



HOKKAIDO UNIVERSITY

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Author(s)	Trulsson, Mats
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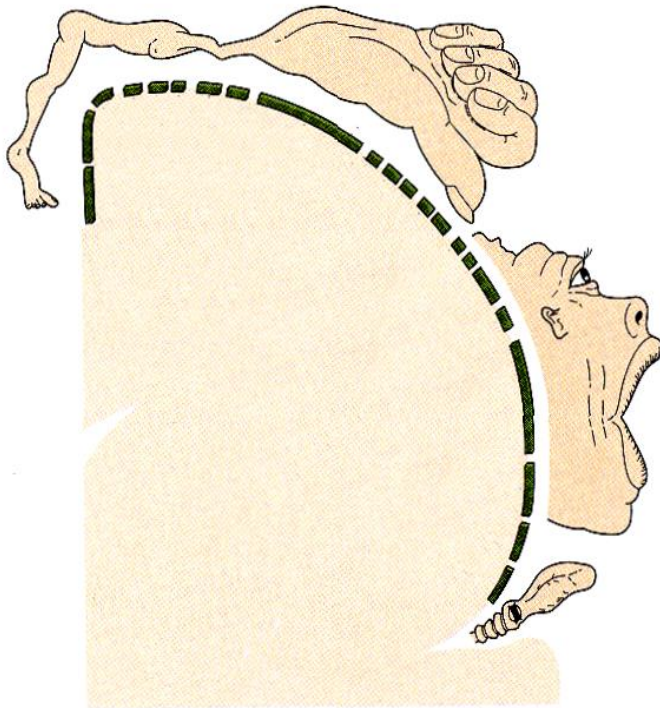
**Karolinska
Institutet**

The enjoyment of oral mechanosensation

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Department of Dental Medicine
Karolinska Institutet

