

The Psychology of the Sense of Smell

Mark Sergeant

Nottingham Trent University

Human olfactory abilities

- Humans traditionally thought to be 'microsmatic'
 - Species where olfaction (sense of smell) plays a limited role in behaviour
- Based on physiology - small olfactory bulb (OB) in humans
 - Olfaction seen as a "phylogenetically involuted relic" (Broca, 1888)
 - Supported by recent studies on human olfactory receptor (OR) gene loss



OR gene loss

- Domestic dog 18%
 - Squirrel monkey 18%
 - Mouse 20%
 - Chimps 32%
 - Gorilla 28%
 - Orang-utan 32%
 - Rhesus macaque 36%
 - **Humans 54% - 70% (~60% loss)**
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- **We *do* have reduced olfactory abilities, but we've still retained ~40% of our OR genes (because we use them)**

Human olfactory abilities

- This is now accepted as misleading
 - Human OB highly integrated (Keverne, 1983)
 - Humans can detect thousands of odours
 - Advanced cognitive abilities (Dobb, 1989)

- But...has resulted in much stronger focus on vision and audition for social communication in Psychological research:
 - Verbal communication (language)
 - Perception of body language

Problems with olfaction research

- Odours are invisible
 - Difficult to measure
 - Lack of standardised methods:
 - No consensus on how to categorise odours
 - Inconsistent findings:
 - Findings are often exploratory (improving)
 - Possible lack of replication (improving)
 - **Why should we study olfaction at all?**
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Olfaction in non-human animals

- Olfaction is the primary means of communication in many non-human species
- Influences a variety of social behaviours
 - Recognition of groups and individuals
 - Marking territory
 - Signalling mating characteristics

