

## Higher Cognitive Functions, 7.5 Credits

### *Course description*

The course will present central theoretical and empirical issues related to higher cognitive functions with a specific focus on cognitive control functions. These control functions, often referred to as executive functions, are assumed to mediate goal-directed behavior and involve planning, coordination and updating of complex intentions. Executive control functions are also central to most higher mental activities, including abstract thinking and problem solving, autobiographic memory, self-image, and social interactions. A variety of neuropsychiatric disorders are associated with impairments and deficits in these functions. Another aim of the course is to examine different forms of higher cognitive functions by focusing on the relation among executive functioning, attention, decision making, memory and metacognition. The course will deal with individual and developmental differences in executive control functions. The course also aims at elucidating the interplay between emotional and cognitive control and their underlying neural mechanisms.

### *Course Objectives*

After completing the course, students should be better able to analyse and critically reflect on central issues of higher cognitive functions. Students are also expected to gain deeper understanding of: executive functions and their relation to other higher cognitive functions, construct validity and measurement problems within the research area, emotional control and their relation to higher cognitive functions, and developmental trends in executive control function.

### *Course Requirements:*

The course consists of lectures, seminars and exercises. To reach the course objectives, students need to attend and participate in all seminars as follows:

- (a) *Contribution to seminars.* In addition to active participation, students are expected to generate 3-5 questions prior to each seminar. The purpose of these questions is to ensure that you have actually read the papers that have been assigned, and to help raise issues for the discussion. You should submit (upload) your questions to the Athena course web by noon the day before the seminar.
- (b) *Leading the discussion.* At each seminar, 1-2 students have the role of Discussants by organizing and leading the group discussion. Discussants will primarily summarize the key points to be extracted from the seminar articles and chair the session by presenting central issues raised by the members of the group. Note that Discussants will lead the seminar, but everyone in the group is responsible for contributing to the seminar. Discussants do not need to submit questions for their seminars.

### *Examination*

The examination is based on each student's contribution during the seminars, with max 2 points/seminar (2 = good, 1 = pass, and 0 = fail/missed seminar (i.e., 6 seminar x max 2p = 12p). In addition to the seminars, students may earn a higher grade (than the max 12 p) by completing a final examination. This written examination is not mandatory, but participation should be registered before the deadline. The examination will be based on the contents of all seminars, including the supplementary articles (\*see below). The maximum score of the written exam is 8 p, and the max score for the whole course is 20 p as summarized below:

Seminars	6 x	0-2p (= max)	12
Written exam		max	8
		Total max	20
Final grade	A	>18	
	B	≥18	
	C	≥16	
	D	≥14	
	E	≥12	
	F	<12	

*Literature (preliminary)*

Articles (in pdf) and other course materials are available at Athena/HCF/Course literature. \*) Supplementary articles included in the written exam.

*HCF 1: Executive functioning*

Miyake et al. (2000). The unity and diversity of executive functions and their contributions to complex “frontal lobe” tasks: A latent variable analysis. *Cognitive Psychology*, 41, 49–10.

Miyake, A. & Friedman, N. P. (2012). The nature and organization of individual differences in executive functions. *Current Directions in Psychological Science*, 21, 8-14.

Benedek, M., Jauk, E., Sommer, M., Arendasy, M., & Neubauer, A. C. (2014). Intelligence, creativity, and cognitive control: The common and differential involvement of executive functions in intelligence and creativity. *Intelligence*, 46, 73-83.

\*Diamond, A. (2013). Executive functions. *Annual Review of Psychology*, 64, 135-68.

*HCF 2: Frontal lobe functions*

Buckner, R. L., & DiNicola, L. M. (2019). The brain’s default network: updated anatomy, physiology and evolving insights. *Nature Reviews Neuroscience*, 20(10), 593-608.

Duncan, J. (2010). The multiple-demand (MD) system of the primate brain: mental programs for intelligent behaviour. *Trends in cognitive sciences*, 14(4), 172-179.

Nee, D. E., Brown, J. W., Askren, M. K., Berman, M. G., Demiralp, E., Krawitz, A., & Jonides, J. (2013). A meta-analysis of executive components of working memory. *Cerebral cortex*, 23(2), 264-282.

