

# Do flies over-generalize memories like PTSD sufferers?

May 3 2017

---



Fruit fly. Credit: John Tann/Wikipedia

No two cakes smell identical, yet we are still able to recognise the general aroma that promises pleasure. Ayse Yarali from the Leibniz Institute for Neurobiology, Germany, explains that this ability to generalise a previously learned link between a cue - such as an odour - and an experience - such as a pleasant taste or the attack of a predator - to a range of similar cues can help us to ensure that we repeatedly

encounter pleasant situations while avoiding risky ones.

As the ability to generalise what is learned about a [scent](#) to a wide range of similar scents is an essential life skill for many species - including [fruit flies](#) - Yarali wondered whether the humble insect's ability to generalise changes over time. Teaming up with Christian König, Yarali decided to investigate how flies that had learned to associate an [electric shock](#) with a specific fruity odour reacted later when they experienced other fruity scents. Together they have discovered that fruit flies, which generalise memories across similar scents, do so more strongly after a period of time in much the same way as PTSD sufferers over generalise memories, and they publish their study in *Journal of Experimental Biology*.

König and his colleagues Emmanuel Antwi-Adjei and Mathangi Ganesan identified three odours (3-octanol, n-amylacetate and 1-octen-3-ol) that could be distinguished by the fruit flies and used a Teflon tube lined with a pair of tightly wrapped copper coils attached to a power supply to shock the insects. 'If a fly happens to touch both of the coils with its legs - six legs give many possibilities - it gets an electric shock', explains Yarali. König then wafted one of the odours through the tube while the flies received a series of shocks in the hope that they would learn to avoid the odour in future. Twenty minutes later, König tested the insects' responses to the odour by placing them in a T-shaped maze where one arm was scented. Sure enough, the majority of flies avoided that region of the maze; they also recalled the memory 24 h later. But would the flies generalise the shocking experience and recall it when they encountered a similar, but different, odour?

König replaced the odour in the T-maze with a new scent and, although some of the shocked flies avoided the novel scent 20 min later, it was a different matter after 24 h. This time, the flies' aversion to the new odour was as strong as their desire to avoid the [odour](#) that was directly

associated with the shock. They had generalised their memory of the shock so that they recalled the memory even when the scent that they encountered was only vaguely familiar.

So, flies can generalise a troubling memory across odours that smell similar. However, Yarali explains that even though the ability to generalise a [memory](#) can be beneficial, it can also become an impediment if it is exaggerated. 'Overly generalised memories of a traumatic experience in humans are one of the key behavioural hallmarks of post-traumatic stress disorder [PTSD]', explains Yarali; and the effects of human PTSD are often delayed, in much the same way that flies did not develop their general aversion to similar odours until several hours later. 'We cannot say that we have a fully fledged fly model of human PTSD', says Yarali, as the flies are unlikely to be suffering the same horrifying experiences that victims of PTSD endure, but they do appear to have at least one of the behavioural hallmarks of the human condition. And she is eager to discover whether the shocked flies exhibit some of the other behaviours that are indicative of a 'disturbed state of mind' with the hope that this research may one day help us to develop new therapeutic strategies for human sufferers of PTSD.

**More information:** König, C., Antwi-Adjei, E., Ganesan, M., Kilonzo, K., Viswanathan, V., Durairaja, A., Voigt, A. and Yarali, A. (2017). Aversive olfactory associative memory loses odor specificity over time. *J. Exp. Biol.* 220, 1548-1553., [DOI: 10.1242/jeb.155317](https://doi.org/10.1242/jeb.155317)

Provided by The Company of Biologists

Citation: Do flies over-generalize memories like PTSD sufferers? (2017, May 3) retrieved 19 April 2024 from <https://phys.org/news/2017-05-flies-over-generalize-memories-ptsd.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.