'Sour Patch' adults: 1 in 8 grown-ups love extreme tartness, study shows

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For most people, biting into a lemon would leave them puckered up and desperate to lose that sour flavor, but a new study by Penn State researchers revealed that roughly one in eight adults like intensely sour sensations. The cross-cultural study, recently published in the journal *Food Quality and Preference*, demonstrated there is a subset of "sour likers" who enjoy exceptionally sour foods.

"This is the first time it's been convincingly shown that there is a segment of adults who likes strongly sour things," said John Hayes, professor of food science, director of the Sensory Evaluation Center at Penn State and author on the study.

Previous studies have shown that some children, roughly one in three, enjoy intensely sour flavors, Hayes explained, but this had not been tested directly in adults. His recent study, conducted in partnership with researchers in Italy, was the first to show that for a sizeable amount of people, the enjoyment of sourness lasts well into adulthood.

"Think about candies like Warheads and Sour Patch Kids," Hayes said. "The market tells us that there must be some people who enjoy them into adulthood, but now we have an estimate of how many."

The international research team set out to test the widespread belief that adults are generally averse to sourness, which they predicted would result in a drop in liking as sourness increases. They tested the liking patterns of sourness in two different countries across two different groups of individuals belonging to different food cultures—Italy and the United States.

The team measured the responses of 143 American adults to various levels of citric acid in water. They also measured the responses of 350

Italian adults to pear juice spiked with various amounts of citric acid. They selected participants with similar age, gender and ethnicity—majority white—from a metropolitan area in Tuscany, Italy, and from the municipality of State College, Pennsylvania, U.S.

Participants were asked to rate the intensity and liking of a range of samples with varying sourness levels. For both cohorts, the researchers found evidence of three distinct patterns of response: a strong negative group where liking dropped with increased sourness, an intermediate group who showed a more muted drop in liking with more sourness, and a strong positive group where liking increased with more sourness.

"Most people didn't like sourness, so if you just average across the entire group, then you'd conclude that more sour equals bad," says Hayes. "But if you dig deeper, you find huge differences across people."

By gauging levels of liking, the researchers were also able to test the hypothesis that "sour likers" might just be less sensitive to sour foods, the theory that higher concentrations of sourness for "sour likers" registered the same as lower concentrations of sourness in someone else.

"You could imagine a case where they're just less responsive to sourness in general," Hayes said. "But that's not what we find. We find the people that like really sour flavor actually experience it just as sour as other people. They simply enjoy it more."

Strikingly, the researchers noted that both the Italian and American cohorts showed similar proportions of response patterns to sourness, with about 63% to 70% in the strong negative group and roughly 11% to 12% in the strong positive group, suggesting these proportions may be stable across cultures.

"Italian food culture and American food culture are so wildly different,"

said Sara Spinelli, a researcher from the University of Florence in Italy and first author on the paper. "And yet we end up with almost identical percentages, which suggests to us this is not an effect of prior exposure. It's probably something innately different about those people. We don't know what that is, but it tells us that it's not just the foods you grew up with."

The researchers noted that the data support the existence of previously unexplored taste profiles that respond positively to sour stimuli. Given that sourness is classically considered to be a negative sensory attribute, the researchers were surprised to discover that that roughly 1 in 8 participants from both countries showed an increase in liking as sourness increased.

"This study highlights the importance of looking at individual differences and potential consumer segments, rather than merely averaging responses across all individuals within a group," Spinelli said. "Because when we average the response, all we see is a dislike of sourness, we lose this subset of people who actually love it."

Hayes explained that this type of segmentation could be used to develop tailored products that account for the specific "sour liker" taste profile.

"This could ultimately serve to promote the consumption of healthier foods and beverages that are lower in sweetness but still acceptable to consumers," he said.

The manuscript was written while the first author was Fulbright Research Scholar at the Sensory Evaluation Center at Penn State.

Other Penn State authors on the study are Helene Hopfer, associate professor of food science, and Victor Moulinier, a sensory science intern for the College of Agricultural Sciences. The other authors from the

University of Florence are John Prescott and Erminio Monteleone.

More information: Sara Spinelli et al, Distinct sensory hedonic functions for sourness in adults, *Food Quality and Preference* (2024). DOI: 10.1016/j.foodqual.2024.105152