

García Burgos, David ; Zamora, María Clara

Exploring the hedonic and incentive properties in preferences for bitter foods via self-reports, facial expressions and instrumental behaviours

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David Garcia-Burgos^{a,1,*}, María Clara Zamora^{b,c}

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9 ^aDepartment of Experimental Psychology, University of Granada, Campus Cartuja s/n, 18071
10 Granada, Spain.

11 ^bMember of Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET).

12 ^cFacultad de Ciencias Agrarias, Pontificia Universidad Católica Argentina, Capitán General
13 Ramón Freire 183, Ciudad de Buenos Aires, Argentina.

14

15 ¹Current address: Department of Psychology, Clinical Psychology and Psychotherapy,
16 University of Fribourg, 2 Rue de Faucigny CH-1700, Fribourg, Switzerland.

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18 *Corresponding author:

19 David Garcia-Burgos

20 *E-mail:* davidgb@ugr.es

21 Tel: +41 26 300 76 56

22 Fax: +41 26 300 97 12

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24 **Conflict of interest**

25 The authors have no conflict of interest to declare.

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27 **Abstract**

28 Preferences for and consumption of bitter foods such as vegetables and fruit are
29 important in addressing the epidemic of obesity as healthy dietary patterns contribute to its
30 prevention. However, few studies have been undertaken to understand the preference for
31 bitter-tasting foods. A generally accepted but not proven explanation is that these acquired
32 preferences involve changes in affective and motivational processes in order to overcome the
33 innate rejection of bitter tastes. To examine this issue we compared the hedonic and incentive
34 responses to bitter substances among bitter likers and dislikers. In addition, the effects of
35 hunger, stress and weight concern on bitter preferences were also explored. Fifty-nine healthy
36 adults (age = 24.8 ± 6.3 ; body mass index = 22.0 ± 2.8) were divided into bitter likers and
37 bitter dislikers according to their food preferences. Both groups sampled the unreinforced
38 flavours of coffee, beer, chocolate and grapefruit under four motivational states induced by
39 static pictures (neutral, food, stressor and obesity) at the time of testing. The results showed
40 that the bitter solutions elicited less aversive responses (higher hedonic ratings and less
41 intense disgust reactions) and fewer avoidance behaviours (slower response time and lower
42 amount of water for rinsing) in bitter likers after viewing neutral images. On the other hand,
43 likers exhibited a further reduction in disgust to coffee after viewing stressor pictures, and
44 also drank more water after tasting chocolate following the obesity pictures, compared with
45 the dislikers. The expression of disgust increased in bitter likers, as well as the amount of
46 water used to rinse the mouth, after tasting chocolate following pictures showing obesity
47 compared with pictures showing food. These results show, for the first time, not only the
48 implication of affective and incentive components in reversal of the predisposition to reject
49 bitterness but also the motivational modulation of the expression of rejection of bitter tastes
50 in humans.

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