Sweet tooth: nature or nurture?

In the Western food environment, overconsumption is prevalent. Reducing dietary sweetness is a recommended strategy to lower energy intake. This project investigated the impact of dietary sweetness exposure on sweet taste preferences.

For a healthy diet, it is important to reduce free sugar intake. To facilitate this, general advice suggests lowering dietary sweetness to reduce preferences for sweet tastes, which would subsequently lead to reduced sugar intake and improved health.

However, the evidence for an association between dietary sweetness and subsequent sweet taste preferences and increased sugar intake is not clear. In other words, do we get used to a lower sweetness level and therefore automatically choose less sweet-tasting foods? Or do we choose sweeter foods after a period of sweetness reduction?

The Sweet Tooth randomized trial – called i-sense – was a dietary intervention study with partial food provision. It collected data on the effect of 6 months of low, regular, and high sweetness exposure on sweetness preferences, sweetness perception, dietary choice and intake, body weight, and biomarkers for diabetes and cardiovascular disease from 180 adult participants.

The study shows that people who followed a low-sweetness diet for six months remained just as fond of sweet as before. Those who consumed extra-sweet foods did not grow to like sweet flavours more. Also no effects were found on body weight and markers associated with diabetes and cardiovascular disease.

‘Our sweet taste preference turns out to be more stubborn than thought,’ concludes PhD student Eva Čad. The trick to temper your sweet tooth by temporarily cutting down on sugar and sweeteners does not seem to work after all

Eva Marija Čad defended her PhD thesis on this research on Friday 13 June at Wageningen University & Research (Division of Human Nutrition and Health).

Frequently Asked Questions (FAQ)

Why was the Sweet Tooth study done?

Many people believe that the more we eat or drink sweet-tasting things, the more we crave and consume sweetness or, in other words, grow a “sweet tooth”. This common belief is also echoed by several public health organizations that recommend cutting back on sweet-tasting foods in our diets, regardless whether the sweetness comes from sugar or sugar substitutes, like low-calorie sweeteners.[1,2,3,4]

The idea is that reducing intake of sweetness lowers our preference for sweetness, ultimately helping us consume less sugar and fewer calories — an important step in preventing obesity.

However, scientific support for this narrative is limited and not consistent in its findings. Most studies are short term and suggest a lower preference for sweet taste after sweet exposure, possible due to sensory satiety. On long term there are limited effects shown. Studies are often small and did not define taste exposure very well.

The sweet tooth study was performed to give an answer to the question whether sweetness consumption affects our liking for sweetness.

References

[1] https://www.who.int/publications/i/item/9789241549028

[2] *https://assets.publishing.service.gov.uk/media/5a7f928c40f0b623026904b7/Sugar_reduction_The_evidence_for_action.pdf*

[3] https://food-guide.canada.ca/en/tips-for-healthy-eating/sugar-substitutes-and-healthy-eating/#section-2

[4] *https://www.mayoclinic.org/healthy-lifestyle/nutrition-and-healthy-eating/in-depth/artificial-sweeteners/art-20046936*

What was the main research question?

Can consuming more↑ or less↓ sweet-tasting foods and drinks for 6 months change how much we like sweetness?

What other questions can be answered?

Does consuming more↑ or less↓ sweet-tasting foods and drinks for 6 months impact how we perceive sweetness and what we choose to eat?
How does it affect body weight and blood markers related to heart disease and diabetes?

What did the Sweet Tooth study find?

Changing how many sweet-tasting foods and drinks we consume does not affect our preference for sweetness. The study also did not show an effect on energy intake or on body weight or blood markers for diabetes and heart disease.

What are the implications of the Sweet Tooth study results?

The common belief that eating or drinking more sweet-tasting things leads to stronger cravings for sweetness over time – the “sweet tooth” effect – is not confirmed.

The idea that cutting back on sweet-tasting foods and drinks shifts our food preferences or choices over time is not supported and not likely to be an effective strategy. The advice to reduce the risk of overconsumption by lowering exposure to sweetness – regardless of source - should be re-evaluated.

To improve health recommendations, we encourage policymakers and other influencers in society to focus on evidence based dietary advice. Such as, regulating energy intake by favouring smaller portions and foods with a low energy intake rate, supporting satiety without excess calories.

What was the intervention like?

The study was a randomized controlled dietary intervention with partial food delivery. Participants received approximately 50% of their daily food items from the University. They got these in bi-weekly packages, brought by them through the supermarket. The focus was mainly on drinks, bread toppings and snacks (dairy, cookies, fruit).

How did you change the sweetness of the 3 different diets?

The participants either received foods that were:

- not sweet tasting (low sweet group, 14% energy from sweet tasting foods),
- only foods that were sweet tasting (high sweet group, 27,2%), or
- a combination of the two (regular sweet group, 20,5)

How do you know whether people really ate the foods you provided?

We interviewed them on what they ate by a 24h recall, and we measured the presence of sweeteners and sugar in their urine. Indeed the high sweetness group showed higher levels of the sweeteners in their urine, indicating that they consumed more sweet foods.

What is the average sweet-tasting food intake in the Netherlands?

We know from previous research that on average the Dutch adult consumes 28% of their energy from sweet tasting foods.

Is sweetness liking related to sweet food intake?

No, liking a sweet taste does not necessarily mean that someone eats a lot of sweet-tasting foods.

Three independent measures of sweet taste liking have weak and inconsistent associations with sugar and sweet food intake - insights from the sweet tooth study.
Čad, Eva M. , van der Kruijssen, Merel , Tang, Claudia S. , Pretorius, Leoné , de Jong, Hanne B.T. , Mars, Monica , Appleton, Katherine M. , de Graaf, Kees (2025) Food Quality and Preference (2025), Volume: 130 - ISSN 0950-3293

How was the study funded?

