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The crunch effect: Food sound salience as a consumption monitoring cue

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ABSTRACT

While a growing body of research explores the impact of normative and environmental extrinsic factors on food consumption quantity, less attention is given to the intrinsic cues, or sensory properties, of the food being consumed. Our research contributes to this growing literature by examining the effect of food sound salience (i.e., the sound that a food makes during mastication) on consumption quantity. Specifically, we show that increased attention to the sound the food makes, or food sound salience, may serve as a consumption monitoring cue leading to reduced consumption. Across three studies, we show a consistent negative relationship between the salience of a food's sound and food intake. Our research highlights the importance of intrinsic auditory food cues on consumption. Our findings are valuable to both researchers interested in understanding how sensory cues are connected to consumption and marketers utilizing sound in their communications to consumers.

1. Introduction

Few decisions are as recurrent in a consumer's daily life as those surrounding food consumption. The consequences of these decisions are serious, as overconsumption can lead to obesity (Hill, Wyatt, Reed, & Peters, 2003; Levitsky & Pacanowski, 2011), increasing the risk of coronary heart disease, type II diabetes, and even breast cancer ("Adult Obesity Causes & Consequences," 2015). Both practitioners and researchers are eager to understand how consumers can better navigate these food consumption decisions. Indeed, a $60 billion weight-loss industry, including diet books, drugs, and weight-loss surgeries ("The U.S. Weight Loss Market," 2015), illuminates the magnitude of this consumer need.

Appropriately, researchers have increasingly explored the drivers of overconsumption and have emphasized the *extrinsic* factors that impact food consumption quantity, including norms, emotions, and external sensory cues (e.g., Bublitz, Peracchio, & Block, 2010; Cornil, Ordabayeva, Kaiser, Weber, & Chandon, 2014; Rozin, Trachtenberg, & Cohen, 2001; Wansink & Chandon, 2014). While the list of normative (Herman, Roth, & Polivy, 2003; McFerran, Dahl, Fitzsimons, & Morales, 2010) and emotional (Gardner, Wansink, Kim, & Park, 2014; Maier, Makwana, & Hare, 2015; Winterich & Haws, 2011) determinants of overconsumption is ever increasing, consumers still report their internal state of satiation, or feeling full, as a primary reason to stop consumption (Vartanian, Herman, & Wansink, 2008). However, in actuality, internal physiological cues are poorly utilized, especially within overweight and obese populations (Herman & Polivy, 2008; Schachter, Goldman, & Gordon, 1968). Thus, consumption researchers have shifted their focus from internal drivers of consumption quantity (i.e., hunger and satiation) to external sensory cues such as ambient sound, scent, and temperature.

The impact of *intrinsic* cues, or sensory properties of the food itself, on consumption has also received increased attention. Extant research in this area has characterized the impact of food taste (Pliner & Mann, 2004), smell (Krishna, Morrin, & Sayin, 2014) and visual properties (Kahn & Wansink, 2004) on consumption. To expand this research stream, we explore how the intrinsic auditory cues elicited during consumption impact consumption quantity. Across three studies, we show that increased attention to the sound the food makes, or food sound salience, leads to reduced consumption. Our research adds to the literature showcasing the impact of sound on flavor perception and consumption (Christensen & Vickers, 1981; de Liz Pocztaruk et al., 2011; Dematte et al., 2014; Spence, 2012; Spence & Shankar, 2010; Woods et al., 2011).

We choose to focus on food sound salience as sound has traditionally been the "forgotten" flavor sense (Spence, 2015), leading to its underutilization in flavor perception. Despite the recent literature establishing sound as an integral component of flavor (Dematte et al., 2014; Spence, 2012, 2015), data from our pilot

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study suggest that consumers still consider sound an unimportant attribute in their consumption decisions. Food sound salience can have a unique impact on food regulation as it can be manipulated by the individual at the time of consumption by either paying increased attention to the sound, or by regulating the sound made during mastication. This attention to sound can be consumer initiated, or even directed by food packaging or advertising cues. Therefore, establishing a link between intrinsic sound and consumption quantity is valuable for both sensory science researchers interested in understanding how sensory cues are connected to consumption, and practitioners who emphasize sound in their communications to consumers.

1.1. Literature review

1.1.1. Sensory cues and consumption

Through a variety of mechanisms, extrinsic sensory cues affect consumption quantity. Pleasant (unpleasant) aromas that are congruent (incongruent) with the food increase (decrease) consumption (Fedoroff, Polivy, & Herman, 1997, 2003; Wadhwa, Shiv, & Nowlis, 2008). Visual cues, such as lighting, impact how long a consumer spends in a restaurant, and consequently how much food is ordered (Lyman, 1989; Stroebele & De Castro, 2004). Sound (via background music) has been shown to affect food consumption by changing the perceived passage of time (Caldwell & Hibbert, 2002; Guéguen, Hélène, & Jacob, 2004; Guéguen, Jacob, Le Guellec, Morineau, & Lourel, 2008), impacting consumers' moods (Alpert & Alpert, 1990), distracting consumers (Bellisle & Dalix, 2001; Stafford, Fernandes, & Agobiani, 2012; Wansink, 1992), and biasing consumers' behaviors by activating attributes consistent with the sounds (North & Hargreaves, 1997; North, Hargreaves, & McKendrick, 1999).

