The Effect of Priming on Food Choice: A Field and Laboratory Study

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1. Introduction

1.1 Research Overview

The high prevalence of overweight and obesity means it is now recognised as a global epidemic, having severe consequences at both the societal and individual level (Dobbs & Manyika, 2015; World Health Organisation, n.d.-a). One of the main contributing factors is the excessive consumption of high-calorie foods, which reinforce further consumption through the rewarding effects on the brain (Fletcher & Kenny, 2018; Kenny, 2011; Mendoza et al., 2007). Consequently, it is important to recognise aspects of the environment that may contribute to unhealthy food and beverage choices, so they can either be modified or removed altogether. In this paper, we look at whether exposure to brand logos that promote unhealthy foods increases the selection of unhealthy foods. Study one examined this effect in the field while study two examined this effect in the laboratory. Study two also measured trait mindfulness to examine whether this moderated any priming effects found and to determine whether increasing mindfulness has the potential to reduce the influence of exposure to unhealthy food-related logos on food choice.

The paper argues that unhealthy food choices may be elicited through behavioural priming effects, where exposure to unhealthy food-related stimuli activates related concepts in memory, promoting behaviour that is in line with these concepts. Although there is much evidence to support the effect of prime stimuli on eating and drinking behaviour (Brunner & Siegrist, 2012; Chiou et al., 2013), no research to date has examined the effect of food-related logos on subsequent food choice. As unhealthy food-related logos are highly prevalent in the environment, it is important to establish the effect they are having on the choices made on a daily basis, particularly if they encourage the consumption of unhealthy foods. It is also argued that mindfulness may moderate the effect of unhealthy food-related primes on food choice, whereby individuals higher in trait mindfulness will be less influenced than individuals lower in trait mindfulness. Specifically, it is argued that individuals higher in trait mindfulness may have a greater awareness of how the prime stimuli are influencing behaviour, resulting in a greater capacity to offset this effect.

1.2 Behavioural Priming

Behavioural priming refers to 'the activation of social representations by exposure to different types of information, and the application of these activated representations in social judgments and behaviours' (Molden, 2014, p. 3). The first study to show behavioural priming effects was by Bargh et al. (1996) who found that priming participants with either the concept of rudeness or politeness increased behaviour that was in line with the active concept. This was just one in a series of studies showing that incidentally presented words could have downstream effects on behaviour; this proved to be an important finding in the history of psychology as it provided evidence that behaviour can be influenced by unconscious processes as well as conscious ones (Payne et al., 2016). These findings subsequently led to the introduction of the term 'behavioural priming', followed by multiple studies examining the various behaviours that could be primed. For example, one study found that subliminal exposure to the Apple computer logo, compared to the IBM logo, increased creativity as measured through the unusual uses test (Fitzsimons et al., 2008). According to the authors, this implies that brand associations exist at a basic cognitive level and have the capacity to influence behaviour outside of awareness. Furthermore, a recent meta-analysis by Weingarten et al. (2016) found a small positive effect of incidentally presented words on different behavioural outcomes, an effect that was consistent across a variety of priming paradigms.

Since the first studies on behavioural priming, the variety of behaviours that can be primed has been closely examined by researchers, with several studies concerning the influence of prime stimuli on food and beverage choice. One study by Fishbach and Dhar (2005) examined the effect of priming either high or low progress towards ideal weight on subsequent snack choice. The participants were initially asked to colour either a wide-scale or a narrow-scale as a means of priming high and low progress respectively, before being asked to select either an apple or a chocolate bar as a parting gift. The results showed a significant difference between the conditions as 85% of participants primed with high progress selected the chocolate bar compared to just 58% of participants primed with low progress. Another study by Chiou et al. (2013) examined whether priming the concept of masculinity through a scrambled sentence task could influence drink choice among men. On completion of the scrambled sentence task, all participants were asked to select either a can of Red Bull or a bottle of Perrier mineral water as a reward for participating in the study. The results showed that participants in the prime condition were significantly more likely to select Red Bull than participants in the control condition, implying that priming the concept of masculinity

promoted behaviour that was consistent with the prime. The unconscious effect of primes on behaviour is further reinforced by several studies that have employed subliminal priming techniques. For example, a study by Karremans et al. (2006) compared the intentions of a prime condition and a control condition to consume Lipton Ice following subliminal exposure to the words ‘Lipton Ice’ (prime condition) or ‘Npeic Tol’ (control condition). The result showed that participants exposed to the Lipton Ice prime had a higher intention to consume Lipton Ice, although further analyses showed that this effect was moderated by degree of thirst.

1.3 Brand Logos as Prime Stimuli

Although there is little research examining the potential for brand logos to influence behaviour, there is evidence that exposure to brand logos can activate a corresponding mental concept in memory (Muscarella et al., 2013). This study compared an unconscious prime condition with a conscious prime condition where both involved exposing participants to five brand logos, previously confirmed as highly familiar and recognisable during a pilot study; these logos had also elicited the strongest unconscious and conscious priming effects in a study that exposed the participants to ten different brand logos. The participants in the unconscious prime condition were exposed to each prime for 17ms, whereas those in the conscious condition were exposed to each prime for 34ms. The participants then completed a lexical decision task where the words presented were from one of four target word categories: (1) a related brand condition (e.g. the McDonald's logo followed by the word "MCDONALDS"); (2) a related non-brand condition (e.g. the McDonald's logo followed by the word "HAMBURGER"); (3) an unrelated brand condition (e.g. the McDonald's logo followed by the word "LACOSTE"); (3) and an unrelated non-brand condition (e.g. the McDonald's logo followed by the word "TIRES"). The results showed that participants responded significantly faster on both brand and non-brand trials where the prime and target word were related as opposed to unrelated. Furthermore, a significant interaction was observed where participants responded faster in the related brand condition than the related non-brand condition. Based on these findings, it was concluded that exposure to brand logos can activate a corresponding mental concept in memory, which has the potential to have downstream effects on behaviour.

1.4 The Situated Inference Model

The increase in the accessibility of a mental concept following exposure to prime stimuli has been well established in the literature (Förster & Liberman, 2007), although the mechanisms that translate this increased accessibility into behaviour are less well understood. One model that attempts to explain the mechanism that underlies behavioural priming effects is the Situated Inference Model by Loersch and Payne (2011), which proposes that the effect of prime stimuli on judgments, decisions, and/or behaviour can be accounted for by a single process that has three discrete stages. The first stage involves exposure to the prime stimulus which increases the accessibility of any mental content that is experientially, semantically, or evaluatively related to the prime. Importantly, this stage only reflects an increase in the readiness to use the activated concept during information processing, as opposed to having a direct effect on judgments, decisions, and/or behaviour. During the second stage, the individual misattributes the increased accessibility of the mental concept to their own natural response toward a specific element of the environment; more precisely, the accessibility of the primed concept is misattributed to the natural thoughts and feelings experienced by the individual and is therefore more likely to be taken into account during subsequent cognitive processing. The third stage relates to the specific questions afforded by the present situation; in other words, the situation determines the different ways in which an individual may respond. As the priming effect obtained depends on the specific questions asked, it is argued that questions related to behavioural responses will subsequently result in behavioural priming effects.