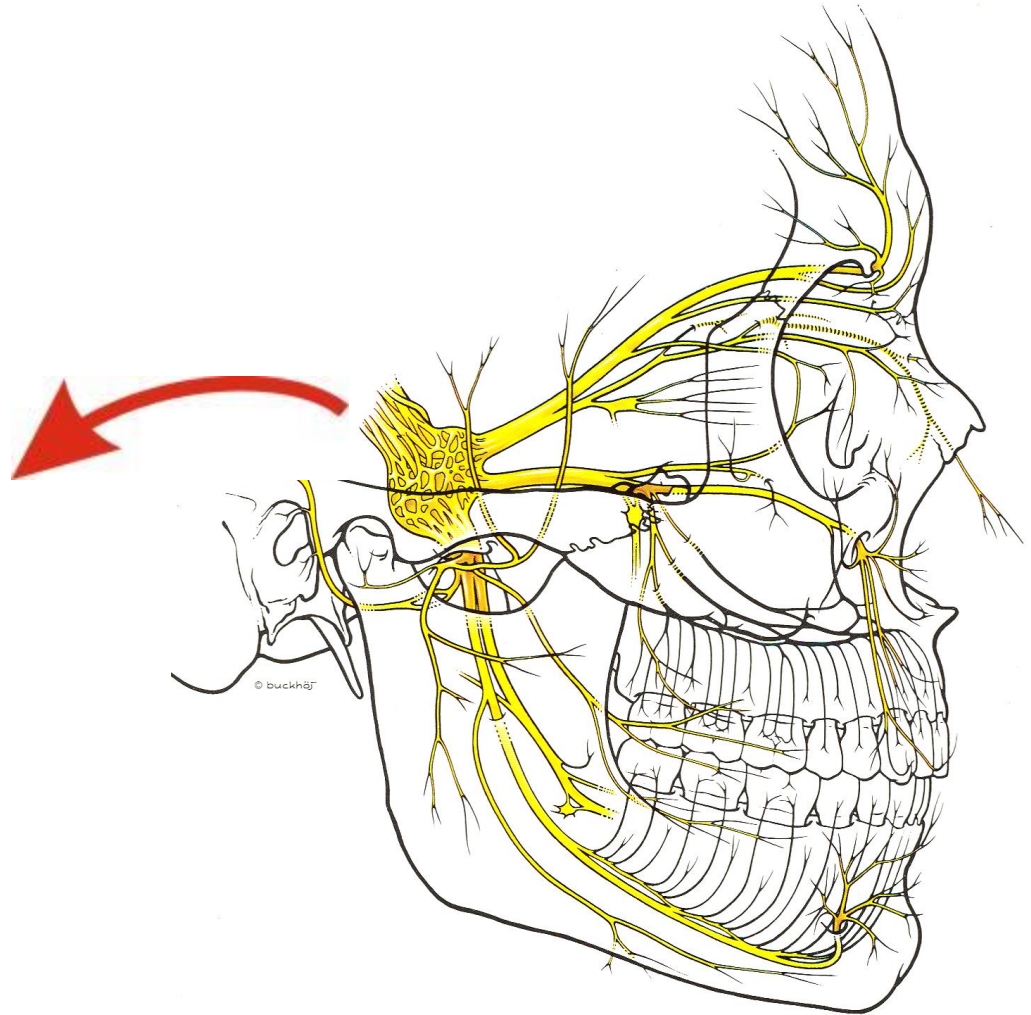
Richly innervated area



Medial

Lateral

Kandel et al, 2000

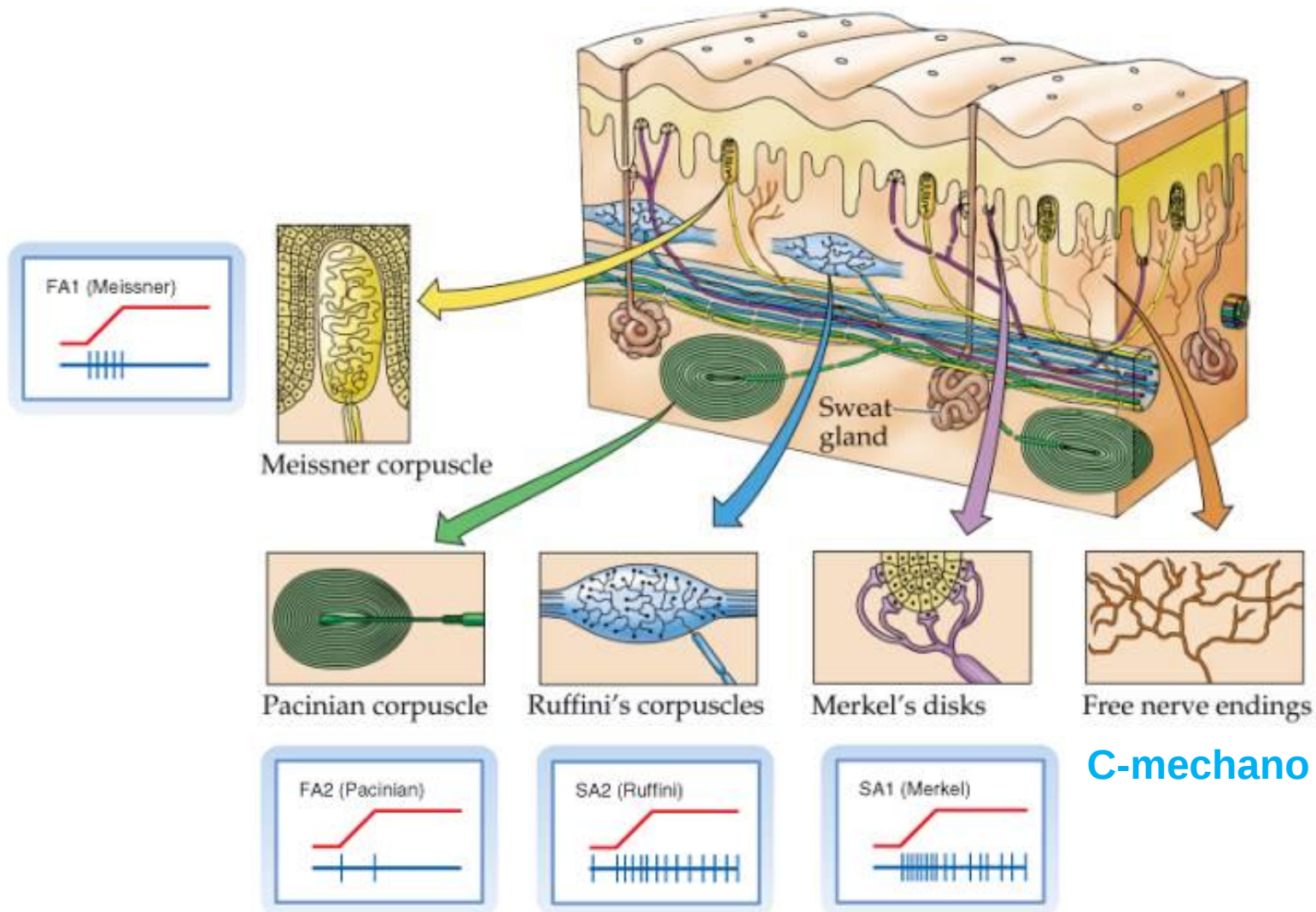


Buckhøj

Sensory receptors

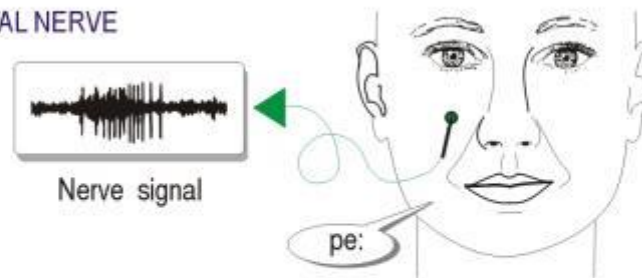
- Mechanoreceptors
- Thermoreceptors
- Chemoreceptors
- Nociceptors