Food consumption quantity is not only subject to the extrinsic sensory cues present in the surrounding environment, but also the intrinsic sensory cues experienced from the food stimulus itself. The most obvious intrinsic sensory cue, taste, has been conceptualized in existing research as palatability, or the experienced pleasure of eating. Perhaps unsurprisingly, palatable foods are consumed in greater quantities than unpalatable foods (Bobroff & Kissileff, 1986).

Additional research on intrinsic sensory cues and food has focused on a subset of the sensory modalities and has largely explored evaluations rather than consumption quantity. Food visibility (Deng & Srinivasan, 2013; Scheibehenne, Todd, & Wansink, 2010), color (DuBose, Cardello, & Maller, 1980; Geier, Wansink, & Rozin, 2012; Hoegg & Alba, 2007), or presentation (Reisfelt, Gabrielsen, Aaslyng, Bjerre, & Møller, 2009) all impact evaluations. More recently, texture (Biswas, Szocs, Krishna, & Lehmann, 2014) and aromas (Krishna et al., 2014) associated with food have also been shown to be important factors affecting consumption evaluations.

The role of intrinsic sound in food consumption has recently received increased attention, primarily in relation to evaluations of the food and not the quantity consumed (see Spence, 2015; Zampini & Spence, 2004, 2010). Crispness, in particular, is the auditory descriptor that is most strongly associated with the pleasantness of a food (Vickers, 1982), although research suggests that crispness is not solely determined through auditory cues (Christensen & Vickers, 1981). More work in this area confirmed that crispness of a food impacts food quality (Zampini & Spence, 2004). Specifically, by selectively manipulating the frequency and amplitude of the sound feedback produced when eating a potato chip, Zampini and Spence (2004) demonstrate a direct link between sound and perceptions of product freshness.

While these studies highlight the important role that sound plays in food evaluations, what remains unclear is the effect of food sound on the quantity of food consumed. In the current research we address this gap by directly testing the relationship between food sound salience and the quantity of food consumed. We explore factors that are expected to directly affect consumption quantity, and can be manipulated by consumers themselves (Wansink & Chandon, 2014).

1.1.2. Consumption monitoring

An important determinant of food regulation is whether consumers are provided with the opportunity to monitor their consumption. Sensory cues that have been shown to enhance consumption monitoring have been visual in nature. For example, Geier et al. (2012) show that "pause points" can be created by enhancing the salience of the visual aspects associated with a snack item (i.e., red potato chips in a container of regular potato chips), which, in turn, encourage monitoring and decrease consumption. In another study, the consumption of chicken wings decreased by 27% when the remaining bones of the eaten chicken wings were left on the table compared to when the waitress took them away (Wansink & Payne, 2007). Thus, drawing attention to the consumed food leads to a decrease in consumption (Wansink, 2006; Wansink & Chandon, 2014).

Just as the sight of consumed food helps consumers monitor their food intake, we predict that drawing attention to the sound of the food may also serve as a consumption monitoring cue. Formally, we hypothesize that increasing (vs. decreasing) food sound salience will lead to less food consumption. The sound that a crunchy food makes when it is consumed provides an intrinsic cue of consumption such that when the consumer no longer hears the sound of the food, an auditory pause in the consumption experience is created. Alternatively, when the crunch of the food is not salient, and the natural pause points created by the sound are not available, the ability to monitor consumption is impaired. In this research we establish the importance of food monitoring via intrinsic sensory cues by focusing on the role of intrinsic food sound on consumption quantity.

We present a pilot study and three additional lab studies to test these relationships. The pilot study establishes consumers' lay beliefs about the role that each sensory modality plays in their food consumption experience. Study 1 tests the relationship between food sound salience and food consumption quantity. In study 2, we explore an alternate means of isolating intrinsic food sound to test its effect on consumption quantity. Finally, study 3 showcases the managerial implications of our findings and conceptually replicates the prior studies by manipulating food sound salience through advertising.

2. Pilot study

2.1. Materials and methods

2.1.1. Participants

Two hundred twenty-three undergraduates (63% male) at a western university participated in this study for course credit.

2.1.2. Stimuli

In an online survey format, a hypothetical eating scenario was presented to all study participants. Participants were told that, "We would like you to think of a typical, but specific sandwich that you will eat. Please imagine that you are eating alone." Following this prompt, participants evaluated what they imagined on dimensions relating to food quality and consumption quantity.