1.5 Priming and Mindfulness

One of the main concerns over priming effects is that they occur automatically outside of conscious awareness and are therefore outside the control of the individual. This point is reiterated by Bargh (1994, p. 13) who states that ‘a lack of awareness of the prime on subsequent judgements, decisions, and behaviour is important as it means the individual has no control over the effect of the prime’. The importance of awareness has also been acknowledged by Wegener and Petty (1997) who proposed that corrective processes can only take place when individuals are aware of a potential bias. Interestingly, it has recently been proposed that cultivating mindfulness may reduce the influence of automatic processes on behaviour, while increasing the influence of conscious processes (Kang et al., 2013). Mindfulness originates from the teachings of the Buddha and has been defined as ‘paying attention in a particular way: on purpose, in the present moment, and non-judgementally (Cantwell, 2010; Kabat-Zinn, 1994, p. 4). Kang et al. (2013) argue that mindfulness increases

the activation of conscious processes through improvements in awareness, attention, ability to focus on the present moment, and non-judgemental acceptance. These lead to the realisation that thoughts are transient mental events that are often far removed from reality, allowing individuals to create mental distance from thoughts (termed cognitive decoupling or decentring) and increasing awareness of the intuitive reactions elicited by internal and external events. This awareness allows individuals to override their intuitive reactions to these events and respond from a conscious rather than an unconscious level. Based on this theory, it is expected that individuals high in trait mindfulness will be less influenced by prime stimuli than individuals low in trait mindfulness.

1.6 Overview of Studies

Study one examined whether unobtrusive exposure to specific food logos (primes) could influence choice of snack in a natural setting. This study aimed to build on previous research in two ways. Firstly, no previous studies to date have used food logos as a means of priming eating behaviour; one of the reasons for using logos is that they are highly prevalent in the social environment and are therefore likely to be highly familiar and easily recognisable. This is partly due to recent advances in technology which have increased the number of ways in which companies can advertise specific brands to potential consumers. Furthermore, the high prevalence of logos in the social environment means that any effects found are likely to reflect how food logos influence eating behaviour on a daily basis. Secondly, the logos were presented in the background of an image rather than in isolation; the main reason for taking this approach was to emulate the presentation of prime stimuli in the natural environment. The importance of brand awareness on product choice has led to the proliferation of stimuli in the social environment as companies compete for consumer attention; as a result, brand logos are usually perceived in the presence of other stimuli.

Study two was a laboratory-based study that examined whether exposure to specific food logos (primes) could influence food choice, building on study one in three ways. Firstly, each logo was presented in isolation to prevent the effect of the prime stimuli from being compromised due to exposure to several different concepts at the same time. This also allowed for a larger image of each logo to be presented, increasing the intensity of the prime stimuli and the resulting concept activation (Bargh & Chartrand, 2000). Secondly, the nature of the priming task meant that all the participants were exposed to the prime stimuli for a fairly long duration. As the logos formed an integral part of the priming task, this maximised

the conscious processing of the primes and further increased the resulting concept activation. Specifically, the priming task involved distinguishing between an original and a modified version of various brand logos and was designed to be fairly difficult for two reasons: (1) to increase the amount of time participants were exposed to the logos; and (2) to reduce the likelihood that participants would become aware of the true aim of the study. Thirdly, the food selection task included a large variety of healthy and unhealthy food items in order to increase the sensitivity of the outcome measure. Consequently, this increased the likelihood of detecting a significant priming effect and also reflected the large variety of foods presently available in the UK (Thornton et al., 2013).

2. Study One

2.1 Study One Overview

In order to examine the effect of specific food logos on subsequent snack choice, participants were primed through the completion of a World Cup Quiz that contained an image with either the Marks & Spencer logo (British retail company that sells food products), the Mars logo, or logos that were unrelated to food visible in the background. Following this, participants were asked to select either an M&S fruit and nut assortment (M&S snack) or a Mars bar as a thank you for taking part. The first confirmatory hypothesis (H1) stated that participants exposed to the M&S logo would be more likely to select the M&S snack compared to participants exposed to the Mars logo or logos unrelated to food. The second confirmatory hypothesis (H2) stated that participants exposed to the Mars logo would be more likely to select the Mars bar compared to participants exposed to the M&S logo or logos unrelated to food. The data analysis also explored whether any effect of the prime stimuli on snack choice was moderated by conscious effort to eat healthily, hunger, tiredness, or BMI. These variables were examined based on previous research findings which have shown them to influence food choice (Ghvanidze et al., 2017; Hoefling & Strack, 2010; Wells & Cruess, 2006; Cohen et al., 2011), although none have been examined in this specific context. This study was pre-registered on the Open Science Framework prior to the start of the data collection period (osf.io/vyter).

2.2 Participants

An a priori power calculation was conducted for a logistic regression analysis using the software G*Power (Faul et al., 2009). This showed that 167 participants would be required to detect a small main effect of priming on food choice (0.25) and achieve a 0.8 level of power with alpha at 0.05. Therefore, a total of 205 participants (before exclusions) were recruited by the first author and a psychology graduate who was briefed on the study procedure. The inclusion criteria stated that participants must be at least 18 years of age; have no allergies or specific dietary needs that would prevent the selection of one or both snacks; be familiar with the M&S and Mars logos; and show no awareness of the true aim of the study during the funnelled debrief. Participants who did not meet these criteria were subsequently excluded from the data analysis. The data collection was due to take place over four sessions with the aim of recruiting a minimum of 167 participants and a maximum of 180 participants (after exclusions). It was explicitly stated in the pre-registration form that the data collection would be terminated as soon as 180 participants had completed the study. However, if less than 167 participants took part over the four sessions scheduled, then extra sessions would take place until a minimum of 167 participants had been recruited. Ethical approval was granted by the City, University of London Psychology Department Research Ethics Committee.

2.3 Measures

Demographic Information

The demographic information questionnaire comprised measures of age, gender and education; participants stated the highest level of education attained at the time of the study.

Funnelled Debrief

Awareness of the link between the priming task and the snacks offered was checked by asking participants two questions: (1) whether they had any ideas about the aim of the present study; and (2) whether they thought anything they had completed during the study may have influenced their snack choice.

