

MOTIVATION & EMOTION

Introduction and History of Motivation and Emotion recap



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2020

Image source:
https://commons.wikimedia.org/wiki/File:Portrait_gemma_and_mehmet.jpg

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Lecture 01 and 02 recap:

Introduction (Ch 1)
History (Ch 2)

(Reeve, 2018)

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Key questions

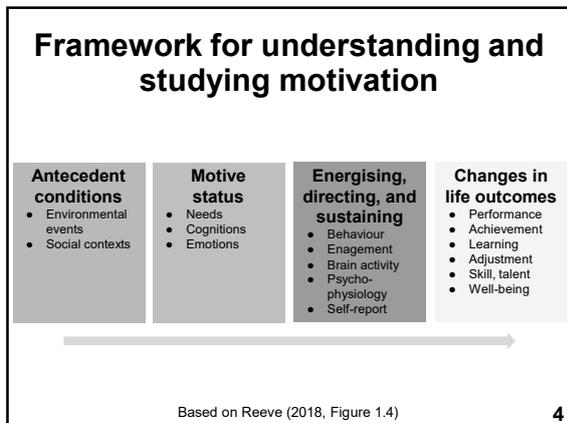
- Why do we do what we do?
- Why do we feel what we feel?
- How can we change what we do and feel?

What is motivation?

- processes that give behaviour **energy, direction, and persistence** (Reeve, 2018).

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History of motivation

1. Grand theories
 1. Will
 2. Instinct
 3. Drive
 4. → Incentive, arousal, discrepancy
2. Mini-theories
 1. Active nature of the person
 2. Cognitive revolution
 3. Applied socially relevant research
3. Contemporary era

Based on Reeve (2018, Ch 2)

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References

- Reeve, J. (2015). *Understanding motivation and emotion* (6th ed.). Hoboken, NJ: Wiley
- Reeve, J. (2018). *Understanding motivation and emotion* (7th ed.). Hoboken, NJ: Wiley.

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MOTIVATION & EMOTION

Motivated & emotional brain



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Image source:
http://commons.wikimedia.org/wiki/File:Brain_090407.jpg

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The motivated & emotional brain

Reading:
Reeve (2018), Ch 3

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Outline

- **Motivation, emotion, and neuroscience**
 - Events activate structures
 - Structures generate M&E
- **Neural basis**
 - Cortical
 - Subcortical
 - Bidirectional
- **Brain structures**
 - Subcortical
 - Reticular formation
 - Amygdala
 - Reward centre
 - Pleasure cycle
 - Addiction
 - Basal Ganglia
 - Hypothalamus
 - Cortical
 - Insula
 - Prefrontal cortex
 - Orbitofrontal cortex
 - Ventromedial PFC
 - Dorsolateral PFC
 - Anterior cingulate cortex

Based on Reeve (2018, Ch 3, p. 44)

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Outline

- **Hormones**
 - Cortisol
 - Oxytocin
 - Testosterone

Based on Reeve (2018, Ch 3, p. 44) 4

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Neuroscience and the human brain

- **Neuroscience**
 - scientific study of the nervous system, especially the brain
- **Human brain**
 - 1.3 – 1.4 kgs consisting of:
 - grey matter (neurons, synapses)
 - white matter (connecting fibers and axons)
 - 100 billion neurons
 - 100 trillion connections

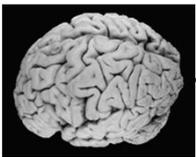
Based on Reeve (2018, Ch 3, p. 46) 5

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The motivated & emotional brain

The brain is not only for thinking, it is also for feeling - it is the center of motivation and emotion.

Brain



Thinking brain
Cognitive functions - thinking, learning, memory, decision-making

Motivated brain
Needs, desires, liking and wanting, cravings, pleasure and pain, addiction

Emotional brain
Emotions, feelings, affect, mood

Image source: http://commons.wikimedia.org/wiki/File:Brain_090407.jpg

Based on Reeve (2018, p. 46) 6

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Principles in motivational and emotional brain research

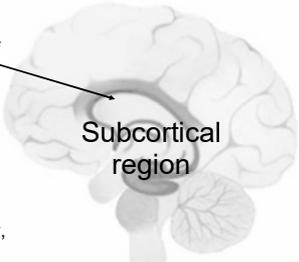
- Day-to-day events activate specific brain structures e.g.,
 - threat → amygdala
 - reward → ventral striatum
- Activated brain structures generate specific motivations and emotions e.g.,
 - insula → feelings
 - dorsolateral PFC → self-control

Based on Reeve (2018, Ch 3, pp. 46-47) 7

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Subcortical brain

- Small nuclei that make up the anatomic core of the brain.
- Associated with:
 - basic urges (e.g., “I want ice cream”)
 - emotion-rich motivations (e.g., hunger, thirst, anger, fear, anxiety, pleasure, desire, reward, and wanting).



Subcortical region

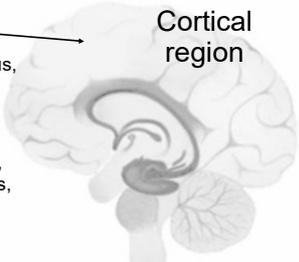
Human brain cross-section showing the broadest level of structure

Image source: https://commons.wikimedia.org/wiki/File:Limba_sistema_sentakste.jpg

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Cortical brain

- Bulging, grooved, wrinkled surface.
- Functions at a conscious, intentional level.
- Associated with cognitively-rich motivations (e.g., goals, plans, strategies, values, and beliefs about the self).
- Engages in self-control, resisting temptation, decision-making, assessing risk, self-regulation.



