Life Sciences

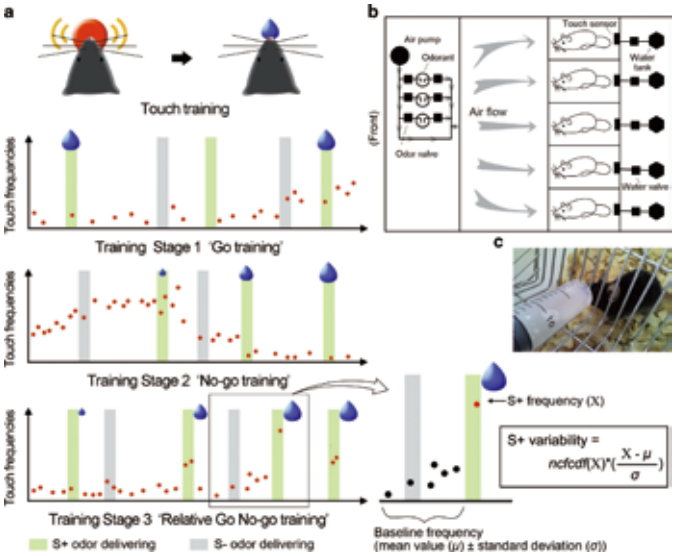
What the Nose Knows: Zoologists Develop a New Framework for Teaching Animals to Detect Odors

Smell detection plays an increasingly important role in numerous areas of daily existence, from sniffing out drugs at the airport to identifying diseases. Most of the time dogs trained to hone their sense of smell for these purposes, but even man's best friend can have limited use in some situations. For example, dogs don't always operate well without a handler, they may suffer reduced abilities in extreme heat, and they are sometimes considered threatening. In these instances, it may be better to have a back up animal, maybe one as small as a mouse.

While rodents are not especially well known for their olfactory abilities, their sense of smell is quite acute. For example, in South Africa rats have been trained to sniff out and uncover landmines. Unlike dogs, they aren't bound to their handlers, which is useful. Rodent use at present, however, is limited by how difficult it is to train them. They can be trained using olfactory-conditioning machines, in which they are trained to insert their noses to trigger a smell and then react appropriately based on the smell. These methods run into problems with real-world application, however, among which is that current paradigms do not stimulate real-time fluctuations in smells, and they focus on one rodent at a time, rather than training many. In light of these problems, HE Jing and Josh Rizak, under Dr. MA Yuanye, set out to develop a new apparatus to train rodents with the needs of public-application in mind.

Compared with the contemporary methods, the new systems targets odors used to train the animals appeared passively and at any time, mimicking real-life odor targets which are unpredictable. Furthermore, this new system allows researchers to measure the real-time reliability of individual animals. In three experiments, the researchers examined the detection rate of the mice under different conditions, and results indicate that the new method leads to a stable and reliable performance. Overall this new approach is promising for further development in respect to various types of application-orientated odor detection systems.

The full text of the study was recently published in *Scientific Reports*. (Text by Andrew Willden from the Kunming Institute of Zoology)



(a) Abridged general view of the training procedure. Orange dots indicate touch frequencies. Blue water-drops indicate conditional changing rewards. Details see the Method section. (b) A diagrammatic sketch of the odor detection device (top view). (c) Image of a mouse receiving water rationing before training.