Understanding everyday strategies used to manage indulgent food consumption: a mixed-methods design

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To maintain a healthy body weight or support weight loss efforts, dietary self-management must allow for the limitation of tempting high energy-dense foods. We were interested in people's implementation of day-to-day strategies in order to successfully manage their indulgent food and beverage consumption. Participants from the Swansea area, UK (N=25; M_{age}=37; 68% male) were divided into four focus groups. The average BMI was within the healthy range (23 kg/m^2). Each group discussed the approaches that they used to manage their consumption of indulgent foods and drinks. Group discussions were then transcribed, thematically analysed and independently reviewed by a second researcher. In a follow-up phase, participants were asked to rate how often they used the identified strategies and to rate the perceived effectiveness of any that applied to them. The thematic analysis revealed four major themes: Exercise, Cognitive Strategies, Availability and Meal Formation. Variability in the frequency with which strategies were used and perceived as effective was evident. Notably, participants tended to use multiple strategies and even lean participants who did not identify themselves as 'dieters' none-the-less employed a variety of strategies to successfully manage their exposure to and consumption of tempting foods. The findings suggest that dietary advice could be improved by taking into account the strategies for managing indulgent food consumption that are frequently used by individuals, as well as those that are perceived as effective.

Keywords: **Mixed methods; dietary strategies; discretionary choices; perceived efficacy; frequency**

Introduction

Overweight and obesity increase the risk of a series of health problems such as diabetes and cardiovascular diseases, and negatively impacts quality of life (World Health Organisation, 2016). Despite increased understanding of the causes and health risks associated with overweight and obesity, the upward trend in obesity persists (NCD Risk Factor Collaboration, 2016). Indeed, recent estimates produced by the World Obesity Federation suggest that by 2025 2.7 billion adults will suffer from overweight and obesity globally (World Obesity Federation, 2017). As such, finding effective interventions to reverse this trend is of high priority (Ells, Demaio, & Farpour-Lambert, 2018).

Calorie controlled diets can result in successful weight loss in the short-term, but this is often not maintained, with weight regain in the longer-term (Rogge & Gautam, 2017). This is likely due to poor adherence to dietary changes implemented with or without the help of a commercial provider (Lemstra, Bird, Nwankwo, Rogers, & Moraros, 2016). This may partly be explained by the high energy dense, indulgent food temptations in the modern food environment (Houben, Nederkoorn, & Jansen, 2012; Stok, et al., 2015). Many people experience great difficulty implementing the dietary self-management strategies that are necessary for a healthy diet (which includes the limitation of tempting foods) in this obesogenic environment (Kruger, Galuska, Serdula, & Jones, 2004; Thomas, Bond, Phelan, Hill, & Wing, 2014). This is unlikely to be because there is a lack of awareness of what constitutes a healthy diet but rather, a failure to translate this knowledge into everyday food choices over a sustained period of time (Croll, Neumark-Sztainer, & Story, 2001).

Appelhans *et al.* have explored this 'failure to translate' within their 'neurobehavioral model of intervention strategies for managing temptation in obesity treatment' (Appelhans, French, Pagoto, & Sherwood, 2016). The model is based on known neurobehavioural processes that are salient when lapses in dietary adherence occur. These are the 'cold-hot empathy gap', 'attentional bias' and 'temporal discounting'. Of particular focus in the model, is the cold-hot empathy gap. In this context, the term 'hot' describes a state of increased wanting, for example when hungry or thirsty. Conversely, the term 'cold' describes a state that is neutral and un-motivated. The cold-hot empathy gap as a whole describes how people in a 'cold' state underestimate their feelings and motivations in a 'hot' state and this leads to unhealthy decisions that depart from plans made in a cold state. For a full review of all three neurobehavioural processes mentioned we direct the reader to the paper presenting the full model (Appelhans, et al., 2016).

The neurobehavioral model is organised into two dimensions and can be visualised as a three

by two table (see Table 1 in Appelhans, et al., 2016). Vertically, a dimension is presented that reflects interventions' demand on executive function (cognitive processes that are important for maintaining goal directed behaviour), from 'high' to 'none'; a) high, when individuals implement strategies to manage temptation by themselves, b) minimal, when individuals commit to interventions, e.g. by enrolling on to a lifestyle program, c) none, when interventions are implemented by an external agent, such as a tax or a 'nudge'. Horizontally, a dimension is presented that reflects 'the intended impact of an intervention on reward processing'. This comprises a) prevention of temptation (implemented in a 'cold' state in order to minimise or avoid temptation) and b) resistance of temptation (implemented in a 'hot' state in order to resist a temptation). Importantly, within a whole lifestyle approach to the management of temptation, each part of the model has a role and the challenge is to find a set of strategies that together reflect this (Appelhans, et al., 2016).

A number of studies have investigated the efficacy of strategies designed to help individuals manage their intake of tempting foods and drinks, which can be viewed in terms of Appelhans et al.'s two-dimensional model. Grieger, Wycherley, Johnson, and Golley (2016), conducted a scoping review of these studies (N = 44) and identified 5 key groups of strategies. These were the reformulation of foods from higher fat to lower fat, the substitution of tempting choices for alternatives (e.g., a high fibre snack), restriction of portion size, supplementation of the diet with nuts and wholegrain to improve overall diet quality and the adoption of permissive and restrictive nutrition messages. However, it is unclear how the strategies at the centre of these separate intervention studies might be integrated into a whole lifestyle that is conducive to the effective long-term management of diet and weight.

An alternative methodological approach is taken by the 'National Weight Control Registry' (see for example Gorin, Phelan, Wing, & Hill, 2004; Klem, Wing, McGuire, Seagle, & Hill, 1998; McGuire, Wing, Klem, & Hill, 1999; Thomas, et al., 2014), which is a database of individuals who have lost at least 13.6kg and maintained this weight loss for at least one year (i.e., successful weight loss maintainers). Individuals reported the *combination* of strategies that they use to maintain their weight (as opposed to specifically managing their intake of tempting foods). Strategies reported included self-monitoring of weight, following a low-calorie/ low fat diet, low variety, exercising daily for about one hour, eating breakfast regularly and consistent eating patterns over weekday and weekend (for a recent summary see Thomas, et al., 2014). Though it should be noted that strategies were selected from a list of suggestions rather than being produced spontaneously and this may have limited findings (i.e., the list may not have been exhaustive). Also, the focus of this study was weight

maintenance; therefore the strategies included but were not limited to those that could be viewed in terms of the management of tempting food consumption.

A similar 'whole lifestyle' approach was taken by Allom and Mullan (2014) who investigated the strategies used by healthy weight young adults (who also considered themselves to be healthy eaters) to regulate their eating behaviour. In this case, a qualitative approach was taken that was based around semi-structured focus groups, therefore, strategies were provided spontaneously by participants. Again, whilst this study was not specifically focussed on managing the intake of tempting foods, this topic featured as part of the broader discussion of healthy eating strategies. This study suggested that this sample were experiencing similar challenges to the maintenance of their healthy eating regime and weight as anybody else. However, this group were *successful* at using strategies to change their environment and engaged self-control to overcome said challenges. For example, they prepared their own meals, made access to unhealthy food harder, planned and monitored their food intake.

Falk, Sobal, Bisogni, Connors, and Devine (2001) also investigated strategies used to manage healthy eating, though they included a broader sample than others having purposely sought participants of varied ethnicity, age, gender and household composition. They identified eight broad themes which related to strategies that were used to manage healthy eating; substitution, avoidance, limitation, preparation of healthy foods, comparison when selecting foods, addition of healthy foods to the diet, eating in specific locations and compensation for unhealthy foods eaten.

There are considerable commonalities among these studies in terms of identified strategies adopted by individuals to manage their healthy eating or maintain their weight. Moreover, some of these strategies for the management of temptation are part of broader discussions on healthy eating or weight maintenance. However, a study which focusses specifically (and in more depth) on strategies used by individuals to manage their consumption of tempting foods is absent. Therefore, the first aim of the current study was to comprehensively explore the variety of strategies used by individuals to manage their intake of tempting foods and drinks on a day to day basis. Consistent with Allom and Mullan (2014), a qualitative semi-structured focus group approach was taken and consistent with Falk, et al. (2001) an unrestricted sample was recruited.