\*Badre, D. & D’Esposito, M. Is the rostro-caudal axis of the frontal lobe hierarchical? *Nat Rev Neurosci* 10, 659-669, doi:10.1038/nrn2667 (2009).

*HCF 3: Emotional control*

Dolcos, F., & Denkova, E. (2014). Current emotion research in cognitive neuroscience: Linking enhancing and impairing effects of emotion on cognition. *Emotion Review*, 6, 362-375.

Gross, J. J. (2015). Emotion regulation: Current status and future prospects. *Psychological Inquiry*, 26, 1-26.

Inzlicht, M., Bartholow, B. D., & Hirsh, J. B. (2015). Emotional foundations of cognitive control. *Trends in Cognitive Sciences*, 19, 126-132.

\*Lerner, J. S., Li, Y., Valdesolo, P., Kassam, K. S. (2015). Emotion and decision making. *Annual Review of Psychology*, 66, 799-823.

*HCF 4: Developmental perspectives*

Doebel, S. (2020). Rethinking Executive Function and Its Development. *Perspectives on Psychological Science*, 15(4), 942–956. <https://doi.org/10.1177/1745691620904771>

Salthouse, T. A. (2004). What and when of cognitive aging. *Current directions in Psychological Science*, 13, 140-144.

Zanto, T. P., & Gazzaley, A. (2017). Cognitive Control and the Ageing Brain. In *The Wiley Handbook of Cognitive Control* (Issue 2017, pp. 476–490). John Wiley & Sons, Ltd. <https://doi.org/10.1002/9781118920497.ch27>

Bailey, R., & Jones, S. M. (2019). An Integrated Model of Regulation for Applied Settings. *Clinical Child and Family Psychology Review*, 22(1), 2–23. <https://doi.org/10.1007/s10567-019-00288-y>

\*Best, J., & Miller, P. (2010). A developmental perspective on executive function. *Child Development*, 81(6), 1641–1660. <https://doi.org/10.1111/j.1467-8624.2010.01499.x.A>

*HCF 5: Metacognition*

Koriat, A. (1997). Monitoring one's own knowledge during study: A cue-utilization approach to judgments of learning. *Journal of Experimental Psychology: General*, Vol 126(4), 126(4), 349–370.

\*Koriat, A., & Levy-Sadot, R. (1999). Processes underlying metacognitive judgments: Information-based and experience-based monitoring of one's own knowledge. In S. Chaiken & Y. Trope (Eds.), *Dual process theories in social psychology* (pp. 483-502). New York :Guilford Publications

Koriat, A., Bjork, R. A., Sheffer, L., & Bar, S. K. (2004). Predicting One's Own Forgetting: The Role of Experience-Based and Theory-Based Processes. *Journal of Experimental Psychology: General*, Vol 133(4), 133(4), 643–656.

Kornell, N., & Bjork, R. A. (2009). A stability bias in human memory: Overestimating remembering and underestimating learning. *Journal of Experimental Psychology: General*, Vol. 138(4), 138(4), 449–468.

*HCF 6: Judgment and decision making*

Del Missier, F., Mäntylä, T., & de Bruin, W. B. (2012). Decision-making Competence, Executive Functioning, and General Cognitive Abilities. *Journal of Behavioral Decision Making*, 25(4), 331–351. <https://doi.org/10.1002/bdm.731>

Hoppe, E. I., & Kusterer, D. J. (2011). Behavioral biases and cognitive reflection. *Economics Letters*, 110(2), 97–100. <https://doi.org/10.1016/j.econlet.2010.11.015>

Svenson, O., Gonzalez, N., & Eriksson, G. (2018). Different heuristics and same bias: A spectral analysis of biased judgments and individual decision rules. *Judgment and Decision Making*, 13(5). Retrieved from <http://eprints.whiterose.ac.uk/137562/>

Toplak, M. E., West, R. F., & Stanovich, K. E. (2011). The Cognitive Reflection Test as a predictor of performance on heuristics-and-biases tasks. *Memory and Cognition*, 39(7), 1275–1289. <https://doi.org/10.3758/s13421-011-0104-1>