Mechanoreceptors

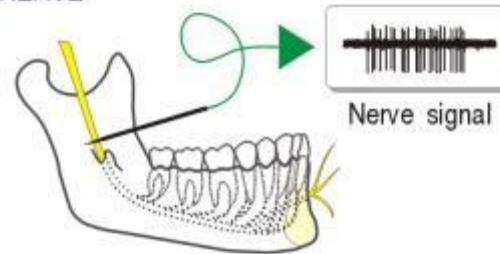


Oro-facial microneurography

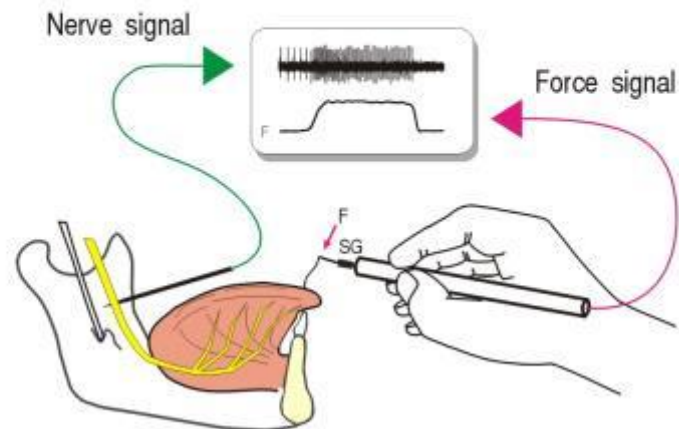
INFRAORBITAL NERVE



INFERIOR ALVEOLAR NERVE

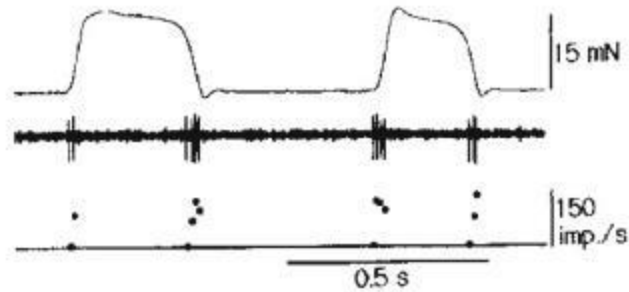


LINGUAL NERVE

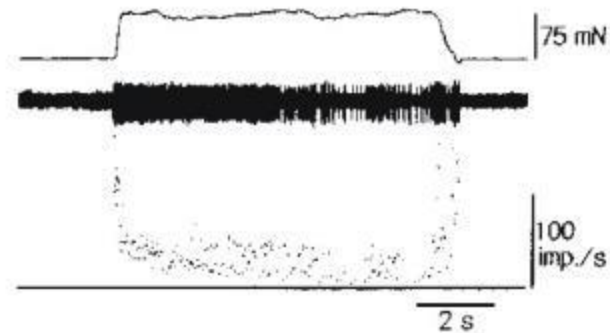


Oro-facial tactile receptors

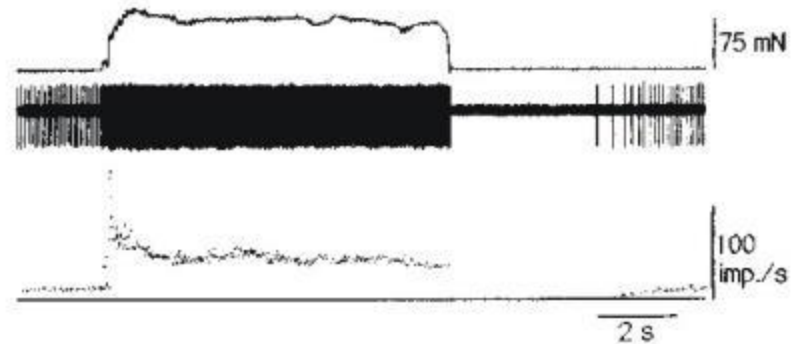
FA I



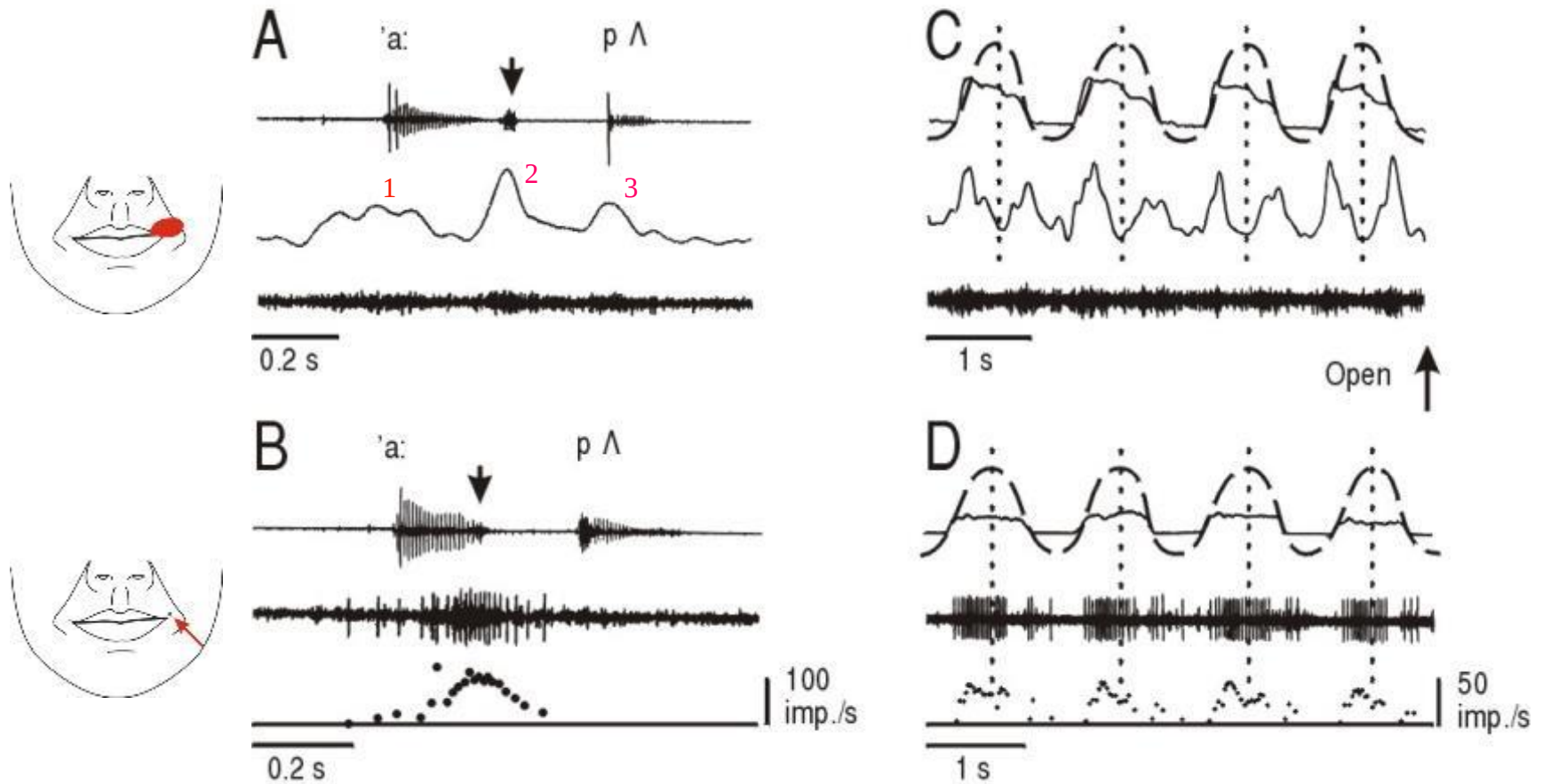
SA I



SA II

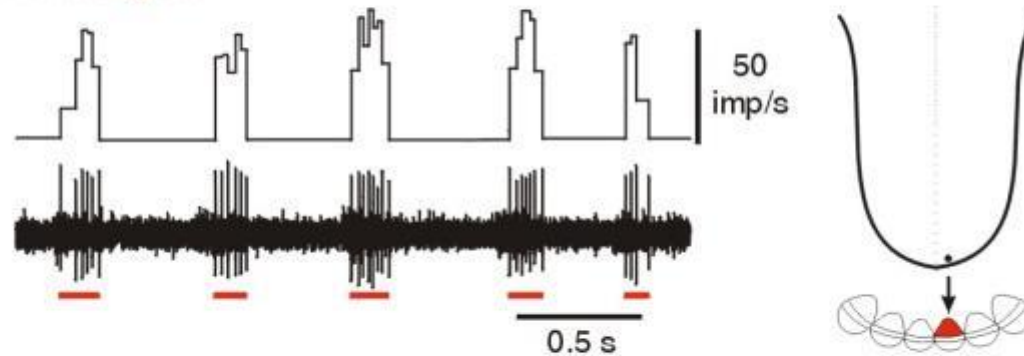


Responses during speech and chewing

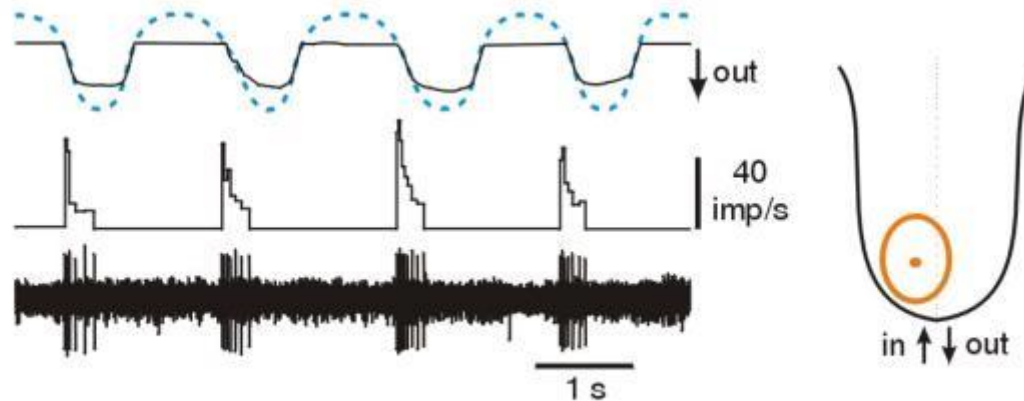


Responses during tongue movements

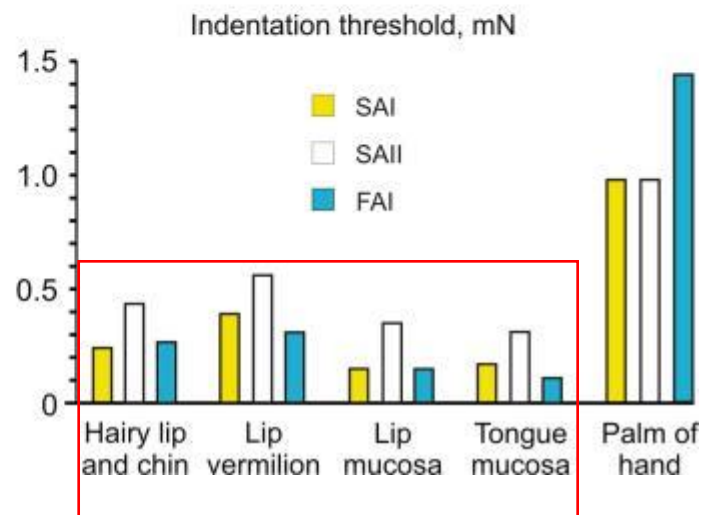
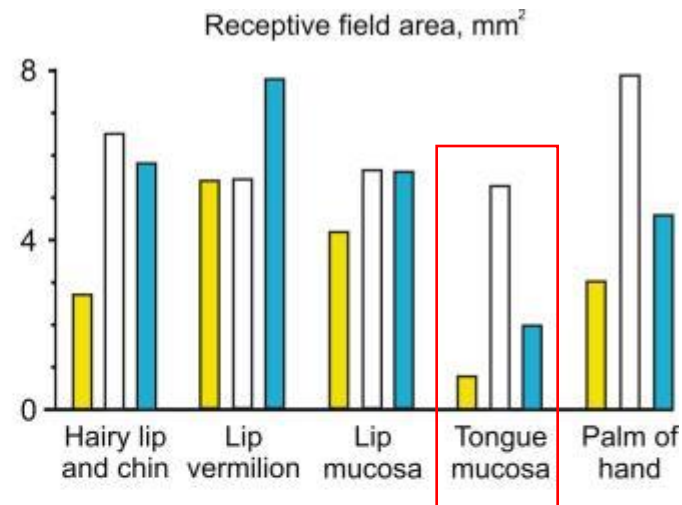
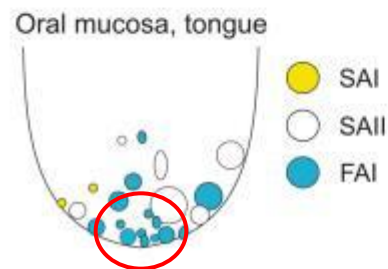
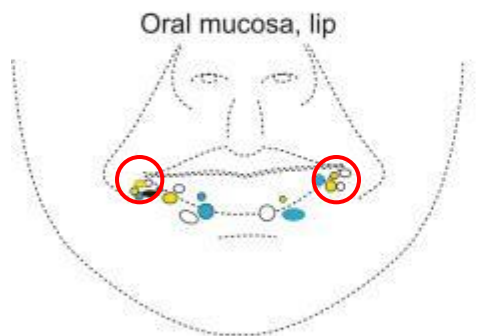
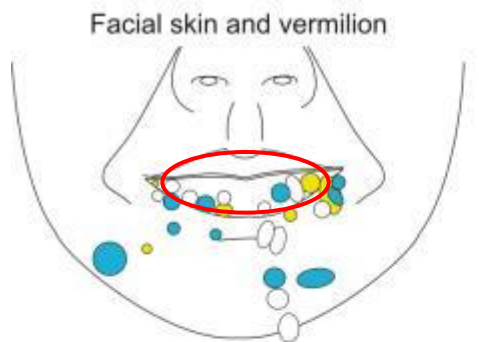
FA I receptor