Information about the combination of strategies that individuals use to manage their intake of tempting foods is likely to be of use to health professionals developing eating

behaviour interventions. Especially, if they are trying to ensure that they follow the neurobehavioral model of intervention strategies for managing temptation in obesity treatment (Appelhans, et al., 2016). Additionally, Falk, et al. (2001) suggest that there is likely to be a benefit from maximising the use of strategies that individuals are already choosing to use.

Nevertheless, considerable questions remain about the implementation of these strategies. For example, which strategies are used the most and which, whilst mentioned, are used less often? If some strategies are used less frequently, is this because they are considered less effective? Therefore, in order to understand the broader context within which these strategies are employed, the second aim of the current study was to assess how often the strategies identified in the qualitative phase were used ('frequency') as well as the perceived effectiveness of these strategies ('effectiveness'). Here, a quantitative questionnaire approach was taken in a follow-up phase to the qualitative focus groups.

Specifically, we hypothesised that a range of strategies would be mentioned by participants that reflect those reported by previous studies but that not all of those strategies would be used with the same frequency and would not be regarded as equally effective.

Phase one: Qualitative focus groups

Methods

Participants

25 participants took part in four focus groups at Swansea University with a mean number of six individuals per group (in line with Howitt, 2013). Participants were recruited via social media and the online university staff community board. They were told that we were interested in the decisions that people make every day about which foods to eat or to avoid and how people manage their bodyweight. The exclusion criteria were also clearly communicated. Participants were excluded from taking part if they were under 18 years old, pregnant or breastfeeding, taking medications or diagnosed with a condition that could affect appetite, a historical or a current diagnosis of an eating disorder, or low proficiency in English. Participants received £5 reimbursement for taking part in the study. The study was approved by the Department of Psychology Research Ethics Committee.

Qualitative focus group discussions

The focus groups lasted around 60 minutes. The discussions explored if, why and how the participants limit their intake of indulgent foods and drinks following a semi-structured interview guide (Table 1). The lead researcher conducted each focus group to ensure consistency. The discussions were audio-recorded and transcribed verbatim.

Table 1. Questions used to guide the focus group discussion.

Focus group question
Why did you volunteer to take part in this focus group?
What kinds of foods do you limit your intake of?
What rules do you set yourself for limiting foods?
When and how do you allow yourself to have these foods?
Why do you limit these foods?
How successful are you at limiting certain foods?
What does indulgence mean for you? Especially regarding foods.

Procedure

Once participants had provided informed consent and demographic information, such as age, gender, profession, living condition and dieting history were collected and confidentiality assured. Following this, information about the aim of the study was given: we were interested in the different approaches people take to manage what and how much they eat to keep a stable weight. After the discussion, participants could ask questions and were debriefed.

Analysis plan

All of the information was anonymised and participants were assigned random numbers to protect their identity. Transcripts of the focus groups were analysed using NVivo 10 (QSR International) following Braun und Clarke's (2006) guidelines for an inductive thematic analysis. A thematic analysis was chosen because it is a flexible tool to gain deep insight into the data (Braun & Clarke, 2006). After repeated reading of the transcripts, the data was coded and themes, sub- and sub-sub-themes were identified based on the coding by two independent researchers (see also Table 3). The themes were reviewed against the original transcript. To support our statements in the results section of this article, representative quotes were obtained. If the researchers had a difference in opinion regarding a (sub)theme, the exact

definition of this (sub)theme was discussed and whether it should be merged, split or needed a more precise name was considered.

We note that, prior to conducting the study, the authors had a general awareness of Appelhans, et al. (2016) work, however, this study was not specifically designed around this model. Considering this, thematic analysis remained the most appropriate approach. Our findings based on the thematic analysis were compared and contrasted explicitly with the Appelhans et al. model only after the analyses were complete.

Results

Participants

The participant age range was from 22 to 61 years old and they were generally lean (M_{BMI} = 23kg/m^2, SD_{BMI} = 3.24) and active ($M_{NrExercise}$ = 4/week). 17 of the participants were male and 8 were female. Most of the participants had never dieted (n = 17), five were current dieters and three had dieted in the past. Most of the participants lived alone (n = 8) or with a partner (n = 8), some lived in a shared flat (n = 7) and two participants lived with their families. All baseline characteristics can be found in Table 2.

Table 2. Sample characteristics of all participants (N = 25).

Measurements	
Age (years)	37 (11.5)
Height (m)	1.73 (0.1)
Current weight (kg)	70.1 (13.5)
BMI (kg/m^2)	23 (3)
Difference between highest and current weight (kg)	5.28 (4.6)
No. of exercise occasions per week	4 (2)
Weight status	
Healthy weight range	21
Overweight	1
Obese	2
Unknown	1

For all measures the mean (SD) is reported except for weight status for which the number of participants is displayed.

Qualitative focus group discussion

Four major themes were identified: use of exercise, manipulation of the availability of tempting foods, implementation of cognitive strategies and the strategic formation of meals. Additionally, sub-themes and further sub-sub-themes were identified (see Table 3 and Appendix 1). These themes are discussed and illustrated with the inclusion of participants' quotes below.

Table 3. Identified strategies to reduce intake of tempting food.

Themes	Sub-themes	Sub-sub-themes
Availability	Accessibility	Avoiding places where there will be temptation
		Making access to tempting foods and drinks harder
		Not having tempting foods and drinks around
	Shopping	Choose a supermarket with limited choices
		Online Shopping
		Being more attentive at shopping
		Planning shopping/making lists
		Buying expensive foods
		Buying in smaller amounts
		Shopping for a longer period of time
Exercise		
Cognitive Strategies	Establishing rules	
	Finding distractions	
	Reflecting on usefulness/wanting	
	Changing mind-set	
	Implementing a flexible approach	
	Postponing indulgence	
Meal Formation	Food choice	Substituting
		Supplementation with low caloric choices

	Implementing variations in diet
	Choosing food according to time
	Listening to your body
Eating routine	Serving smaller portions
	Taking time
	Having a set meal frequency
	Having set eating times
	Implementing meal termination behaviour
Planning meals in advance	
Home cooking	
Diet	Using a commercial diet
	Fasting
	Using apps
	Being vegetarian/vegan

Availability

Participants described finding the resistance of temptation difficult when food or drinks are available in the immediate environment. A common example is when colleagues bring cookies or cakes into work. To avoid this temptation, participants identified techniques such as reducing the availability of these snacks and beverages by making it more difficult to access them or by not buying them. Such techniques are discussed below under the headings of accessibility and shopping respectively.

Accessibility

Some of the participants mentioned that they avoid places that are very likely to have temptations around for example, the kitchen or the staff room.

> 020: On a day that I have lower calories, I tend to eat as soon as I get [home] from work. […] But the rest of my family will sometimes eat, but I would stay away from the kitchen. (FG3)

Another approach is to make access to tempting foods or drinks harder, for example, by putting the tempting food or drink at the back of a shelf. As a result, it requires more effort to obtain the food and participants are less likely to consume it.

019: I try not to have anything very accessful [*sic*], you know, to be able to access very easily. So I have everything in my cupboards, sealed as well, […] So it takes some time to open it […] So, sometimes the whole procedure to open this stops me from actually wanting [?]. (FG3)

A stricter strategy is to not have desired foods or drinks in the house or office, for example, by giving items away as presents or by not buying them in the first place (see also the strategies around shopping described below). As they are not confronted with temptation, participants' report experiencing fewer cravings for these foods or drinks.

