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Single scale for odor intensity in rodent olfaction

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Central to understanding the neural basis of perception is the relationship between stimulus identity and intensity. In olfaction, odor identity can signal a food source or a predator, while intensity can provide information about its proximity or quantity. The relative intensities of odors are therefore important in guiding behavioral decisions. It is however not known how animals compare quantities of different odors. Using a novel behavioral assay assessing perceived odor intensity in rats, we found that rats measure the intensity of different odors using a common perceptual scale. Position of an odor along this intensity scale was determined by three factors: concentration, molecular weight, and the adaptation state of the animal. Our results imply that the olfactory system separates intensity and identity, forming a common intensity scale for making quantitative comparisons between different odors.

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