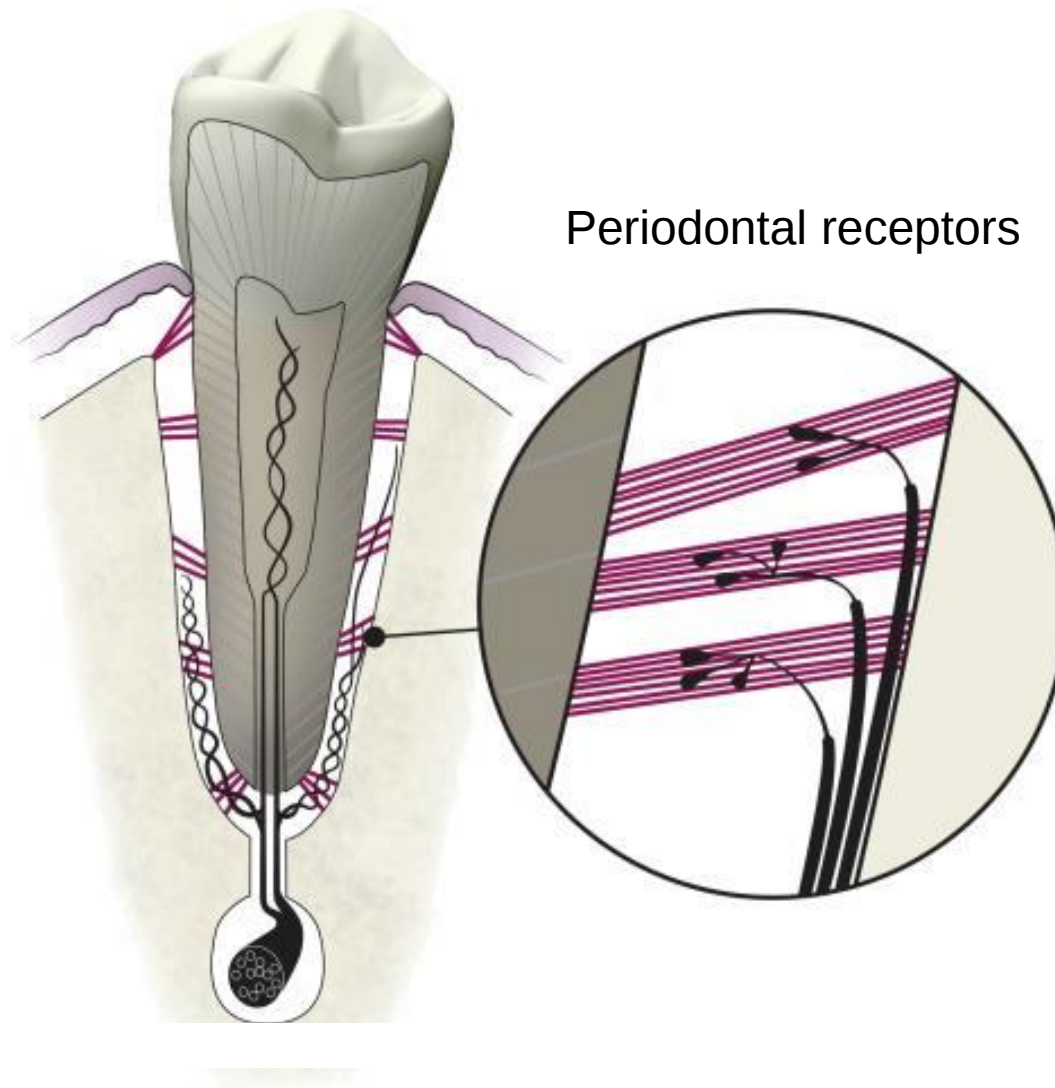
Muskel receptor



Receptive fields



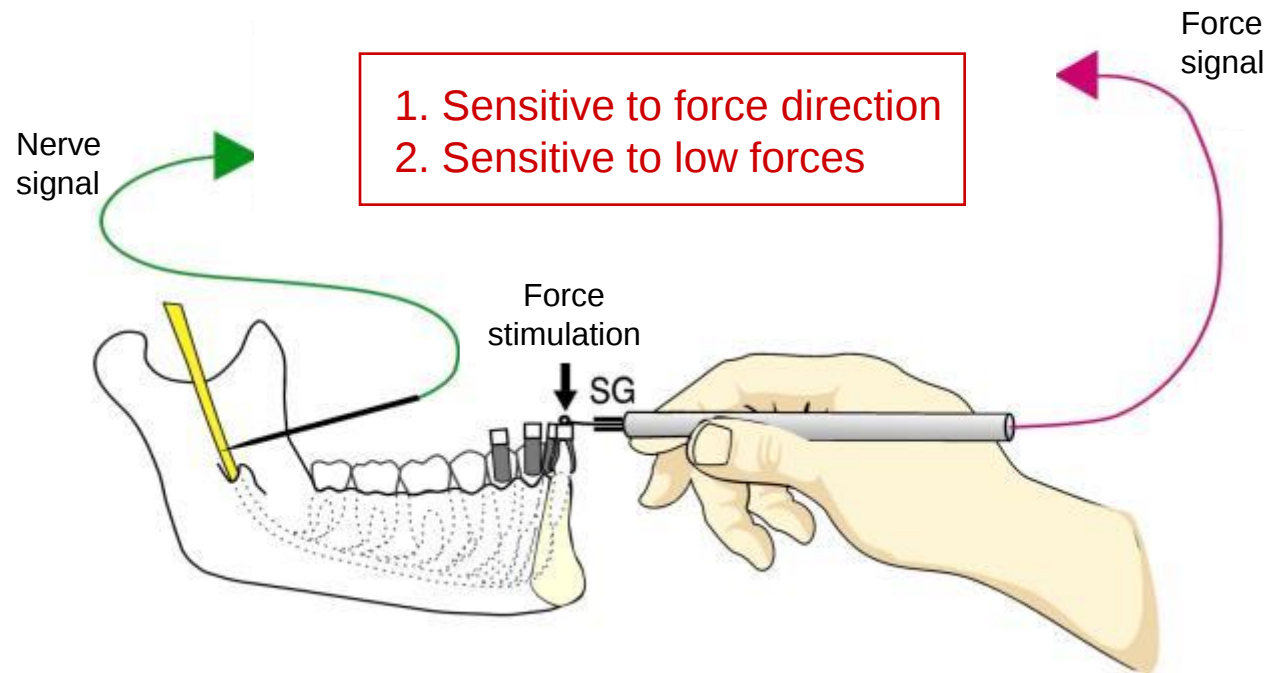
Natural Tooth



Recording from human periodontal receptors

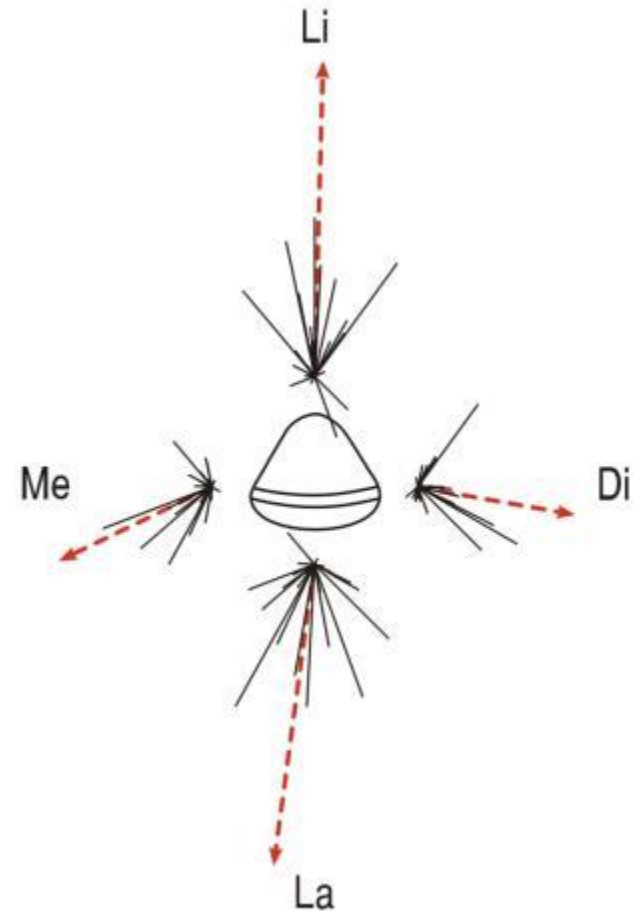
