



Hypothalamus

An Extremely Important Structure

Psychology 372

Physiological Psychology

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Overview

- Is very small
- Weighs only about 4 grams
Brain=1400 grams
- Contains a variety of specialized structures.

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Regulates

- Control of blood pressure and electrolyte composition.
- Body temperature
- Energy metabolism
- Reproduction
- Emergency responses to stress

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Regulates Mechanisms by

- Receiving sensory information from all areas of the body.
- Comparing sensory information with biological set points.
- Adjusting the system to restore the body balance when deviations from biological set points occur.

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Some Set Points

- Blood sugar
- Hormone levels
- Temperature
- Sodium

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Hypothalamic Regions and Related Structures

- Can be divided into three regions
 - Anterior
 - Middle
 - Posterior

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Anterior

- Contains the Preoptic Nucleus
 - Is concerned with the integration of sensory stimuli that is related to set points.

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Preoptic Nuclei Control

- BP
- Blood composition
- Temperature
- Hormones
- Reproductive activity
- Others

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Middle Third

- Overlays the pituitary stalk
- Contains
 - Dorsomedial Nuclei
 - Ventromedial Nuclei
 - Paraventricular Nuclei
 - Supraoptic Nuclei
 - Arcuate Nuclei

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Paraventricular Nuclei

- Includes magnocellular and parvocellular components
 - Controls the Pituitary Gland
- Contains neurons that innervate sympathetic and parasympathetic neurons in the Medulla and Spinal Cord.
 - Regulates autonomic responses

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Ventromedial and Dorsomedial Nuclei

- Regulates
- Growth
- Feeding
- Maturation
- Reproduction

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Is Between the Medial Forebrain Bundle

- MFB are long pathways
- Runs through the lateral hypothalamus
- Connects the hypothalamus with the
 - Brain Stem
 - Basal Forebrain
 - Amygdala
 - Cortex

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Function

- Help organize behaviors
- Autonomic functioning
- Highly involved with the addiction process
- Heavily loaded with Dopamine Neurons

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Posterior Third

- Mammillary Body
 - Function unknown
- Posterior hypothalamic Nuclei
 - Contains Tuberoamammillary Nucleus
 - Regulates wakefulness and arousal

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Endocrine System

- Regulated by the Hypothalamus
- Direct Connection
 - Sends neuroendocrine materials from the posterior pituitary
- Indirect
 - Sends hormones into the anterior pituitary
 - Regulates the production and release of pituitary hormones into circulatory system

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Some Hypothalamic Hormones

- TRH (Thyrotropin-Releasing Hormone)
 - Pit. Thyrotropin and Prolactin
- GRH (Growth Releasing Hormone)
 - Pit. Growth Hormone
- PRF (Prolactin-Releasing Factor)
 - Pit. Prolactin
- PIH (Prolactin Release-Inhibiting Hormone)
 - Pit. Prolactin
- Others

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Thirst

- Drinking is controlled by two mechanisms
 - Osmolarity (Determined by Sodium)
 - Vascular volume (Fluid)
- Act on Osmoreceptors in Hypothalamus
- Acts on the Kidney

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Kidney

- Secretes Renin
- Renin cleaves Angiotensinogen into Angiotensin I (A1)
- A1 is hydrolyzed into A2

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Angiotensin II

- Causes
 - vasoconstriction
 - Release of aldosterone
 - Release of Vasopressin by paraventricular nucleus
 - Regulates water retention
- Subfornical Organ is very sensitive to A-II
- Preoptic area also receives information from baroreceptors
- Both regulate drinking.

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Hunger

- Past
- Regulated by
 - Lateral Hypothalamus
 - Stimulate, animal starts eating
 - Destroy, animal stops eating
 - Ventromedial Hypothalamus
 - Stimulate, animal stops eating
 - Destroy, animal becomes obese

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Today

- Not as clear cut
- Usually damage nearby structures
- Example
 - Damage Lateral, damage trigeminal system and dopamine fibers in MFB
 - Results in decreased stimuli activating visual, olfactory, and somatosensory stimuli.
 - Result, don't start eating.
- May also alter set points.
- LH and VMH are still important, but probably work with other systems

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Pleasure

- Past When stimulated animal would not do anything else.
- Today, Not as clear cut.
- Involved with MFB which is more important.

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Conclusion

- Is an extremely important structure
- Is involved with many other things
 - Sexual behavior
 - Temperature
 - Etc.
- Damage causes lots of problems.

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