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Gender differences in the influence of personality traits on spicy food liking and intake

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ABSTRACT

It has been proposed, and only minimally explored, that personality factors may play a role in determining an individual's sensitivity to and preference for capsaicin containing foods. We explored these relationships further here. Participants rated a number of foods and sensations on a generalized liking scale in a laboratory setting; after leaving the laboratory, they filled out an online personality survey, which included Arnett's Inventory of Sensation Seeking (AISS) and the Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ). Recently, we reported strong and moderate correlations between the liking of a spicy meal and the personality constructs of Sensation Seeking (AISS) and Sensitivity to Reward (SPSRQ), respectively. Here, we use moderation models to explore the relationships between personality traits, perceived intensity of the burn of capsaicin, and the liking and consumption of spicy foods. Limited evidence of moderation was observed; however differential effects of the personality traits were seen in men versus women. In men, Sensitivity to Reward associated more strongly with liking and consumption of spicy foods, while in women, Sensation Seeking associated more strongly with liking and intake of spicy foods. These differences suggest that in men and women, there may be divergent mechanisms leading to the intake of spicy foods; specifically, men may respond more to extrinsic factors, while women may respond more to intrinsic factors.

1. Introduction

It is well accepted that liking of a food drives intake (Cowart, 1981; Duffy, Hayes, Sullivan, & Faghri, 2009; Randall & Sanjur, 1981; Rozin & Zellner, 1985; Schutz, 1957). In the absence of economic and availability constraints, liking may be the single most important determinant of food choice in meals eaten both in and outside the home (Eertmans, Baeyens, & Van den Bergh, 2001; IFIC, 2014). Healthfulness is the second most important criteria in determining food choice (IFIC, 2014). While capsaicin intake has been linked with a number of health benefits (Ludy & Mattes, 2011a; Ludy, Moore, & Mattes, 2012; Matsumoto et al., 2000; Westerterp-Plantenga, Smeets, & Lejeune, 2005; Yoshioka et al., 1995, 1999, 2004), the burning and stinging sensation elicited by capsaicin can still serve as a strong deterrent against intake for some individuals. Assuming an individual's affective response to oral burn is a major determinant in whether that individual will consume spicy foods, there is merit in exploring the factors that may cause some individuals but not others to enjoy burning sensations in food.

Factors that reportedly influence food liking include physiological differences such as taste phenotype (Duffy & Bartoshuk, 2000; Duffy et al., 2007) or oral anatomy (Bartoshuk, 1993; Miller & Reedy, 1990), as well as prior exposure and familiarity with spicy foods (Logue & Smith, 1986; Ludy & Mattes, 2011b; Rozin & Schiller, 1980; Stevenson & Yeomans, 1993). Moreover, humans can learn to like the burn of capsaicin with repeated exposure (Rozin, 1990), and acute and chronic desensitization to capsaicin in and outside the laboratory are well-documented phenomena (Green & Hayes, 2003; Karrer & Bartoshuk, 1991; Lawless, Rozin, & Shenker, 1985; Stevenson & Prescott, 1994). Thus, it is conceivable that the higher usage levels typically observed among frequent chili users is due to greater tolerance to the burn (i.e., reduced burn intensity). However, Rozin and others have suggested that any effect of desensitization on liking of capsaicin is small, and that the affective shift from disliking to liking is attributable to other factors (Rozin & Rozin, 1981; Rozin & Schiller, 1980; Stevens, 1996).

Personality is also known to play a role in determining the liking of spicy foods. The liking of chili peppers and "unusual spices" has been linked with personality characteristics such as strength

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and daring and with thrill and adventure seeking behaviors (Rozin & Schiller, 1980; Stevens, 1996; Terasaki & Imada, 1988). Rozin and Schiller (1980) asked rural Mexican villagers ($N = 13$) a number of questions about "hypothetical twins who were identical, except that one ate chili and the other did not" during interviews to explore possible social associations with chili consumption. These questions included "Which twin is stronger? Which twin is female? Which twin is less intelligent?" A majority of the respondents identified the twin that ate chili as being stronger, and they also indicated none of the other attributes could be determined just by knowing which twin consumed chili. Rozin and Schiller hypothesized this attribution of strength to chili eaters may be related to the Mexican idea of *machismo*, indicating that traits of daring and masculinity. No difference in the preference for spicy foods between men and women was found in the Mexican sample, possibly due to the prevalence of chili in the diet of the region. Later, Rozin reported enjoyment of certain activities, which he classified as masochistic, such as amusement park rides, dangerous sports, and gambling, were linked with the liking of chili peppers (Rozin, 1990). However, the link to sensation seeking was an inference based on a common theorized 'constrained risk' across these activities, as Rozin never directly associated measures of sensation seeking with chili liking or intake. Notably, since this work was conducted, use and consumption of capsaicin and chili peppers in the United States has risen substantially (Govindarajan & Sathyanarayana, 1991; Lucier, Pollack, Ali, & Perez, 2006; Reinagel, 2012).