Cortical region

Human brain cross-section showing the broadest level of structure

Image source: https://commons.wikimedia.org/wiki/File:Limba_sistema_sentakste.jpg

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Bidirectional control

- **Subcortical → Cortical:**
Subcortical activations send excitatory and inhibitory information to the cortical brain
- **Cortical → Subcortical:**
Cortical activations send excitatory and inhibitory information to the subcortical brain
- **Subcortical vs Cortical:** Often in competition and conflict (e.g., decision-making, delay of gratification, short-term vs. long-term goals)

Based on Reeve (2018, Ch 3, pp. 46-47) **10**

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Structures inside the brain

Based on Reeve (2009, Ch 3)

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3D Brain App

Install to learn about the location & function of brain structures

<https://play.google.com/store/apps/details?id=org.dnalc.threedbrain>
<https://apps.apple.com/au/app/3d-brain/id331399332>

Brain structure:

- 3D view
- Labels
- Info

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Reticular Formation

- Cluster of neurons about size of little finger in brain stem
- Key role in arousal and awakening
 - Ascending (alerts and arouses cortex)
 - Descending (regulates muscle tone)

Figure 3.6
Function of the Reticular Formation

Based on Reeve (2018), pp. 49-50 **16**

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Amygdala

- Almond-shaped collection of nuclei which respond to emotionally significant and aversive events; each nuclei serves a different function involved in self-preservation e.g., anger, fear, anxiety, reward
- **Impairment** → tameness, affective neutrality, lack of emotion responsiveness, preference for social isolation over affiliation, willingness to approach previously frightening stimuli

Source: https://commons.wikimedia.org/wiki/File:Amygdala_small.gif Based on Reeve (2018), pp. 50-52 **17**

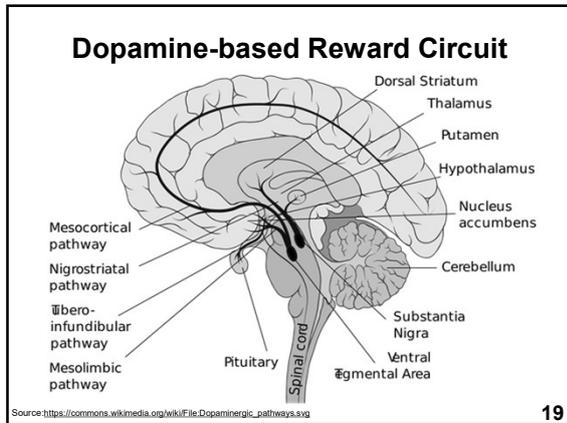
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Amygdala

- Involved in perception of others' emotions, facial expression, and our mood, especially negative emotionality
- Detects, evaluates, and responds to emotionally charged stimuli in the environment.
- Stimulation activates neighbouring structures (e.g., hypothalamus and release of neurotransmitters)

Source: https://commons.wikimedia.org/wiki/File:Amygdala_small.gif Based on Reeve (2018), pp. 50-52 **18**

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Reward Center: VTA, Nucleus Accumbens, Striatum, and Basal Ganglia

- Reward centre consists of subcortical structures which communicate via the dopamine network:
 - Ventral tegmental area (VTA) manufactures dopamine which is released to the nucleus accumbens (NA).
 - NA extends into the prefrontal cortex, which is involved in the subjective experience of pleasure, and into the orbitofrontal cortex, which stores the object's learned reward value. like it").

Based on Reeve (2018), pp. 52-54 **20**

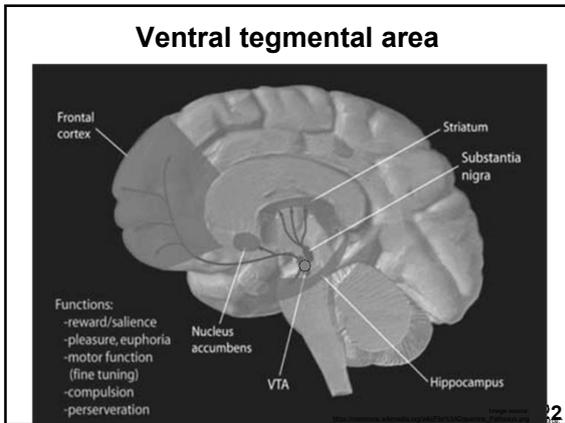
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Reward Center: VTA, Nucleus Accumbens, Striatum, and Basal Ganglia

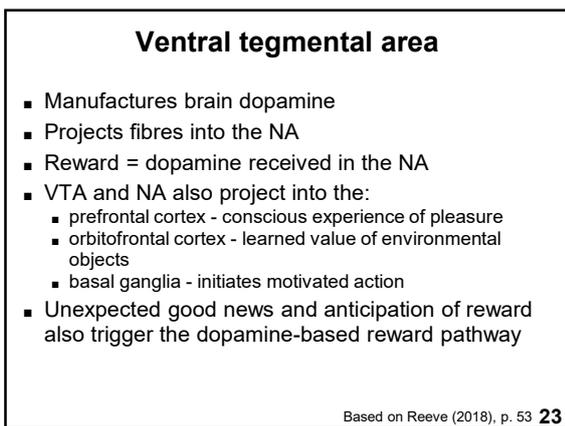
- Activation of the ventral (lower part) striatum (NA, caudate nuclear, putamen) → experience of reward or "hedonic evaluation of stimuli."
- These structures allow us to learn what to like, what to prefer, and what to want.
- Reward is fundamental to motivation, survival, well-being, and goal-directed effort.
- Environmental stimuli characteristics are processed in the amygdala and ventral striatum, with experience of pleasurable feelings occurring in the NA (e.g., "I like it").