Eating Behaviour Questionnaire

Motivation to consume a healthy diet was measured by means of a single question; participants were asked to rate the statement ‘I make a conscious effort to eat healthy foods’ on a 7-point Likert scale from ‘Strongly disagree’ to ‘Strongly agree’. Participants were also asked to specify whether they were currently dieting and whether they had any allergies and/or specific dietary needs that prevented them from taking one of the snacks offered.

Hunger was measured by asking participants to rate how hungry they felt at the time of the study on a 7-point Likert scale from “Extremely hungry’ to ‘Extremely full’. Similarly, tiredness was measured by asking participants to rate how tired they felt at the time of the study using a 7-point Likert scale from ‘Extremely tired’ to ‘Extremely alert’. Recognition of both the M&S logo and the Mars logo was checked by asking participants to indicate whether they recognised each logo by ticking one of two boxes (corresponding to yes or no). Finally, each participant was asked to self-report their height and weight before indicating whether they chose the M&S fruit and nut assortment, the Mars bar, or declined to take a snack; the actual snack chosen was observed by the researcher in order to confirm that the response to this question was correct.

2.4 Priming Task

Participants were primed through the completion of a quiz on the 2018 World Cup which was developed by the first author. The quiz was presented on an A4 sheet of paper and included an image of the England manager, Gareth Southgate, located at the top of the quiz sheet; the image was approximately 16cm x 8.6 cm in all three conditions. In the background of the image was an advertising board displaying the logos of various sponsors of the English Football Association (FA). The logos shown on the advertising board were modified so that the M&S logo was shown four times in the first experimental condition, the Mars logo was shown four times in the second experimental condition, and no food-related logos were shown in the control condition. These logos were used as both Mars and M&S are sponsors of the English FA and the use of different food logos could be considered false advertising. Furthermore, the M&S and Mars logos were presented alongside several logos that were unrelated to food to prevent participants from becoming aware of the true aim of the study. The last quiz question concerned the identity of the individual in the image (Gareth Southgate) to ensure all participants would look directly at the logos.

2.5 Procedure

The study took place in one of the indoor walkways at the university. A stand was set up between 11am and 3pm on five weekdays over a two-week period and consisted of two display boards, two tables and two chairs. The display boards were arranged in a T shape with one table and one chair on either side of the vertical display board; this set-up allowed the researchers to recruit two participants at a time and prevented the participants from seeing each other's snack choice. The snacks were offered to participants in a small wicker basket

that was hidden behind the horizontal display board so participants were not aware that the study involved food. Posters were also attached to the display boards which advertised the study as a brief quiz on the 2018 World Cup, with two notifications informing the participants they could enter a prize draw for a £50 Amazon voucher on completion of the study. The participants included students, staff, and visitors to the university who were recruited as they walked past the stand. All participants were provided with basic information about the study and were required to give verbal consent prior to taking part.

The quiz sheets were randomly ordered by the third author who was not involved in the data collection. A restricted randomisation was used to ensure each condition was approximately the same size throughout the data collection period (Schulz & Grimes, 2002). The quiz sheets were randomised in blocks of nine using the website graphpad.com, where three quiz sheets from each of the three conditions were randomly ordered in each block. The quiz sheets were subsequently given to the participants in the order they were received, with the researchers collecting the data unaware of how the participants were allocated to conditions. The demographic information questionnaire was also attached to the quiz sheet and was intentionally placed over the image of Gareth Southgate to ensure each trial was double-blind. Once each participant had agreed to take part, they were seated at one of the tables and completed the demographic questionnaire followed by the World Cup Quiz. The quiz comprised five questions and took approximately 1-2 minutes to complete; however, participants were only required to look at the image to answer the fifth question. Once the quiz had been completed and returned to the researcher, each participant was asked if they would like to select either an M&S fruit and nut assortment or a Mars bar as a thank you for taking part; participants were also free to decline if they did not want to take either snack. Once a snack had been selected (or declined) each participant was taken through the funnelled debrief in order to check for awareness of the true aim of the study; this was done verbally by the researchers who wrote the responses on an A4 sheet of paper. Participants were then asked to fill in the eating behaviour questionnaire before being debriefed about the aims of the study. All participants who wished to enter the prize draw were asked to write down their email address before leaving.

2.6 Data Analyses

Both confirmatory hypotheses were specified before the first author began collecting the study data. The pre-registration form stated that the data would be analysed by means of a

multinomial regression analysis in order to compare the three levels of the dependent variable: M&S snack chosen, Mars snack chosen, and no snack chosen. However, as it was later decided to exclude the participants who declined to take a snack, both the confirmatory and exploratory analyses were examined through a series of logistic regression models.

3. Results

3.1 Data Screening and Participant Characteristics

A total of 35 participants did not meet the inclusion criteria and were therefore excluded from the analysis. The first five participants were excluded as the participants may have guessed the aim of the study due to procedural errors by the researcher; seventeen participants reported having an allergy or specific dietary need that influenced their snack choice; five participants failed to recognise at least one of the logos during the eating behaviour questionnaire; and five participants guessed the aim of the study during the funnelled debrief. A further three participants were excluded as two participants reported having a dislike for one of the snacks (influencing snack choice) and one participant gave the snack back at the end of the study, implying they had no intention to consume the snack selected. This resulted in a final sample size of 170 participants. Table 1 shows the demographic and personal characteristics as a function of condition.

Table 1

Characteristics of Participants as a Function of Condition

Characteristic[a]	Control (n = 60)	M&S Prime (n = 56)	Mars Prime (n = 54)
Females (%)[b]	32	45	47
Age (Mean, SD)[cd]	25.1 (9.8)	24.0 (7.3)	27.8 (11.2)
Completed education level (%)[e]			
GCSE's	2	2	4
A-Levels	60	48	46
Bachelor's degree	22	27	26
Postgraduate degree	17	23	24

Conscious effort to eat healthily (Mean, SD)	5.0 (1.4)	5.4 (1.2)	5.3 (1.3)
Dieting (%)[f]	15	22	32
Hunger (Mean, SD)	3.8 (1.5)	3.9 (1.4)	3.8 (1.4)
Tiredness (Mean, SD)	4.2 (1.7)	3.8 (1.6)	3.7 (1.8)
BMI (Mean, SD)[g]	23.9 (3.4)	23.1 (3.5)	25.2 (4.7)

[a]Conscious effort to eat healthily, hunger, and tiredness were all measured on 7-point Likert scales: higher scores reflected higher agreement with each measure.
[b]Three missing values in the control condition and the Mars prime condition.
[c]One missing value in the control condition and the M&S prime condition.
[d]Significance based on Welch's F-test due to unequal homogeneity of variance.
[e]Percentages may not total 100 due to rounding.
[f]One missing value in the M&S prime condition.
[g]Number who declined to say: Control = 7, M&S prime = 3, Mars prime = 7.

