

10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

0 1 2 3 4

12. Perceived Effort

On a scale of 1 (Not at all) to 5 (Very much), please answer how much you agree with the following statements:

I had to work hard to get the brownies

1 2 3 4 5

The brownies were within easy reach

1 2 3 4 5

Before eating the brownies, I had to do something else

1 2 3 4 5

Reaching the brownies was effortless

1 2 3 4 5

I had to use effort to attain the brownies

1 2 3 4 5

13. Perceived Salience

On a scale of 1 (Not at all) to 5 (Very much), please answer how much you agree with the following statements:

The chocolate brownies looked tempting

1 2 3 4 5

I was able to resist the brownies effortlessly

1 2 3 4 5

The brownies looked nice

1 2 3 4 5

The brownies looked irresistible

1 2 3 4 5

I barely noticed the brownies

1 2 3 4 5

14. Recollection of Consumption

On a scale of 0 (Extremely Unclear) to 100 (Extremely Clear), please say how clearly you remember how many brownies you ate?

0-100 sliding scale

How many chocolates do you think you ate?

Open answer

On a scale of 1 (Not at all) to 5 (Very much), please say how confident are you with your answer?

1 2 3 4 5

15. Food Liking? If Needed

Please enter how much you like the following foods, between 1 (Not at all) and 100 (Very much).

Red Grapes

Dairy Milk

Strawberries

Brownies

Apple Slices

16. Eating Behaviour (TFEQ-r18)

The Three-Factor Eating Questionnaire

Please read each statement and select from the multiple choice options the answer that indicates the frequency with which you find yourself feeling or experiencing what is being described in the statements below.

1. When I smell a delicious food, I find it very difficult to keep from eating, even if I have just finished a meal.

Definitely true (4)/ mostly true (3)/ mostly false (2)/ definitely false (1)

2. I deliberately take small helpings as a means of controlling my weight.

Definitely true (4)/ mostly true (3)/ mostly false (2)/ definitely false (1)

3. When I feel anxious, I find myself eating.

Definitely true (4)/ mostly true (3)/ mostly false (2)/ definitely false (1)

4. Sometimes when I start eating, I just can't seem to stop.

Definitely true (4)/ mostly true (3)/ mostly false (2)/ definitely false (1)

5. Being with someone who is eating often makes me hungry enough to eat also.

Definitely true (4)/ mostly true (3)/ mostly false (2)/ definitely false (1)

6. When I feel blue, I often overeat.

Definitely true (4)/ mostly true (3)/ mostly false (2)/ definitely false (1)

7. When I see a real delicacy, I often get so hungry that I have to eat right away.

Definitely true (4)/ mostly true (3)/ mostly false (2)/ definitely false (1)

8. I get so hungry that my stomach often seems like a bottomless pit.
Definitely true (4)/ mostly true (3)/ mostly false (2)/ definitely false (1)
9. I am always hungry so it is hard for me to stop eating before I finish the food on my plate.
Definitely true (4)/ mostly true (3)/ mostly false (2)/ definitely false (1)
10. When I feel lonely, I console myself by eating.
Definitely true (4)/ mostly true (3)/ mostly false (2)/ definitely false (1)
11. I consciously hold back at meals in order not to weight gain.
Definitely true (4)/ mostly true (3)/ mostly false (2)/ definitely false (1)
12. I do not eat some foods because they make me fat.
Definitely true (4)/ mostly true (3)/ mostly false (2)/ definitely false (1)
13. I am always hungry enough to eat at any time.
Definitely true (4)/ mostly true (3)/ mostly false (2)/ definitely false (1)
14. How often do you feel hungry?
Only at meal times (1)/ sometimes between meals (2)/ often between meals (3)/almost always (4)
15. How frequently do you avoid “stocking up” on tempting foods?
Almost never (1)/ seldom (2)/ moderately likely (3)/ almost always (4)
16. How likely are you to consciously eat less than you want?
Unlikely (1)/ slightly likely (2)/ moderately likely (3)/ very likely (4)
17. Do you go on eating binges though you are not hungry?
Never (1)/ rarely (2)/ sometimes (3)/ at least once a week (4)
18. On a scale of 1 (No restraint, eat whatever and whenever you like) to 8 (total restraint, always limiting food intake and never giving in), what number would you give yourself?

1 2 3 4 5 6 7 8

17. Study Awareness

Please answer the following questions honestly, there are no right or wrong answers.

Do you think you know what the study was investigating?

Yes ☐

No ☐

If yes, what do you think the research was? Please state below?

Do you think anything in the room affected your eating behaviour?

Yes

No

Did the fact you were in a laboratory for a study influence your behaviour?

Yes

No

Do you think how the brownies were presented affected how many you ate?

Yes

No

Did the distance of the brownies affect how many you ate?

Yes

No

Did the wrappers/unwrapped brownies affect how many you ate?

Yes

No

18. BMI

With the assistance of the researcher, please state your height

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With the assistance of the researcher and the weighing scales, please state your weight. This will be kept completely anonymous and confidential, and shall not be shared with any outside party

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Thank you for answering these questions and for your participation. If you have any questions, please feel free to ask the researcher.

B) Procedure Script:

Thank you for choosing to participate in this study. As you should be aware from reading the information sheet and consent form, the study will investigate the stress levels university students' face at different points of the year. Your stress scores will be kept completely confidential, and will not be shared with anyone outside of the research team.

For the study, you are asked to complete a short questionnaire, split into two sections. You are allocated 10 minutes to complete the first part of the questionnaire, so there is no need to rush your answers. If you complete the questionnaire before the 10 minutes have expired, please feel free to browse the magazines on the table. * If there are wrappers on the brownies, please remember to remove them before consuming them * Please do not use your phone or any other mobile device, as we aim to keep conditions controlled and some notifications may cause a high level of stress. On the table are some chocolates which you are welcome to eat if you so wish, as a thank you for participating in the study. I, the researcher, will leave the room for 10 minutes to file away consent information, and will return once the time has elapsed. After I return, I will start the second part of the study. Do you have any questions before I leave?

Thank you *leaves room*