Based on Reeve (2018), pp. 52-54 **21**

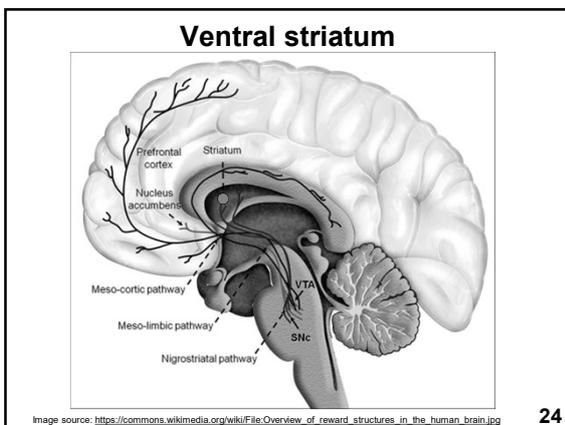
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Ventral striatum

- Striatum is the largest structure of the basal ganglia
- Component of reward and motor systems
- Ventral striatum includes the nucleus accumbens
- Once activated by the release of dopamine, the ventral striatum translates the experience of reward into motivational force, approach behavior, and the exertion of physical effort.

Based on Reeve (2018), p. 53 **25**

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Nucleus accumbens

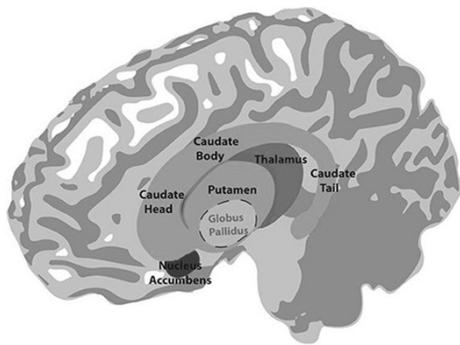


Image source:Unknown*

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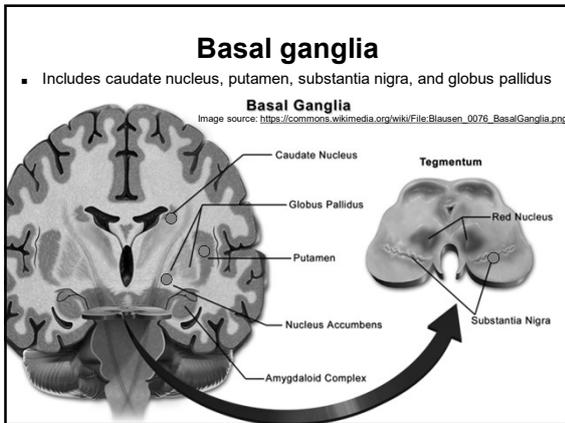
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Nucleus accumbens

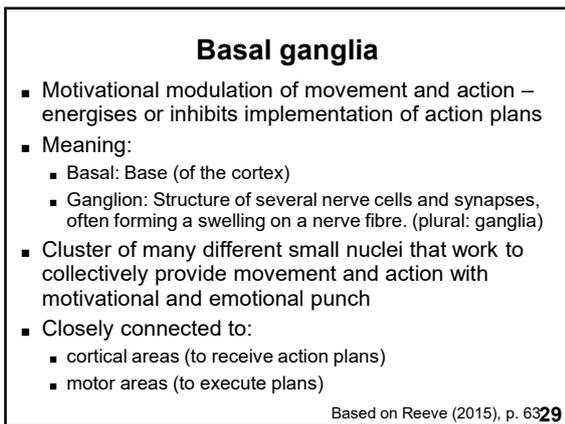
- The brain's reward center.
- Responds to signals of reward (dopamine release) to produce pleasure, wanting, liking, and approach.
- Active during the experience of pleasant taste, pleasant image, social acceptance, and several addictive drugs.
- Once activated by the release of dopamine, the ventral striatum translates the experience of reward into motivational force, approach behavior, and the exertion of physical effort.