007: I get chocolate at Christmas and I give it away as New Year presents.
001: I had done that by myself. Yea, that's a good one. (FG1)

Shopping

Another sub-theme that was identified as a way to manage consumption of calorie-dense foods and drinks was a strategy to *not* buy products and therefore they would be absent from the home or workplace (see also the section above). However, these approaches only work if participants do not then go to a vending machine or supermarket to buy a snack or sweetened beverage when they feel a craving for it.

001: So the big thing for me is just to avoid the temptation to buy stuff when I am at shopping, that means, I don't have it in the house. 'Cause inevitably if I do have things in the house, sooner or later I am going to eat them. (FG1)

The choice of supermarket also has an influence. By going to a supermarket with a limited choice of products or by shopping online, it decreases the number of unhealthy choices available, according to the participants. In particular, buying groceries online reduces the opportunity to browse and therefore to get tempted.

018: I do a lot online shopping, so … That's how I avoid it […] but if I bought it in the shop, then I will put in a lot of stuff I didn't plan to buy, so… (FG3)

Similarly, writing a shopping list and planning a trip to the supermarket as well as being attentive while shopping helped participants to make healthier choices. The list and attentiveness keep them focused on buying only the products which are needed.

006: I go in [a supermarket] knowing what I want with a set list and that's what I'm getting, that's what I'm coming out with. You know, I won't go down the aisle and like 'Oh, I've that, that and that.' (FG1)

A few individuals mentioned deliberately buying more expensive products. This strategy helped them to eat or drink smaller portions. They reasoned that the higher value of the products resulted in them wanting to enjoy them for longer. This was in addition to their awareness of product price.

> 002: I also, just realising now, […] I buy very expensive foods, I buy all organic. Costs quite a lot, so I can only [buy] bits of it. And then, there is something that comes from long way back, […] about being careful with your money. Which means then, I would limit, I would only have one piece of bread a day, because it is very expensive. (FG1)

Another approach was to buy fewer high-caloric products. The following participant said they use a basket to limit the number of products they buy.

> 006: Ehm, the best against desire was 'I always use a basket'. (FG1)

Many of the participants only go shopping once a week. This approach can have advantages as well as disadvantages. The products purchased on this shopping occasion then dictate the kinds of foods and beverages that are available at home for the rest of the week. If healthy foods are bought, then healthy meals and snacks can be prepared and with the help of this strategy participants reduced their intake of tempting products over the course of the week.

> 014: Ehm, but again going back to the weekly shop, you know, just do it sensibly and that's probably the way I would stop or change. (FG2)

However, if unhealthy products were bought, participants would have unhealthy choices for the whole week.

> 017: Yea, I mean, you can plan for [the whole week]. It is just, that if it […] happens that you were hang-over and not paying attention when you are shopping, then you buy something slightly less healthy than usual and you have a week when you're not eating quite as well and once you have started, you just don't stop for the entire week. So, it's got drawbacks, but it's a method I try to implement. (FG3)

Exercise

Participants mentioned three different reasons for why they find exercise helpful: they can reward themselves afterwards with food or 'burn off' calories with the help of exercise, after exercising they feel less hungry and/or less tempted to eat high-caloric food, unhealthy foods

and drinks are counter-productive to the health goals participants want to achieve with the help of exercise.

People think they can consume high-caloric products after exercising, because they burn off the calories during training. Other participants saw it the other way around, they went to the gym to burn off the food that they had already consumed.

> 004: …when I went to the gym and worked really hard, then perhaps I reward myself with something. (FG1)

> 009: Yea, that's my strategy. Eat as much chocolate as I like and go to the gym afterwards. (FG2)

Some participants experienced reduced hunger and/or were less tempted by high-caloric food after they exercised. On the other hand, some participants felt hungrier after physical activity due to the energy that they had used.

> 009: On a day where I exercise, I tend to be less tempted by foods than on a day when I don't exercise. (FG2)

> 025: I don't even know if I'm healthier when I'm exercising, 'cause I found I eat so much more. Like I really noticed that I'm much more hungry. (FG4)

Along with physiological reasons, participants mentioned a more goal directed reason for reducing their intake of unhealthy products - they exercise to keep healthy and fit, and consuming unhealthy products would be counter-productive for those goals.

> 009: 'Cause one strategy I tend to use sometimes, is: I say to myself 'Well, you know, you've been to the gym and worked your ass off basically. Why do you wanna self-sabotage almost by, you know, indulge in biscuits and cakes and chocolate and things?' It's a bit counter-productive. (FG2)

Cognitive Strategies

Six different cognitive approaches were mentioned: Establishing rules, finding a distraction, reflecting on usefulness/wanting, changing mind-set, implementing a flexible approach and postponing indulgence.

Establishing rules

Using rules to reduce intake is a very broad and flexible strategy and can therefore be adapted to specific situations and goals. These rules can be strict and long term (such as not eating meat anymore) or more flexible and short term (eating only one piece of chocolate in a particular week).

> 002: I set myself rules, like if I had something one day, you know, it could be any sort of rule, and then they may change every time. (FG1)

Finding a distraction

Distraction during a meal can lead to increased food intake (van Dillen & Andrade, 2016); however, distraction is also seen as a way to prevent snacking. By engaging in another activity such as exercise, thoughts about a temptation are interrupted and this can help with forgetting about them.

> 011: it's very hard for me not to have [the temptation]. So I need to think of something else, that could be like sport or like DVD or something. So if I don't think about it anymore, I'm able to stop. (FG2)

Reflecting on usefulness or wanting

Once confronted with tempting foods or drinks, some participants reflected on the usefulness, need or wanting associated with that food or drink. This reflection helped them to focus on their goals and to assess their satiety-status which, in turn, made it easier for them to resist consuming indulgent foods and drinks.

> 019: I always trying to think if it's, […] from the practical point of view… if it's useful what I'm gonna eat. […] it helps me to think so "is this useful for my body or it's not. Is it gonna offer me something good"… […] So, sometimes it does […] help me avoid some stuff that […] are not very healthy. Yea… (FG3)

Changing your mind-set

The mind-set that an individual has towards eating is an important influence on consumption (Hege, et al., 2018). Some participants found it helpful to regard indulgent foods or drinks as a treat or as a necessity ("fuel"). The view was that if indulgent products are seen as a treat or reward, they are something special and therefore consumed rarely. Whereas, if food is seen as

a necessity or "fuel", eating is not associated with pleasure and therefore cravings are reduced.

Mind-set was also influenced by the negative consequences of overindulging (e.g. an increased weight), which can motivate individuals to eat less energy-dense food.

> 013: before I noticed any difference, I ate whatever […] I could and I wouldn't even think about it. But as soon as I saw physical effect to eating certain food types, […]… so, that was the motivating for me to think 'Oh, maybe I shouldn't do that.' (FG2)

On the other hand, success (e.g., weight-loss) could be an incentive to continue with an implemented strategy.

> 014: […] whereas now with the [named diet plan], I don't have to do it. So it's more difficult. But I think, once I start testing myself… maybe every week or every fortnight, it'll give me the incentive then to perhaps do more… trying to get myself a bit more balanced with the [named diet plan]. (FG2)

Implementing a flexible approach

The participants commented that a very strict approach to *not* consuming tempting products did not always result in abstinence. Rather, it leads to increased craving and disinhibited eating. Therefore participants described allowing themselves indulgent food and drinks, but restricting the quantity and frequency of consumption. In cases where they could not resist the temptation and indulged, they described how they tried to be compassionate to themselves and accept the indulgence. This approach helped them to limit their intake in the future and not give up on their goals.

> 021: […] you know, eh, I tried to restrict myself on certain types of food. And what happened is, there was a rebound, eh, craving for that food; say like sugar, crème. And then whatever diet I used to do for a week or for a month, it used to get neutralised by one day tasks. So, there I decided […] [the] best […] trick is to restrict the quantity. (FG4)

Postponing indulgence

Another strategy mentioned was the postponement of indulgence. If a tempting food is present, postponing consumption to a specific time-point in the future, such as the evening of the same day or an unspecified 'later' time, helped to reduce temptation. A more general approach is to set a certain time in the day or week at which indulgence is allowed. The

knowledge of the planned future indulgence can decrease cravings and increases one's ability to say 'no' to unexpected opportunities to consume tempting products.

