



Sensation

Psychology 372

Physiological Psychology

Steven E. Meier, Ph.D.

Listen to the audio lecture while viewing these slides

1

Psyc 372 – Physiological Psychology

Sensation, Perception, and Cognition

- All sensory systems operate the same, they only use different mechanisms.
- Have a physical stimulus (e.g., weight, heat, cold, light)
- The stimulus emits some sort of energy.
- Energy activates some sort of receptor system.

2

Psyc 372 – Physiological Psychology

Sensation

- The receptor system is designed to convert (transduce) the energy to action potentials.
- You then organize the physical energy to neural energy by electrical/chemical reactions.

3

Psyc 372 – Physiological Psychology

Perception

- You then organize and filter the energy as the information progresses through the different systems.
- Ultimately, you develop patterns and process the material.

4

Psyc 372 – Physiological Psychology

Cognition

- Allows you to determine what the pattern means.
- Uses different brain systems depending on the stimulus.

5

Psyc 372 – Physiological Psychology

Summary

- Sensation is involved with detecting the stimulus and converting the information to action potentials.
- Perception is involved with organizing the action potentials.
- Cognition is involved with giving the organization some meaning that we can understand.

6

Somatosenses

- Provides information relating to events on the skin and to events occurring within the body.
- Two groups
 - **Cutaneous Senses**
 - receive various signals from the skin that form the sense of touch
 - Pressure
 - Vibration
 - Heating/cooling
 - Stimuli that damage tissue (and produce pain)
 - **Kinesthesia**
 - Provides information about body position and movement
 - Are action potentials from receptors located within the joints, tendons, and muscles.

Touch

- Lots of Receptors
 - Three main Groups
 - Nociceptors
 - Cutaneous and Subcutaneous Mechanoreceptors
 - Muscle and Skeletal Mechanoreceptors

The Skin

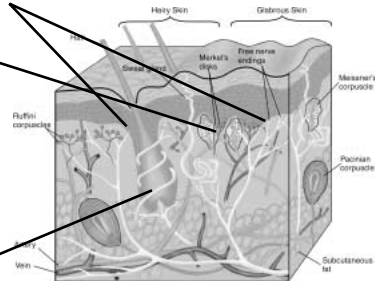
Free Nerve Ending

Merkels Receptor

Epidermis

Dermis

Hair Receptor



Nociceptors

- Are receptors for detecting pain.
- Have free nerve endings within the skin that respond to stimuli
- Also respond to heat, acids, and capsaicin
- Four main types
 - Mechanical
 - Sharp, pricking pain
 - Thermal and Mechano-thermal
 - Sharp, pricking pain
 - Thermal and Mechano-thermal
 - Slow, burning pain
 - Polymodal
 - Slow, burning

The Skin

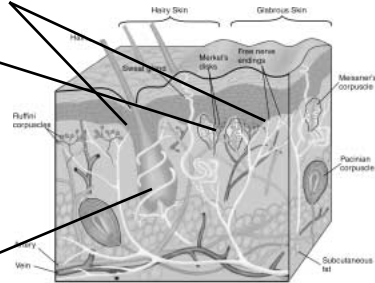
Free Nerve Ending

Merkels Receptor

Epidermis

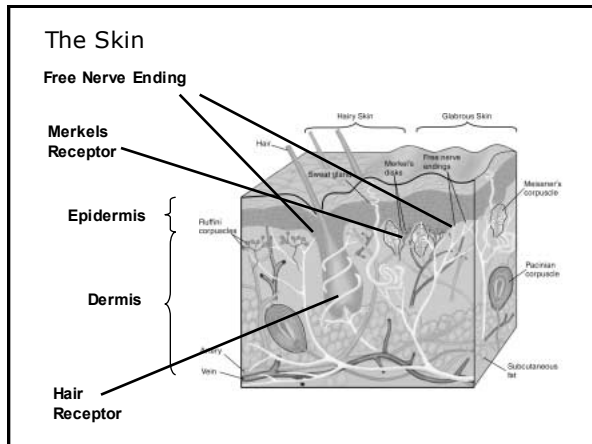
Dermis

Hair Receptor



Cutaneous and Subcutaneous Mechanoreceptors

- Are responsible for Touch Sensations
- Have several types of receptors.
 - Meissner's Corpuscle Flutter
 - Pacinian Corpuscle Vibration
 - Ruffini Corpuscle Steady Skin Indentation
 - Merkel Receptor Steady Skin Indentation
 - Hair-guard Flutter
 - Others



Psyc 372 – Physiological Psychology

Pain

14

Psyc 372 – Physiological Psychology

Pain Receptors

- Nociceptors
 - Are receptors for pain
 - Have free nerve endings networks within the skin that respond to intense pressure
 - Also respond to heat, acids, and capsaicin
- Receptors are activated by mechanical, chemical stimulation

15

Psyc 372 – Physiological Psychology

Different Systems for Touch and Pain

- Dorsal-Column-Medial Lemniscal
- Anterolateral

16

Psyc 372 – Physiological Psychology

Dorsal-Column-Medial Lemniscal System

- Involved with
 - Discriminative touch,
 - Vibration,
 - Perceiving and understanding the form and nature of objects (Stereognosis),
 - Receiving stimuli within the tissues of the arm (Proprioception),
 - Weight discrimination.

17

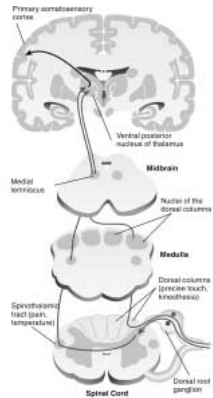
Psyc 372 – Physiological Psychology

Structures Used

- Uses the Fasciculus Gracilis and Fasciculus Cuneatus in the Dorsal Column of the Spinal Cord.
- Signal Crosses at the Medulla
- Uses the Medial Lemniscus pathway from the Midbrain to the Thalamus.
- Terminates in posterior lateral nucleus and posterior lateral group of the Thalamus.
- Signal goes from Thalamus to primary and secondary somatic sensory cortices (Area 3 1 2) and posterior parietal cortex

18

Dorsal-Column-Medial Lemniscal System



Anterolateral System

- Responsible for
 - Pain
 - Cold
 - Warmth
 - Pressure
 - Tickle
 - Itch
 - Crude Touch

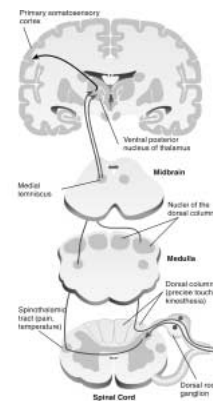
20

Structures Used

- Signal crosses at the spinal cord.
- Uses the Lateral Spinothalamic Tract of the
 - Spinal Cord to travel to the:
 - Reticular Formation
 - Tectum
 - Ventral Posterior Lateral Nucleus
 - Posterior nuclear group of the Thalamus
 - Intralaminar nuclei
- Signal goes from Thalamus to primary and secondary somatic sensory cortices (Area 3 1 2) and posterior parietal cortex

21

Anterolateral System



Muscle and Skeletal Mechanoreceptors

- Again, several different types
 - Muscle Spindle Primary Limb Proprioception
 - Muscle Spindle Secondary Limb Proprioception
 - Joint Capsule Mechanoreceptors
 - Joint Capsule Pressure
 - Has a limited role in limb proprioception

23