Brief report

Phenylthiocarbamide tasting and family history of depression, revisited: low rates of depression in families of supertasters

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Received 18 March 2003; accepted 28 December 2003

Abstract

Past studies suggest that phenylthiocarbamide (PTC) taste status is related to vulnerability to depression, such that those sensitive to PTC are more vulnerable. We questioned this, reasoning that those insensitive to PTC may be more vulnerable (because they may have lower hedonic tone and higher risk for alcohol abuse). Forty-two volunteers responded to questionnaires regarding family history of depression, and were assigned to supertaster, taster, or non-taster categories based on taste reactions to a 3.80 cm piece of commercially prepared paper treated with PTC. Supertasters were significantly less likely to report first-degree relatives with a history of depression than were tasters and non-tasters. Supertasters may be afforded some protection from depression; elucidating the mechanisms of this protection is a potentially interesting avenue for future research.

Keywords: Phenylthiocarbamide (PTC) tasting; Family history of depression

1. Introduction

The ability to taste some bitter substances like phenylthiocarbamide (PTC) is heritable and follows an incompletely dominant pattern (Fischer et al., 1961; Bartoshuk, 2000). Individuals who are very sensitive to these substances have been labeled ‘supertasters’, and probably have two dominant alleles on the relevant gene; those who taste the bitter substances but are not as sensitive are labeled ‘tasters’, and have one dominant and one recessive allele; and those who cannot taste the bitter substances at all are ‘non-tasters’, and have two recessive alleles.

Supertasters and tasters differ from non-tasters regarding taste preferences, food consumption, physical features of the tongue, vulnerability to some health problems, personality style, and possibly vulnerability to some forms of psychopathology. In addition to being more sensitive to bitter-tasting substances, supertasters and tasters perceive sweet substances as sweeter than non-tasters (Gent and Bartoshuk, 1983), detect more saccharin in substances (Bartoshuk, 1979), and can better discriminate fat content in foods compared with to non-tasters (Tepper and Nurse, 1997). Supertasters and tasters tend to dislike...
green vegetables and eat them less frequently than non-tasters (Kaminski et al., 2000). Regarding physical features of the tongue, supertasters and tasters have more taste buds and fungiform papillae on the anterior tongue than non-tasters (Tepper and Nurse, 1997).

Perhaps, as a function of differences in food preferences and consumption, supertasters and tasters may be more vulnerable to certain health problems (e.g. some cancers; Prutkin et al., 2000). There is some evidence that supertasters and tasters tend to be more apprehensive and tense than non-tasters on personality inventories (Mascie-Taylor et al., 1983).

Based on this personality result, Whittemore (1986, 1990) reasoned that since supertasters and tasters tend to be more tense and apprehensive, they may also be more vulnerable to depression. He reported evidence consistent with this view: Tasters tended to suffer from deeper depressions, have longer episodes of sadness, and report more of a family history of depression than non-tasters (he did not differentiate supertasters from among the general group of tasters).

Why would supertasters be more vulnerable to depression? There is some possibility that tense or apprehensive personality characteristics put them at greater risk. However, there are reasons to suspect that supertasters, far from being depression-prone, may be protected from depression.

First, supertasters experience more burn from oral irritants, including alcohol (Bartoshuk et al., 1994), and thus may be somewhat less likely to abuse alcohol. Alcohol abuse is a depression risk factor (Rohde et al., 2001); thus, if supertasters are protected from alcohol abuse, this may also confer protection against depression.

Second, supertasters experience more pleasure than others, at least with regard to taste (it is an intriguing but untested possibility that they experience more pleasure in general). Insofar as lack of pleasure (i.e. anhedonia) is a key-defining feature of depression, supertasters may derive some protection against depression from a higher level of hedonic tone (certainly regarding taste, possibly regarding other things as well).

Accordingly, we wondered whether supertasters may actually be protected from depression, even despite the past finding that tasters may be depression-prone (Whittemore, 1986, 1990). Following up on Whittemore’s (1986) strategy of relating taste status to family history of depression (but making the distinction between supertasters and tasters), we evaluated rates of depression in first-degree biological relatives of supertasters vs. tasters vs. non-tasters. A family history strategy is viable not only because it follows up on the approach of past work, but also because positive family history constitutes a risk factor for depression and because, among non-clinical volunteers, family history reports may produce more variance than reports of personal history (important, given our data-analytic approach). Given our reasoning regarding possible protective processes for supertasters, we predicted that rates of depression in first-degree biological relatives of supertasters would be lower than those for tasters and non-tasters (a risky prediction in the Popperian [Popper, 1959] sense, because it partly contradicts earlier findings; Whittemore, 1986).

2. Methods

2.1. Participants

Forty-two volunteers (27 women), selected from department personnel (average age: 31.74 [± 8.91] years; 37 were Caucasian; three were African-American; two were Hispanic).

2.2. Instruments

Participants completed a questionnaire regarding family history of depression, including: ‘Of your first-degree biological relatives, how many have been diagnosed with depression?’ This approach to assessment of family history has been validated in past work (Joiner et al., 2002, 2003).

People also reported on their total number of first-degree relatives. We calculated the proportion of first-degree relatives who had been diagnosed with depression. The average proportion was 0.20 (S.D. = 0.23).