> 022: Yea, for me [indulgence is] also related to relaxing, in a sense. […] after work or Friday or so, I like to finish the week with going out and having dinner. Not at home, just to break the routine. But then I like to have a beer in the pub. […] but then you also eat a burger or something similar. And eh, one strategy is… well it imposed by my girlfriend and I do agree on that. Well let's not ever [go out] on a Wednesday or Thursday, but wait until Friday or so. (FG4)

Meal Formation

A number of factors were identified which influence meal formation and the quality of eating occasions. Based on the discussions with the participants, five themes could be identified: food choice, eating routine, planning meals in advance, meal preparation and following a diet.

Food choice

An important factor is the choice of foods and how to change these choices to healthier ones. One way is not to give up snacks completely, as many people find this very difficult, but to replace unhealthy snacks with healthier choices like fruits.

> 001: because I try to replace, […] chocolate or biscuits, unhealthy stuff with snack food that would be more healthy [*sic*] like oranges or apples or nuts would be a good example. (FG1)

These alternatives seemed to satisfy their desire for a snack. One participant mentioned drinking tea instead of snacking. Other participants described drinking water first if they feel hungry, which successfully keeps them full for a period of time.

Similarly, a smaller portion of a high energy-density dish can be supplemented with lower energy-dense foods. This allows people to enjoy their desired food but also to restrict the amount of it. However, they can eat a larger amount of the lower calorie food and therefore do not feel hungry. One of the interviewees found that an additional advantage is the knowledge that you can eat as much as you want of the low-caloric dish.

> 019: I eat something […] substantial, so I would have some meat or some fish or something […] But then I eat a bucket of salad that actually helps, because it fills you

up and […] you're not hungry anymore, yea… […] Ah, it helps so much. Because […] you're allowed to eat as much as you want with the salad. (FG3)

Trying new dishes and products can start a reflective process about the healthiness and wanting of this dish. Additionally, it increases variation in the diet. Enjoying food variety and trying new dishes can be helpful in continuing a healthy lifestyle.

006: and then just for, […] pretty much every day I am eating more, a lot more fruits and vegs than I was. And I am enjoying it; making new dishes, trying out different things. Because I am so much enjoying it, it's easier to carry on with that. (FG1)

A common strategy is to base the choice of foods or eating time on other factors like the time of day or exercise. This can be achieved by following a specific diet which is based on the time of day, not eating treats after a certain time or consuming high-caloric foods after exercising.

021: Like, eh, I don't eat that stuff, whether chocolates, fried stuff, sugar stuff, oily… […] not after 6 pm. […] I make sure that I eat my dinner before 7 o'clock or 8 o'clock. (FG4)

Another technique that was mentioned was listening to one's body. Participants reported stopping consumption of a meal when they no longer felt hungry or felt full, instead of eating until the plate was empty or they did not feel well.

012: I agree with the volume comment. I usually just tend to eat until I'm just not hungry, as supposed to being not full. But, to indulge myself I binge eat until I'm really full. Usually if I go out and eat I do that. (FG2)

Eating routine

Daily eating routines were identified as an important way to control intake of indulgent products.

Consistent reductions in the portion size of indulgent foods and drinks were identified as a way to decrease intake. Participants could therefore enjoy these tempting products but consume a smaller quantity. One participant mentioned that cutting down on their intake of sweetened beverages in a step by step approach was useful. Each week he drank less per day and he drew a line on the bottle to indicate how much he was allowed to consume on that day. Another participant also described an eating routine around consuming smaller portions of bread:

449 019: [I] try to avoid bread, at all costs. Because I was kind of addictive to it. So now I
450 just have a small slice of brown bread in the morning with my breakfast and then that's
451 it for the rest of the day. (FG3)

452 However, other participants could not follow this strategy because they felt too hungry after a
453 short period of time and got distracted by that hunger.

454 016: even when I try to limit how much I eat and […] have, let's say, half of the usual
455 go-for. Then I will feel hungry again, you know, twice as fast as the normal period. And
456 then […] I cannot really think properly, […]. And when I'm hungry again, I just can't
457 think at all… (FG3)

458 Another strategy reported was taking more time over a meal. Eating more slowly, chewing the
459 food more or taking a short break before taking another portion were reported as useful for
460 giving the digestive system time to signal fullness. Therefore a smaller serving is consumed.

461 011: […] I mean, I like to eat a lot and if I cook something delicious for example, […] –
462 I try to eat like, eh, more slowly, so I chew a lot more. […] ' 'cause I think that the
463 feeling of being filled up takes a while to derive, so I think if you eat slow-more
464 slowly… it's not what I do often, actually, but sometimes I try to do it. So, and I found
465 that it helps me a lot, yea. To eat less. (FG2)

466 Participants found it helpful to consistently consume meals frequently over time. However,
467 there was variation in meal frequency routines with different outcomes on eating behaviour.
468 While some of the participants preferred to have fewer, larger meals, others favoured more
469 frequent but smaller meals. Individuals having fewer, larger meals reported feeling like
470 snacking less between meals. On the other hand, individuals with more frequent meals did not
471 mind eating more often because every portion is small.

472 006: In the same manner, I sort of force myself to make sure I actually have proper
473 meals instead of snacking here and there, because you grab what is quick and easy
474 instead of having proper set dinner. (FG1)

475 021: I have read a lot of articles that, […] if you want to maintain your weight, […] you
476 should eat frequent meals…frequent small meals. It boost your metabolism or even it is
477 better for our digestion system also. So that is the trick. I don't mind getting hungry
478 after two hours, rather than dumping myself at one time. Because […] I feel sleepy or I
479 don't feel energetic then. So, that's the trick I do. (FG4)

In addition to frequency, having a set time for meals was important for some participants. Knowing the time of the next meal helped them to reduce snacking. However, keeping to very strict times is not always possible considering work.

> 017: I try to eat at very regular hours. […] the time perspective of it is how I think I manage or to make most of it. Because I know it's then and it's not any other time. It's really help me reduce, eh, sort of snacking. [?] It really helps me […] the notion that you eat now and you don't eat any other time. (FG3)

Creating a habit of ending the meal in a certain way was perceived as helpful. It signals that the meal is finished and that there is no need for food in the near future. For example, for one of the interviewees the "food day" ends with cleaning the kitchen and they can move on to other things. Another participant rounds off the meal with a tea.

> 019: And tea, actually. I found that it helps. […] especially after lunch, I really want something sweet just as a dessert. But with a cup of tea actually helps me to calm down the feeling. […] usually because I'm in front of my computer and eh, usually it's really nice to have something to snack on. Actually tea helps a lot, just to have something to drink… kind of.
> 020: That's probably ritual, perhaps, you know…to finish off.
> 019: Yea, I've really need to finish off my lunch with something else, so, yea.
> 017: The body understands: now you can't eat anymore. You've had your tea
> 019: And actually, yea, it makes you full, if you drink something afterwards, […]. So you don't want anything else, you know. (FG3)

However, a third participant associates tea with biscuits. Therefore having tea as a signal for the end of eating would be the wrong choice. So people have to be careful what habits they create.

> 018: If I have a cup of tea though, I also want a biscuit with it. (FG3)

Planning meals in advance

A common approach was to plan meals ahead of time for the whole day, the next few days or for the whole week. It was felt that the knowledge of meal times and composition helped to reduce snacking between meals.

> 003: It's good to actually plan your meals ahead, […] what am I going to eat that day. And […] during that period when you are trying to stop, […] I know, [what] I am going

511 to eating and when. And I know I just have to last until that time. I find that works.
512 (FG3)

513 Alongside main meals, snacks can also be planned in advance. Since healthy snacks are often
514 hard to access in work and university environments, participants brought their own snacks to
515 the office such as fruits or nuts.

