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Taste perception is influenced by extreme noise conditions

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Eating is a fundamentally multisensory experience: we don't just eat our food, we also see it, smell it, and hear ourselves chewing it. However, perception of non-food components of the dining experience can also influence flavor perception. For instance, desserts are rated as sweeter if they are presented on a white vs. black plate, and exposure to loud noise reduces affective food ratings.

The latter result is particularly relevant to the bad reputation of airline food. Air cabins are unusual environments where food is routinely consumed under extreme noise conditions. In recent work published in the *Journal of Experimental Psychology: Human Perception and Performance*, Yan and Dando (2015) examined the influence of the extreme noise conditions encountered during flight on the five basic tastes. Participants rated sweet, salty, sour, bitter, and umami solutions on a scale from 'barely detectable' to 'strongest imaginable'. Each basic taste was tested with three concentration levels. Solutions were evaluated in two sessions, one with simulated air cabin noise (broad spectrum, peak ~290 Hz, delivered at 80-85 dB), and one with normal ambient room noise. Noise was delivered for 30 minutes prior to testing while participants read or studied, and continued to play during testing.

Noise condition had no influence on intensity ratings for salty, bitter, and sour tastes. However, taste intensity was suppressed for sweet solutions at all concentration levels, and enhanced for umami solutions at higher concentrations, in the air cabin noise condition. Effects of air cabin noise were specific to sweet and umami taste perception: there were no

differences in tactile, color saturation, or sound intensity (of a tone) ratings between conditions. Moreover, there were no differences in performance on a simple reaction time test, ruling out differences in task focus or attentiveness between conditions. These results suggest that enjoyment of airline food may be rated consistently lower than would be expected because the loud ambient noise dampens perception of pleasurable sweet flavors. However, the results also suggest that this could be ameliorated by focusing on the sought-after taste quality of umami, which was not just immune to the effects of loud noise, but enhanced by it.

A relationship between audition and taste is not surprising: bilateral branches of the facial nerve that innervate taste buds cross the tympanic membrane of the ear on their way to the brain. But why were only two of the five basic tastes affected by noise? Unlike the other basic tastes, sweet and umami share a common taste receptor. Moreover, this particular taste receptor is associated with prevalent genetic mutations, leading the authors to speculate that genetic factors may modulate the magnitude of the effects observed here. Indeed, inspection of individual data suggested two distinct groups: those who showed robust modulation of both sweet and umami as a function of noise level, and those who were virtually unaffected for either taste.

More information: Kimberly S. Yan et al. A crossmodal role for audition in taste perception., *Journal of Experimental Psychology: Human Perception and Performance* (2015). DOI: 10.1037/xhp0000044