



Research report

Great expectations. Eating expectancies as mediators of reinforcement sensitivity and eating



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ABSTRACT

Eating expectancies are proposed as cognitive pathways linking reinforcement (reward and punishment) sensitivities and the tendency to over-eat in response to appetitive and emotional cues. In Study One ($N = 243$ university women) explicit eating expectancies were tested as potential mediators of reinforcement sensitivities and eating styles. Broadly, expectancies that eating alleviates negative affect/boredom mediated both reward and punishment sensitivity and emotional eating. The expectancy that eating is pleasurable and rewarding mediated reward sensitivity and external eating. In Study Two ($N = 109$), using an implicit eating expectancy task, reward sensitivity and external eating was mediated via positive expectancy statements, notably, that eating is pleasurable and rewarding. Reward sensitivity and emotional eating was mediated specifically by expectancies that eating manages boredom. Punishment sensitivity was not associated with any implicit expectancies. Findings support the role of expectancies as cognitive mediators in the relationship between reinforcement sensitivities and emotionally-driven versus externally-driven eating styles. However, the largely appetitive implicit expectancies task only supported an association with reward sensitivity.

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Introduction

A leading explanation for the rise in obesity in recent decades is the availability and increased portion size of high calorie processed foods. Yet despite the ubiquitous exposure to a calorie-saturated environment, many individuals do not over-indulge. Others still, maintain a healthy BMI but struggle with considerable issues around eating, including personally-distressing episodes of binge-eating and 'yo-yo' dieting. There is growing evidence that some individuals are inherently sensitive to noticing and consuming appetitive, calorie-saturated foods. For instance, in obese populations a subgroup has been identified showing unusually high reinforcement from the consumption of energy-dense foods (Temple & Epstein, 2012). Whilst research has focused on those already obese, individuals in a healthy weight range with a heightened desire for palatable foods are similarly vulnerable to overconsumption, placing them at risk of gaining excess weight over time.

Loxton and Dawe (2001, 2006) have used a prominent theory of personality in which the pursuit of appetitive substances is a key trait. Reinforcement Sensitivity Theory (RST; Gray, 1970; Gray & McNaughton, 2000) combines neurophysiology and learning theory to describe personality and has been increasingly applied to a wide range of psychopathologies, including eating behaviour

(Bijttebier, Beck, Claes, & Vandereycken, 2009). Updated in 2000, RST incorporates three biologically-driven motivational subsystems: the revised Behavioural Approach System (r-BAS), the Fight/Flight/Freeze System (FFFS) and the revised Behavioural Inhibition System (r-BIS).

The r-BAS mediates approach responses towards rewarding substances and has been proposed as key trait in the tendency to notice and seek out appetitive food (Smillie, Loxton, & Avery, 2011). However, while there is considerable support implicating this trait in binge-eating, bulimia nervosa, and episodic over-eating over-eating (Bijttebier et al., 2009) virtually all past research has used measures of the BAS developed prior to the revision of the overall theory (referred to as the original BAS, o-BAS). However, the r-BAS is distinguished from the o-BAS by an emphasis on more targeted *goal-oriented approach* behaviour rather than more diffuse, *dysfunctional approach* behaviour (e.g., Harnett, Loxton, & Jackson, 2013; Smillie & Jackson, 2006). This raises the question as to whether over-eating is driven specifically by individual differences in attending to, seeking out, and forming strong reinforcing associations between food cues and pleasurable outcomes (i.e., as specified by the revised theory) or a more general impulsive approach response (i.e., as often assessed by measures of the original theory).

In addition to the r-BAS, RST includes two systems associated with noticing and responding to threat. The FFFS activates to cues associated with *threat* and elicits a fear response. The r-BIS detects and resolves goal *conflict* in situations that may involve both re-

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ward and threat, i.e., situations that activate both the r-BAS and FFFS (Gray & McNaughton, 2000). The r-BIS serves to increase arousal, momentarily inhibiting ongoing behaviour and switching attention to the source of the conflict. Strong r-BIS reactivity is associated with a propensity for anxiety due to the stress of managing goal conflicts and often the need to approach the feared object. In contrast to the innately appetitive nature of high-calorie foods, overconsumption is associated with negative consequences for health and societally-approved physical attractiveness. For many there is constant conflict between desiring pleasurable food and maintaining a socially desirable weight. Given the negative consequences of overconsumption, and the presence of this conflict, the FFFS and r-BIS are highly relevant in untangling the complex relationships between the rewarding and aversive components of eating. Earlier research has found women with eating-related problems score higher than non-problem eaters on measures of the original BIS (o-BIS; Kane, Loxton, Staiger, & Dawe, 2004; Loxton & Dawe, 2001, 2006). However, the o-BIS, often termed *punishment sensitivity*, encompassed both threat and conflict sensitivity while the r-BIS and FFFS clearly differentiate between the two (Gray & McNaughton, 2000). Thus, further investigation using the new theory may provide more fine-grained analyses of eating motivation beyond that captured by the o-BIS (Smillie et al., 2011).

