Typical & Atypical Cognitive Development

Unit 5. Recap & Preparing for Exam

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RECAP & PREPARING FOR EXAM

- Today‘s assignment
  - Reflecting key messages of each of the previous units
  - Finding answers to corresponding key questions
- Exam next week
  - Form available at https://seasense.github.io on 20th April 2019
  - Answers to be sent to paul.seitlinger@tlu.ee by 10th May the latest
- Final assessment
    - Homework
      - 5 reflections: 15 points
      - 3 (compulsory) reading assignments: 9 points
    - Exam: 16 points
    - Maximum: 40 points

UNIT 0: INTRODUCTION TO BIOLOGICAL CONSTRAINTS OF COGNITIVE DEVELOPMENT

- **Key messages**
  - Much of neural development
    - is postponed until after birth.
    - consists in the development of efficient communication between neurons (within cell circuits) and increasingly specialized brain areas (of large-scale brain networks).
  - Examples of biological mechanisms involved are synaptogenesis, myelination, and synaptic pruning.
- **Key question**
  - Why does the phenomenon of synaptic pruning indicate that fundamental learning mechanisms take place as an interaction of biological and environmental factors?

UNIT 1: TRANSACTIONAL MODEL OF GENE-ENVIRONMENT INTERACTIONS

- **Key messages**
  - Cognitive development can be understood as an interplay of maturation and learning.
  - Results of behavior genetics can be interpreted meaningfully, only if context variables, such as socio-economic status or age, are taken into account.
- **Key questions**
  - Maturation
    - Which processes mediate between genetically encoded information and protein synthesis?
    - What is *gene expressivity*?
  - Learning
    - How can we describe classical conditioning in biological terms?
    - What is the learning rule of Hebb?
  - Which logic (in research on behavior genetics) underlies the estimation of h^2, c^2, and e^2?
  - Which conditions help an individual fulfill her or his genetic potential?

UNIT 2: THEORIES OF COGNITIVE DEVELOPMENT

- **Key messages**
  - Piaget suggests that children progress through different stages of increasing intellectual sophistication: sensory-motor, preoperational, concrete-operational, and formal-operational.
  - Contemporary approaches, such as Neo-Piagetian theories and the framework of Neuroconstructivism, aim to explain the mechanisms underlying this developmental progress.
- **Key questions**
  - Why does the controversy between empiricism and nativism continue in the context of Neo-Piagetian theories?
  - Which levels of observation are taken into account by the neuroconstructivism and which sources of constraints on cognitive development are associated with these levels?

UNIT 3: INDIVIDUAL DIFFERENCES IN COGNITIVE DEVELOPMENT

- **Key messages**
  - On a neuro-physiological level, executive functions (EF) are sub-served by a large-scale brain network spanning prefrontal and parietal regions.
  - The strength of fronto-parietal connections increases from infancy to adulthood. The improvement of this “communication structure” goes hand in hand with EF improvements.
  - Extensive engagement in cognitively demanding activities, such as learning to read, can increase a child’s performance in tasks on EF.
- **Key questions**
  - Which EF sub-functions are typically distinguished in the corresponding research literature and what are typical instruments to measure each of them?
  - Which of these sub-functions contributes most to the prediction of a child’s reading comprehension skills?
  - Which “sources of constraints” (as proposed within the framework of neuroconstructivism) help us understand the reciprocal relations between reading comprehension and EF?

UNIT 4: NEUROPHYSIOLOGICAL CORRELATES & TRAINING OF EXECUTIVE FUNCTIONS

- **Key messages**
  - Positive EF training effects on a behavioral level (performance in EF tests) are reflected on a neurophysiological level in form of an increased fronto-parietal brain activation.
  - Training programs that implement a certain set of empirically validated principles can improve EF.
- **Key questions**
  - Why does the neuroconstructivist concept of *interactive specialization* help us understand the neurophysiological effects of effective EF training programs?
  - Which of the above mentioned principles are easily implementable by a computer-based cognitive training on the one hand and physical exercises (integrating mindfulness) on the other hand?