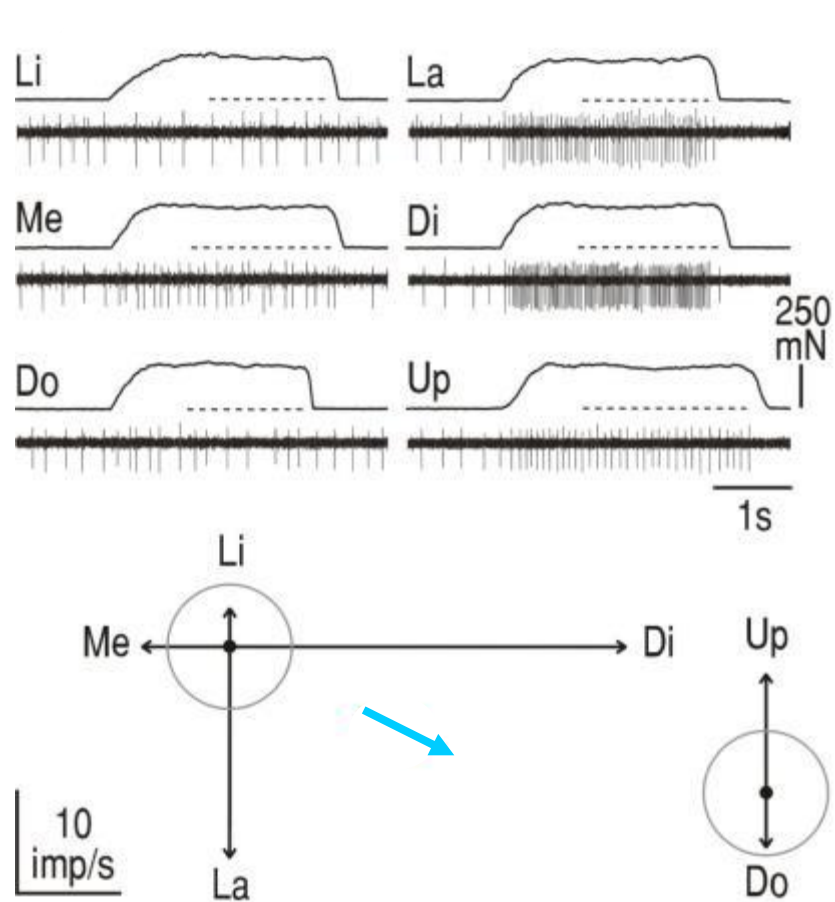


Microneurography

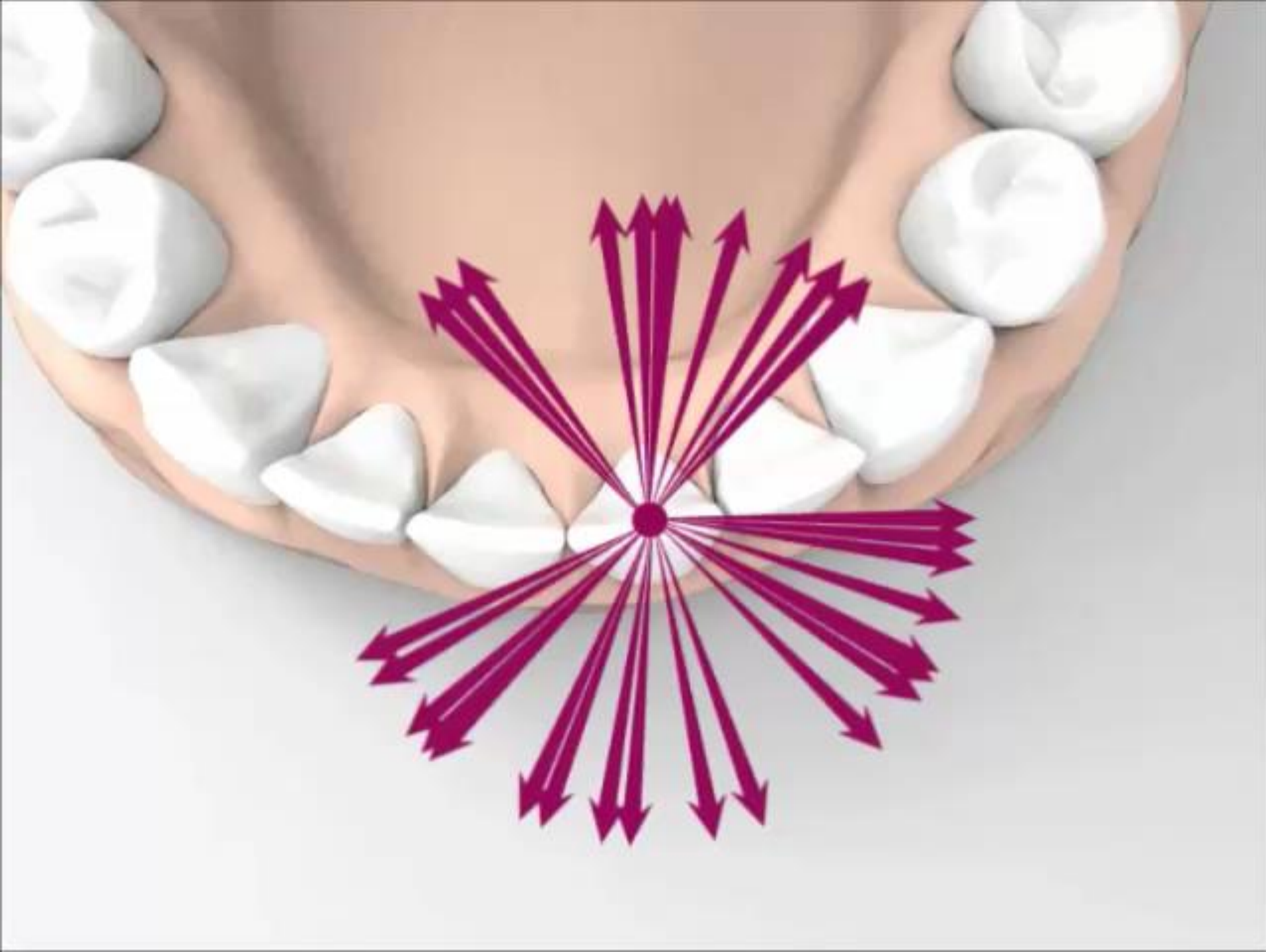


Trulsson och Johansson,
Prog Neurobiol. 1996.
Johnsen och Trulsson,
J Neurophysiol. 2005.