Eating behaviour is complex and over-eating, in particular, can be motivated by a host of factors, including external and internal cues. It is very likely that differing reinforcement sensitivities are associated with differing eating styles. External eating refers to the tendency to eat in response to external food cues, such as the sight and smell of food (regardless of state hunger). Individuals high on external eating show a bias to noticing and orienting towards images of palatable food, and score higher on measures of o-BAS (Brignell, Griffiths, Bradley, & Mogg, 2009; Davis et al., 2007; Hou et al., 2011). Emotional eating reflects the tendency to eat in order to cope with diffuse and/or identifiable emotional states (van Strien, Frijters, Bergers, & Defares, 1986). Although external and emotional eating styles are typically seen as exogenous individual difference factors, we would argue that these styles of eating reflect endogenous phenotypic expressions of reinforcement sensitivities. Notably, we would expect reward sensitivity traits (both conceptualised by the original and revised theory) would be drive external eating styles and punishment sensitivity traits to be involved with the management of emotional states.

Given that RST is firmly based on individual differences in learning appetitive and aversive associations, it is likely that such traits convey the risk to specific problematic eating behaviour, in part, via eating expectancies. Self-reported measures of eating expectancies typically assess positive reinforcement expectancies (e.g., that “eating is rewarding and pleasurable”) and negative reinforcement expectancies (e.g., “eating to alleviate boredom”, “eating helps manage negative affect”; Hohlstein, Smith, & Atlas, 1998). Looking at differential relationships between these expectancies and eating behaviours, Combs, Smith, and Simmons (2011) found the expectancy that eating helps manage negative affect to be specifically predictive of clinical levels of binge-eating in middle-school girls whereas the expectancy that eating is rewarding and pleasurable was predictive of social/celebratory over-eating, but not binge-eating. Eating expectancies may thus capture cognitive factors that predict motivation and different eating behaviours.

While there is a distinct absence of research investigating RST and eating expectancies, this is a burgeoning area in the addictions field. For example, recent studies have found RST traits to play a specific role in the development of drinking expectancies and motives, which mediate hazardous drinking behaviour (Gullo, Dawe, Kambouropoulos, Staiger, & Jackson, 2010; Ivory & Kambouropou-

los, 2012; Kabbani & Kambouropoulos, 2013). Given previous research has found RST traits to be common to both over-eating and hazardous drinking (e.g., Loxton & Dawe, 2001, 2006) we would expect similar mediating effects in relation to eating styles. In examining eating expectancies as mediators of both the original and revised RST on external and emotional eating we aim to test the utility of RST systems in understanding cognitive mechanisms by which individual differences in reward, punishment and conflict sensitivity contribute to eating behaviours. This has broad theoretical implications for the revised reinforcement sensitivity theory as well as applied implications for understanding mechanisms that drive specific eating styles. Given the development of new measures of the revised theory, we use measures of both the original and revised RST. Further, two studies were performed whereby we tested eating expectancies as mediators of reinforcement sensitivities using both explicit (Study One) and implicit measures (Study Two). In accordance with previous studies we focused on three eating expectancies: (1) eating is rewarding and pleasurable, (2) eating alleviates boredom, and (3) eating helps manage negative affect. The general model tested in both studies is shown in Fig. 1.

Study One

The aim of Study One was to use self-report measures to test specific eating expectancies as mediators of reinforcement sensitivities and emotional and external eating. We hypothesised that o-BAS and o-BIS would be positively associated with all three eating expectancies reflecting the broader measurement of approach and avoidance tendencies in these measures, while r-BAS, r-BIS and FFFS would be associated with only some eating expectancies, supporting the more specific nature of the revised systems. We hypothesised that r-BAS would be positively associated with eating for reward and pleasure, but not the relief of negative affect or boredom. As the r-BIS functions as a conflict detector between appetitive and threatening situations and involves an approach component (to resolve the conflict), we hypothesised that r-BIS would be positively associated with alleviating negative affect and boredom, but less likely to be associated with eating for reward and pleasure. As the FFFS is proposed as underlying the tendency to attempt to escape from threat, we hypothesised that individuals with high FFFS sensitivity are more likely to learn that eating can be used as an escape from aversive states (i.e., avoid negative affect). Finally, we hypothesised that the expectancy that eating is rewarding and pleasurable would be positively associated with external, rather than, emotional eating. The expectancies that eating helps alleviate negative affect and boredom were predicted to be positively associated with emotional, rather than, external eating.

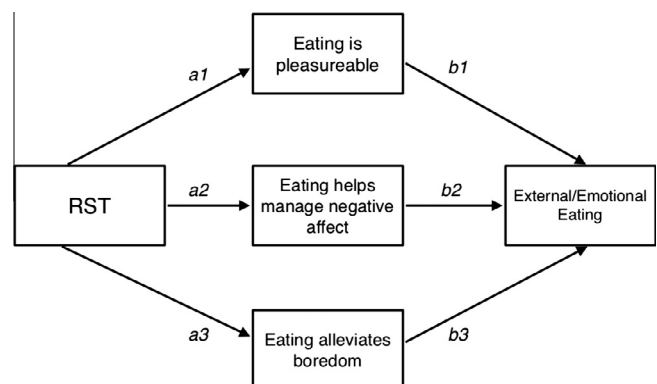


Fig. 1. General model tested for multiple mediation.

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