Participants were also administered a 3.80×1.43 cm piece of commercially prepared paper treated with PTC (obtained from the Carolina Biological
Supply Company, Burlington, NC). Participants were asked if they had smoked, eaten, or drunk anything in the hour prior to the taste test; if they had, the test was delayed until an hour had passed. Participants rinsed their mouth with water, and were instructed to moisten their tongue with saliva and to place the paper in the middle of their tongue. After 5 s, they were instructed to chew the paper into a ball and discard it. They then indicated if they detected no taste or if they detected bitterness, and if the latter, then they rated the intensity of the bitterness on a scale of 1–9, with 1 corresponding to ‘very mildly bitter’ and 9 corresponding to ‘among the most bitter things I have ever tasted’ (approach is similar to past work; e.g. Frank and Korchmar, 1985).

Those who indicated that they experienced no taste were classified as non-tasters (n = 15). Those who were confident that they sensed a bitter taste, clearly beyond any bitterness that would be imparted by paper alone, were classified as a taster if they rated the bitterness as 6 or below (n = 15; all ratings ranged from 2 to 5; mean = 3.67, S.D. = 0.98).1 Those who rated the bitterness as 7 or above were classified as supertasters (n = 12). Interestingly, every supertaster in our sample had a clear behavioral reaction to the test, including grimacing and agitation, and verbal descriptions such as ‘it tastes like poison!’ All supertasters rated the bitterness as either 8 or 9 (mean = 8.69, S.D. = 0.48).

3. Results

Neither age nor gender2 was correlated with either the taste status variable (coded 0 = non-taster; 1 = taster; and 2 = supertaster) or the family history of depression variable. Results of one-way analysis of variance showed that effects of taste status (independent variable) on family history of depression (dependent variable) were statistically significant (F [2, 39] = 3.38, P < 0.05). As expected, the proportion of depressed first-degree biological relatives among supertasters (proportion = 0.06) was significantly lower than that among both non-tasters (proportion = 0.26) and tasters (proportion = 0.25). The latter two groups did not differ from each other (F [1, 28] = 0.001, P = n.s.), whereas proportions among tasters (F [1, 25] = 7.83, P < 0.05) and non-tasters (F [1, 25] = 5.29, P < 0.05) were each significantly different from that among supertasters.

4. Discussion

As predicted, we found an association between status as a PTC-supertaster and a family history of depression, such that supertasters reported lower rates of depression among first-degree biological relatives than did tasters and non-tasters. We expected this association, because we reasoned that supertasters (and by extension their relatives) may be afforded protection via at least two mechanisms: less alcohol abuse among supertasters, and possibly higher hedonic tone among supertasters. On this latter count, hedonic difficulties are a landmark feature of depression; we therefore believed that those with acute hedonic sensitivity in a major sense modality might be protected from depression (as indicated by low familial risk). Results were consistent with our expectation. Supertasters may be afforded some protection from depression. Determining the nature of this protection, which may involve hedonics, risk for alcohol problems, and/or other factors, represents an interesting focus for future research.

Our prediction was risky in the Popperian sense, because past work had shown that tasters (presumably including supertasters) were more vulnerable to depression (Whittemore, 1986, 1990). What may account for the differences between Whittemore’s and our results?

Regarding methodological differences, Whittemore (1990) included a total of 23 women with
major depression. The DSM major depression symptom criteria, including severity and duration definitions, were explained to the women, who were then asked to apply the labels of ‘depressed’, ‘nondepressed’, or ‘cannot say’ to grandparents, aunts, uncles, parents, and siblings. As Whittemore acknowledged, the small sample size, the restriction in range due to only focusing on currently depressed women, and the methodological limitations inherent in that particular family history approach combine to encourage conservative interpretation of the findings.

Whittemore (1986) avoided some of these problems by focusing on a larger and less restricted sample. However, family history data were only collected on parents – null results were obtained regarding paternal depression, whereas he found that tasters reported more maternal depression than non-tasters. The method of family history assessment was not specified, and the reasons for differences in maternal vs. paternal depression were not addressed.

In evaluating the relation between PTC-taste status and depression, it is important to control for a key third variable – gender. In general, women are more likely to be supertasters (see footnote 2), and women are more likely to experience depressive symptoms, leading to the possibility of a spurious conclusion that supertasters are more likely to be depression-prone. This problem may have affected the findings of Whittemore (1986); 56% of participants in that study were women. Relations of gender, depressive symptoms, and taste status were not reported.

Another relevant point is that Whittemore (1986, 1990) did not make the distinction between supertasters vs. others (the distinction was not well known at the time of his studies). Had we combined tasters and supertasters, and compared them with non-tasters, we would have obtained null results, but in the direction of supertasters and tasters having less significant family histories of depression. The direction of this finding contradicts Whittemore’s results, as does our main result of lower rates of depression in the families of supertasters.

Our findings, too, possess limitations. Results are restricted to a family history of depression, assessed briefly, and do not directly reflect the participants’ individual vulnerability. This study is limited by a small sample size. Obviously, this limitation should be considered in interpreting these findings while keeping in mind that despite the associated reduction in statistical power, statistically significant results emerged nevertheless.

References