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Contact: Public Affairs Office
(202) 336-5700

THE NOSE KNOWS: TINY DIFFERENCES BETWEEN ODORS CAN EITHER STALL OR SHARPEN VISUAL ATTENTION

New study sniffs out odor’s impact on physiology and perception

WASHINGTON — Stopping to smell the roses changes us in more ways than one. In France, psychologists have discovered that scents that differ on the molecular level affect human visual attention in very different ways. The results suggest that odor affects the nervous system in such a way as to alter physiological and other perceptual processes. This intriguing evidence of cross-modal modulation appears in the June issue of Behavioral Neuroscience, published by the American Psychological Association (APA).

Experimental participants became far more visually attentive to environmental distractions when, unaware, they were exposed to an odor that stimulates the facial trigeminal nerve. Because this nerve travels to the brain’s “danger” center, the researchers suspect that certain odors may signal the nervous system to put the other senses on guard.

George Michael, PhD, and his colleagues compared the effects on visual attention of three different conditions – a no-scent control, PEA (phenyl ethyl alcohol) and AIC (allyl isothiocyanate), which is like PEA in many ways but also stimulates the trigeminal nerve. Participants later rated both PEA and AIC as equally pleasant, so their different reactions were not due to whether they liked the scents or the scents affected mood.

The experiment included 47 women including 16 in the PEA group, 16 in the AIC group, and 15 in the no-odor control group. Michael says scent researchers rely on women due to their greater sensitivity to fragile, fleeting odors. The researchers told
participants in advance that they were testing attention in rooms that might have odors lingering from prior experiments.

Participants in a room sprayed with PEA were significantly more sluggish in responding to brightness (luminance) changes in white circles on a computer screen than were control participants in the no-odor baseline session. As the circles changed, PEA-exposed participants took consistently longer to press the response keys. The data suggest that this olfactory-only stimulant dampened physiological arousal and, with it, attention to the visual environment.

However, when the test room was sprayed with AIC, participants behaved differently. Although they responded to normal changes in luminance the same as baseline, they were significantly more vigilant than both the control and the PEA groups about luminance changes in on-screen distractors, taking their time to respond. It appeared that they inspected the distractors more closely and for a longer time. This over-responsiveness, says Michael, suggests that the women were “stuck” on luminance increments.

The authors speculate that some odors influence visual perception in a kind of anatomically enabled safety patrol: Odors such as AIC stimulate not only the olfactory (nasal scent) system but also the trigeminal (fifth cranial) nerve, which gathers input from throughout the face and jaw. The trigeminal nerve travels to the brain’s amygdala, which processes incoming “danger” signals. Thus bad odors could alert participants’ brains to possible trouble and lead other perceptual systems to be on the lookout. The visual system, for instance, might want to closely inspect any sudden changes in the background -- as happened in the AIC condition.

Lead author George Michael, PhD, a cognitive neuropsychologist with Université Lumière-Lyon 2, says, “Our findings may contribute significantly to the comprehension of cross-modal interactions. We have obtained new evidence that these links are mediated by both neurochemical interactions and neuroanatomical arrangements.”

He continues, “This is a quite new perspective because [prior studies have] interpreted such findings as mediated through the hedonic [gratifying] properties of odors. We provide seminal evidence that odors modulate the activity of the basic circuitry of attention.”

It makes sense for survival. Michael explains that, “Cross-modal interactions offer a more complete image of the state of the environment at any given moment. This information may just indicate some situations to approach or avoid, such as when the smell of smoke tells us to watch for a fire. It may also indicate
with some precision the contents of the immediate environment.”

Psychologists have already determined that the olfactory system affects recall via the brain’s limbic system, and aromatherapy researchers have found that essential oils change mood and behavior. The new findings offer an early look at potential neurochemical reasons for these interactions – the “why” that could explain the “what.”

Article: “Ambient odors influence the amplitude and time course of visual distraction,” George Andrew Michael, PhD, Université Lumière-Lyon 2, and Laurence Jacquot, PhD, Jean-Louis Millot, PhD, and Gérard Brand, PhD, Université de Franche-Comté; Behavioral Neuroscience, Vol. 119, No. 3.

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George Andrew Michael can be reached at George Andrew Michael or by phone at +33 478 77 4395. He is easier to reach by E-mail.

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