Sensation and Perception

- **Sensation** is the stimulation of a sensory receptor which produces neural impulses that the brain interprets as a sound, visual image, odor, taste, pain, etc. Sensation occurs when sensory organs absorb energy from a physical stimulus in the environment. Sensory receptors then convert this energy into neural impulses and send them to the brain.

- **Perception** (from the Latin *perceptio, percipio*) is the organization, identification and interpretation of sensory information in order to represent and understand the environment (*how our brain*
The laws of perceptual organization
The Laws of Perceptual Organization

Each of the laws deals with how the mind has a tendency to fill in missing information.

- **Similarity** deals with how similar objects are grouped together.
- **Pragnanz** is how people usually simplify reality as much as possible.
- **Proximity** is how objects that are closest to each other are usually grouped together.
- **Good continuation / Continuity** is the tendency of the mind to prefer smooth lines, therefore lines are usually seen as following the smoothest path.
- **Closure** is how objects that are impartial and grouped together are usually seen as whole.
Illusions
Attention
Attention

- **Attention** is the cognitive process of selectively concentrating on one aspect of the environment while ignoring other things. Attention has also been referred to as the allocation of processing resources.
- Overt attention is the act of directing sense organs towards a stimulus source.
- Covert attention is the act of mentally focusing on one of several possible sensory stimuli.
Spotlight model
• **Bottom-up** processing, also known as stimulus-driven attention or exogenous attention. These describe attentional processing which is driven by the properties of the objects themselves. Some processes, such as motion or a sudden loud noise, can attract our attention in a pre-conscious, or non-volitional way. We attend to them whether we want to or not. These aspects of attention are thought to involve parietal and temporal cortices, as well as the brainstem
Top-down processing, also known as goal-driven, endogenous attention, attentional control or executive attention. This aspect of our attentional orienting is under the control of the person who is attending. It is mediated primarily by the frontal cortex and basal ganglia as one of the executive functions. Research has shown that it is related to other aspects of the executive functions, such as working memory and conflict resolution and inhibition.
Features of attention

- Selection of the information source (selective attention)
- **Attention span** is the amount of time that a person can concentrate on a task without becoming distracted
- **Attentional control** refers to individuals' capacity to choose what they pay attention to and what they ignore
- **Attentional shift** is the process by which information that is currently relevant in the mind is replaced by other information. This information is typically sensory in nature but may also be semantic.
- **Vigilance**, also termed sustained attention is defined as the ability to maintain attention and alertness over prolonged periods of time
- **Visual search** is a type of perceptual task requiring attention that typically involves an active scan of the visual environment for a particular object or feature (the target) among other objects or features (the distractors).
Find the orange square
Memory

1. Sensoric memory
2. Short term memory / Working memory
3. Long term memory
Sensoric Memory

- Sensoric Memory is considered to be outside of cognitive control and is instead an automatic response. The information represented in SM is the "raw data" which provides a snapshot of a person's overall sensory experience.
- Types: iconic, echoic, haptic …
Short-term memory (STM)

- Capacity for holding a small amount of information in mind in an active, readily available state for a short period of time
- 7 +/- 2 elements
- Chunking is a process by which a person organizes material into meaningful groups
Working memory

- System which actively holds multiple pieces of transitory information in the mind when needed for verbal and nonverbal tasks such as reasoning and comprehension, and to make them available for
Central executive

- **Executive functions** is an umbrella term for cognitive processes such as planning, working memory, attention, problem solving, verbal reasoning, inhibition, mental flexibility, multi-tasking, and initiation and monitoring of actions. The **executive system** is a theorized cognitive system in psychology that controls and manages other cognitive processes. It is responsible for processes that are sometimes referred to as executive functions, **executive skills**, **supervisory attentional system**, or **cognitive control**.
Long-term memory (LTM)

- Memory in which associations among items are stored
- “no limit”
- Encoding, storing, recalling

**Stages of Memory**

1. **Encoding**
2. **Storage**
3. **Retrieval**
Semantic memory
Principles of memory

- **Elaboration principle**: a new information is stored easier, if it suits previous knowledge
- **Organization principle**: a new information is stored easier, if it can be connected with other information
- **Time dependance principle**: an information is stored worse, if the time since it was encoded is longer
- **Clue-dependance principle**: its easier to retrieve information, if the clues are appropriate
- **Encoding specificity principle**: informations associated with encoding stage also helps retrieving
- **Schema-processing principle**: a new information is stored better, if it suits current schema
- **Reconstruction principle**: while retrieving, an information is reconstructed from different memories, sources and emotions
Future

- Inability to form new memories.

