Appetite ■■ (2014) ■■–■■

Contents lists available at ScienceDirect

Appetite

journal homepage: www.elsevier.com/locate/appet

Research report

Feeling happy and thinking about food. Counteractive effects of mood and memory on food consumption

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ARTICLE INFO

Article history:
Received 31 May 2014
Received in revised form 4 September 2014
Accepted 21 September 2014
Available online

Keywords:
Mood
Memory
Unrestrained
Consumption
Food intake
Limited capacity hypothesis

ABSTRACT

Separate lines of research have demonstrated the role of mood and memory in the amount of food we consume. However, no work has examined these factors in a single study and given their combined effects beyond food research, this would seem important. In this study, the interactive effect of these factors was investigated. Unrestrained female participants (n = 64) were randomly assigned to either a positive or neutral mood induction, and were subject to a lunch cue (recalling their previously eaten meal) or no lunch cue, followed by a snack taste/intake test. We found that in line with prediction that food intake was lower in the lunch cue versus no cue condition and in contrast, food intake was higher in the positive versus neutral mood condition. We also found that more food was consumed in the lunch cue/positive mood compared to lunch cue/neutral mood condition. This suggests that positive mood places additional demands on attentional resources and thereby reduces the inhibitory effect of memory on food consumption. These findings confirm that memory cue and positive mood exert opposing effects on food consumption and highlight the importance of both factors in weight control interventions.

Introduction

The importance of memory in regulating how much food we consume has gained prominence in recent years. The background to this is centred on the role of the hippocampus and case studies from neuropsychology. It is well known that the hippocampus plays a central role in learning and memory (Vargha-Khadem et al., 1997), with interestingly, more recent evidence suggesting greater involvement in certain types of memory; episodic more than semantic (Steinvorth, Levine, & Corkin, 2005). The emphasis on episodic memory helps in understanding how impairments to the hippocampus might influence eating behaviour. For instance, it was found that densely amnesic patients with hippocampal damage (Hebben, Corkin, Eichenbaum, & Shedlack, 1985; Rozin, Dow, Moscovitch, & Rajaram, 1998) consumed multiple meals, having no explicit memory of what was eaten previously. This led to the proposal that at least under certain circumstances, memory of eating and the current eating situation are more predictive of consumption than physiological signals. In support of this, it was emphasized that across both studies (Hebben et al., 1985; Rozin et al., 1998), all three patients had different but overlapping brain damage; but what they all shared was a dense amnesic syndrome and extremely poor/no memory for recently eaten meals. Further, since there was no evidence of damage to the hypothalamic structures, this therefore suggested that their inability to sense when to discontinue eating could not be attributed to accessory damage to food-regulation structures.

To understand the role of memory in neurologically intact populations, Higgs (2002) assigned healthy volunteers to either a 'lunch cue' (required to explicitly recall the lunch they had eaten that day) or a 'no cue' (free thought) condition followed by a taste test. Findings revealed that the explicit recall of lunch had an inhibitory effect on the participants' intake of snack foods. It was concluded that this reduction in intake was likely due to remembering what had been eaten triggering beliefs about the satiating effects of that food. The follow up study which compared the effect of remembering lunch eaten the previous to the current day confirmed that the effect was limited to memory for food eaten that day (Higgs, 2002).

In addition to memory influencing eating behaviour, another important factor is mood. It is widely accepted that human eating behaviour changes according to changes in emotional state, for example experiencing sadness or happiness (Canetti, Bachar, & Berry, 2002). Patel and Schlundt (2001) found that individuals in a positive and negative mood consumed significantly higher amounts of calories from fat, protein and carbohydrate at meal times than individuals in a neutral mood. However, as Canetti et al. (2002) pointed out, the relation between emotion and eating differs according to the particular characteristics of the individual and their specific emotional states. For instance, Schotte, Cools, and McNally (1990) and Baucom and Aiken (1981) discovered that individuals who were dieting ate more when depressed than non depressed dieters. In food related research, individuals are often characterized according to level of 'restraint' and separately 'disinhibition'. Restrained

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http://dx.doi.org/10.1016/j.appet.2014.09.021
0195-6663/

individuals are those adopting a high level of dietary restraint due to worries about body image and weight (Bryant, Kiezerbrink, King, & Blundell, 2010). Those categorized as disinhibited eaters are more likely to consume food opportunistically, e.g. being especially responsive to the palatability of food and other people eating with them (Bryant, King, & Blundell, 2008).

