

# Course syllabus

Course title	Developmental cognitive neuroscience
Instructor(s)	Przemysław Tomalski, Ph.D.
Contact details	Stawki 5/7 - Room 218, e-mail: p.tomalski@uw.edu.pl
Affiliation	University of Warsaw, Faculty of Psychology
Course format	seminar
Number of hours	30 hours
Number of ECTS credits	<b>3 ECTS credits</b>
Brief course description	<p>Infancy and early childhood is a period of most dramatic changes in brain organization. The majority of perceptual, motor and cognitive skills emerge during this period. A large proportion of our knowledge about the world is based on developmental achievements from this time.</p> <p>Throughout the course we will look at basic concepts and key studies in the area of Developmental Cognitive Neuroscience. That is, the study of associations between cognitive and brain development, with particular emphasis on changes in functional brain organization.</p>
Full course description	<p>The course introduces key concepts and ideas, as well as most important research evidence in developmental cognitive neuroscience. Throughout the course we will try to answer the most important question in this area of research – how does the brain specialise to perform specific functions? How do selected brain networks specialise for different cognitive tasks? What is the relationship between changes in brain activity and changes in the child's knowledge and skills?</p> <p>We will approach these questions by reviewing the principles of brain development and known theories of functional specialisation. We will then look at several domains of cognition and the development of their brain correlates. Finally, we will review few cases, where atypical biological constrains or atypical, adverse environment lead to atypical neurocognitive development of the child.</p>
Learning outcomes	<p>After the course student will:</p> <ul style="list-style-type: none"> <li>• know fundamental processes of structural and functional brain development (K_W02, K_W05)</li> <li>• understand the complex relationships between biologically-driven mechanisms and experience-dependent processes (K_W02, K_W05)</li> <li>• be able to explain basic concepts related to neurocognitive development (experimental paradigms, research methods) (K_W02, K_W05)</li> <li>• be able to explain, using examples, the relationships between selected domains of cognitive development and changes in functional brain networks (K_U07, K_U08)</li> <li>• be able to explain atypical and abnormal development in terms of developmental trajectories of neural systems (K_K02, K_K07)</li> <li>• be able to communicate acquired knowledge of functional brain development in English (K_U09, K_K02)</li> <li>• be able to independently collate and critically evaluate original research papers in</li> </ul>

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English from the area of developmental cognitive neuroscience (K\_U01, K\_U07, K\_U08)

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Learning activities and teaching methods      Short presentations by the lecturer; Group discussions; Small group activities; Independent study and essay writing.

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List of topics/classes and bibliography      Full list of topics with literature:

Obligatory textbook in full:  
Johnson M. & de Haan M. (2015). *Developmental Cognitive Neuroscience*, 4th Ed. Oxford: Wiley. (available online for UW students at Dawsonera)

1. Developmental change. Biological constraints on brain development. Interactive specialisation. DCN Chapter 1-4
2. Vision. DCN Chapter 5
3. Orienting & attention. DCN Chapter 5
4. Perceiving and acting in a world of objects.  
Kaufman, J., Csibra, G., & Johnson, M. H. (2005). Oscillatory activity in the infant brain reflects object maintenance. *Proceedings of the National Academy of Sciences of the United States of America*, 102(42), 15271–4. <http://doi.org/10.1073/pnas.0507626102>
5. Acting on objects and moving  
Adolph, K. E., & Hoch, J. E. (2019). Motor Development: Embodied, Embedded, Enculturated, and Enabling. *Annual Review of Psychology*, 70(1), 141–164. <https://doi.org/10.1146/annurev-psych-010418-102836>
6. Social brain I. Face processing.  
Johnson, M. H., Senju, A., & Tomalski, P. (2015). The two-process theory of face processing: Modifications based on two decades of data from infants and adults. *Neuroscience & Biobehavioral Reviews*, 50, 169–179. <http://doi.org/10.1016/j.neubiorev.2014.10.009>
7. Social brain II.  
Blakemore, S.-J., & Mills, K. L. (2014). Is adolescence a sensitive period for sociocultural processing? *Annual Review of Psychology*, 65, 187–207. <http://doi.org/10.1146/annurev-psych-010213-115202>
8. Emerging language.  
Skeide, M. A., & Friederici, A. D. (2016). The ontogeny of the cortical language network. *Nature Reviews Neuroscience*, 17(5), 323–332. <http://doi.org/10.1038/nrn.2016.23>
9. Learning & Memory. DCN Chapter 8
10. Prefrontal cortex, planning, working memory. DCN Chapter 10
11. Atypical neurodevelopment. DCN Chapter 2

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12. Early adverse environment.

Tomalski, P., & Johnson, M. H. (2010). The effects of early adversity on the adult and developing brain. *Current Opinion in Psychiatry*, 23(3), 233–8. <http://doi.org/10.1097/YCO.0b013e3283387a8c>

Farah M.J. (2018). Socio-economic status and the brain: prospects for neuroscience-informed policy. *Nature Reviews Neuroscience*, 19(7), 428-438. Doi: 10.1038/s41583-018-0023-2.

13. Multisensory processing.

Murray, M. M., Lewkowicz, D. J., Amedi, A., & Wallace, M. T. (2016). Multisensory Processes: A Balancing Act across the Lifespan. *Trends in Neurosciences*, (June 2016). <http://doi.org/10.1016/j.tins.2016.05.003>

14. Atypical cortical organisation.

Siuda-Krzywicka, K., Bola, Ł., Paplińska, M., Sumera, E., Jednoróg, K., Marchewka, A., ... Szwed, M. (2016). Massive cortical reorganization in sighted braille readers. *eLife*, 5(MARCH2016), 1–26. <http://doi.org/10.7554/eLife.10762>

15. Summary. Neuroconstructivism.  
DCN Chapter 13-14

Assessment methods and criteria	Short essay (20%) Final test (80%)
Attendance rules	2 unexcused absences are allowed. Students may submit short written work to make up for up to 2 additional missed classes.
Prerequisites	Basic knowledge of neuroanatomy and cognitive neuroscience.
Academic honesty	Students must respect the principles of academic integrity. Cheating and plagiarism (including copying work from other students, internet or other sources) are serious violations that are punishable and instructors are required to report all cases to the administration.
Remarks	None