3.2 Confirmatory Analysis: The Effect of Condition on Snack Choice (H1 and H2)

The data analysis was run with and without the participants who declined to take a snack; when these participants were included, the no snack choice and M&S snack choice were collapsed into one category as both choices can be interpreted as being healthier than selecting the Mars bar. Although the results were the same, the participants who took no snack (n = 11) were excluded from the analysis. This decision was made as collapsing these categories is based on the assumption that the participants who took no snack had the same underlying motivation as the participants who chose the M&S snack. However, it may be the case that the participants who declined a snack did so as they disliked both of the snacks offered.

A logistic regression analysis was run to examine the effect of condition (M&S prime, Mars prime, or control) on snack choice (M&S snack or Mars bar), with the control condition entered as the reference category (see Table 2 below). The results showed that the participants assigned to either the M&S prime or the Mars prime condition were no more likely than those assigned to the control condition to select the M&S snack or the Mars bar.

Table 2

A Logistic Regression Model Showing the Effect of Condition on Snack Choice

		b (S.E)	Sig.	Odds Ratio	95% CI for Odds Ratio	
					Lower	Upper
Included						
Constant		0.07 (0.27)	0.79	1.07		
Condition	M&S prime	-0.07 (0.39)	0.85	0.93	0.44	1.98
	Mars prime	-0.03 (0.39)	0.93	0.97	0.45	2.07

Note. The control condition served as the reference category.
R^2 = 0.00 (Hosmer-Lemeshow), 0.00 (Cox-Snell), 0.00 (Nagelkerke).
Model $\chi^2(2) = 0.03$, $p = .98$.

Another logistic regression analysis was run to compare the M&S prime condition with the Mars prime condition. The analysis showed that there was no difference in the snack choices made by either the M&S prime condition or the Mars prime condition (p = 0.92). The main findings are visually represented in Figure 1 which shows the percentage of M&S snacks and Mars bars selected in each condition.

Figure 1

The Percentage of M&S Snacks and Mars Bars Selected in Each Condition

Insert Figure 1 here

The results showed that participants assigned to the M&S prime or the Mars prime condition were no more likely than those assigned to the control condition to select the M&S snack or the Mars bar. The model was a poor fit for the data observed ($\chi^2(2) = 0.03$, p = .98).

3.3 Exploratory Analysis: The Moderating Effect of Traits

A series of logistic regressions were run to determine whether age (mean centred), gender, and education level moderated the association between prime condition and snack choice. For each moderator variable, three separate regressions were run to compare the three conditions. Each analysis involved entering the moderating variable at step 1, condition at step 2, and the interaction term at step 3. The M&S snack choice was coded as 0 and the Mars bar was coded as 1 for each analysis. A significance cut-off point of $p < 0.05$ was used despite the large number of tests being performed. A stringent Bonferroni correction for seven moderators in total – the three traits explored here (age, gender, and education level) and four states considered below (effort to eat healthily, hunger, tiredness, and BMI) – and three regressions

per moderator (hence 21 tests) would imply a significance cut-off at $p < 0.0024$ (0.05/21). However, conscious of the limited sample size and therefore power of the current study, the findings are reported at the conventional 0.05 threshold.

The Moderating Effect of Age, Gender, and Education Level

The results showed a significant main effect of age on snack choice whereby older participants were more likely to select the M&S snack than younger participants, $b = -0.06$, $OR = 0.95$, $p = 0.01$, R^2 (Cox & Snell) = 0.05, R^2 (Nagelkerke) = 0.07. A significant interaction between condition and age was found when the control condition (coded as 0) was compared with the M&S prime condition (coded as 1), $b = -0.19$, $OR = 0.82$, $p = 0.04$. A simple slopes analysis was run to explore the interaction between age and condition when comparing the control condition (coded as 0) with the M&S prime condition (coded as 1), although none of the simple slopes reached significance. The results showed there was no moderating effect of gender or education level.

3.4 Exploratory Analysis: The Moderating Effect of States

A series of logistic regressions were run to determine whether conscious effort to eat healthily, dieting status, hunger, tiredness, and/or self-reported BMI moderated the association between prime condition and snack choice; these were all mean centred before being entered into the regression models. For each moderator variable, three separate regressions were run to compare the three conditions. Each analysis involved entering the moderating variable at step 1, condition at step 2, and the interaction term at step 3. The M&S snack was coded as 0 and the Mars bar was coded as 1 for each analysis.

The Moderating Effect of Conscious Effort to Eat Healthily, Dieting Status, Hunger, Tiredness, and Self-Reported BMI

There was a significant main effect of conscious effort to eat healthily on snack choice whereby participants showing a greater effort to eat healthily were more likely to select the M&S snack, $b = -0.54$, $OR = 0.59$, $p < 0.001$. No significant interactions between condition and conscious effort to eat healthily were found. However, there was a significant interaction between condition and dieting status when the M&S prime condition (coded as 0) was compared to the Mars prime condition (coded as 1) ($b = -2.72$, $OR = 0.07$, $p = 0.01$); a simple slopes analysis found that participants who were dieting were more likely to select the snack that corresponded with the prime stimuli presented, $b = 2.20$, $OR = 9.03$, $p = 0.02$. There was

also a main effect of hunger on snack choice whereby participants with higher levels of hunger were more likely to select the M&S snack than participants with lower levels of hunger, b = -0.29, OR = 0.75, p = 0.02. Furthermore, the results showed a significant interaction between condition and hunger when the M&S prime condition (coded as 0) was compared to the Mars prime condition (coded as 1), b = -0.71, OR = 0.49, p = 0.03; however, none of the simple slopes reached significance. The findings indicated a significant interaction between condition and tiredness when the control condition (coded as 0) was compared to the M&S prime condition (coded as 1), b = 1.92, OR = 6.85, p = 0.02; a simple slopes analysis showed that the effect of condition on snack choice just reached significance for participants who reported feeling less tired, b = -1.32, OR = 0.27, p = 0.05. Lastly, there was a significant interaction between condition and self-reported BMI when the control condition (coded as 0) was compared with the Mars prime condition (coded as 1), b = -0.27, OR = 0.76, p = 0.03, as before, none of the simple slopes reached significance.

4. Discussion

Contrary to expectations, the results showed no effect of the logos on snack choice; the percentage of participants selecting the M&S snack and the Mars bar was similar across all three conditions. Although this does not support the initial prediction, two explanations that may account for this finding are discussed below.