The relationship between negative emotions and eating behaviour has been widely studied and numerous studies are in agreement with the notion that negative affect decreases food intake in unrestrained eaters (Polivy & Herman, 1976; Sheppard-Sawyer, McNally & Fischer, 2000). However, there has been little experimental investigation into the effects of positive mood on an individual's consumption of food. Macht (2008) proposed that positive mood has an identical effect as negative mood on food intake in restrained eaters because all intense emotions impair cognitive eating controls. This is consistent with the limited capacity hypothesis proposed by Boon, Stroebe, Schut, and Jansen (1998), which claims that restrained eaters' cognitive capacity to maintain restricted food intake is limited by distraction. Although that theory has mostly been applied to restrained eaters (e.g. Lattimore & Maxwell, 2004), since work has also found that distraction led to higher food consumption in unrestrained individuals (Boon, Stroebe, Schut, & IJntema, 2002), suggests that cognitive resources involved in controlling intake are limited in both restrained and unrestrained individuals. This is also underlined by one study that used different film extracts to manipulate mood state (Yeomans & Coughlan, 2009) and found that individuals low in restraint (and high disinhibition) ate more in the positive affect condition than the negative and neutral condition. Therefore, being in a positive mood state may have acted as a distraction to these unrestrained individuals and thus demanded mental resources also used to control food intake; since such resources are limited, the consequence is that less capacity is available to monitor intake, resulting in higher consumption. The fact the effect was unique to positive mood could also be linked to the suggestion that when an individual is in a positive rather than a negative or neutral mood, the act of eating food has a greater effect on elevating mood (Macht, Haupt, & Salewsky, 2004). In other words, exposure to snack foods in the positive affect condition increased 'hedonic hunger'; that is, eating to gain a pleasurable experience, and so resulted in increased intake.

Whilst research has examined the effect of memory cues (Higgs, 2002) and mood (Yeomans & Coughlan, 2009) separately, no work has looked at these factors together. This is important to explore for a number of reasons. Firstly, it is clearly the case that natural episodes of eating take place in the presence of both mood and cognition; hence studying these factors separately tells us little about everyday food consumption. This being the case, the potential to inform therapies aimed at reducing weight gain is much better served by studies including both of these core factors which can also measure the magnitude of their separate effects on food intake. Secondly, there are separate lines of research that predict an interaction of mood and memory's effect on food intake. Increases in positive mood have been suggested to increase dopamine activity in key areas of the brain involved in emotion and cognition, including the hippocampus, amygdala and prefrontal cortex (Ashby, Isen, & Turken, 1999). It has been theorized that these alterations, which can be triggered by positive mood induction, are responsible for improvements in cognitive performance (Ashby et al., 1999; Mitchell & Phillips, 2007). However, it is further speculated that the extent to which increased dopamine activity benefits cognition follows an inverted-U shape (Mitchell & Phillips, 2007). This might also help explain why positive mood induction has been shown to improve performance in certain types of tasks such as creativity, whereas it actually impairs performance on tasks requiring more focussed attention, such as alternating Stroop tasks and memory (Phillips et al., 2002; Seibert & Ellis, 1991; Stafford, Ng, Moore, & Bard, 2010). For instance, in one of those studies, free recall was lower for those individuals in the positive versus neutral mood induction (Stafford et al., 2010). It is therefore theorized in the present study that induction into a positive mood state would act to reduce attentional focus and thereby also impair memory's ability to access previous eating episodes. As a consequence, it is predicted that positive mood will reduce the inhibitory effects of memory (lunch cue) on food consumption.

In the present study, unrestrained female eaters consumed a standard (provided) lunch and later the same day completed a snack taste/intake test in one of four conditions; induced into either a neutral or positive mood and then exposed to either a "lunch cue" or "no cue" condition. The rationale for using only unrestrained consumers was to focus more on the effects on those not actively dieting and to be consistent with previous work (Higgs, 2002). We predict on the basis of previous research (Higgs, 2002; Yeomans & Coughlan, 2009) that individuals in the lunch cue versus no cue condition would consume less food in the snack taste/intake test, whilst those in the positive versus neutral mood induction will consume more food. On the premise of limited capacity theory (Boon et al., 1998) and the deleterious effects of positive mood on memory (Stafford et al., 2010), we further expect an interaction of these two factors; where we tentatively predict more food will be consumed in the lunch cue/positive mood compared to lunch cue/neutral mood condition.

Methods

Participants

Participants were 69 females, age ranging from 18–23 (M = 20.33, SD = 1.29), comprising of undergraduate students and non-students recruited locally (Table 1). Participants were excluded on the basis of whether they had any food allergies, if they were currently dieting or had experienced any problems with their eating. Potential participants were informed that the study was examining the factors that influence taste. Participants were not paid but the lunch provided was free. The University of Portsmouth Ethics Committee approved the study protocol.

Design

The study used a 2 × 2 independent groups factorial design. Participants were randomly allocated to conditions. The independent variables were Mood Induction: MI-P (positive mood) or MI-N

Table 1
Mean restraint and age scores for the four groups.

	Positive mood No memory cue (n = 14)		Positive mood Memory cue (n = 15)		Neutral mood No memory cue (n = 16)		Neutral mood Memory cue (n = 17)		
	M	SE	M	SE	M	SE	M	SE	Group differences
Age	20.0	0.3	20.4	0.4	20.2	0.4	20.5	0.2	p > .70,NS
Restraint	1.8	0.1	1.8	0.1	1.8	0.1	1.7	0.1	p > .99,NS

Please cite this article in press as: Rebecca Collins, Lorenzo D. Stafford, Feeling happy and thinking about food. Counteractive effects of mood and memory on food consumption, Appetite (2014), doi: 10.1016/j.appet.2014.09.021