



## Personality traits and gender influence liking and choice of food pungency

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### ABSTRACT

The study, part of the larger Italian Taste project, was aimed at exploring the role of personality traits and taste responsiveness on liking and choice of pungent foods. Data of 1146 subjects (61% females, aged 18–60) were analysed. Subjects were characterised for demographics, taste functions (responsiveness to PROP and fungiform papillae density), and personality traits: sensitivity to reward (SR), to punishment (SP) and to disgust (SD), private body consciousness (PBC), alexithymia (TAS) and food neophobia (FN). They evaluated capsaicin and other tastants in solutions, then evaluated liking and perceived intensity (burning, acid, sweet and overall flavour) in a series of four samples of tomato juice, each spiked with capsaicin at a different concentration (0.3; 0.68; 1.01; 1.52 mg/kg). A choice index for pungent food was calculated as a sum of the choices of the spicy option using a questionnaire developed to evaluate preferences within a pair of food items (pungent vs non pungent option).

Males and females differed for frequency of chili consumption and were studied separately. Age was not associated with frequency of chili consumption. Responsiveness to PROP was found to be positively correlated to perceived burn intensity. Results from ANOVA models showed that High SR, Low FN, Low DS (both males and females) and Low SP (males) liked significantly more the burning samples. Low FN and DS (in both genders), low SP (in females) perceived lower burning, and overall flavour intensities, while this was not observed in High SR. PLS regression models were used to gain a deeper understanding of the factors that affect pungent food choice. Choice was positively correlated with liking, and negatively with burning intensity, FN and DS. In addition, choice was negatively correlated with SP in females and positively with SR in males.

Our results confirmed that many factors interplay in spicy food liking and choice and highlighted the role played by different personality traits in females and males. It was also reported that for same traits an effect on liking of pungency is associated with a lower perceived intensity of burning and overall flavour, while for other traits only an effect on liking was observed.

**Abbreviations:** FPD, fungiform papillae density; FN, food neophobia; HCP, hot chili pepper; PBC, private body consciousness; SD, sensitivity to disgust; SP, sensitivity to punishment; SR, sensitivity to reward; TAS, alexithymia

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## 1. Introduction

The preferred level of pungency in food – sensations of burning, bite, tingling and so on – varies considerably worldwide. How individuals come to like and enjoy foods characterised by pungency, in particular the intense and often aversive sensations produced by chilies, has been the subject of several studies since the 1980s. Rozin and Schiller (1980), in their seminal study aimed at better understanding the mechanism related to the acquisition of a preference for chili, noted the fundamental role of exposure. They hypothesised that because a hedonic shift is produced by exposure, pungent sensations might become associated with positive events, including enhancement of the taste of bland foods, postingestional effects, or social rewards. Rozin and Schiller (1980) also reported an association between preference for chili and the personality trait of sensation seeking: for some individuals, the initial mouth burn produced by the chili may become pleasant as the person realizes that it is not really harmful (see the concept of “constrained risk”, Rozin & Schiller, 1980).

Increasingly, research has also addressed the question of whether personality factors might influence preference development for pungent foods. Significant positive correlations have been reported between preference for spicy and chili-containing foods and measures of sensation seeking (Brown, Ruder, Ruder, & Young, 1974; Logue & Smith, 1986; Terasaki & Imada, 1988; Byrnes & Hayes, 2013), as well as with measures of sensitivity to reward (Byrnes & Hayes, 2013), a trait associated with the responsivity to BAS (Behavioural Activation System), a conceptual system responsible for approach behaviour in response to incentive (signals of reward or non-punishment). Interestingly, a further study of Byrnes and Hayes (2015) highlighted gender differences in these relationships, with spicy food liking and intake associated with sensitivity to reward in men and with sensation seeking in women. A recent study by Byrnes and Hayes (2016) confirmed the association between sensation seeking and both liking and intake of spicy foods, while finding an association of sensitivity to reward and the trait of risk taking only with spicy foods intake.

Another personality trait, sensitivity to punishment describes individual differences in reactivity and responsivity to the Behavioural Inhibition System (BIS), hypothesized to control behaviour in response to signals of punishment, frustrating non-reward and novel stimuli. While an association with spicy food intake has not been reported for sensitivity to punishment (Byrnes & Hayes, 2013, 2015, 2016), a weak association was found with liking of spicy foods (Byrnes & Hayes, 2013). In a further study, Nolden and Hayes (2017) did not see any effect of food adventurousness (variety seeking, measured using the VARSEEK scale) on burn perception, while a significant effect was found on liking ratings for samples spiked with different concentrations of capsaicin, and on reported liking for spicy foods, and a trend was reported on frequency of chili intake. Törnwall et al. (2014) reported that the individuals who preferred spicy foods and a strawberry flavoured jelly spiked with capsaicin to one without it were less neophobic, but they did not report differences in the intensity of pungency.