Firstly, the priming task may have been too weak to have an effect on snack choice due to the complexity of the image shown to participants. Despite research evidence showing that even subliminal primes can increase the accessibility of a mental concept and influence subsequent behaviour (Van den Bussche et al., 2009; Karremans et al., 2006), these studies usually involve presenting the prime stimuli in isolation; for example, presenting a concept by itself rather than as part of a more detailed image. As it has been proposed that the level of concept activation achieved is determined by the duration and intensity of the prime stimuli presented (Bargh & Chartrand, 2000), it may be that the activation of the mental concepts in the present study was too low to show an effect.

Secondly, the effectiveness of the priming task may have been compromised by the inclusion of several different concepts in the prime image. Negative priming effects occur when the

inhibition of a prime stimulus reduces the accessibility of the corresponding mental concept during a subsequent task (Tipper, 1985). According to Frings et al. (2015), if an initial distractor stimulus subsequently becomes the target stimulus in a cognitive or behavioural task, response to this target is reduced in terms of latency and/or accuracy. For example, perception of the image may have activated irrelevant mental concepts through the identification of Gareth Southgate, as well as recognition of the logos that were not food-related. As the specific food-related logos in the image were irrelevant to the initial priming task – recognition of the individual in the image – they may have acted as distractor stimuli and therefore become less accessible as a result.

Overall, the results of study one did not support the hypothesis that exposure to food-related primes would increase the selection of the corresponding snack in a subsequent choice task. However, the results may have been influenced by the specific priming task employed; the task did not require conscious processing of the prime stimuli which was presented as part of a more detailed image that included various logos that were unrelated to food. Therefore, the aim of study two was to advance study one by including a stronger priming task that involved consciously processing the prime stimuli, as well as administering a more sensitive measure of food choice.

5. Study Two

5.1 Study Two Overview

In order to examine the effect of unhealthy food-related logos on food choice, participants were primed through the completion of a novel priming task that involved distinguishing between an original and a modified version of various brand logos. Approximately five minutes after completing the priming task, participants were presented with a food selection task that involved selecting five foods from a list of 12 healthy and 12 unhealthy food items. The first confirmatory hypothesis (H1) stated that participants who were exposed to the unhealthy food-related logos would select a greater number of unhealthy food items during the food selection task. The second confirmatory hypothesis (H2) stated that participants exposed to the unhealthy food-related logos who were also high in trait mindfulness would be less influenced by the prime stimuli (moderation). The data analysis also explored whether any effect of the unhealthy food-related logos on food choice was moderated by alertness,

last food consumption, conscious effort to eat healthily, and/or BMI. As for study one, these variables were included as previous research findings have shown them to influence food choice (Ghvanidze et al., 2017; Hoefling & Strack, 2010; Wells & Cruess, 2006; Cohen et al., 2011), although none have been examined in this specific context. This study was pre-registered on the Open Science Framework prior to the start of the data collection period (osf.io/cdb5p).

5.2 Participants

An a priori power calculation was conducted for an independent t-test using the software G*Power (Faul et al., 2009). This showed that 156 participants would be required to detect a medium main effect of priming on food choice (0.4) and achieve a 0.8 level of power with alpha set at 0.05. Therefore, a total of 170 female participants were recruited (before exclusions) through leaflets administered in the Department of Psychology, as well as an advertisement on the online experiment management system SONA. Females were recruited as it was important for the participants to be motivated to eat healthily in order to find a priming effect; no motivation to eat healthily would likely lead to the selection of the unhealthy foods regardless of the prime stimuli due to the greater reward associated with highly palatable foods that are unhealthy. The assumption that females are more motivated than males to eat healthy foods in order to regulate body weight was confirmed by Renner et al. (2012). The inclusion criteria also stated that participants must be at least 18 years old, have resided in the UK for a minimum of three years (to ensure familiarity with the logos), and have normal or corrected-to-normal vision (to ensure each logo could be perceived clearly). Furthermore, any individuals with a food allergy or who identified as vegan were excluded from the study due to the influence this may have on the food selection task. Ethical approval was granted by the City, University of London Psychology Department Research Ethics Committee.

5.3 Measures

Demographic Information. The demographic information questionnaire comprised measures of age and education; participants stated the highest level of education attained at the time of the study.

Alertness. Level of alertness was measured by asking participants to rate how alert they felt in the present moment on a 7-point Likert scale from 'Extremely alert' to 'Extremely unalert'.

Food Selection Task. The food selection task presented participants with a total of 24 food items, including 12 healthy foods and 12 unhealthy foods that were identified through a pilot study (see pilot study one in the supplementary materials). Each participant was asked to select five foods to evaluate in a supposed 'taste test' at the end of the study, with both the healthy and unhealthy categories comprised of six savoury and six sweet food items.

Food Desire. Food desire was measured by asking participants to rate how much they wanted to consume the food items in the present moment, without concern for calories or a healthy diet. The participants rated each of the 24 food items on a 7-point Likert scale from 'No desire' to 'Extreme desire'.

Five-Facet Mindfulness Questionnaire Short-Form (FFMQ-SF). The FFMQ-SF is a 24-item questionnaire that measures trait mindfulness through five components: observing, describing, acting with awareness, non-judgement, and non-reactivity (Bohlmeijer et al., 2011). The observing subscale consists of four items (α for the present study = 0.52), whereas the describing subscale (α = 0.85), acting with awareness subscale (α = 0.81), non-judgement subscale (α = 0.80), and non-reactivity subscale (α = 0.74) all consist of five items. The authors have confirmed the replicability and validity of the questionnaire by cross-validating with an independent sample of participants (Bohlmeijer et al., 2011).

Funnelled Debrief. Awareness of the link between the priming task and the food selection task was assessed by asking participants a series of questions based on the awareness check guidelines provided by Bargh and Chartrand (2000). For example, participants were asked whether they had any ideas about the aim of the present study and whether any of the tasks completed during the 'first study' could have influenced their responses during the 'second study' (see supplementary materials for a complete list of questions).

Eating Behaviour. Motivation to consume a healthy diet was measured by means of a single question; participants were asked to rate the statement 'I make a conscious effort to eat

healthy foods' on a 7-point Likert scale from 'Strongly disagree' to 'Strongly agree'. Participants were also asked to specify (1) whether they were following a particular diet at the time of the study; (2) the last time they consumed food to the nearest 15 minutes; and (3) when they next planned to consume food to the nearest 15 minutes.

Body Mass Index (BMI). After giving consent, the height and weight of each participant was taken so that BMI could be calculated.