516 022: Sometimes it is also a bit of organisation. Once I know that if I'm here until late
517 […] then at seven or so I get really hungry. And eh, sometimes I think about it earlier,
518 the day before, in the morning I take a banana or so. Because otherwise, […] you get
519 some-some chocolate, just… to get enough sugar. So… sometimes it helps a bit to plan.
520 (FG4)

521 *Home cooking*

522 Being able to cook and enjoy cooking was perceived as being advantageous. Meals that are
523 cooked at home and brought to work facilitated healthier choices as participants were not
524 reliant on supermarkets, cafes or cafeterias close to the workplace.

525 015: which helped me a lot was a learning to cook. […] And as soon as I started
526 cooking, you don't buy processed food anymore. (FG2)

527 One interviewee described taking his prepared meals to a friend's BBQ, if he had left-overs
528 from previous dishes. This strategy prevented him from eating the higher caloric choices at
529 the BBQ.

530 Additionally, cooking dishes a few days or a whole week in advance was perceived as being
531 helpful as it reduced the time spent cooking in the week and meals are quickly and easily
532 prepared. In addition, the influence of factors like tiredness on the choice of food was reduced
533 due to ease of preparation.

534 023: Yea, I try to cook, ehm,… for instance if I have chicken breast, I tend to cook all
535 the things I have and make portions for the week. So, that way I know that I can bring
536 stuff, healthy things. And I don't worry for cooking more things. Just maybe a salad that
537 is quick. (FG4)

538 However, the disadvantage is that it is hard to catch up with cooking if the usual time for
539 cooking is missed, e.g. by meeting friends, going on a trip.

> 019: One thing with planning though is that if you actually miss-[...] for me it's every Sunday or Saturday, I have time, so I cook for the next week. But if I miss that, go on a trip or anything, then that's quite hard during the week to cook… (FG3)

Diets

Another approach was changing the diet with the help of commercial diets or apps. However, in the questionnaire distributed after the focus groups, only 8 of the 25 participants indicated that they had ever dieted.

All commercial diets were perceived as helpful and could be continued over a longer period of time (except one of the diets which was started only a few weeks before the discussion).

> 020: I am on a [named diet plan] at the moment. […] for two days a week I eat only 500 cals. […] I would indulge myself and then it's two days. That's quite nice. It's only any other days, I don't have to worry. Really, it's on two days discipline […] because sometimes I do get hungry on the 500 calorie days, I have to manage two days well. And here it's small lunch and then at least something for dinner. Usually in the evening I think "Ah, I miss food". Not really hungry, really miss food. I think it's more emotional, me feeling sorry for myself. […] But the next day, it's part of the sort of feast-faming thing, the next day your hunger switches low. I wake up the next morning not hungry. That's quite interesting. To see, to-to see I can do it. Eh, but also I don't need the whole world. (FG3)

Fasting was not only mentioned as part of a commercial diet, but also independently on single occasions within a week.

> 002: And the other thing I do, […], that I fast once a week and that then helps me to reregulate my foods. And get in touch with it. (FG1)

Some participants reported using mobile devices to support weight loss, healthy eating and physical activity.

> 004: I haven't actually done it strictly, but I started using [named fitness app] now and then I have started to log my foods and I think I feel a lot better since doing that. (FG1)

Lastly, following a vegetarian, vegan or pescetarian diet was perceived as helpful for facilitating healthy eating.

008: But putting less on my plate and eating less meat. Makes for me a massive difference. (FG2)

Phase 2: Quantitative Follow-up

Methods

Personality trait measures

Following Oldham-Cooper, Wilkinson, Hardman, Rogers, and Brunstrom (2017), we characterised our sample in terms of dietary traits by asking participants to complete the short Three Factor Eating Questionnaire (TFEQ-18R: Karlsson, Persson, Sjostrom, & Sullivan, 2000) which includes subscales concerned with dietary restraint, uncontrolled eating and emotional eating. In addition, given that the study is concerned with the management of temptation, we also included a measure of impulsivity (the Barratt Impusiveness Scale (BIS-11); Patton, Stanford, & Barratt, 1995), which has been shown to moderate the relationship between food reward responsivity and BMI (Price, Higgs, & Lee, 2015). Including these measurements made it possible to compare our population to the samples of previous studies in the literature. Additionally, these data on the characteristics of our sample have potential to contextualise the strategies mentioned, for example, if the overall sample is particularly high in cognitive restraint they might discuss many highly restrained strategies.

More detailed information about the questionnaires can be found in Appendix 2.

Measures of 'frequency' and 'effectiveness' of the strategies

The themes, sub-themes and sub-sub-themes identified in the analysis of the transcripts in the qualitative phase of the study were used to design a quantitative questionnaire for follow up. For every sub-theme or sub-sub-theme, which relates to a strategy to manage the intake of tempting foods and drinks (e.g. serving smaller portions), participants were asked how often they use this strategy (e.g. How often do you consume smaller portions, for example, just one piece of chocolate, less sugar in your tea, a smaller piece of meat?). Some (sub-)sub-themes contained very similar strategies to each other. To avoid ambiguity in these cases, there was a different question for every strategy, for example, for the sub-sub-theme "Having a set meal frequency", we split it up into two questions: "How often do you eat proper meals to reduce snacking behaviour?" and "How often do you have small, but more frequent meals in order to

reduce intake?". This variable was called 'Frequency' and was measured on a 5-point Likert-scale ranging from 'Never' to 'Always'. If anything other than 'Never' was selected in the above questions, they were then asked how effective they thought this strategy was in reducing their intake of tempting foods or drinks. Responses were provided on a 100mm VAS scale anchored with 'Not at all' to the left and 'Extremely' to the right. Examples of questions include "How effective is distraction in limiting your intake of tempting food/drinks?" or "How effective is buying smaller/reasonable amounts in limiting your intake of tempting food/drinks?". This variable was labelled 'Effectiveness'.

92% (23 out of 25) of the focus group participants took part in this follow-up questionnaire. Due to technical issues, four participants had to do the questionnaire a second time. Only the answers entered last and were complete were considered for analysis.

Procedure

At least five working days after the focus group, participants received emails containing a hyperlink to an online questionnaire. Following an information and informed consent screen, basic information about height, weight, the highest weight since reaching their current height and how often participants exercise for more than 30 min per week was collected. Then the impulsivity questionnaire (BIS-11; Patton, et al., 1995) and the short version of the Three Factor Eating Questionnaire (TFEQ-18R; Karlsson, et al., 2000) were completed. Following this, participants answered questions about the frequency and perceived efficacy of strategies. Finally, debriefing information was provided including the aim of the study and the possible future application of the results. The questionnaire was hosted by Qualtrics (Provo, Utah, USA).

Analysis plan

All quantitative analyses were conducted using SPSS v22 software (IBM, New York, USA).

'Frequency' was coded such that 'Never' equals 0 to 'Always' equals 4. Then the strategies were grouped based on sub-themes and the mean 'frequency' and the mean 'effectiveness' for each of these was calculated. These sub-themes were ranked based on their mean value from most used or most effective to the least used or least effective. Current and highest weight of one participant was not provided and therefore their BMI could not be calculated. These data were excluded from the analyses.

Results

Personality trait measures

TFEQ and BIS-11 scores were collected to characterise our sample. TFEQ and BIS-11 scores were comparable to samples within the literature; the means were around the middle of the scales except for the emotional eating mean score (TFEQ) which was relatively low in the present sample (Price, et al., 2015) (Table 4).

Table 4. Baseline scores in the TFEQ and BIS-11 subscales.