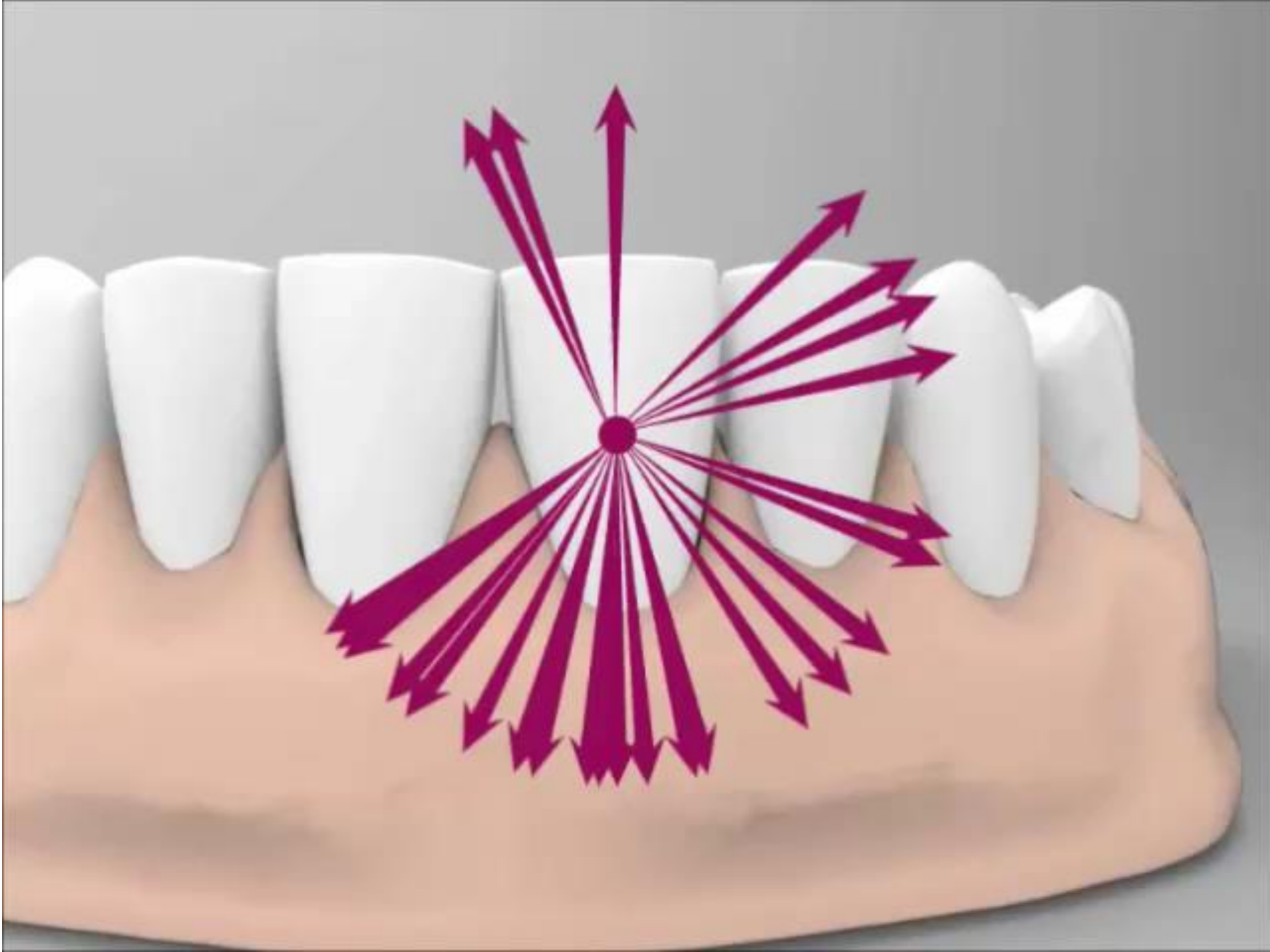
Sensitive to force direction

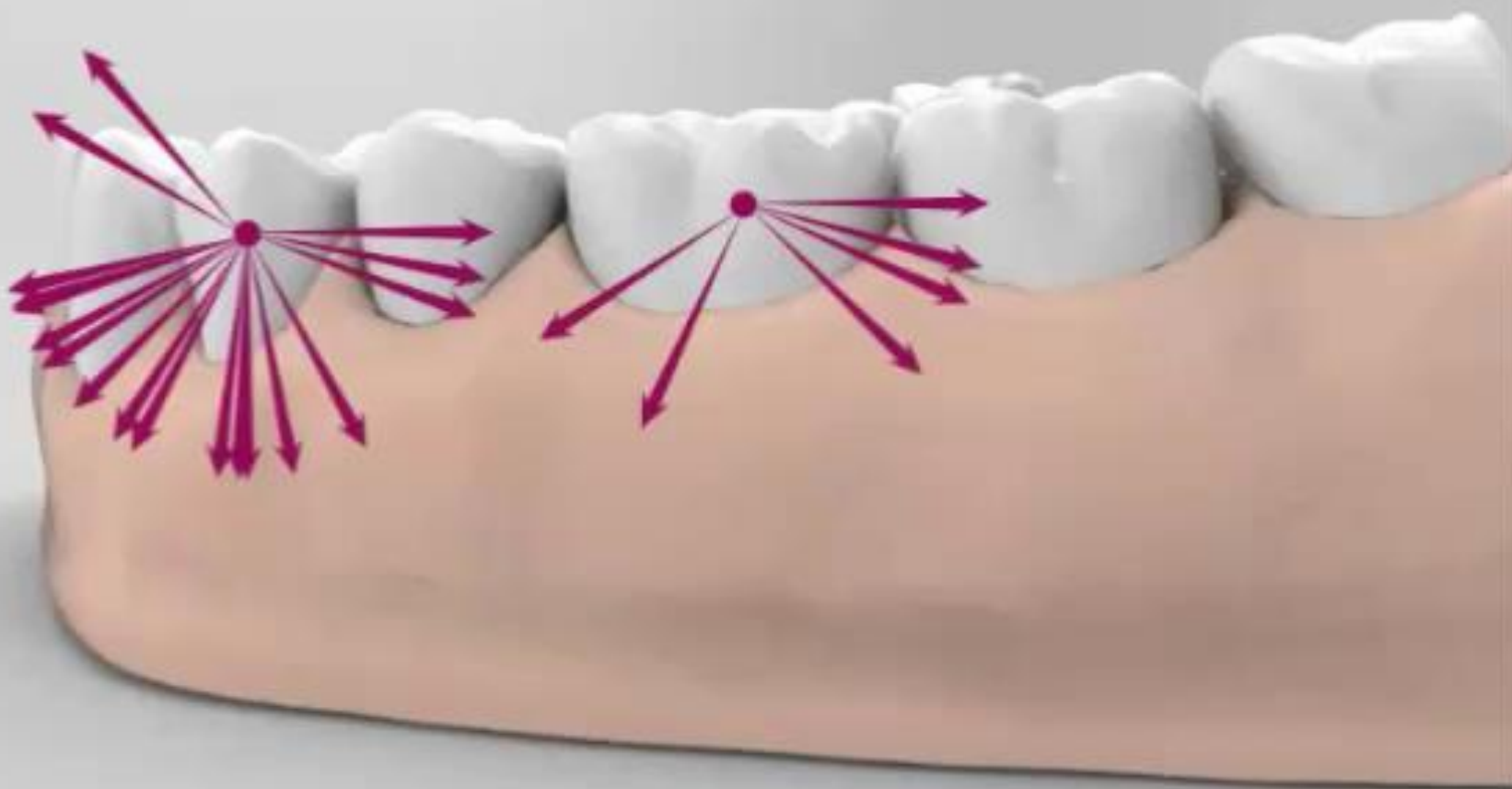




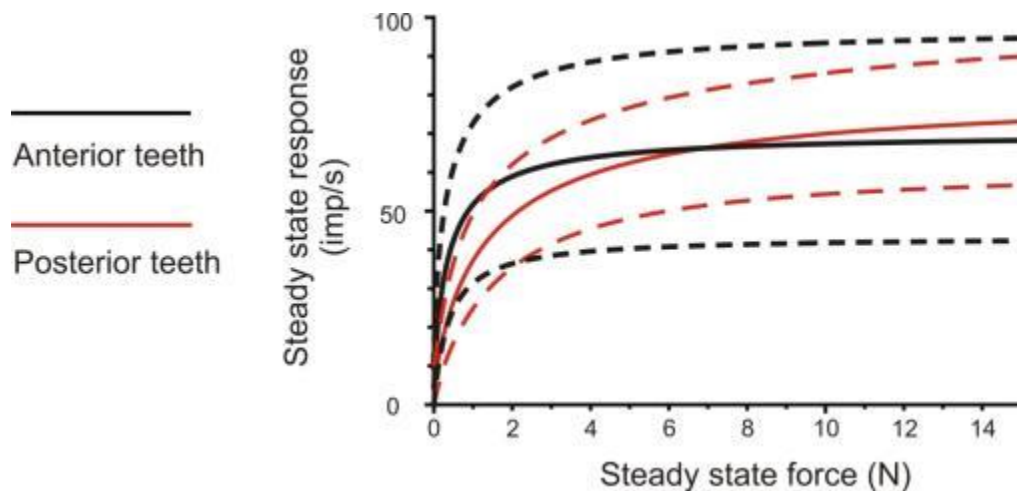
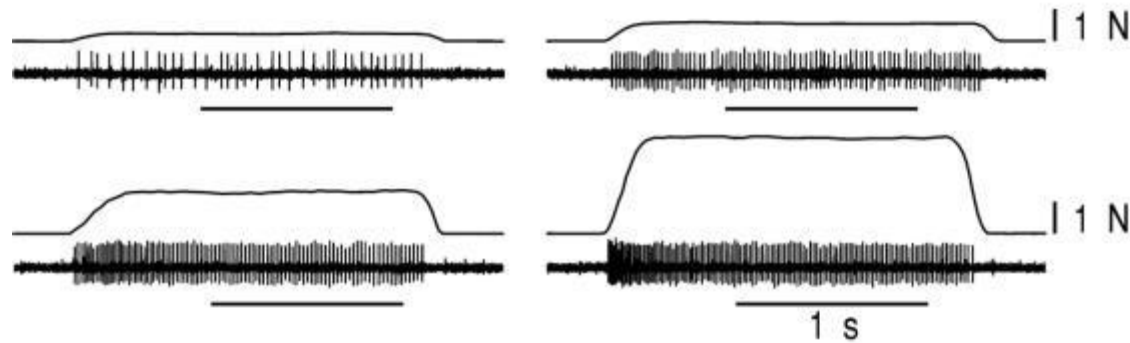








Sensitive to low forces



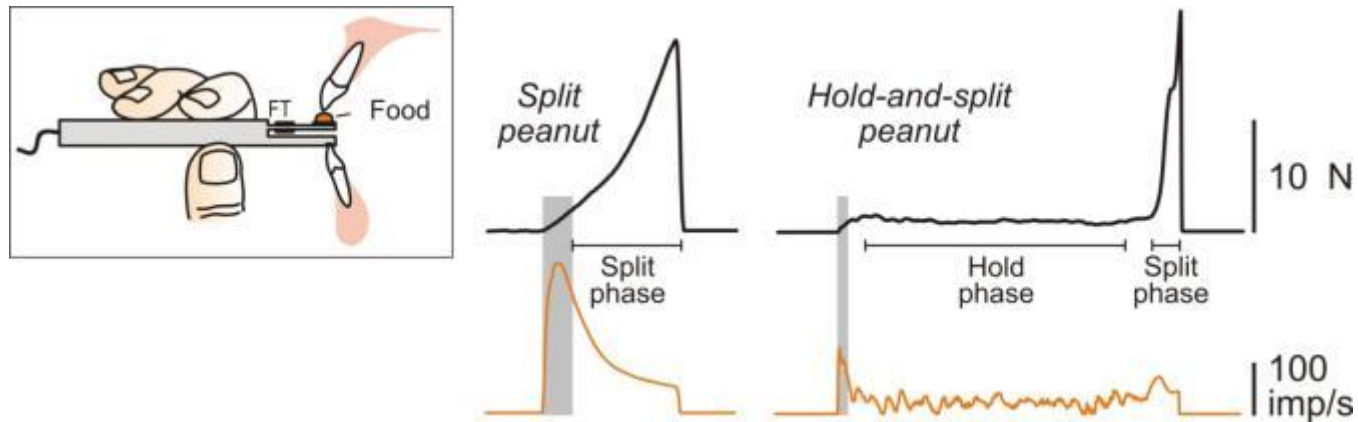
Mathematical model