5.4 Priming Task

Both the priming and control tasks consisted of 18 trials whereby each trial involved distinguishing between an original and a modified version of a well-known brand logo. Participants in the prime condition were presented with six trials of unhealthy food-related logos, six trials of social media logos, and six trials of car logos. Participants in the control condition were presented with the same logos as the prime condition, apart from the presentation of six trials of clothing shop logos in place of the six trials of unhealthy food-related logos. The following unhealthy food-related brand logos were identified through two pilot studies (see pilot study one and two in the supplementary materials) and comprised the main prime stimuli: McDonald's, Ben & Jerry's, Magnum, Cadbury's, Thornton's, and Mr Kipling. Each logo was approximately 15cm by 10cm on the computer screen, although this varied slightly depending on the shape of the logo. For each trial, participants were asked to indicate whether they recognised the logo and to identify the original version. The duration of the exposure to each prime stimuli could not be measured due to the logos being presented in a random order by Qualtrics. Furthermore, even though the responses to each trial were recorded, the participants were not given any feedback regarding their performance on the priming task.

5.5 Procedure

Participants were recruited through advertisements in the department and the experiment management system SONA. All participants were emailed and asked to confirm that they adhered to the eligibility criteria before taking part. The study was completed through the computer software Qualtrics in one of the behavioural research laboratories located in the Department of Psychology. On arrival, participants were informed that they would be completing two separate studies to disguise the true aim of the research. All participants were given a study information sheet and asked if they had any questions before giving informed

consent. Explicit instructions were provided on the computer screen to guide participants through the study.

The ‘first study’ was titled ‘Recognition memory and thinking style’ and took approximately 10 minutes to complete. The researcher waited outside the laboratory while the study was being completed to avoid unconsciously influencing the responses made. Participants were initially asked to state their age, educational attainment and present level of alertness before being automatically randomised to either the prime or control condition by Qualtrics. The participants then completed either the priming task or the control task which are described in section 5.4 above. Subsequently, participants were asked to complete the 10-item rational-experiential inventory (REI-10) which is a brief measure of thinking style and was administered purely as a decoy to prevent participants from becoming aware of the true aim of the study; the responses to this questionnaire were not included in the present analysis. On completion of the REI-10, a message on the computer screen asked the participant to inform the researcher they had now completed the 'first study' and were ready to start the 'second study'. The studies were purposely set up as separate projects in Qualtrics to prevent the participants from becoming aware of the link between the priming task and the food selection task.

The ‘second study’ was titled ‘Food evaluation and personality’ and also took approximately 10 minutes to complete. Prior to starting the ‘second study’, the participants were reminded that the first task was to select five foods to consume and evaluate as part of a ‘taste test’ at the end of the study; this reminder ensured that participants were under the impression they would have to consume the five foods selected later on. The researcher then left the laboratory to avoid unconsciously influencing the subsequent responses made. Once five foods had been selected from the 12 healthy and 12 unhealthy foods items, the participants were asked to rate their desire for each of the 24 foods on a 7-point Likert scale from ‘No desire’ to ‘Extreme desire’; the order in which the foods were presented during this task was automatically randomised by Qualtrics. This task was followed by completion of the FFMQ-SF and the behavioural approach systems subscale of the RST-PQ. After filling out both questionnaires, the participants were given the verbal funnelled debrief to ensure they were unaware of the link between the priming task and the food selection task. The final part of the study involved completing the eating behaviour questionnaire and recording the height and weight of participants who consented to having these measures taken. Following this, the

participants were told that they would not be required to complete the taste test and were informed of the true nature of the study; all participants received a debrief sheet and were asked if they had any questions or comments regarding the study. As a result of not completing the taste test and as a thank you for taking part, all participants were offered a snack to take away with them. Lastly, the assigned number of course credits or payment due was given to each participant.

5.6 Data Analyses

Both confirmatory hypotheses were specified before the first author began collecting the study data. Although the pre-registration form stated that both hypotheses would be analysed by means of several regression analyses, the first confirmatory hypothesis was analysed using an independent t-test as this was considered more appropriate. A third confirmatory hypothesis stated that trait mindfulness would reduce the effect of the unhealthy food-related logos through a reduction in reward reactivity (mediation). However, as the reinforcement sensitivity theory of personality questionnaire measures trait reward reactivity, it was not possible to determine whether this acts as a mediating variable; therefore, we have omitted any further discussion of this. Even though no exploratory analysis were specified prior to the study, the potential for certain variables to act as moderating variables was also examined.

6. Results

6.1 Data Screening and Participant Characteristics

A total of four participants did not meet the inclusion criteria and were therefore excluded from the main analysis; all four of these participants showed awareness of the true aim of the study during the funnelled debrief. A further eight participants were excluded for the following reasons: the first six participants may have been unaware the five foods selected were to be consumed as part of a ‘taste test’, as all six participants started to leave the laboratory after completing the ‘second study’; one participant was aiming to gain weight which may have increased the number of unhealthy foods selected; and one participant was found to be chewing gum throughout both studies, which may have influenced appetite. This resulted in a final sample size of 158 participants. Table 3 shows the demographic and personal characteristics of the participants as a function of condition. Table 4 shows a correlation matrix of the predictor and criterion variables.

Table 3

Characteristics of Participants as a Function of Condition

Characteristic[a]	Control (n = 82)	Prime (n = 76)
Age (Mean, SD)	21.8 (6.3)	20.8 (6.8)
Completed education level (%)		
GCSE's	1	0
A-Levels	70	78
Bachelor's degree	11	12
Postgraduate degree	12	5
Other	6	5
Alertness (Mean, SD)	5.6 (1.0)	5.7 (1.1)
Conscious effort to eat healthily (Mean, SD)	4.8 (1.3)	4.8 (1.2)
Dieting (%)	9	9
Last food consumption in hours (Mean, SD)[b]	2.8 (3.8)	3.1 (3.7)
BMI[c] (Mean, SD)	23.3 (5.4)	24.5 (6.4)

[a]Alertness and conscious effort to eat healthily were both measured on 7-point Likert scales where higher scores reflected a higher agreement with each measure.
[b]One missing value in the control condition.
[c]Number who declined to have measures taken: Control = 9, prime = 12.

Table 4

A Correlation Matrix of the Predictor and Criterion Variables

		1	2	3	4	5	6	7
1	Condition	1						
2	Alertness	0.04	1					
3	Conscious desire to eat healthily	0.01	0.11	1				

4	Desire for healthy food	-0.05	-0.09	0.04	1			
5	Desire for unhealthy food	0.15	-0.06	-0.07	0.25**	1		
6	Mindfulness score	-0.03	0.20*	0.15	-0.08	0.20*	1	
7	Food choice score	0.03	0.05	-0.21**	-0.11	0.02	-0.17*	1

*Correlation is significant at the 0.05 level (two-tailed).
**Correlation is significant at the 0.01 level (two-tailed).