Based on Reeve (2018), p. 53 **27**

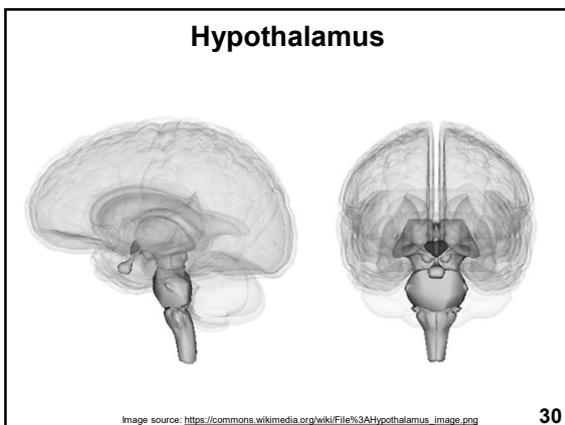
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Hypothalamus



- Less than 1% of brain volume, but a "motivational giant"
- Subcortical collection of 20 interconnected nuclei that serve separate and discrete functions
- Regulates:
 - pituitary gland (endocrine system's "master gland") which regulates hormones
 - ANS (arousal (sympathetic activation) and relaxation (parasympathetic activation)) (e.g., arousal - hypo → pit → stimulates adrenal glands to produce its hormones (epinephrine, norepinephrine) → fight or flight)
 - important biological functions including eating, drinking and mating

Source: https://commons.wikimedia.org/wiki/File:Hypothalamus_small.gif

Based on Reeve (2018), pp. 57-59 **31**

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Insula (insular cortex)

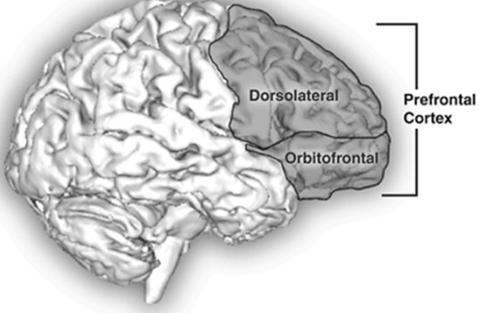
- Large and highly interconnected structure deep within the brain (fold between posterior frontal lobe and anterior temporal lobe, above the subcortical brain)
- Anterior insular:
 - Monitors "gut" (body-based) feelings e.g., disgust
 - Largely unconscious, but generates feeling info
 - Key structure involved in intrinsic motivation and satisfaction
- Others' emotions, incl. empathy, anxiety, informs perceptions of trust
- Processes and learns about risk and uncertainty
- Involved in perceptions of "self as cause" - self-agency



Based on Reeve (2018), pp. 57-61 **32**

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Prefrontal cortex



Prefrontal Cortex

Dorsolateral

Orbitofrontal

Image source: * **33**

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Prefrontal cortex

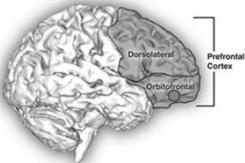
- Cerebral cortex sends info to limbic system to influence emotion
- Prefrontal cortex houses conscious goals which compete against one another
- Right prefrontal cortex
 - negative and avoidance-oriented feelings - behavioural inhibition system (BIS)
- Left prefrontal cortex
 - positive and approach-oriented feelings - behavioural activation system (BAS)
- Personality differences indicate greater right or left prefrontal cortex sensitivity/stability



Based on Reeve (2018), pp. 61-62 **34**

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Orbitofrontal cortex



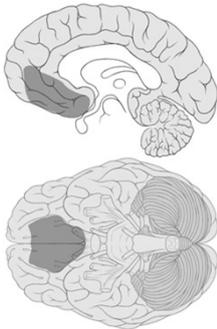
Source: https://commons.wikimedia.org/wiki/File:Prefrontal_cortex.png

- Processes incentive-related information
- Helps with making choices between options e.g., which product to buy
- Central to delayed gratification

Based on Reeve (2018), pp. 62-63 **35**

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Ventromedial prefrontal cortex



Source: https://commons.wikimedia.org/wiki/File:Ventromedial_prefrontal_cortex.png

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Ventromedial prefrontal cortex

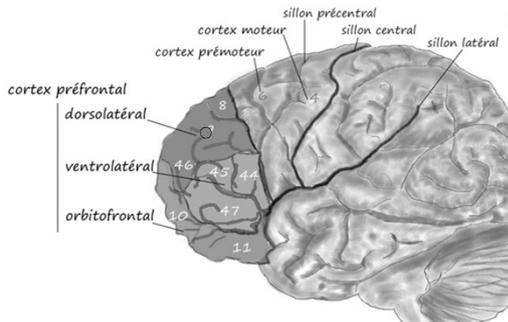
- Evaluates the unlearned emotional value of basic sensory rewards and internal bodily states.
- Integrates emotional information with cognitive and social judgments.
- Responsible for emotional control.

Based on Reeve (2018), p. 63

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Dorsolateral prefrontal cortex



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Dorsolateral prefrontal cortex

- Evaluates learned emotional value of environmental events and possible courses of action.
- Responsible for self-control over urges and risks during the pursuit of long-term goals
- Facilitates socioemotional competence by inhibiting urge for self-interest

Based on Reeve (2018), p. 64

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Anterior cingulate cortex

- Mid-frontal cortical brain area
- Info-processing, conflict-detection
- Organises cognitive resources to deal with conflicting choices
- Involved in cost-benefit analysis
- Provides “top-down” executive or cognitive control over decision making, goal pursuit, and action.



