



Research report

The association of food characteristics and individual differences with ratings of craving and liking



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ABSTRACT

Craving and liking are related to eating-related problems, but less is known about the association of specific food characteristics (e.g., sugar, fat) with craving/liking. The relation of individual differences in eating behavior with these craving and liking patterns is also relatively unknown. We examine the nomothetic impact of sugar, fat and processing on food craving and liking and the moderation of these effects by idiographic factors (e.g., Body Mass Index [BMI], hunger). One hundred and five overweight and obese women completed craving and liking ratings on 180 foods that differed in levels of sugar, fat and processing. Food craving was linked positively to fat content, but negatively to sugar. Food liking was associated negatively with sugar content and processing level. Addictive-like eating predicted elevated overall food craving and liking, and increased craving and liking for processed foods. Attempted restriction efforts were unrelated to craving and liking. BMI was associated with less craving for fattier foods and lower liking for the average food. Hunger was associated with increased craving for the average food. These findings highlight the role of fat in cravings and differences in craving and liking based on BMI, loss of control over eating, and hunger. These findings are relevant to theories of problematic eating and the development of eating-related interventions.

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Introduction

Craving and liking for foods are thought to influence patterns of food consumption, overeating, obesity, and binge eating (Drewnowski, Kurth, Holden-Wiltse, & Saari, 1992; Finlayson, King, & Blundell, 2007; Hill, 2007). Despite the proposed importance of these constructs, limitations exist in the understanding of the nomothetic (normative) associations between food attributes (e.g., sugar, fat) and food craving and liking. There is also limited knowledge regarding how idiographic (individual-level) factors (e.g., disinhibited eating, obesity) are related to craving and liking. A greater understanding of food craving and liking may highlight mechanisms associated with problematic eating that could be targeted for intervention.

Food craving

Craving has been proposed as an important construct in motivating eating, overeating, and binge eating (White, Whisenhunt, Williamson, Greenway, & Netemeyer, 2002). The best way to define craving has been a matter of debate, but generally food craving is

defined as an urge, want or desire for a particular food (Berridge, Ho, Richard, & DiFeliceantonio, 2010; Hill, 2007; Pelchat, 2002). Although there are behavioral measures proposed to measure craving (Finlayson & Dalton, 2012), the most common approach to measuring this construct is for participants to self-report their craving for a predetermined list of food (Rodin, Mancuso, Granger, & Nelbach, 1991; Weingarten & Elston, 1991; Zellner, Garriga-Trillo, Rohm, Centeno, & Parker, 1999). Chocolate has been identified at or near the top of many craving lists (Massey & Hill, 2012; Rodin et al., 1991; Weingarten & Elston, 1991; Zellner et al., 1999) and other sweets (e.g., cookies, cakes, pastries, ice cream) are also identified as frequently craved foods (Christensen & Pettijohn, 2001; Massey & Hill, 2012; Pelchat, 1997; Rodin et al., 1991; Weingarten & Elston, 1991; Zellner et al., 1999). White et al. (2002) identified four categories of frequently craved foods: high-fat foods (e.g., fried chicken, sausage, fried fish, hot dogs), sweets (e.g., brownies, cookies, candy, chocolate), starchy carbohydrates (e.g., rolls, waffles, biscuits, bread), and high-fat foods served at fast-food restaurants (e.g., hamburger, French fries, chips, pizza). Elevated levels of craving for sweets and other high carbohydrate foods¹ (especially during times of neg-

¹ Although sugar is a type of carbohydrate, prior research has often distinguished between craving for sweets (e.g., cake, chocolate) and craving for more general carbohydrates that include foods high in sugar and/or other carbohydrates, like flour (e.g., doughnuts, pasta, crackers).

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ative affect) led to the proposal that craving for carbohydrates was driven by the potentially mood altering effects of increased serotonin resulting from carbohydrate consumption (Wurtman & Wurtman, 1995). Alternatively, many of the frequently craved high-carbohydrate foods were also high in fat (Drewnowski et al., 1992) and craving for low-fat foods is relatively rare (Pelchat, 1997). Thus, it is unclear whether fat or carbohydrates (such as sugar) may be more closely linked with craving. Of note, the majority of craved foods (e.g., chocolate, French fries) are also foods that have been processed to increase palatability by the addition of sugar, fat and/or salt, which may impact craving levels (Rodin et al., 1991; White et al., 2002).

Individual differences have also been associated with food craving. Attempts to restrain eating have been proposed as a trigger for increased food craving (Hill, 2007; Polivy, Coleman, & Herman, 2005), although this literature is somewhat mixed. Restrained eating has not been associated with craving in some studies (Hill, Weaver, & Blundell, 1991; Jáuregui-Lobera, Bolaños-Ríos, Valero, & Prieto, 2012; Rodin et al., 1991; Weingarten & Elston, 1991), whereas others have found that restrained eaters report a stronger desire to eat chocolate, higher general levels of craving, a greater likelihood of consuming craved foods, and increased craving in response to food cues (Fedoroff, Polivy, & Herman, 2003; Massey & Hill, 2012; Polivy et al., 2005).