6.2 Confirmatory Analysis: The Effect of Condition on Unhealthy Food Choice (H1)

The number of unhealthy food choices made by each participant were summed to give a total unhealthy food choice score out of 5; participants selecting 5 healthy foods scored 0 and participants selecting 5 unhealthy foods scored 5. As four participants selected six foods to consume rather than five, these scores were adjusted to reflect the proportion of unhealthy food choices made by each participant based on the selection of five foods; this was calculated by dividing the original unhealthy food choice score by six and then multiplying by five. The descriptive statistics showed that the mean unhealthy food choice score was similar for both the control condition (mean = 2.88, SD = 1.41) and the prime condition (mean = 2.96, SD = 1.40); an independent t-test confirmed that there was no difference in the food choices made by both conditions, $t(156) = -0.36$, $p = 0.72$. The mean unhealthy food choice scores for the control condition and prime condition are visually represented in Figure 2. This hypothesis was also tested through an analysis of covariance in order to control for alertness, last food consumption, conscious effort to eat healthily, and BMI; as this made no difference to the results, these variables were removed from the analysis.

Figure 2

The Mean Unhealthy Food Choice Scores for the Control and Prime Conditions

Insert Figure 2 here

6.3 Confirmatory Analysis: The Moderating Effect of Mindfulness on Unhealthy Food Choice Score (H2)

A hierarchical linear regression was run to determine whether trait mindfulness (centred) moderated the association between condition and unhealthy food choice score. The analysis involved entering trait mindfulness at step 1, condition at step 2, and the interaction term at

step 3. Table 5 shows a main effect of trait mindfulness on unhealthy food choice score whereby participants higher in trait mindfulness were significantly less likely to select unhealthy foods, *ß* = -0.17, *t* = -2.19, *p* = 0.03. The results also showed there was no significant interaction between condition and trait mindfulness on unhealthy food choice score, *ß* = 0.09, *t* = 0.88, *p* = 0.38. However, as the sample size calculation was based on the first confirmatory hypothesis (main effect of priming on food choice) it may be the case that this analysis was underpowered, increasing the likelihood of a type II error.

Table 5

A Linear Regression Model Examining the Main and Moderating Effect of Trait Mindfulness on Unhealthy Food Choice Score.

	Food choice score		
	B	SE	Beta
Step 1			
Constant	2.92	0.11	
Trait mindfulness	-0.50	0.23	-0.17**
R^2	0.03		
Step 2			
Constant	2.88		
Condition*	0.07	0.22	0.02
R^2	0.03		
ΔR^2	0.00		
Step 3			
Constant	2.89		
Interaction	0.40	0.46	0.09
R^2	0.04		
ΔR^2	0.01		

*Control = 0, prime = 1.
**$p < 0.05$.

6.4 Exploratory Analysis: The Association Between Trait Mindfulness and Unhealthy Food Choice Score

A forced entry multiple regression showed the association between the five subscales of the FFMQ-SF and unhealthy food choice score was low to moderate (Multiple $R = 0.27$, $p = 0.04$) with the subscales accounting for 4% of the variance in unhealthy food choice score (Adjusted R^2). The data analysis showed that none of the subscales were intercorrelated

(observing, VIF = 1.08; describing, VIF = 1.21; non-reactivity, VIF = 1.21; acting with awareness, VIF = 1.27; non-judgement, VIF = 1.44). Overall, non-judgement was the only significant predictor of unhealthy food choice score whereby participants reporting higher levels of non-judgement selected fewer unhealthy foods, β = -0.27, p = 0.004 (95% CI = -0.79 – -0.15). The unstandardised and standardised coefficients for each of the five subscales are shown in Table 6.

Table 6

A Linear Regression Model Examining Associations between the Five Subscales of the FFMQ-SF and Unhealthy Food Choice Score.

	Food choice score		
	B	SE	Beta
Step 1			
Constant	4.77	0.82	
Observing	-0.27	0.17	-0.13
Describing	0.09	0.14	0.06
Non-reactivity	-0.09	0.16	-0.05
Acting with awareness	0.10	0.15	0.06
Non-judgement	-0.47	0.16	-0.27*

*p < 0.05.

6.5 Exploratory Analysis: The Moderating Effect of States

A series of hierarchical linear regressions were run to determine whether alertness, last food consumption, conscious effort to eat healthily and BMI moderated the association between condition and unhealthy food choice score. All moderator variables were mean centred before being entered into the regression models. Each analysis involved entering the moderating variable at step 1, condition at step 2, and the interaction term at step 3.

The Moderating Effect of Alertness, Last Food Consumption, Conscious Effort to Eat Healthily, and BMI

The results showed there was no main effect of alertness on unhealthy food choice score and there was also no interaction effect between condition and alertness. Visual inspection of the data showed that last food consumption had a non-normal distribution, although this was

corrected following a log10 transformation. The results showed there was no main effect of last food consumption on unhealthy food choice score and the coefficient of the interaction term was also not significant. However, a main effect of conscious effort to eat healthily on unhealthy food choice score was found, whereby higher levels of conscious effort to eat healthily were associated with fewer unhealthy food choices, $ß = -0.21$, $t = -2.64$, $p = 0.009$. The coefficient of the interaction between condition and conscious effort to eat healthily was not significant. As five BMI scores were identified as outliers through tests of normality, the values of these scores were replaced with the largest BMI score that was not identified as an outlier (Kwak & Kim, 2017). The results showed there was no main effect of BMI on unhealthy food choice score and there was also no interaction effect between condition and BMI.

6.6 Exploratory Analysis: The Effect of Condition on Desire

As desire was measured on a 7-point Likert scale, a mean desire rating for the 12 unhealthy food products was calculated and compared between conditions. The descriptive statistics showed that the desire ratings were similar for both the control condition (mean = 2.38, SD = 0.62) and the prime condition (mean = 2.58, SD = 0.69); an independent t-test confirmed that there was no difference in the desire ratings of both conditions, $t(156) = 1.90$, $p = 0.06$.

7. Discussion

The results showed there was no effect of the unhealthy food-related primes on the number of unhealthy food items selected; the mean number of unhealthy food items selected was similar for both the prime and control conditions. Although this result was unexpected, two potential explanations to account for these findings are discussed below.

Firstly, the priming task exposed the participants to six unhealthy food-related logos which only accounted for 33% of the stimuli in the priming task. As the task was developed to increase the strength of the concept activation by presenting the primes at a high intensity for a fairly long duration, it was determined that a higher frequency of prime stimuli may increase the proportion of participants becoming aware of the aim of the study. However, the importance of frequent exposure to prime stimuli has been demonstrated by Srull and Wyer (1979) who varied both the proportion of prime stimuli presented (20% or 80%) and the

length of the priming task (30 items or 60 items). The results showed that participants exposed to a higher proportion of prime stimuli showed a stronger priming effect during a subsequent evaluation task than those exposed to a lower proportion of prime stimuli. Furthermore, participants who completed the 60-item priming task showed a stronger priming effect than participants who completed the 30-item priming task, even when both tasks had a high proportion of prime stimuli. Therefore, the lack of effect found in the present study may be due to the low proportion of prime stimuli presented during the priming task.