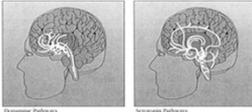
Source: https://commons.wikimedia.org/wiki/File:Anterior_cingulate_gyrus_animation.gif

Based on Reeve (2015), pp. 64-65 **40**

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Neurotransmitter pathways in the brain

- Neurotransmitter pathway
A cluster of neurons that communicate with other neurons by using a particular neurotransmitter
- Four motivationally relevant neurotransmitter pathways
 - Dopamine
 - Serotonin
 - Norepinephrine
 - Endorphin



Based on Reeve (2015)

Source: Mapping the Mind, by R. Carter, 1998, Berkeley: University of California Press. [Dopamine Pathways](#) [Serotonin Pathways](#)

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Neurotransmitters

Messengers in the brain.
Activate motivation, emotion, cognition, and behaviour.

| | | | |
|-----------------------|------------------------|-----------------------------|----------------------------|
| Dopa- mine | Sero- tonin | Norepin- ephrine | Endor- phin |
| Pleasure & reward | Lack → low mood | Arousal Attention ess | Opioid ↓ Pain ↑ High |

Based on Reeve (2018), pp. 65-66 **42**

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Dopamine

- Neurotransmitter for the neural reward circuit (Ventral tegmental area → Nucleus accumbens → Pre-frontal cortex)
- Rewards approach motivation
- Critical for learning
- Underlies addiction

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Serotonin

- Plays a role in low mood regulation
- Helps motivation to cope
- Depleted by stress
- Low levels contribute to depression

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Norepinephrine

- Neurotransmitter and hormone
- Brain adrenalin (noradrenaline)
- Endogenous amphetamine
- Increases arousal and alertness
- Energises fight/flight response (readiness for action)
- Enhances concentration, sensory processing, learning etc.

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Endorphins

- Endogenous opioid system
- Released during stress
- Pain inhibition
- Exercise-high
- Interacts with dopamine system to facilitate reward system

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Hormones

Messengers in the bloodstream.
Several underlie motivation, emotion,
and behaviour:

| | | |
|------------------------------------|--------------------------------------|-----------------------------------|
| Cortisol Stress response | Oxytocin Tend and befriend | Test-osterone Dominance |
|------------------------------------|--------------------------------------|-----------------------------------|

Based on Reeve (2018), pp. 65-66

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Cortisol

- "Stress hormone"
- Activated in reaction to social-evaluative threats.
- Short-term adaptive function, but long-term association with poor intellectual functioning, negative affect, and poor health outcomes

Based on Reeve (2018), p. 65

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Oxytocin

- Bonding hormone
- Supports the “Tend and befriend stress response”
- Raises trust in others
- Motivates seeking counsel, support, and nurturance of others during times of stress

Based on Reeve (2018), pp. 65-66

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Testosterone

- Associated with high competition, status-seeking, and sexual motivation
- Underlies status-seeking behaviour (especially after status is questioned).
- Underlies the mating effort (but low levels associated with better parenting)
- Reduces fear

Based on Reeve (2018), p.-66

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Your brain is more than a bag of chemicals:
David Anderson

TED Talk (16 mins)

https://www.ted.com/talks/david_anderson_your_brain_is_more_than_a_bag_of_chemicals



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Summary:

Neural & physiological sources of motivation and emotion

- **Brain structures**
limbic (emotion) vs. cortex (goals); left and right prefrontal cortex = approach and avoid respectively
- **Hormones**
ghrelin/leptin for hunger/satiation, oxytocin for bonding, cortisol for stress, testosterone for mating and dominance
- **Neurotransmitters**
dopamine for reward, serotonin for mood, norepinephrine for arousal, endorphin for pain

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References

- Gerrig, R. J., Zimbardo, P. G., Campbell, A. J., Cumming, S. R., & Wilkes, F. J. (2008). *Psychology and life* (Australian edition). Sydney: Pearson Education Australia.
- Reeve, J. (2009). *Understanding motivation and emotion* (5th ed.). Hoboken, NJ: Wiley.
- Reeve, J. (2015). *Understanding motivation and emotion* (6th ed.). Hoboken, NJ: Wiley.
- Reeve, J. (2018). *Understanding motivation and emotion* (7th ed.). Hoboken, NJ: Wiley.

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MOTIVATION & EMOTION

Physiological needs



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Image source:
https://commons.wikimedia.org/wiki/File:Apple_bitten.svg

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Physiological needs

Reading:
Reeve (2018), Ch 4

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Outline

- **Need**
- **Regulation**
 - Physiological need
 - Psychological drive
 - Homeostasis
 - Negative feedback
 - Multiple inputs/Multiple outputs
 - Intraorganismic mechanisms
 - Extraorganismic mechanisms
 - Homeostatic mechanism
- **Thirst**
 - Physiological regulations
 - Environmental influences
- **Hunger**
 - Short-term appetite
 - Long-term energy balance
 - Environmental influences
 - Self-regulatory influences
 - Weight gain and obesity
 - Comprehensive model of hunger
- **Sex**
 - Physiological regulation
 - Facial metrics
 - Sexual scripts
 - Sexual orientation
 - Evolutionary basis of sexual motivation

Based on Reeve (2018, Ch 3, p. 71)

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Need: Any condition within a person that is essential and necessary for life, growth, and well-being.