Disinhibited eating may also be linked with food cravings (Greeno, Wing, & Shiffman, 2000; Mitchell, Hatsukami, Eckert, & Pyle, 1985). A relatively new and controversial theory suggests that some forms of disinhibited eating could be caused by an addictive response to highly processed foods (Avena, Rada, & Hoebel, 2008; Gold, Frost-Pineda, & Jacobs, 2003; Johnson & Kenny, 2010). A central component of addiction is a loss of control over consumption (American Psychiatric Association, 2000). Addictive-like eating as measured by the Yale Food Addiction Scale (YFAS) is strongly related to binge eating tendencies (Gearhardt, Corbin, & Brownell, 2009) and is related to increased frequency of binge eating episodes in clinical populations (Gearhardt, White, Masheb, & Grilo, 2013; Gearhardt, White, Masheb, Morgan, Crosby, & Grilo, 2012). Yet, it is currently unclear whether the YFAS assesses an addictive response to certain foods or solely disinhibited eating caused by other mechanisms. Elevated craving is also a core feature of addiction (Sayette, Martin, Wertz, Shiffman, & Perrott, 2001); thus, “food addiction” would theoretically be related to greater food cravings. The literature on this topic is limited, but self-identified chocolate “addicts” have been found to report higher overall levels of chocolate craving (Macdiarmid & Hetherington, 1995) and greater cravings in response to external chocolate cues relative to participants who did not report feeling addicted to chocolate (Tuomisto, Hetherington, Morris, Tuomisto, Turjanmaa, & Lappalainen, 1999). Similarly, participants with higher scores on the YFAS (Gearhardt et al., 2009) indicated higher levels of trait food craving (Meule & Kübler, 2012).

General tendencies to experience food cravings have been associated with higher body mass index (BMI) (Franken & Muris, 2005), and more frequent craving for processed high-fat foods is associated with obesity (White et al., 2002). Higher BMI has also been related to more consistent (but not more frequent) craving for certain high-fat food types (e.g., chips, seafood, pork/ham/bacon and Mexican food) (Rodin et al., 1991). Moreover, carbohydrate and sweets cravings are frequently reported triggers for eating in overweight relative to lean women (Björvell, Roennberg, & Roessner, 1985) and binges for obese women (Greeno et al., 2000).

An area of limited research is the role of state hunger on food cravings. Prior research has found that elevated craving is related to higher scores on trait-based susceptibility to hunger (Hill et al., 1991), but little research has explored how fluctuations in state-based hunger levels are related to craving response.

Food liking

Food liking has been defined as the “qualitative, affective (hedonic) evaluation of food; the degree of experience of pleasure or displeasure” (Mela, 2001), and increased food liking correlates with increased consumption (Drewnowski & Hann, 1999). Sugar and fat have been identified as important contributors to food palatability (Cordain et al., 2005), and participants generally report more liking of high-fat sweet and savory items relative to low-fat versions (Finlayson et al., 2007). The role of processing in food liking has received little systematic attention, although highly liked foods are often processed (e.g., chocolate, fries) (Finlayson et al., 2007).

Restrained eating may also be related to food liking. Fedoroff, Polivy, and Herman (1997) found that liking ratings for a number of palatable foods did not differ between restrained and unrestrained eaters at baseline, but exposure to food cues resulted in elevated liking ratings for restrained eaters. In contrast, restrained eaters did not exhibit stronger liking for high-fat foods than unrestrained eaters on tasks that indirectly measured food liking (Roefs, Herman, MacLeod, Smulders, & Jansen, 2005). Greater disinhibited eating in dieters is associated with higher liking ratings for sweets, pastries served with coffee, fruit-based sweet foods, butter and margarine (Lähteenmäki & Tuorila, 1995). The association of disinhibited eating related to addictive-like eating behavior and food liking has not been previously examined.

The association of food liking and elevated BMI is currently a topic of debate. Some studies have found that obese compared with lean participants indicate greater preferences for high-fat versus low-fat foods (Laurent-Jaccard, De Matteis, Hofstetter, & Schutz, 1994). Higher body fat in lean subjects was also related to increased preferences for fat (Mela & Sacchetti, 1991). Furthermore, obese individuals with a history of weight cycling relative to weight-stable obese participants reported higher preferences for dairy solutions with higher fat/sugar content (Drewnowski & Holden-Wiltse, 1992), and obese participants frequently identified high carbohydrate/fat, high-fat sweets, and meats as their favorite foods (Drewnowski et al., 1992). Other research has found that obese compared with lean participants indicate lower food liking for salty and sweet foods (the role of fat was not examined) (Cox, Galen, Hedderley, Perry, Moore, & Mela, 1998). Thus, the current literature on food liking and body weight is not entirely consistent.

A limited number of studies have examined the separate contribution of fat and sugar to food liking in overweight/obese participants. Drewnowski, Brunzell, Sande, Iverius, and Greenwood (1985) found that obese relative to normal-weight individuals preferred the taste of sugar/fat mixtures that were relatively low in sugar, but high in fat. In contrast, other research suggests that young overweight participants' liking rates were only associated with increased sugar content (but not fat levels) (Warwick & Schiffman, 1990). Overall, it appears that fat and sugar are related to food liking in obesity, but the direction of the relationship is unclear and the association of food processing with liking in obesity has received little attention.

Elevated state-based hunger has been associated with increased pleasantness ratings of food pictures (Stoeckel, Cox, Cook III, & Weller, 2007). Further, increased hunger is associated with preferences for foods with higher fat content (Finlayson et al., 2007) and higher pleasantness ratings for sweet beverages (Laeng, Berridge, & Butter, 1993).

In sum, food craving and liking are potentially important factors in eating behavior. The relevant nutritional attributes of commonly craved foods are not entirely clear, but sugar and fat have been identified as important components. Food liking also appears related to sugar and fat levels. The relationship between restrained eating and craving and liking is relatively mixed, but disinhibited-type eating appears to be more consistently associated with increased

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