Personality traits	Mean	SD
TFEQ-Cognitive Restraint score	57.2	14.3
TFEQ-Uncontrolled Eating score	50.6	12.4
TFEQ-Emotional Eating score	46.3	17.9
BIS11-Attentional Impulsiveness	16.2	2.7
BIS11-Motor Impulsiveness	21.8	3.6
BIS11-Nonplanning Impulsiveness	23.3	3.3

Frequency and perceived efficacy

Results showed that the strategies which involve home cooking and planning ahead are the most frequently used and were also perceived as the most effective (Table 5). In contrast, the frequency of use for diets (commercial diets, fasting and mobile apps) was low with a mean of less than one and ranked at position 11 out of 14 with a mean of 56.88 (SD = 22.29) measured on VAS scale from 0-100. Generally, the difference in absolute means between each rank is small both in frequency of usage and perceived effectiveness of each sub-theme. An exception is the perceived effectiveness of 'exercise' which has a mean that is less than half of the strategy ranked directly above, which is 'postponing of indulgences' (M=22.09 and M=53.14, respectively). Only the first five sub-themes are used at least 'sometimes' (on average), the other nine sub-themes are only used 'rarely' or 'never'. All sub-themes – except 'exercise' – are perceived to be 50-75% effective.

A more detailed ranking of sub-sub-theme strategies can be found in Appendix 3 and Appendix 4.

657 Table 5. Ranking of the sub-themes according to their mean frequency (on a 5-point Likert scale from 0-4) and
658 mean effectiveness (on a 100mm VAS scale).

Sub-themes	Themes	Frequency of use			Perceived effectiveness		
		Rank	Mean	SD	Rank	Mean	SD
Home cooking	Meal Formation	1	2.78	1.00	2	72.3	20.82
Planning meals in advance	Meal Formation	2	2.36	1.06	1	73.07	17.86
Implementing a flexible approach	Cognitive Strategies	3	2.26	0.92	7	62.00	21.94
Food choice	Meal Formation	4.5	2.04	0.53	8	61.49	9.72
Eating routine	Meal Formation	4.5	2.04	0.64	9	61.03	12.96
Changing mind-set	Cognitive Strategies	6	1.85	0.42	12	55.21	16.65
Exercise	Exercise	7	1.74	0.58	14	22.09	15.81
Postponing of indulgence	Cognitive Strategies	8	1.70	0.82	13	53.14	21.41
Reflecting on usefulness/wanting	Cognitive Strategies	9	1.65	1.07	4	67.80	20.14
Shopping	Availability	10	1.64	0.68	5	65.18	20.15
Accessibility	Availability	11	1.60	0.64	3	70.46	16.88
Establishing rules	Cognitive Strategies	12	1.43	1.20	6	64.25	22.51
Finding distraction	Cognitive Strategies	13	1.17	1.23	10	60.21	29.29
Diet	Meal Formation	14	0.93	0.62	11	56.88	22.29

659

660

661 **General discussion**

662 The aim of this study was to understand the everyday strategies used to manage intake of
663 tempting foods and drinks and how they are implemented, by assessing their frequency of use
664 and perceived efficacy. Four broad strategy themes were identified; these were the use of
665 exercise, manipulation of the availability of tempting foods, implementation of cognitive

strategies and the strategic formation of meals. Our quantitative measures of the personality characteristics of the sample, which were in the 'middle range' and comparable to previous literature, suggest that these strategies are used by individuals without a particularly strong tendency towards impulsiveness, restraint or uncontrolled eating.

Two of the four major themes identified here strongly echoed the themes identified by Allom and Mullan (2014) and Falk, et al. (2001) in their qualitative studies investigating strategies to maintain healthy eating. The first of these themes concerned avoiding temptation altogether by avoiding certain locations and ensuring that certain foods are not 'around'. The second concerned 'meal formation' and in particular planning and preparation. Thirdly, whilst cognitive strategies were mentioned to some extent by Allom and Mullan (2014), it was not such an elaborated theme as it was here (further discussion of specific sub-themes below).

The fourth theme, exercise, has had little mention in previous studies in the specific context of avoiding tempting foods (see Grieger, et al., 2016), though this is a prominent theme in research concerned with strategies for weight maintenance; e.g., Foright, et al. (2018). In our study, 23 of our 25 participants mentioned feeling less tempted to eat high calorie food following exercise. This strategy was in the top 15 of frequently used strategies, however, it was also the lowest rated in terms of efficacy. One possibility is that these findings reflect a role of engaging in exercise as a motivator for health goals (e.g., motivational spill-over described by Mata, et al., 2009) whilst also reflecting the increases in appetite, hunger and food intake that are known to accompany increases in physical activity (Beaulieu, Hopkins, Blundell, & Finlayson, 2016; Blundell, Gibbons, Caudwell, Finlayson, & Hopkins, 2015; Foright, et al., 2018).

Strategy sub-themes were also identified (N = 14). The majority of these sub-themes can be viewed in terms of the neurobehavioral model of intervention strategies for managing temptation in obesity treatment (Appelhans, et al., 2016) and therefore offer support for the applicability of this model. First, considering the 'executive functioning' dimension of the model, the vast majority of the strategies reported here were self-initiated and therefore demand high executive functioning. Considering the reward processing dimension, there were six strategies that seem to be aimed at preventing temptation, these were home cooking, advanced meal planning, eating routine, exercise, shopping and accessibility. There were four strategies that seem to be aimed at resisting temptation which were implementing a flexible approach, food choice (e.g., listening to your body), reflecting on usefulness or wanting and finding a distraction.

However, three of our sub-themes seem to reflect both the prevention and resistance of temptation. These were the postponement of indulgence, establishing rules, and diet. For example, postponing indulgence by planning to consume a tempting food or drink at a later time may occur at a time when an individual is not specifically tempted (discussed in Appelhans, et al., as a 'cold state'). This planning behaviour reflects facets of the prevention of temptation. In addition, when an individual is specifically tempted (discussed in Appelhans, et al., as a 'hot state') remembering this plan to indulge later may help to resist temptation in the moment. These kind of dual-purpose plans must be reflected in Appelhans et al's model, perhaps with an addition to the 'reward processing dimension'. Importantly, such approaches may help to bridge the 'cold-hot empathy gap' (where long-term health goals made in a cold state do not account for the short-term hedonistic goals of the hot state; Fisher & Rangel, 2014; Loewenstein, 1996).

Consistent with our hypothesis, there was variability in the frequency with which strategies were used, with the most used sub-theme ('Home cooking') scoring an average of 2.78 (SD = 1.00) on a 5-point Likert scale (0 - 4) and the least used sub-theme ('Diet') scoring an average of 0.93 (SD = 0.62). There was also variability in the perceived efficacy of those strategies, from the top strategy ('Planning meals in advance') mean of 73.07mm (SD = 17.86) on a 100mm VAS to the bottom strategy ('Exercise') mean of 22.09mm (SD = 15.81). Notably, the three sub-themes perceived as most efficient are temptation prevention strategies considering Appelhans, et al. (2016) model. These results are supported by Milyavskaya and Inzlicht (2017), who found that goals are reached more easily if temptation is prevented as opposed to resisted.

Nevertheless, the congruence of perceived efficacy with *actual* efficacy must be considered. A comparison between our perceived efficacy findings at the sub-sub-theme level and Grieger, et al. (2016) scoping review of the actual efficacy of interventions aimed at reducing intake of discretionary (tempting) foods and beverages (as described in the introduction) allows for such an assessment[1]. Two of the strategies mentioned by Grieger, et al. (2016) as effective strategies for reducing energy intake featured in the top ten of our most perceived effective strategies (see Appendix 4); these were substitution for healthier items (ranked 4th; n = 22) and portion size restriction (ranked 6th; n = 18). Other strategies mentioned by Grieger, et al. (2016) were those that could not be implemented by an individual e.g., reformulation of products.

[1] We recognise that this approach does not allow for an exhaustive assessment of the actual efficacy of every strategy mentioned in this study.

More generally, considering that these strategies are those that participants are choosing to engage in frequently and perceive as effective, one possibility is that they are relatively acceptable and likely to facilitate adherence. Future research might test this hypothesis by investigating if these strategies also relate to actual efficacy. Such strategies could be emphasised within programmes or advice aiming to reduce consumption of tempting foods for weight-loss or general healthy eating. Furthermore, what may be of particular interest are those strategies that have been shown to be effective at intervention but that are viewed particularly negatively by participants (i.e., those that are used the least frequently and viewed as the least effective). It may be helpful to consider how to make such strategies more acceptable before basing dietary advice or programmes around them.