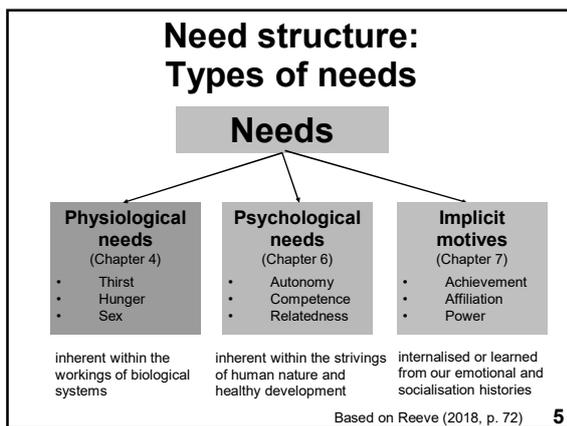
When needs are nurtured and satisfied, well-being is maintained and enhanced.

When needs are neglected or frustrated, damage disrupts biological or psychological well-being.

Motivational states provide the impetus to act before damage occurs to psychological and bodily well-being.

Based on Reeve (2018, p. 72) 4

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Maslow's hierarchy of needs

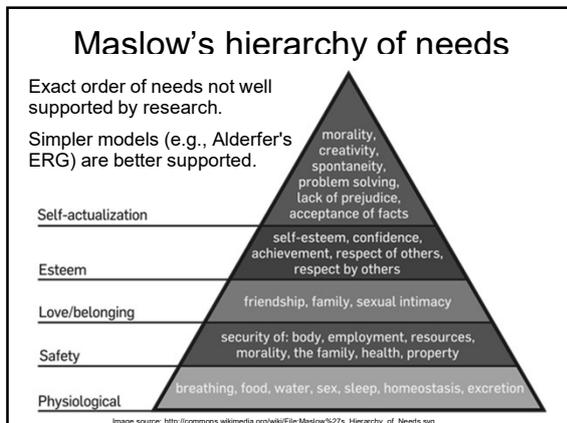
- Abraham Maslow (1970) suggested that human needs can be organised hierarchically.
- **Physiological (deficit) needs** (e.g., breathing, hunger) come first
- **Psychological (growth) needs** (e.g., self-esteem) then pursued



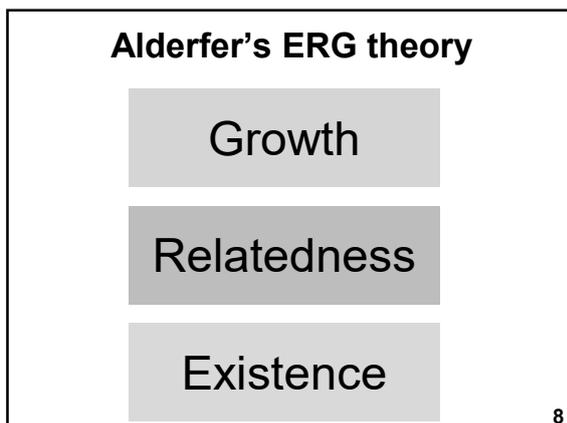
Image source: http://en.wikipedia.org/wiki/File:Abraham_Maslow.jpg

