FOOD FILES

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Is there a multi-sensory fingerprint, and does it link to obesity?

In general terms, sensory sensitivity refers to an individual's ability to perceive small intensity differences of a sensory stimulus. There are multiple measures to determine sensitivity with detection and recognition thresholds providing estimates of the lowest chemical concentration that can be perceived by an individual.

For example, a food may contain salt at a concentration undetectable to the general population, but as the concentration is increased, a detection threshold is reached such that the food can be discriminated from a food without added salt. As the concentration of salt is further increased, a recognition threshold is attained, and this is the point where the salt is perceived as salty. Suprathreshold intensity refers to the perceived intensity of saltiness at concentrations above recognition threshold. As the salt concentration increases, the perceived intensity will also increase, eventually reaching a plateau of saltiness intensity.

For a number of years numerous investigations have attempted to link sensory sensitivity to food consumption and obesity. Research has separately investigated relationships between BMI and olfactory, gustatory, visual and auditory sensitivities. While strong evidence emerges of links between sensory sensitivity and BMI, the direction of these relationships is not consistent. For example, those more sensitive to fat taste consume less energy and have lower BMI, while individuals who are more sensitive to carbohydrate taste consume more energy and have greater waist circumference.

Overall, the approach of linking mono-modal sensory sensitivities to obesity has provided an interesting and varied story of the relationship between sensory sensitivity and the relationship to overweight and obesity.

So what about multi-modal sensitivity (more than one sensory system: taste and texture, or smell and audition) and the concept of generalised sensory sensitivity. Mei Peng's research group at the University of Otago combined a review, meta analysis and an empirical study to investigate whether multi-sensory sensitivities are generalised and whether individuals possess a multi-sensory 'fingerprint' that makes them susceptible to overweight and obesity.

The review and meta analysis kept taste-olfaction-trigeminal sensitivities and audio-visual-tactile sensitivities separate as there is little data assessing correlations across these groups of senses. For the chemical senses, n=232 articles were screened and 14 were included in the meta-analyses. There were significant and positive associations between olfaction and taste, olfaction and trigeminal, but not taste and trigeminal.

The authors suggest that olfaction (sense of smell) is an important sense for multisensory relationships. For vision, audition and touch n=306 articles were screened and n=12 were included in the meta analyses. There were significant and positive associations between the three senses and it was noted that there is strong evidence for compensatory associations between vision, audition and touch – when one of these senses is diminished, the other two

are enhanced. This was not noted for the chemical senses. Overall, there was some evidence of a generalised sensitivity although there was also contrary research showing no associations.

To further investigate the area, the team from Otago collected data from n=98 participants on olfactory, gustatory, visual and auditory discriminability over nine sessions. While there was little evidence of generalised sensitivity across all modalities and all participants, cluster analysis revealed three broadly distinct multisensory groups.

Cluster 1 (n=34) was represented by enhanced sensitivity to all senses tested. Cluster 2 (n=18) was characterised by reduced sensitivity to all senses tested. Cluster 3 (n=46) had reduced chemosensory sensitivity, but enhanced visual and auditory sensitivity. In terms of BMI, cluster 3 had significantly higher BMI than cluster 1.

So, multi-sensory fingerprints are measurable and may influence factors such as the development of overweight and obesity.

Ginieis R, *et al* (2022) Searching for individual multi-sensory fingerprints – new insights from meta analysis and empirical data. Food Quality and Preference 99 https://doi.org/10.1016/j.foodqual.2022.104574

Exercise and eat!

In simple terms, weight increase is a result of an imbalance between energy intake and energy expenditure. During the COVID pandemic, consumers were forced to stay at home, which is still the case if you are unlucky enough to see two lines appearing on your COVID test.

Two interesting energy related phenomena took place during the periods of lockdown in Australia. First, the number of online meal orders rapidly increased. Which, given the average energy density of online ordered meals, would not be beneficial for your waist-line. Second, the ordering of in-home exercise equipment such as smart bikes steeply increased. As with online food delivery apps, smart bikes can be connected to the internet, which

can provide an immersive game-like experience when riding your bike in your garage.

A recent study in the journal Appetite suggests this virtual reality exergaming may have a positive impact on your food consumption, at least if you are worried about eating too much while in isolation. In this small, but well controlled study, 34 inactive adults completed two exercise sessions on a stationary bike.

During one session they were just cycling, in the other session they were cycling while being immersed in a VR exergame. In a VR exergame, you can ride through a virtual world, with or against others. The game responds to how fast you pedal and the bike responds to the terrain you encounter in the VR exergame. The researchers made sure that heart rate during the cycling sessions, energy expenditure and duration were kept constant across the two sessions.

After each cycling session, participants were asked, amongst other questions, about their enjoyment, appetite and perceived level of physical exertion. In addition, participants could eat from an all you can eat buffet on completion of each session.

The results show that the VR condition, compared to the non-VR condition, resulted in greater enjoyment, but not in different levels of appetite or perceived exertion. However, when participants were munching away at the buffet, the researchers did see that after the VR condition participants consumed on average 12% less calories than they consumed after the non-VR condition.

The results fit with previous studies which suggest that negative emotional responses after exercising tend to drive food consumption. Participants who did not enjoy the exercise might think "I went through all this trouble, now I deserve something nice". This in contrast to those who enjoyed the exercise who may not feel a need for such compensating eating behaviour.

So, next time you start your exercise, focus on the fun part, rather than on exercise for the sake of exercise. Your waist-line will thank you for it.

Sauchelli S, Brunstrom JF. Virtual reality exergaming improves affect during physical activity and reduces subsequent food consumption in inactive adults. Appetite 175 (2022) 106058 https://doi.org/10.1016/j.appet.2022.106058

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