It is important to consider these findings in the broader context of the healthy eating and weight maintenance literatures of which the management of tempting food intake is only a part. A number of the strategies reported here are also used by individuals to improve their healthy food consumption (as opposed to limiting their tempting food consumption). For example, Crawford, Ball, Mishra, Salmon, and Timperio (2007) conducted a cross-sectional questionnaire study to investigate the relationship between eating behaviours and fruit and vegetable consumption. They found that home cooking, meal planning, trying new dishes, planning shopping and shopping in more expensive supermarkets were associated with a higher consumption of fruit and vegetables.

Furthermore, a number of the strategies used to manage temptation that were discussed here also feature in the weight maintenance literature as part of individuals' overall strategy to maintain a healthy weight. For example, Stelmach-Mardas, Mardas, Walkowiak, and Boeing (2014), in a literature review, found that planning meals ahead, allowing occasional indulgences and increased physical activity are associated with successful weight loss maintenance. Moreover, eating regularly at home is associated with less weight gain (Zong, Eisenberg, Hu, & Sun, 2016) and a regular meal pattern is associated with a higher chance of success in weight maintenance (Westenhoefer, von Falck, Stellfeldt, & Fintelmann, 2004).

A number of limitations of this study must be noted. Firstly, many of our participants reported that they had never dieted to lose weight but were nevertheless lean. On the one-hand, the serendipitous recruitment of this sample provided an opportunity to understand the habits of people who have achieved the health goals that elude many. Notably, participants in our study did not explicitly refer to the use of these strategies to reduce the intake of tempting foods and beverages as 'dieting'. However, participants were able to identify said strategies

765 when asked and seemed to actively and effortfully implement them. This is at odds with
766 Allom and Mullan's (2014) suggestion that for healthy weight individuals, such behaviours
767 may be relatively automatic. However, it is important to acknowledge that the development of
768 individuals' habits may reflect broader natural tendencies and personality traits. This is likely
769 to be of use to understand the strategies that are acceptable to those who are intending to lose
770 weight or those who have already lost weight. A future study might consider using a similar
771 methodology to the present study but with a more targeted sample.

772 Secondly, the results describing the perceived effectiveness of the strategies should
773 not be over-interpreted as they are based on only the participants who reported using that
774 particular strategy and therefore the samples are at times small. Thirdly, in this study self-
775 reported weight and height were used to calculate BMI and could therefore be biased because
776 weight is often under-reported. Fourthly, most participants lived alone or with their partner
777 and only two out of 25 participants lived with their families. Some of the presented strategies
778 might be more difficult to implement when other family members, especially children, with
779 their own needs and wishes have to be taken into account. Finally, as information was
780 considered at a group level, differences in participant characteristics could not be analysed.

781

782 In sum, the current study identified four major strategy themes to manage tempting
783 food and drink consumption; the use of exercise, manipulation of the availability of tempting
784 foods, implementation of cognitive strategies and the strategic formation of meals. These
785 findings support the neurobehavioral model of intervention strategies for managing
786 temptation in obesity treatment (Appelhans, et al., 2016) and offer evidence in support of the
787 extension of the 'reward processing dimension' that features as part of this model. We suggest
788 that this dimension should also account for strategies that have a dual purpose (both
789 temptation prevention and resistance); this possibility may help to close the key issue of the
790 'hot-cold empathy gap'. For the first time, this study showed that participants are using a
791 range of strategies with differential frequency and perceived efficacy. This information is
792 likely to be useful in the context of increasing acceptability and adherence to dietary
793 programmes and advice to improve food choices, support weight loss and weight loss
794 maintenance. There is also the potential for some of these strategies to be used across
795 modalities (i.e., these strategies can be applied to any temptation not just food); specifically,
796 by focusing on strategies that are used frequently and have high perceived efficacy and
797 minimising focus on strategies that are used infrequently and perceived as having little
798 efficacy.

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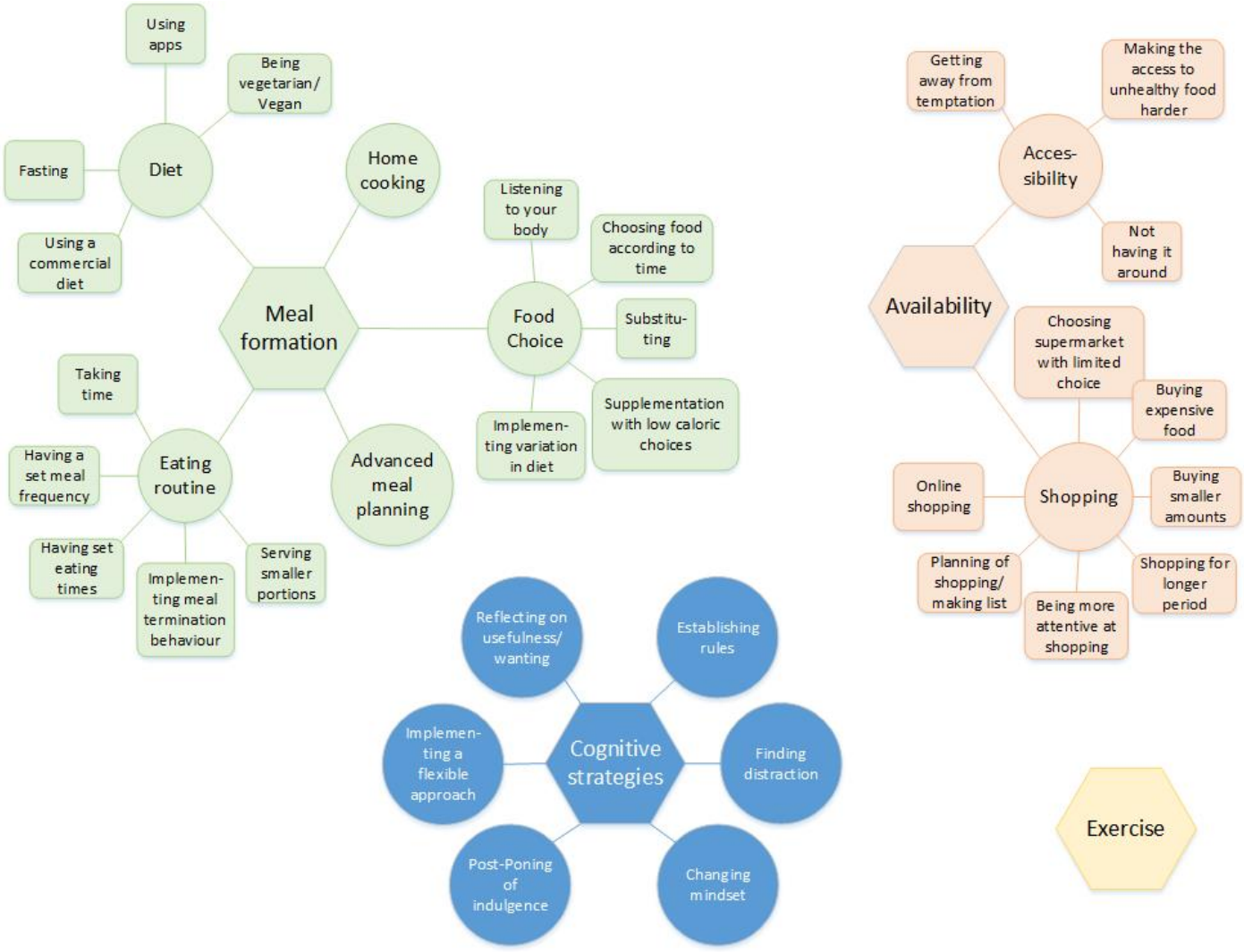
916 **Supplementary data**



917

918 Appendix 1. Identified strategies to reduce intake of tempting food <*online only coloured*>

Appendix 2: Descriptions of the personality trait measures BIS-11 and TFEQ.