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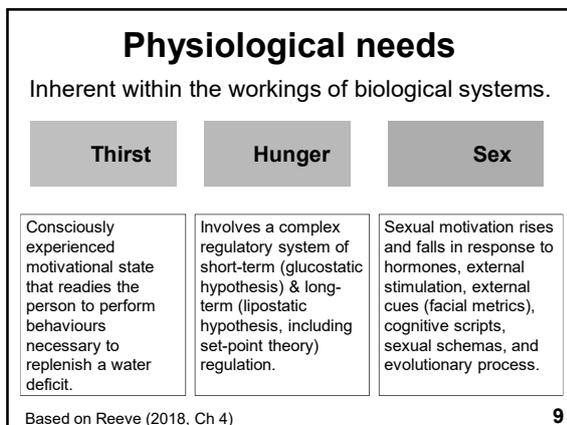
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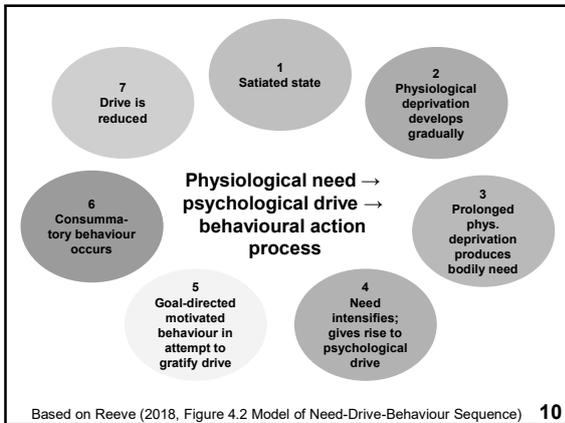
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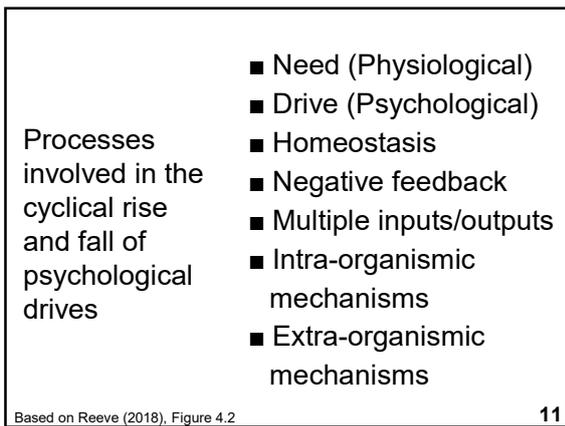
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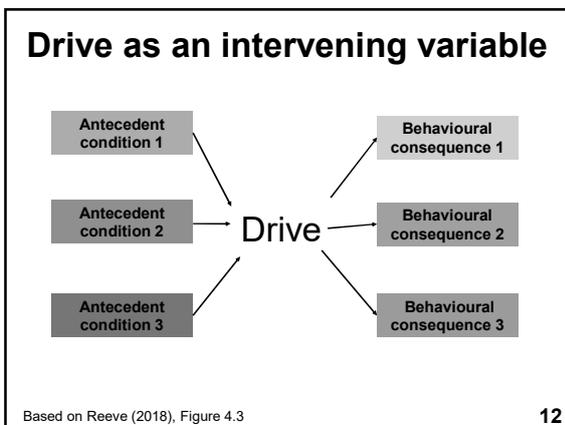
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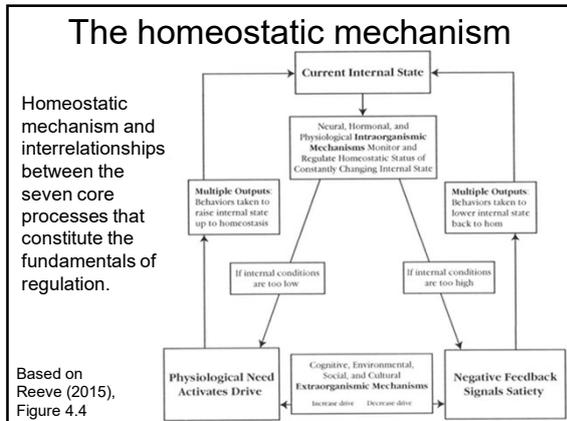
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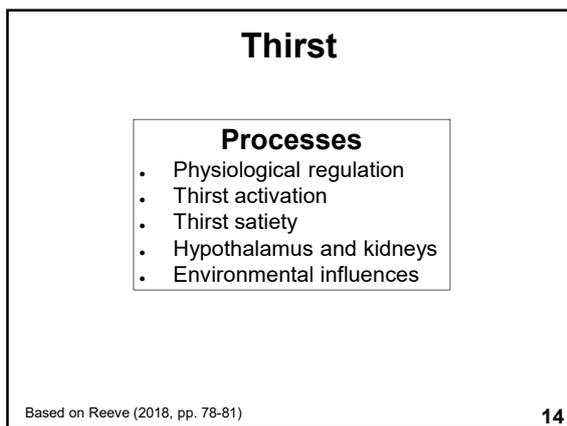
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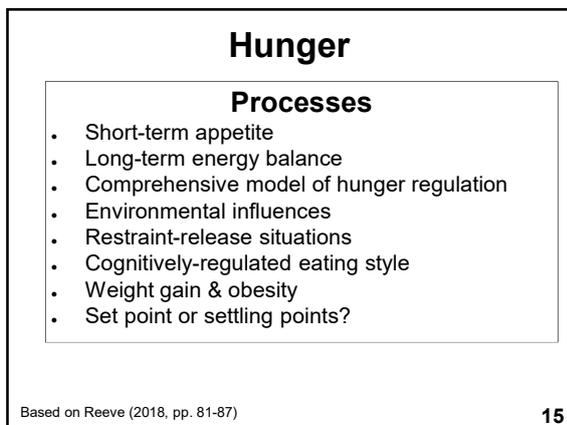
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**Hormones of hunger:
Leptin and ghrelin**
Corporis

Youtube (9:33 mins)
<https://www.youtube.com/watch?v=IZ4YnYUJnOQ>



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The motivated brain: Food deprivation
“Food deprivation activates the ghrelin release that stimulates the hypothalamus to create hunger.”

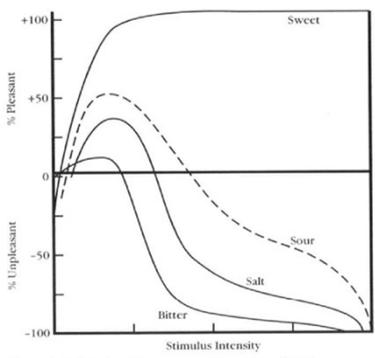
| Environmental event | Biochemical agent | Brain structure | Aroused motivation |
|----------------------------------|--|---------------------------------|--|
| Food deprivation (i.e., dieting) | Ghrelin (a hormone) produced and circulated in the bloodstream | Ghrelin stimulates hypothalamus | Stimulated hypothalamus creates the psychological experience of hunger |

Based on Reeve (2009), Figure 3.2, p. 51

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Relative pleasantness of four taste solutions



The incentive values for four tastes:

- sweet,
- sour,
- salty,
- bitter,

represented at various stimulus intensities.