Secondly, the participants may have justified the selection of unhealthy foods by viewing the taste test as a 'one off' situation that is not frequently encountered. This is synonymous with the phenomenon of self-licensing whereby individuals are more likely to select hedonic food items when the decision context allows for consumption to be justified. It has been argued that 'sometimes indulgence is not determined by one's capacity to control oneself but rather by the availability of reasons to justify the prospective indulgence' (De Witt Huberts et al., 2012, p. 491). Therefore, the participants may have thought that consuming unhealthy foods on this occasion would have little impact on overall weight compared to more habitual eating behaviours. It may also be the case that the selection of one healthy food item justified the selection of one unhealthy food item (Chandon & Wansink, 2007). Research has also shown that the mere presence of a healthy food option can lead to the selection of an indulgent food choice (Wilcox et al., 2010). Although there is no way for future research to account for this, it is important to at least acknowledge the potential effect of self-licensing on the results.

8. General Discussion

8.1 The Findings in Relation to Theory and Previous Research

Both studies were based on the Situated Inference Model which proposes that exposure to a prime stimulus increases the accessibility of a synonymous mental concept in memory (Loersch & Payne, 2011). The individual misattributes this increased accessibility for their own thoughts and feelings which subsequently influences judgements, decisions, and behaviour. Overall, neither study provided support for the Situated Inference Model as both failed to show a significant effect of the prime stimuli on food choice. As discussed above, this may be because neither priming task successfully activated the corresponding mental concepts in memory. Although the priming task in study two was designed specifically to

maximise the level of concept activation achieved, the effectiveness of both priming tasks employed was not confirmed. Secondly, as this model explicitly states that the increase in the accessibility of a mental concept is only temporary, it may also be the case that the delay between the priming task and the outcome measure in both studies was too long for the level of activation achieved. Thirdly, the participants in the prime condition may not have attributed the increased accessibility of the primed concepts to their own thoughts and feelings. If this is the case, then the increased accessibility of the primed concepts will have been dismissed by the participants during the food selection task, having no effect on the foods selected by the participants.

The findings reported by study one and study two are also in contrast with the results of previous research that has examined the effect of priming on eating and drinking behaviour (Chiou et al., 2013; Fishbach & Dhar, 2005; Karremans et al., 2006). However, as the purpose of study one was to replicate a natural setting where various stimuli are visible simultaneously, the priming task employed did not require conscious processing of the prime. In contrast, previous research has often employed priming tasks, such as the scrambled sentence task or a task that involves memorising and recalling a list of words, that require the participants to consciously process the prime stimuli. This means that the level of concept activation may have been significantly lower in study one compared to previous research. However, the priming task developed for study two appears to be comparable to the tasks employed in previous research, as the participants were required to consciously process the prime stimuli in order to complete the task. One potential explanation for the different effects found may be the substantial delay between the priming task and the food selection task in study two, which may have offset the level of concept activation initially achieved. However, it is uncertain whether there was a substantial delay between the priming task and the outcome measure in the three studies mentioned above, meaning it is unclear to what extent this may account for the difference in the findings reported.

Despite the lack of priming effects found, study two revealed a significant main effect of mindfulness on food choice, whereby participants higher in trait mindfulness selected a higher proportion of healthy foods. This supports previous research which also found that individuals higher in trait mindfulness selected healthier foods than individuals lower in trait mindfulness (Jordan et al., 2014). However, the present study specifically found that this was accounted for by non-judgement of inner experience – allowing thoughts and feelings to be

experienced without evaluating them as good or bad (Baer et al., 2008). This supports the proposition by Elkins-Brown et al (2017) who argue that mindfulness enhances self-control through two mechanisms: interoceptive awareness and non-judgemental acceptance. According to the authors, these mechanisms moderate responses to conflict-related affect by activating self-control processes that ensure behaviour is in line with present goals. Therefore, cultivating non-judgement of inner experience may be an effective way of encouraging healthier choices when faced with a variety of healthy and unhealthy options.

8.2 Future Research

As mentioned above, the lack of priming effect reported by both the field study and the laboratory study may be due to the ineffectiveness of the priming tasks completed. However, as the capacity of each task to activate the corresponding mental concepts in memory was not assessed, the extent to which this contributed to the null findings is unknown. Therefore, it is important that future research assesses the effectiveness of the specific priming task employed in order to confirm that the task was successful in activating the target concept. This could be achieved through presenting the prime stimuli at a subliminal level prior to the completion of a lexical decision task – a string of letters is presented immediately following the prime stimuli and the participant is asked to indicate whether it is a word or a non-word. The words presented are either target words or neutral words where the target words are either the same as or related to the prime stimuli. A decreased response time to the target words, compared to the neutral words, is taken as evidence that the priming task has been successful.

Secondly, future research would benefit from having greater control over the exposure duration to the prime stimuli; one of the main weaknesses of the present research is that the specific priming tasks employed precluded the possibility to control the length of time the participants were exposed to the primes. Based on the assumption that the level of concept activation achieved is determined by the intensity and duration of the exposure to the prime stimuli (Bargh & Chartrand, 2000), it is important for future research to ensure that the participants are exposed to the prime stimuli for a fairly long duration; a video of an interview with a football manager or player could achieve this while also ensuring that each participant is exposed to the prime stimuli for the same length of time. Furthermore, in order to test this formula directly, it would be interesting for future research to vary the exposure

time across conditions to determine whether a longer exposure time results in stronger priming effects in this particular context.

8.3 Conclusions

Although previous research has shown that exposure to prime stimuli can influence both eating and drinking behaviour, the research presented found no evidence for an effect of food-related logos on subsequent food choice. Even though this may be due to the specific priming tasks utilised, it is also important to consider the possibility that food-related logos have no effect on food choice. Consequently, further research is required to advance the present understanding of this topic.

Author Contributions

STF: designed and executed study one and study two; performed part of the data analysis for study one and all of the data analysis for study two; wrote the first draft of the manuscript. AP: assisted with the data analysis for study one; wrote part of the result section for study one; edited the final manuscript. KT: collaborated with the design of study one and study two; edited the final manuscript. All authors approved the final version of the manuscript for submission.

Declarations of Interest

None

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Data Availability

All the study data is available on the Open Science Framework.

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