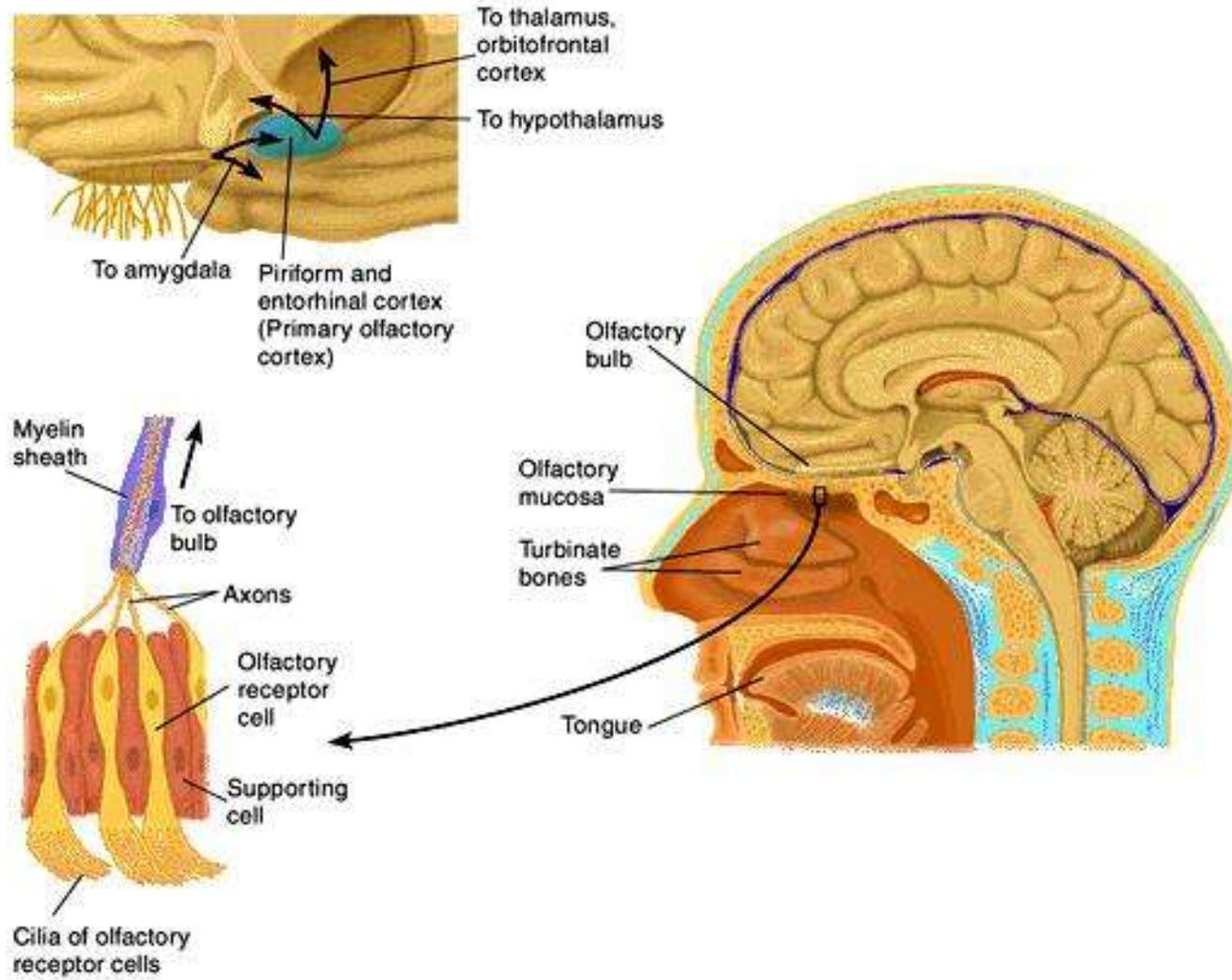


Human olfactory systems

- The main olfactory system (MOS)
 - Mediates what is commonly thought of as odour perception
 - Responsible for the flavours of food and beverages
- Trigeminal somatosensory system (TSS)
 - Mediates somatosensory sensations such as a sensation of burning, cooling and tickling
 - Capsaicin in chillis

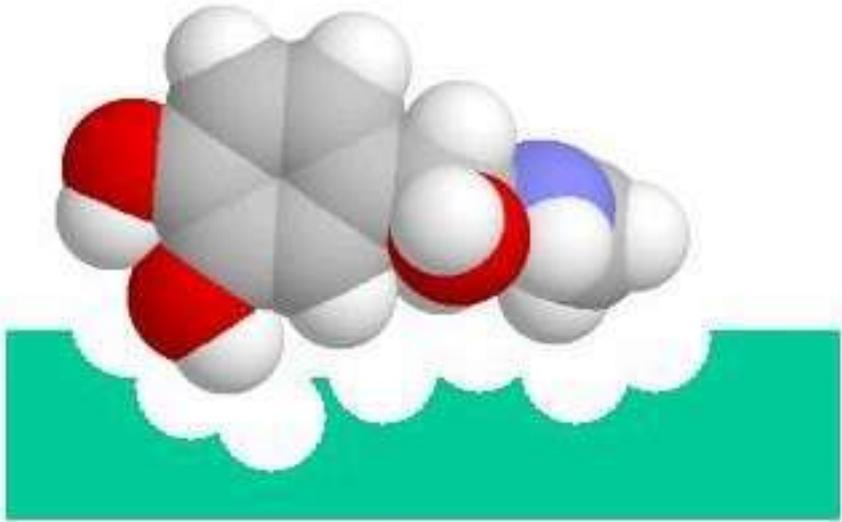
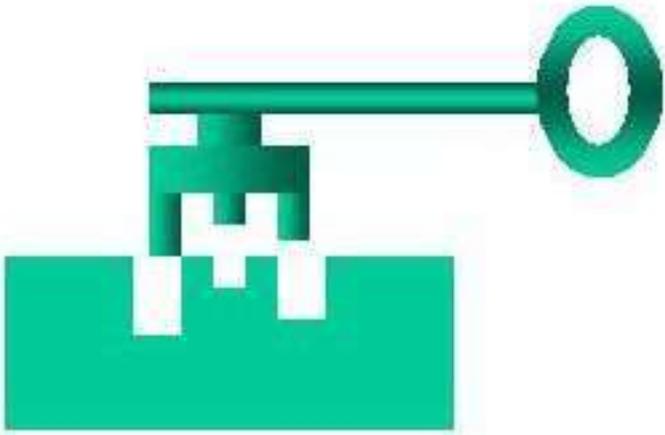


► The Olfactory System



Olfactory receptor (OR) genes

- OR genes are the basis for the sense of smell
 - Odour molecules bind to the receptors
 - An action potential is generated and sent to the olfactory bulb
 - Each OR doesn't code for a single odour
 - Provide ability to smell lots of odours
 - Odor receptor nerve cells may function like a key-lock system
 - **Odotope theory**
 - Different receptors detect only small pieces of molecules
 - These pieces combined to create a larger olfactory perception (an odour)
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Parents and offspring

- Newborn babies learn the specific odours of their mother in the first few hours after birth (Porter & Winberg, 1999)
- Mothers learn the odour of their infant after only 6 hours exposure (Gall & Weisfeld, 2000)
- Most fathers, aunts and grandmothers also learn this odour after 72 hours exposure (Porter et al., 1986)



Human olfactory abilities

- Memory
 - Strong association with childhood memory (Rouby et al., 2002)
 - Linked to emotionally-salient events
 - Mood
 - Growing evidence odours can influence mood (Herz, 2009)
 - Environmental odours can effect mood and stress levels ('hog industry' odours - Avery et al., 2009)
 - Communicating emotions
 - Happiness (Chen & Haviland-Jones, 2000)
 - Fear (Ackerl et al., 2002)
 - Attraction (my research field)
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Thank you for listening

Quick questions?