Elsewhere, personality measures used previously have been criticized for containing gender and age-biased items, as well as for the response style employed by the scales (Arnett, 1994; Haynes, Miles, & Clements, 2000). Recently, we reported strong positive correlations between the personality variable Sensation Seeking, as measured with Arnett's Inventory of Sensation Seeking (AISS; Arnett, 1994), and the liking of some types of spicy food (Byrnes & Hayes, 2013). We also observed a more modest positive relationship between spicy food liking and the Sensitivity to Reward subscale of the English language version (O'Connor, Colder, & Hawk, 2004) of Torrubia and colleagues' Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ; Torrubia, Avila, Molto, & Caseras, 2001). These findings extend existing literature on the links between personality traits and orally irritating foods, by suggesting that multiple, distinct personality constructs may influence an individual's affective response to chili-containing foods. However, not all studies study support an association between personality and liking of spicy foods (e.g., Ludy & Mattes, 2012), although a failure to observe a relationship may be due to low power (small n) or measurement error inherent to brief measures of personality.

The original objective of the present work was to test the hypothesis that personality modifies the relationship between the perceived burn of capsaicin and the liking/disliking of spicy foods. To formally test this, we constructed a model to test whether personality moderates the relationship between capsaicin burn and spicy food liking, using standard guidelines established by Baron and Kenny (1986). In a moderation model, the outcome variable is regressed onto the predictor and moderator variables as well as onto a multiplicative interaction term of the predictor and the moderator. This interaction term is included in the model to test the influence of the putative moderator (here, personality trait) on the relationship between the predictor (burn) and outcome (liking), seen in Model 1 of Fig. 1. If the interaction term accounts for a statistically significant amount of variance in the outcome variable, this is evidence of moderation. Here, our model tests whether the relationship between the perceived burn of a 25 uM capsaicin stimulus and reported spicy food liking systematically varies across individuals as a function of personality.

Based on our prior work showing strong to moderate correlations between Sensation Seeking ($r = +0.50$) and Sensitivity to Reward ($r = +0.23$) and spicy food liking (Byrnes & Hayes, 2013), we hypothesized that these personality traits would moderate the relationship between the perceived burning/stinging of 25 uM capsaicin and the reported liking/disliking of spicy foods. A second aim of this study was to assess whether the relationship between liking and intake of spicy foods was moderated by personality. Finally, we also explored the role of gender, given the possible association of masculine traits with the consumption of spicy foods.

2. Methods

2.1. Overview

Similar to our previous report (Byrnes & Hayes, 2013), these data were collected as part of a larger, ongoing study of the genetics of oral sensation (Project GIANT-CS, phase I). Briefly, data were collected in one-on-one testing across multiple days, but only data from the first laboratory session and an online follow-up survey are reported here. During the first session, participants completed a food-liking questionnaire and rated the intensity of sensations from sampled stimuli, including capsaicin. After leaving the laboratory, participants filled out an online survey that included several different personality measures, as well as a measure of spicy food intake frequency.

2.2. Participants

Participants were recruited from the Penn State campus and the surrounding area. To be eligible, individuals needed to be non-smoking, fluent English speakers between 18 and 45 years old, with no known defect of taste or smell. Additional exclusion criteria included being pregnant or breastfeeding, taking prescription pain medications, the presence of lip, cheek, or tongue piercings, or prior diagnosis with a disorder involving either a loss of sensitivity or chronic pain. Participants who qualified were asked not to eat or drink within 1 h of testing and were asked to abstain from eating hot and/or spicy foods for at least 48 h prior to testing.

Present data are a superset of the cohort described previously ($n = 97$; Byrnes & Hayes, 2013); here, we report data from 246 participants (99 men). Participant ages ranged from 18 to 45 (mean 25.9). Self reported race and ethnicity were collected as two separate questions, as recommended by the 1997 OMB Directive 15 guidelines. The present analysis included 35 Asians, 6 African Americans, and 172 Caucasians; 33 individuals did not report a race. For ethnicity, 12 individuals identified themselves as being Latina or Latino and 203 responded as being not Latina or Latino; 31 did not report an ethnicity.

2.3. Measuring sensation intensity

A general Labeled Magnitude Scale (Bartoshuk et al., 2004) was used to collect all intensity ratings. Prior to rating any sampled stimuli, participants were oriented to the scale using a list of 15 imagined or remembered sensations that included both oral and non-oral items (Hayes, Allen, & Bennett, 2013). Both the scale instructions and orientation procedure encouraged participants to make ratings in a generalized context that was not limited to food or oral sensations. The top of the scale was labeled as the "strongest imaginable sensation of any kind". For each sample, participants were asked to rate sweetness, bitterness, sourness, burning/stinging, umami/savory, and saltiness. All data were collected via Compusense *five* Plus, version 5.2 (Guelph, Ontario, Canada).