The Barratt Impulsiveness Scale (BIS-11; Patton, Stanford, & Barratt, 1995)

A common questionnaire to measure impulsivity is the BIS-11. This 39-item questionnaire is comprised of the second order sub-scales Motor Impulsiveness, Attentional Impulsiveness and Nonplanning Impulsiveness. The Motor Impulsiveness sub-scale is a measure for the tendency to act without thinking (e.g. "I act on the spur of the moment") and has eleven items. Attentional Impulsiveness is defined as the lack of concentration or attention (e.g. "I have 'racing' thoughts") and consists of eight items. The Nonplanning Impulsiveness sub-scale is comprised of eleven items and is defined as an orientation on the present or a lack of "future thinking" (e.g. "I say think without thinking"). A score is obtained by summing up items for each sub-scale and a total score can then be acquired. Higher scores indicate higher impulsiveness. Internal consistency measured by Cronbach's α for the original BIS-11 scale is .82 (Patton et al., 1995).

The Three Factor Eating Questionnaire (TFEQ-18R short version; Karlsson et al., 2000)

The TFEQ-18R measures cognitive and behavioural components of eating and has three sub-scales. The cognitive restraint sub-scale is designed to measure the tendency to restrict dietary intake in order to control weight and has six items (e.g. "I deliberately take small helpings as a means of controlling my weight"). The uncontrolled eating sub-scale is designed to measure the extent of control over eating behaviour (e.g. "Sometimes when I start eating I just can't seem to stop") and has nine items. The emotional eating subscale is designed to measure the tendency to eat in response to negative emotions (e.g. "When I feel blue, I often overeat") and has three items. The short version was selected as it has been shown to be a valid measure of eating behaviour (Keranen et al., 2009; Keranen, Strengell, Savolainen, & Laitinen, 2011). Scores are calculated for each sub-scale as a proportion of the highest possible value and expressed on a scale of 0-100 and higher scores indicating greater tendencies to restrain, lose control over eating or eat when in a negative mood respectively. Cronbach's α for the original TFEQ-18R Cognitive Restraint scale is .77, Uncontrolled Eating scale .83 and Emotional Eating scale .85 (Karlsson et al., 2000).

Rank	Strategy usage	Mean	SD

1.5	Being more attentive at shopping	2.87	0.92
1.5	Eating bigger, but fewer meals to avoid snacking	2.87	0.92
3.5	Home cooking	2.78	1.00
3.5	Bringing own food/snacks to uni/work	2.78	1.31
5.0	Listening to your body	2.74	0.75
6.0	Having a mindset of seeing food/drinks as necessity	2.65	0.98
7.0	Having set eating times	2.61	1.08
8.0	Not having tempting foods/drinks around	2.52	0.90
9.0	Substituting with healthier options	2.48	0.85
10.5	Eating vegetarian, vegan, pescetarian or similar	2.43	1.12
10.5	Planning meals in advance	2.43	1.12
12.0	Finding success as incentive to continue	2.30	1.11
13.5	Feeling less hungry or tempted to eat high caloric food after doing exercises	2.26	0.81
13.5	Implementing a flexible approach	2.26	0.92
15.5	Shopping for a longer period of time	2.22	1.28
15.5	Trying different dishes and foods	2.22	0.67
17.0	Implementing variation in diet	2.09	0.90
18.5	Avoiding situations with temptations	2.04	0.98
18.5	Serving smaller portions	2.04	1.33
20.0	Implementing a meal termination behaviour	2.00	1.31
21.0	Cooking in advance	1.87	1.32
22.0	Post-poning of indulgence	1.77	0.81
23.0	Reflecting on usefulness/wanting	1.65	1.07
24.5	Taking time during a meal	1.61	1.03
24.5	Having a certain time for indulgence	1.61	0.99
26.5	Having a mindset of seeing food/drinks as "fuel"	1.48	1.12
26.5	Taking negative feedback as a motivation to change eating behaviour	1.48	1.04
28.5	Supplementation with low caloric choices	1.43	1.16
28.5	Establishing eating rules	1.43	1.20
30.0	Having a mindset for seeing food/drinks as reward/treat	1.35	0.98
31.0	Choosing food according to time	1.26	1.14
32.0	Using exercises to reward yourself afterwards with tempting food or to burn off food	1.22	0.90
33.0	Finding distraction	1.17	1.23

34.0	Doing grocery shopping online	1.13	1.25
35.5	Buying smaller/reasonable amounts	1.09	1.20
35.5	Having small, but more frequent meals in order to reduce intake	1.09	0.85
37.0	Buying expensive food/drinks	0.91	1.08
38.5	Using a commercial diet plan	0.48	1.20
38.5	Fasting	0.48	0.99
40.0	Making the access to unhealthy food harder	0.43	0.73
41.0	Using fitness apps	0.35	0.78

950 Appendix 3. Ranking of the strategies according to their mean frequency on a 5-point Likert scale (0-4).

951

Rank	Strategy effectiveness	N[1]	Mean	SD
1.0	Not having tempting foods/drinks around	22	81.95	12.48
2.0	Bringing own food/snacks to uni/work	21	80.90	14.01
3.0	Being more attentive at shopping	23	80.22	20.52
4.0	Substituting with healthier options	22	79.59	13.02
5.0	Listening to your body	23	72.52	15.18
6.0	Serving smaller portions	18	72.50	16.66
7.0	Eating bigger, but fewer meals to avoid snacking	22	72.41	21.68
8.0	Home cooking	23	72.30	20.82
9.0	Planning meals in advance	21	70.71	26.19
10.0	Cooking in advance	18	70.67	22.24
11.0	Using a commercial diet plan	4	69.75	29.15
12.5	Fasting	5	67.80	18.82
12.5	Reflecting on usefulness/wanting	20	67.80	20.14
14.0	Having set eating times	21	67.05	22.58
15.0	Using fitness apps	5	65.60	21.59
16.0	Shopping for a longer period of time	21	65.19	27.39
17.0	Establishing eating rules	16	64.25	22.51
18.0	Supplementation with low caloric choices	18	63.72	22.96
19.0	Avoiding situations with temptations	21	63.71	23.18
20.0	Finding success as incentive to continue	21	63.67	20.09
21.0	Choosing food according to time	15	62.47	24.20
22.0	Implementing a flexible approach	22	62.00	21.94
23.0	Having a mindset of seeing food/drinks as "fuel"	17	60.82	21.53
24.0	Finding distraction	14	60.21	29.29
25.0	Buying smaller/reasonable amounts	13	59.54	26.92
26.0	Taking time during a meal	20	56.55	25.41
27.0	Having a mindset of seeing food/drinks as necessity	23	56.35	27.95
28.0	Having a certain time for indulgence	20	55.35	22.88
29.0	Using exercises to reward yourself afterwards with tempting food or to burn off food	17	53.88	21.66
30.0	Doing grocery shopping online	13	53.77	31.09
31.0	Post-poning of indulgence	21	52.05	25.95
32.0	Eating vegetarian, vegan, pescetarian or similar	22	51.82	27.92
33.0	Having small, but more frequent meals in order to reduce intake	17	49.88	20.95

34.0	Making the access to unhealthy food harder	7	49.57	19.10
35.0	Taking negative feedback as a motivation to change eating behaviour	18	49.44	25.67
36.0	Implementing variation in diet	22	47.32	22.89
37.0	Implementing a meal termination behaviour	19	47.26	26.13
38.0	Having a mindset for seeing food/drinks as reward/treat	19	44.32	30.99
39.0	Trying different dishes and foods	23	42.78	23.71
40.0	Buying expensive food/drinks	12	41.75	31.63
41.0	Feeling less hungry or tempted to eat high caloric food after doing exercises	23	2.17	10.43

[1] N represents the number of participants which indicated that they used this strategy (either 'Rarely', 'Sometimes', 'Often' or 'Always') and therefore answered the second question about perceived effectiveness of the strategy.

Appendix 4. Ranking of the strategies according to their mean effectiveness on a 100mm VAS scale.