Based on Reeve (2015), Figure 4.6, p. 95

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Environmental influences

Environmental influences that affect eating behaviour:

- time of day
- stress
- sight, smell, appearance, and taste
(e.g., eating behaviour increases when there are a variety of foods, nutrients, and tastes)
- social context
- friends' weight

Based on Reeve (2018, p. 85) 19

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Overweight and obesity prevalence

Australians' BMI (w/h²):

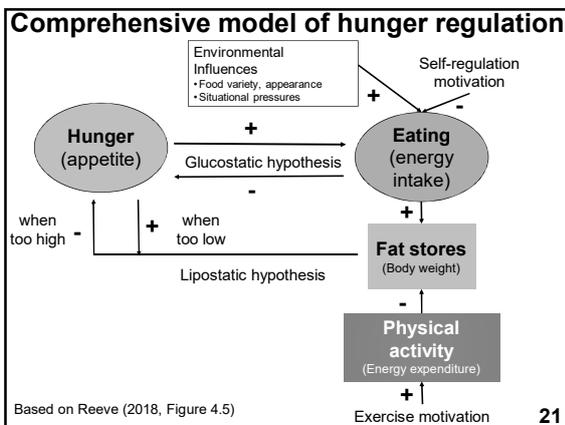
- Underweight: 2%
- Normal: 35%
- Overweight (25-30): 35%
- Obese (> 30): 28%

} 63%

Overweight/obesity increases with age but drops off in elderly.

http://www.abs.gov.au/ausstats/bsbs@nfl/lookup/by%20Subject/4338-0-2011-13-Main%20Features-Overweight%20and%20obesity-10007 20

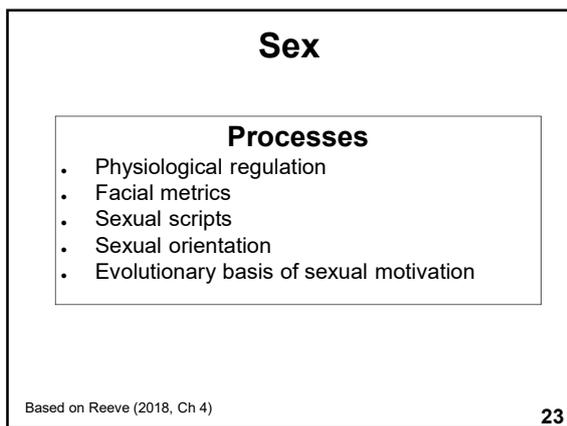
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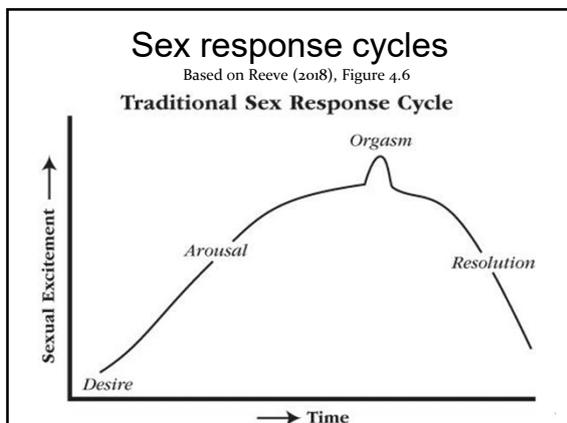
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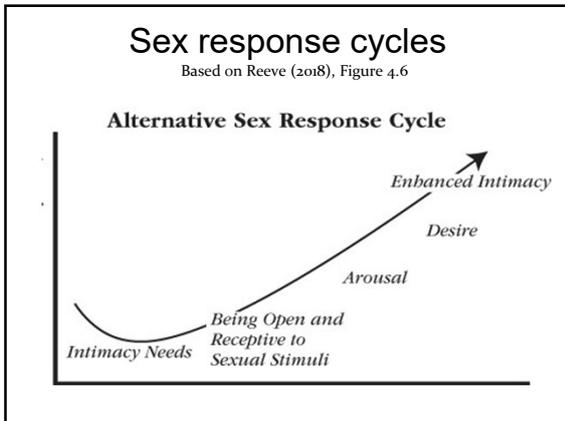
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Failure to self-regulate physiological needs

People fail at self-regulation for three primary reasons:

- **Power of biological urges**
Underestimate power of biological urges when not currently experiencing them.
- **Lack of standards**
Lack of or inconsistent, conflicting, unrealistic, or inappropriate standards.
- **Failure to monitor**
Fail to monitor what we are doing as we become distracted, preoccupied, or intoxicated.

Based on Reeve (2009, p. 105)

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Summary

- Need satisfaction required to prevent harm and enhance well-being.
- Needs can be hierarchically arranged as existence, relatedness, and growth.
- Example physiological needs: thirst, hunger, sex, sleep, oxygen, and excretion.

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Summary

- Physiological needs → psychological drive → behavioural action
- Comprehensive model of hunger and eating considers short-term (glucostatic) and long-term (lipostatic) regulation.
- Sexual motivation has multiple mechanisms but key models are based on evolution and intimacy

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Summary

- We underestimate the power of biological forces
- Consumptory behaviours are difficult to regulate when we were are under physiological and/or psychological stress

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References

- Reeve, J. (2009). *Understanding motivation and emotion* (5th ed.). Hoboken, NJ: Wiley.
- Reeve, J. (2015). *Understanding motivation and emotion* (6th ed.). Hoboken, NJ: Wiley.
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Next lecture

- Extrinsic motivation and internalisation (Ch 05)
- Psychological needs (Ch 06)

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