There are also some limited data (Stevens, 1990) that have suggested that individuals with high Private Body Consciousness (PBC) – reflecting awareness of internal sensations – rate the burn of capsaicin as more intense than those with low PBC, hypothesising that this might be linked to a higher intake, but further studies did not support these findings (Byrnes & Hayes, 2013).

Genetic factors have major influence on liking of oral pungency and spicy foods, accounting for 18–58% of the variation in a study on adults Finnish twins (Törnwall, Silventoinen, Kaprio, & Tuorila, 2012). Some of this relationship appears to be mediated by PROP tasting, which is strongly genetically determined. However, the role of sensitivity to PROP is not clear, with several studies reporting a positive association with pungency (Karrer & Bartoshuk, 1991; Prescott & Swain-Campbell, 2000; Tepper & Nurse, 1997) while other studies did not find a significant association (Törnwall et al., 2012). Tepper et al. (2009) found

liking of chili to be a function of PROP status, with non-tasters liking the chili more than did supertasters in an Italian but not in a US sample, while Bajec and Pickering (2010) reported no effect of PROP responsiveness on liking of hot spices (including hot peppers, and curry, wasabi and horseradish) in a Canadian sample. Ullrich, Touger-Decker, O’Sullivan-Maillet, and Tepper (2004) reported that those PROP tasters who were also more food adventurous liked chili and hot sauce more than PROP tasters who were less food adventurous; in addition, the authors reported that, in non-tasters, food adventurousness had little influence on liking of chili and other spicy foods.

The complexity of these influences on liking of spicy foods and in the perception of pungency suggest that an understanding of the development of liking for chili is far from complete. It is likely that there are multiple routes to liking, variously linked to the interactions of the different factors that play a role (see also Dalton & Byrnes, 2016). The conflicting research findings may be due to the low number of subjects participating in the studies and to the different measures used, encouraging further investigation of these issues on larger samples. In addition, liking for burning has been explored primarily in water solutions or in flavoured jelly (Byrnes & Hayes, 2016; Törnwall et al., 2012), but seldom in a food matrix (Ludy & Mattes, 2012) and in this case on a very limited number of subjects ( $n = 25$ ).

Investigating the factors that influence pungent food liking is of interest not only to fully understand food choice and preference, but also for the beneficial consequences for health that the consumption of foods rich in capsaicin and capsiate might have in augmenting energy expenditure (Ludy, Moore, & Mattes, 2012; Mattes & Ludy, 2016). In addition, a recent study reported that the consumption of hot red chili pepper was associated with reduced mortality in a large population sample (Chopan et al., 2017).

The present study was aimed at further exploring the role of personality traits and taste responsiveness on liking and choice of chili and other pungent foods. The rationale behind this study is the adoption of a multidisciplinary and multidimensional approach to food choices and preferences (Köster, 2009; Monteleone et al., 2017) to better understand the complexity of preferences for pungent foods. Based on previous research (Byrnes & Hayes, 2015) that suggested that personality variables influence the intake of spicy foods differently in men and women, and that the relationship between the variables of personality, perceived burning/stinging of capsaicin, liking of spicy foods, and consumption of spicy foods may differ between men and women, we aimed to assess in two larger samples, one of females and one of males, whether (1) personality and taste responsiveness were associated with sensory perception and liking of burning in a food; (2) personality and taste responsiveness were associated with pungent food choice; (3) personality variables influence the intake of spicy foods differently in females and males.

## 2. Material and methods

### 2.1. Overview

The present data were collected as part of the larger, ongoing “Italian Taste Project” which aims to investigate influences on food choice and preferences in a large population sample (Monteleone et al., 2017). This multisession study involved an online questionnaire session (at home) and a one-on-one testing in a sensory laboratory across 2 days. Only a selection of these tests will be presented here. For a complete overview of the testing and further details on the definition of the procedures, see Monteleone et al. (2017).

### 2.2. Participants

Data were collected on 1225 subjects during the first year of the Italian Taste project. Three subjects were excluded because they did not complete the sensory test and 76 subjects due to problems in the use of

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