The study received funding from both public institutions and private companies (TKI-AF-17107).

The study was conducted under the TiFN framework, now Next Food Collective, which facilitates public–private partnerships while ensuring compliance with ethical standards. To prevent any conflicts of interests special attention went to the governance of the project, including an advisory and a steering committee.

Advisory committee: The private funders were part of an Advisory Committee, they did not have decision-making power over the study's design or results. The members were: American Beverage Association, Apura Ingredients, Arla Foods, Cargill, Cosun Nutrition Center, DSM-Firmenich, International Sweeteners Association, SinoSweet Co., Ltd, and Unilever Foods Innovation Centre Wageningen.

Steering committee: An independent Steering Committee had the authority to approve study protocols and publications, helping to manage potential conflicts of interest. This committee included experts from universities (Leeds and Copenhagen), France's National Research Institute for Agriculture, Food and Environment (INRAE), the Dutch Institute of Public Health (RIVM), and the Dutch Diabetes Fund. They provided binding advice on the study's design, execution, and reporting to ensure scientific integrity.

Was the study protocol and the analyses pre-registered?

Yes, the study protocol and the data analyses are registered under number ClinicalTrials.gov: NCT04497974.

Was the study monitored?

Yes, in addition to the independent steering committee there was an independent study monitor from Biofortis (Chicago, US) that monitored the adherence to the study protocol and the data collection.

Was the study approved by an ethical committee?

Yes, we obtained ethical approval on July 28th 2020, under registration number NL72134.081.19.

Did participants experience any weight changes or health issues from eating more sweet-tasting foods?

No, we did not any find any changes in body weight or body composition, nor did we observe any other health issues or serious adverse effects.

Does this mean it is healthy to eat sweet foods?

No, this does not mean that it is healthy to eat sweet foods.

We tested the effect of sweet tasting foods and our primary interest was a change in preference.

We measured a limited number of health related outcomes, so we cannot rule out any effects of the sugar or sweeteners on other health related outcomes than the ones we measured.

We refer to the national dietary guidelines to eat a balance and varied diet, for the Netherlands these are the dietary guidelines of the Health council[1], translated into public dietary advice by the nutrition centre.

References

[1] Dutch dietary guidelines 2015 | Advisory report | The Health Council of the Netherlands

[2] The Netherlands Nutrition Centre | Voedingscentrum

Does this mean it is healthy to eat sugary foods?

No, this does not mean that it is healthy to eat sugary foods. We tested the effect of sweet tasting foods and not sugar and we measured a limited number of health related outcomes, so we cannot rule out any effects on other health related outcomes.

Does it mean that it is healthy to use artificial sweeteners?

No, this does not mean that it is healthy to eat foods with artificial sweeteners. We tested the effect of sweet tasting foods and we only measured a limited number of health related outcomes, so we cannot rule out any effects on other health related outcomes.

Will the data be made public?

Yes, we share the data with other researchers upon reasonable request.

Publications

The Sweet Tooth Trial: A Parallel Randomized Controlled Trial Investigating the Effects of A 6-Month Low, Regular, or High Dietary Sweet Taste Exposure on Sweet Taste Liking, and Various Outcomes Related to Food Intake and Weight Status. Čad, E. M., Mars, M., Pretorius, L., van der Kruijssen, M., Tang, C. S., de Jong, H. B., ... & de Graaf, K. (2025). The American Journal of Clinical Nutrition, 101073. https://doi.org/10.1016/j.ajcnut.2025.09.041

Three independent measures of sweet taste liking have weak and inconsistent associations with sugar and sweet food intake - insights from the sweet tooth study. Čad, Eva M. , van der Kruijssen, Merel , Tang, Claudia S. , Pretorius, Leoné , de Jong, Hanne B.T. , Mars, Monica , Appleton, Katherine M. , de Graaf, Kees (2025) Food Quality and Preference (2025), Volume: 130 - ISSN 0950-3293 https://doi.org/10.1016/j.foodqual.2025.105536

Study protocol of the sweet tooth study, randomized controlled trial with partial food provision on the effect of low, regular and high dietary sweetness exposure on sweetness preferences in Dutch adults. Čad, Eva M. , Tang, Claudia S. , de Jong, Hanne B.T. , Mars, Monica , Appleton, Katherine M. , de Graaf, Kees (2023) BMC Public Health (2023), Volume: 23, Issue: 1 - ISSN 1471-2458 https://doi.org/10.1186/s12889-022-14946-4

How sweet is too sweet? Measuring sweet taste preferences and liking in familiar and unfamiliar foods amongst Dutch consumers. Čad, E.M. , Tang, C.S. , Mars, M. , Appleton, K.M. , de Graaf, K. (2023) Food Quality and Preference (2023), Volume: 111 - ISSN 0950-3293 https://doi.org/10.1016/j.foodqual.2023.104989

More information

Do you have a question about the topic? Ask our expert! *dr.ir. M (Monica) Mars*

Sensory Science and Eating Behaviour Group

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Partners

Bournemouth University,

Wageningen University

Next Food Collective

American Beverage Association

Arla Foods

Cargill

DSM-Firmenich

International Sweeteners Association

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Apura Ingredients

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Read more

https://clinicaltrials.gov/ct2/show/NCT04497974

Eating more sweet food may not sway sweet preference | EurekAlert!

Related work

https://www.bournemouth.ac.uk/research/projects/sugar-sweeteners-sweet-taste