Key Note

# Chapter 7: Taste and smell

## Key note 7A: Smells and memory

The aim of this note is to describe the unusually strong relationship between olfaction and memory. Although there is much anecdotal evidence for this, it is difficult to investigate in experimental studies, though attempts have been made.

Particular odours can evoke powerful and compelling memories, often with an emotional overtone. These are sometimes called ‘Proustian’ in the literature, after the French writer Marcel Proust, who described how the smell of cake evoked a vivid memory of an event in his childhood. In the laboratory, odours, even when unconsciously detected, can elicit the mood experienced during an earlier exposure to the odour. For example, if an odour is paired with a demanding cognitive task, later presentation of the odour can lower the participants’ mood compared with that of controls, even if participants report being unaware of the odour (Zucco et al., 2009). Outside the laboratory, the odour of a particular alcoholic drink can produce a feeling of nausea if, on a previous occasion, excessive consumption of that drink had caused nausea and vomiting. Odours can also act as effective cues to recall. Pointer and Bond (1998) had participants read a prose passage on paper which was either white, but impregnated with a peppermint odorant, or yellow and odour free. After 5 minutes working on an unrelated task, participants were asked to write down as much of the prose passage (word for word) as they could recall. Before doing so, those who had read from the peppermint-impregnated paper received a blank white sheet, either with or without the peppermint odour. Those who had read from yellow paper received either a blank yellow or a blank white sheet of paper. Compared with that of participants who received a white odourless sheet of paper during recall, the performance of the colour group was not significantly different, whereas that of the odour group was significantly better (by around 12%). The authors could not rule out the possibility that the odour effect arose from its greater salience, compared with the visual cue, but point to the projections from the olfactory bulb to the hippocampal region as a likely substrate for the cueing of memory by odours.

Although the neural processes underlying this result may be same as those underlying cueing of autobiographical memories, the timescale between storage and retrieval is clearly many orders of magnitude different, and autobiographical material is harder to manipulate experimentally. Chu and Downes (2000) presented the odours of or verbal cues to common objects to older participants (in their late 60s or early 70s) and asked them to relate any autobiographical experience which came to mind. The experimenters found that memories evoked by verbal cues came from a period during which the participants were between the ages of 11 and 25, whereas those evoked by odours tended to come from an earlier time, when they were between the ages of 6 and 10. Using a similar set of stimuli, Goddard et al. (2005) presented either an odour, a word label, or a visual image to students with a mean age of about 26. They found that odour-cued memories tended to refer to a period of time (such as a holiday period), were retrieved more slowly, and tended to come from earlier periods in life. Females reported more vivid memories than did males. The authors suggest that their participants searched memory using more perceptual features of the cue when an odour was presented, as opposed to a more conceptually based search when a picture or verbal label was presented. This is in agreement with the idea that children attend to sensory information to a greater extent than do adults, and so autobiographical memories based on odour are likely to come from an earlier period of life than other autobiographical memories.

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Pointer SC, Bond NW (1998) Context-dependent memory: colour versus odour. *Chemical Senses* 23: 359–362.

Zucco GM, Paolini M, Schaal B (2009) Unconscious odour conditioning 25 years later: revisiting and extending ‘Kirk-Smith, Van Toller and Dodd’. *Learning and Motivation.* doi:10.1016/j/lmot2009.05.01