

# Cognitive Neuroscience for AI Developers (CNAID)

SS 2023

## Week 2, The psychological approach of Cognitive Science

Supervisor Achim Schilling

### Multiple Choice Exercise

(Please mark the right answer with a cross. Only one answer is correct!)

Q1: Which statement on psychology is correct?

- ☐ Psychology exclusively studies internal events (e.g. perception) but does not investigate external events (behavior) False: Psychology also investigates behavior -> e.g. in Behaviorism
- ☐ Since the late 19<sup>th</sup> century there was an overarching theory and framework in psychology False: Different theories and approaches
- ☒ In modern psychology the scientific method is applied True
- ☐ Psychology is a young discipline compared to robotics False: old, but young compared to philosophy
- ☐ Since the late 19<sup>th</sup> century psychologists stopped to apply introspection as method to gain scientific insight False: see Voluntarism and Structuralism

Q2: Which statement on the scientific method is **not** true?

- ☐ From a general theory a specific hypothesis is derived, which is then tested in an experiment True
- ☒ The independent variable is the parameter that is measured in the experiment False: dependent variable is measured
- ☐ Systematic errors have to be prevented by randomization and counterbalancing True
- ☐ Systematic errors are not regarded in inferential statistics (e.g. t-tests) True
- ☐ In experiments at least two groups have to be compared (experimental group and control group) True

Q3: Which statement on IQ-tests is **not** true?

- ☐ In the early 20<sup>th</sup> century the IQ-test was developed under the assumption that intelligence is innately endowed and does not change over time True
- ☐ Historic IQ-tests had a strong cultural bias True: see example with coins
- ☒ IQ-tests are well suited to measure all forms of intelligence (linguistic intelligence, musical intelligence, social intelligence etc.) False: IQ is just one number
- ☐ Some portion of general intelligence is not innate and can be improved True: when people are put into supportive environment
- ☐ A major criticism of IQ tests is that intelligence cannot be represented in a single number True

Q4: Which statement on psychological Voluntarism, Structuralism and Functionalism is **not** true?

- ☐ In analogy to chemical elements the Voluntarists wanted to create a periodic table of mental elements True
- ☐ The main method of Voluntarists and Structuralists was introspection True
- ☐ In contrast to Voluntarism in Structuralism subjects were trained on performing introspection to improve the scientific rigor True
- ☐ Functionalism is the precursor of evolutionary psychology True
- ☒ Structuralism describes the mind as a stream of consciousness False: Functionalism

Q5: Which statement on Gestalt psychology and psychoanalytic psychology is **not** true?

- Gestalt psychology is a counterreaction to Voluntarism and Structuralism **True**
- Main method of Gestalt psychology is phenomenology **True**
- Max Wertheimer defined the principles of visual perceptual organization **True**
- Sigmund Freud proposed the three-tiered system of consciousness (unconscious, pre-conscious, conscious) **True**
- ✗ **The superego is the mental structure, which always tries to maximize pleasure** **False: the id**

Q6: Which statement on Behaviorism is **not** true?

- Behaviorism was highly influenced by animal research (animal experiments were performed) **True: e.g. Pavlov's Dog**
- Behaviorism rejected introspection **True**
- The Skinner box is a tool to investigate operant conditioning **True: reinforcement and punishment**
- Behaviorists assume the mind as a black box and investigate the behavioral responses of subjects after presenting a stimulus **True**
- ✗ **Pavlov's dog is an example for operant conditioning** **False: classical conditioning (new stimulus)**

## Discussion Exercise

### The McGurk effect

"MOST verbal communication occurs in contexts where the listener can see the speaker as well as hear him. However, speech perception is normally regarded as a purely auditory process. The study reported here demonstrates a previously unrecognised influence of vision upon speech perception. It stems from an observation that, on being shown a film of a young woman's talking head, in which repeated utterances of the syllable [ba] had been dubbed on to lip movements for [ga], normal adults reported hearing [da]. [...]" "When these subjects listened to the soundtrack from the film, without visual input, or when they watched untreated film, they reported the syllables accurately as repetitions of [ba] or [ga]. Subsequent replications confirm the reliability of these findings; they have important implications for the understanding of speech perception." (McGurk and McDonald, 1976)

McGurk, H., & MacDonald, J. (1976). Hearing lips and seeing voices. *Nature*, 264(5588), 746-748.

This is the abstract of a very important paper on multi-modal perception and integration. Please discuss this abstract in the light of the scientific method.

- 1) Please explain which variable is the dependent and independent variable.
- 2) What is the theory and what is the hypothesis?

**1) Dependent variable:** The syllable people understand in single experiment ([ba] or [ga]).

**Independent variable:** **control 1:** only auditory stimulus, **control 2:** both stimuli that do **not** contradict each other, **experimental group:** both stimuli that contradict each other.

**2) Theory:** The mind uses auditory system as well as visual system to understand speech resp. language (multi-modal integration). Speech understanding is not a pure auditory process.

**Hypothesis:** Coincident presentation of visual input contradicting the auditory input has an effect on speech understanding.

Auditory: [ba], Visual: [ga] -> people understand [da]