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Valence and arousal-based affective evaluations of foods

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ABSTRACT

We investigated the nutrient-specific and individual-specific validity of dual-process models of valenced and arousal-based affective evaluations of foods across the disordered eating spectrum. 283 undergraduate women provided implicit and explicit valence and arousal-based evaluations of 120 food photos with known nutritional information on structurally similar indirect and direct affect misattribution procedures (AMP; Payne et al., 2005, 2008), and completed questionnaires assessing body mass index (BMI), hunger, restriction, and binge eating. Nomothetically, added fat and added sugar enhance evaluations of foods. Idiographically, hunger and binge eating enhance activation, whereas BMI and restriction enhance pleasantness. Added fat is salient for women who are heavier, hungrier, or who restrict; added sugar is influential for less hungry women. Restriction relates only to valence, whereas binge eating relates only to arousal. Findings are similar across implicit and explicit affective evaluations, albeit stronger for explicit, providing modest support for dual-process models of affective evaluation of foods.

How we feel about a food shapes what, when, and how much we eat (e.g., Berridge, Ho, Richard, & DiFeliceantonio, 2010). We are more likely to eat the chocolate cake in the break room if we think the cake is very pleasant and desirable. In addition, dual process models suggest that automatic processes predict spontaneous behaviors, while controlled processes predict deliberative behaviors,[2] although these processes interact (Fazio & Olson, 2014; Perugini, 2005; Strack & Deutsch, 2004). Automatic evaluations of foods may contribute to disinhibited consumption, especially of fatty, sugary foods. Controlled evaluations are linked to deliberate, planful behaviors (e.g., Fazio & Olson, 2014), such as eating restriction. Understanding how automatic and controlled affective evaluations interact to shape eating behavior may inform intervention choice.

Classic dual-process models would predict theoretically that automatic evaluations of foods may play a greater role than controlled evaluations in the disinhibited consumption of foods high in fat and sugar, particularly when there are insufficient resources to inhibit the initial positive or activating evaluation (e.g., Hofmann, Rauch, & Gawronski, 2007). For example, when our cognitive resources are harnessed by an engrossing movie, we may be surprised to find that we have emptied the popcorn bucket, despite our intention to eat only a few handfuls. In contrast, theoretically, traditional dual-process models would posit that more effortful controlled evaluations may contribute to successful restriction of food intake to a greater degree than automatic evaluations. For instance, when our self-control resources have been bolstered by a good night's sleep, we may choose to forego a tasty pastry at the meeting, despite our initial desire for a baked good. It is important to understand for whom and under what circumstances automatic and controlled affective evaluations shape eating behavior.

However, three theoretical and methodological issues limit prior works' interpretability. First, researchers interested in automatic and controlled processes often juxtapose indirect evaluation measures (e.g., implicit association tests, IATs) with direct evaluation measures (e.g., self-reports). Often, null correlations between IATs and self-reported food attitudes are interpreted as dissociations between indirect and direct food affective evaluations. Such measures differ in procedural dimensions (e.g., response scaling and speed); such discrepancies, known as *poor structural fit* (Payne, Burkley, & Stokes, 2008), may inflate differences between implicit and explicit assessments. Without accounting for structural fit, implicit-explicit dissociations could reflect differences in the constructs of interest or the methods used to assess them.

The second issue involves affective dimensions. Most food evaluation studies examine only the pleasant-unpleasant *valence* dimension, though most affect models converge on both a valence and an activating-unactivating *arousal* dimension (e.g., Lang, 1995). Arousal is implicated in appetite for or motivation to approach reinforcing stimuli

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[2] Automatic processes possess *efficiency*, *unawareness*, *unintentionality*, and/or *lack of control*, whereas controlled processes may require cognitive resources, operate consciously and/or intentionally, and/or be under volitional control (Bargh, 1994; Moors & De Houwer, 2006). We use *implicit* and *explicit* as synonyms for *automatic* and *controlled*, respectively (e.g., De Houwer, 2006; De Houwer & Moors, 2007).

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(e.g., Berridge, Robinson, & Aldridge, 2009; Berridge et al., 2010), such as palatable food, and may be relevant to disinhibited eating. For example, a dieter may *want* a cookie but may not *like* it because consuming high-fat, high-sugar foods is inconsistent with her weight-loss goal; she has evaluated the cookie to be activating but not pleasant. Much prior food-related affective evaluation work has overlooked arousal, though arousal theoretically plays a critical role in eating-related behavior (e.g., Craeynest, Crombez, Koster, Haerens, & De Bourdeaudhuij, 2008; Czyzewska & Graham, 2008).

Third, prior work typically examines restrictive or disinhibited eating, and utilizes coarse distinctions among food stimuli (e.g., healthy/unhealthy). Investigating the full disordered eating spectrum provides a more nuanced test of eating-related dual-process models. Coarse stimulus distinctions confound nutritional characteristics (e.g., fat and sugar content), which may independently influence affective evaluations (e.g., Woodward & Treat, 2015).