$$R = a + b f + d f_{HP}$$

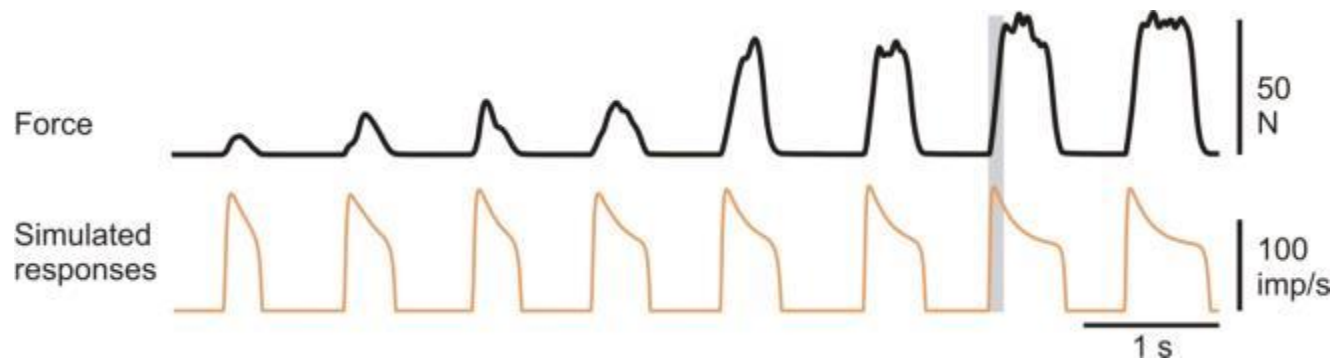
$$f = \frac{F}{(F + c)}$$

The tooth as a sensor - hypothesis

Signaling during manipulation and biting



Signaling during chewing



Role of Periodontal mechanoreceptors

Periodontal receptors signal information about:

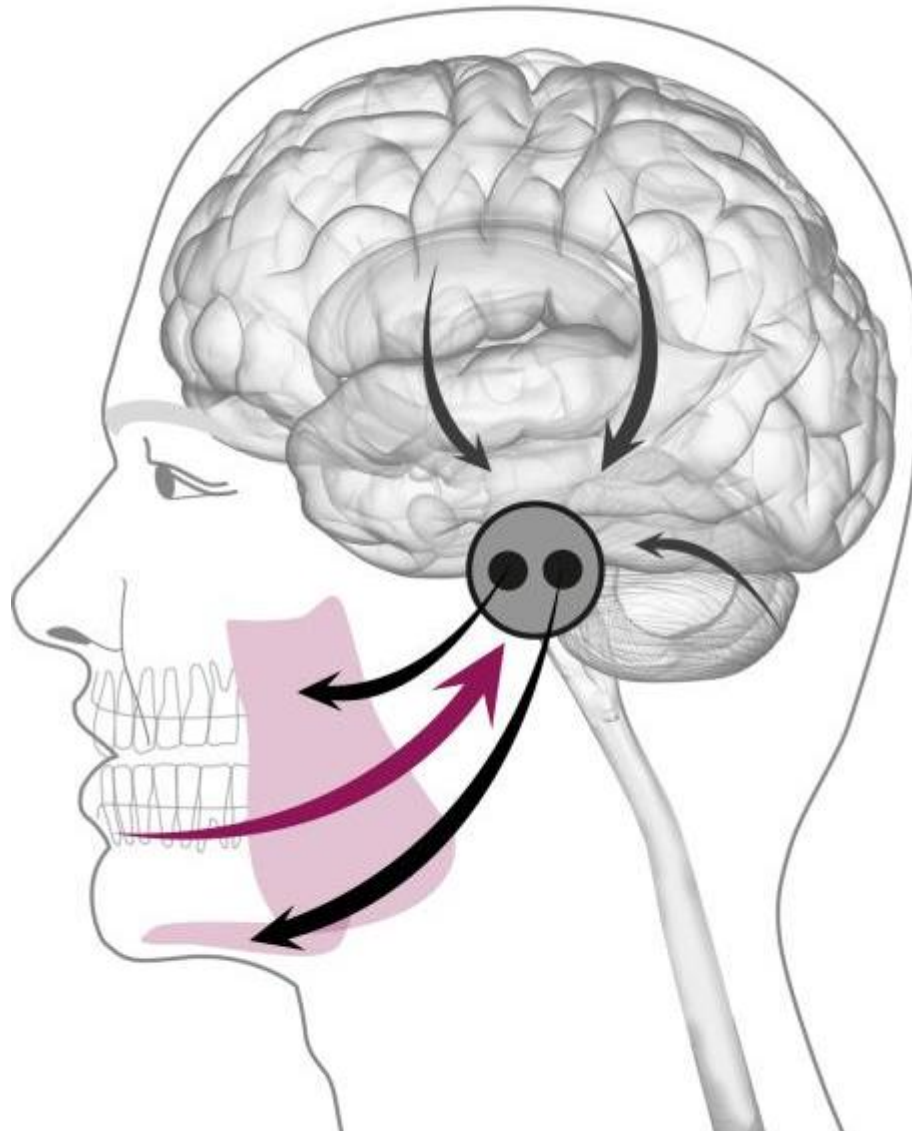
- The point of attack and the direction of tooth loads.
- The intensity of the force, with the highest sensitivity at very low force levels.



The information is used by the brain to control:

- Food positioning and bite force direction.
- The force intensity during manipulation, biting and chewing.

Orofacial Mechanoreceptors

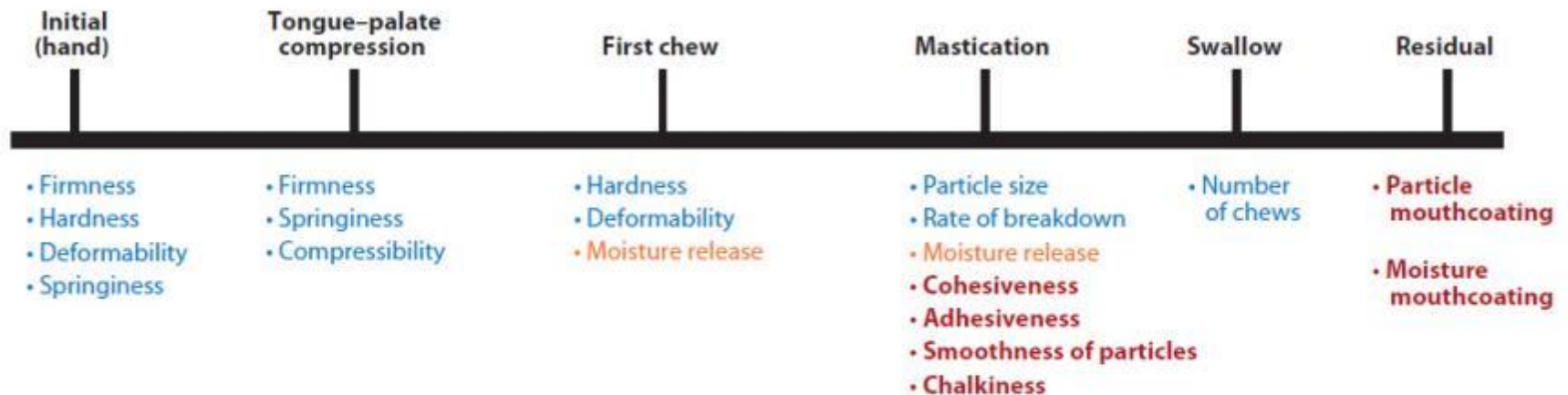


Exteroceptors
Proprioceptors

Perception
Sensorimotor
regulation

Mechanoreceptors and the enjoyment of eating

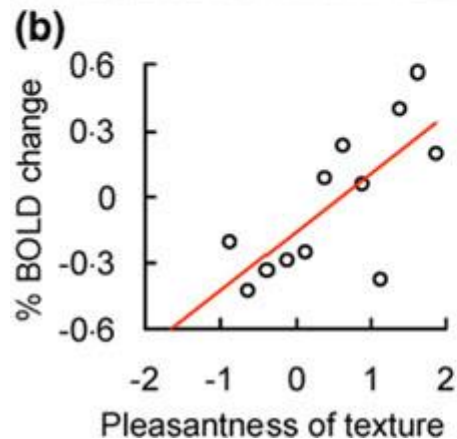
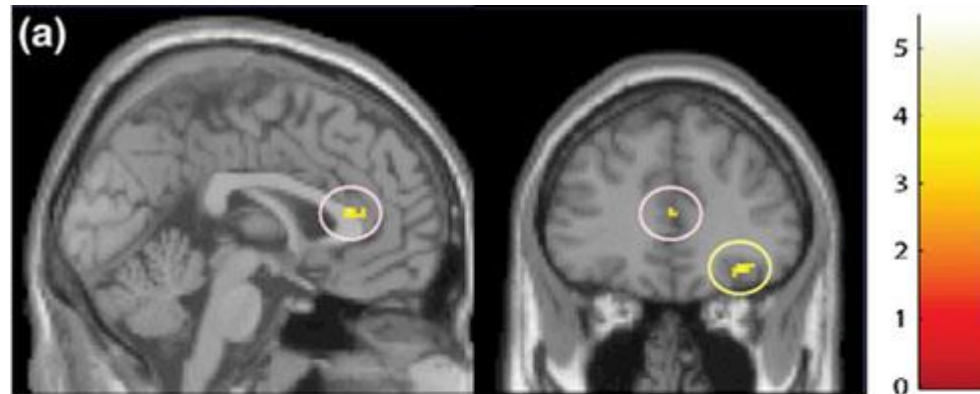
Textural perception of food



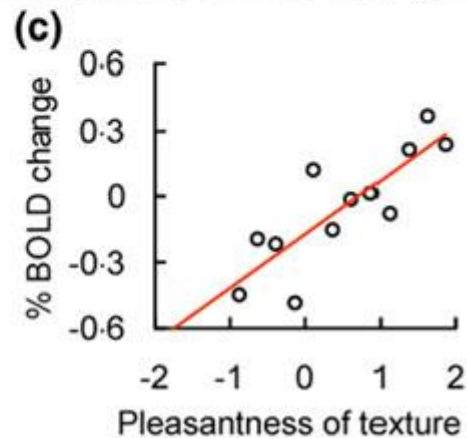
Sensory attributes evaluated at different stages of oral processing. Terms are associated with force deformation and fracture (*blue*); microstructure (*orange*); or saliva, bolus formation, and oral surface interactions (*red*).

Mechanoreceptors and the enjoyment of eating

Subjective pleasantness of fat texture



Anterior cingulate cortex
(Pink circles)



Orbitofrontal cortex
(Yellow circle)

Mechanoreceptors and the enjoyment of eating

Sensorimotor regulation of chewing

Gum chewing in young adults resulted in:

- Improved attention
- Increased alertness
- Elevated mood
- Decreased Stress



Chewing makes you feel good!