Anterograde amnesia

- Time point of brain injury

Old memories

- Inability to access old memories. Retrograde amnesia may be incomplete with older memories being accessible, while more recent memories are not.
Information processing is the change (processing) of information in any manner detectable by an observer.

- **Central executive**
  - Conscious part of the mind
  - Coordinates incoming information
  - Controls attention
  - Selects, applies and monitors the effectiveness of strategies

- **Sensory register**
  - Represents sights and sounds directly and store them briefly

- **Working and short-term memory**
  - Holds limited amount of information that is worked on to facilitate memory and solve problems

- **Long-term memory**
  - Stores information permanently
Intelligence
Intelligence

- Abstract thought, understanding, self-awareness, communication, reasoning, learning, having emotional knowledge, retaining, planning, and problem solving
- Latin „Intelligere”, derives from inter-legere meaning to "pick out" or discern, distinguish, recognize
- Hierarchical (G factor) and non-hierarchical models
The story of g

- Ch. Spearman – general intelligence factor „g”
- Fluid Intelligence (Gf): includes the broad ability to reason, form concepts, and solve problems using unfamiliar information or novel procedures.
- Crystallized Intelligence (Gc): includes the breadth and depth of a person's acquired knowledge, the ability to communicate one's knowledge, and the ability to reason using previously learned experiences or procedures.
Carroll’s model

Strength of relationship with “g”

General intelligence “g”

Fluid int.  Crystallized int.  General memory and learning  Broad visual perception  Broad auditory perception  Broad retrieval perception  Broad cognitive speed  Processing speed

Specific factors

Eg. Reaction time
Sternberg’s triarchic theory

**Analysisal intelligence**
- Apply strategies
- Acquire task – relevant and metacognitive knowledge
- Engage in self-regulation

**Creative intelligence**
- Solve novel problems
- Make processing skills automatic to free working memory for complex thinking

**Practical intelligence**
- Adapt to …
- Shape … and/or
- Select …
- Environments to meet both personal goals and the demands of one’s everyday world
Gardner's theory of intelligence(s)

- **Linguistic Intelligence**: Sensitivity to the sounds, rhythms and meaning of words and the functions of language.

- **Logical-Mathematics Intelligence**: Sensitivity to, capacity to detect, logical or numerical patterns; ability to handle long chains of reasoning; a scientific ability.

- **Spatial Intelligence**: The ability to form a mental model of a spatial world and to be able to maneuver and operate using that model.

- **Musical Intelligence**: Ability to produce and appreciate pitch, rhythm or melody, aesthetic quality of the forms of musical expressiveness.
Gardner’s theory of intelligence(s)

- **Bodily-kinesthetic intelligence**: The ability to solve problems or to fashion products using one's whole body, or parts of the body; to handle objects skillfully. For example, dancers, athletes, surgeons, craftspeople, etc.

- **Interpersonal intelligence**: The ability to see things from the perspective of others, or to understand people in the sense of empathy (their moods, temperaments, motives, intentions). Strong interpersonal intelligence would be an asset in those who are teachers, politicians, clinicians, religious leaders, etc.

- **Intrapersonal intelligence**: Ability to discriminate complex inner feelings and use them to guide one's
Psychometrics

- A theory of psychological testing
- Measuring of intelligence - Intelligence quotient (IQ)
- The most popular tests: Stanford-Binet, Raven's Progressive Matrices, the Wechsler Adult Intelligence Scale
- „An intelligence is what intelligence tests measure”
- Normal distribution for IQ
Thank you for your attention (and perception, memory, intelligence)