1. Overview of the present study

We examined the nomothetic (i.e., food-specific) and idiographic (i.e., person-specific) relevance of automatic and controlled processes to valenced and arousal-based food-related affective evaluations. We investigated both arousal-based and valenced evaluations, and simultaneously included both restrictive and disinhibited-eating measures to assess the role of food-related affective evaluations across the disordered-eating spectrum. We examined a dual-process model of food evaluations using measures that control method variance.

1.1. Nomothetic, food-specific predictors

We employed many food images with known nutritional properties to examine the effects of added sugar, added fat, and their interaction on food evaluations. We expected that foods high in added fat, added sugar, or both would be evaluated positively—especially for explicit affective evaluations (e.g., Berridge et al., 2010; Finlayson, King, & Blundell, 2007)—and evaluated as activating (e.g., Craeynest et al., 2008).

1.2. Idiographic predictors

We included BMI, hunger, binge eating concerns, and restrictive eating as individual-differences predictors of food affective evaluations. Table 1 depicts the associations between individual-differences factors and affective dimensions expected theoretically within a dual-process model framework. Generally, dual process models predict that more spontaneous eating behaviors will be better predicted by implicit affective evaluations, whereas more deliberative eating behaviors will be better predicted by explicit affective evaluations (Fazio & Olson, 2014; Perugini, 2005; Strack & Deutsch, 2004). We expected that arousal- and valence-based affective evaluations would differentially predict binge eating and restriction, respectively, and would both be associated with hunger.

Table 1
Current theoretical framework of affective evaluations of foods drawn from dual-process models: expected associations between affective evaluations of foods and eating- and weight-related criterion variables.

		Affective dimensions	
		Valence	Arousal
Dual-process model	Explicit	Hunger*	Hunger**
		Restriction***	Binge Eating*
	Implicit	Hunger*	Hunger**
		Restriction*	Binge Eating***

Note: * indicates the expected strength of the effect. Note: BMI is not listed in any of the cells as the equivocal literature precludes our making specific predictions.

1.2.1. Binge eating

Binge eating characterizes both bulimia nervosa and binge eating disorder (American Psychiatric Association, 2013), and falls at the more impulsive, disinhibited end of the disordered eating spectrum. We expected binge eating to predict positively both valenced and arousal-based affective evaluations of foods, consistent with our prior work (Woodward & Treat, 2015). Theoretically, the impulsive and thus more automatic nature of disinhibited eating should be more strongly related to implicit evaluations of foods, though in our prior work, disinhibited eating in response to external cues correlated more strongly with explicit evaluations of foods. We used a different measure of binge eating in the current work, and thus tentatively hypothesized that implicit food-related evaluations would be more strongly associated with binge eating than explicit evaluations of foods. We expected implicit evaluations, with their presumed greater reliance on automatic processes, would reflect the impulsive, out-of-control nature of binge eating. We anticipated that binge eating would be associated with more activating affective evaluations of foods, since arousal is implicated in motivation to approach palatable food.

1.2.2. Eating restriction

Restricting individuals (i.e., those with anorexia nervosa and successful dieters) evaluate foods more negatively than healthy control subjects (e.g., Roefs et al., 2011). We expected that successful eating restriction would predict more negative evaluations of foods. Successful eating restriction is deliberate and overcontrolled by nature. Explicit food-related affective evaluations are presumed to rely on primarily controlled processes. We further hypothesized that deliberate, overcontrolled eating restriction would be more strongly associated with explicit than implicit evaluations of foods, as the former are presumed to rely on primarily controlled processes. We tentatively expected that restriction would predict valenced, but not arousal-based, affective evaluations of foods (e.g., Keating, Tilbrook, Rossell, Enticott, & Fitzgerald, 2012).

2. Method

2.1. Participants

384 undergraduate women participated for class credit. Participants were excluded if they scored <75% correct on conceptual check (n = 27; see Procedure) or if they endorsed food allergies (n = 30), familiarity with Chinese characters (which are used as neutral stimuli [see Measures]; n = 3), low motivation (n = 13; see Self-reported measures) or poor understanding (n = 14; see Self-reported measures). Technical errors rendered 15 participants' AMP data incomplete. The final sample (n = 283) averaged 19.08 (*SD* = 1.40) years old, and 89.9% identified as White.

2.2. Stimuli

Food stimuli consisted of 120 food images (see Fig. 1) available via internet or photographed by study personnel. Nutritional labels, brand websites, and www.nutritiondata.com provided nutrition facts. Food stimuli varied along dichotomous dimensions of added sugar and added fat (high or low).

2.3. Measures

2.3.1. AMP tasks

The affect misattribution procedure (AMP) provides one means of improving poor structural fit. Participants view rapidly presented images (i.e., photo, neutral Chinese character). In the direct AMP, participants rate the photo's pleasantness and ignore the character; in the indirect AMP, participants ignore the photo and rate the character's pleasantness (see Fig. 2). The AMP's indirect (Payne, Cheng, Govorun,