Cognitive Neuropsychology: From Patients to Functional Models

Coordinators: Prof. Dr. Albert Postma and Dr. Teuni ten Brink, Experimental Psychology, Helmholtz Institute, Utrecht University

Summerschool 2022 – beginning and advanced PhD student course. As an advanced training in Cognitive Neuropsychology, the course aims to teach PhD students how to collect and interpret patient data in order to test cognitive theories and build cognitive models. The emphasis will be on 'doing research'. Candidates will get an acquaintance with standard neuropsychological testing, will be shown examples of patients cases, case statistics and will build, run and analyse their own experiment. A special training in reviewing and reporting is included.

Cognitive Neuropsychology studies the functional disorders people suffer after brain injury in order to construct and test formal models of cognitive functioning. It is strongly driven by fundamental theory but also can have implications for clinical diagnosis and therapy. Cognitive Neuropsychology gives invaluable insights in how the human mind works and forms an indispensable instrument in the modern Cognitive Neuroscience toolbox.

Cognitive Neuropsychology has strongly been inspired by fascinating reports of patients such as Broca's mister 'Tan', who could only utter a single world after frontal lobe ailment, and the tragic case of Henry Molaison who, following medio-temporal lobe surgical removal to treat epilepsy, could no longer remember any new events happening in his life. Studies with comparable groups of patients have further stimulated the field of cognitive neuropsychology

The course spans 10 full days of lectures and practical work, in which cognitive neuropsychology research examples and methods are discussed. Students have to do a

short research project, including setting up and trying out their own cognitive neuropsychology experiment, and complete a number of writing assignments. Senior, international cognitive neuropsychologists give lectures and supervision.

The course will address history and methodology of cognitive neuropsychology research; statistical techniques; examinations in large clinical groups; disorders such as topographical amnesia, visuospatial neglect; amnesia.

After this course, PhD candidates:

a) will have gained new insights and skills in how to conduct cognitive neuroscience research,

b) are able to read, evaluate and integrate in their own research, recent literature from the field of cognitive, clinical and applied neuropsychology, and

c) can directly strengthen their own PhD projects with new analytic and experimental approaches.

Schedule

Active student participation: Students have to conduct their own mini cognitive neuropsychology research project, requiring them to think further about the ins and outs of patient research, to design new experiments or make new combinations of neuropsychological tests, and to write a research paper and review other papers from the domain of cognitive neuropsychology. Active participation is thus highly stimulated.

This is a hybrid course. In principle, it is fully taught on location in the city of Utrecht. Attending online only is also a possibility. For the social part and the experience to be at Utrecht University we recommend to come to campus, but this is no requirement.

All meetings will take place at Utrecht Science Park*. The rooms are available for the attendees from 9am to 5pm.

Notice at the times during which no central meeting has been planned, you can work either on your own (reading, writing, analysing) or plan a meeting with your own group.

Day 1　　　　**Prof. Albert Postma (SGG - C020)**　　　　　　　**4-7-2022**

10-12am　　Lecture: The fascinating cases of Monsieur Tan and H.M.: An Introduction to cognitive neuropsychology.

Groups are made of 3-4 students. Each group receives global description of a hypothetical cognitive disorder. They have to choose a number of suitable existing neuropsychological instruments in order to screen this disorder and/or assess background functioning. Moreover, they have to construct their own specific experiment to directly asses the cognitive function under scrutiny.

Methodological topics: dissociations; converging operations and causality; single cases vs groups; importance of checking background variables.

Literature

Caramazza, A. (1992). Is Cognitive Neuropsychology Possible? Journal of Cognitive Neuroscience, 4(1), 80–95. https://doi.org/10.1162/jocn.1992.4.1.80

Farah, M. J. (1994). Neuropsychological inference with an interactive brain: A critique of the "locality" assumption. Behavioral and Brain Sciences, 17(1), 43–61. https://doi.org/10.1017/S0140525X00033306

Kosslyn, S. M., & Intriligator, J. M. (1992). Is Cognitive Neuropsychology Plausible? The Perils of Sitting on a One-Legged Stool. Journal of Cognitive Neuroscience, 4(1), 96–105. https://doi.org/10.1162/jocn.1992.4.1.96

1-3.30pm　　Group work: collect additional literature; design the study.

3.30-5pm　　Seminar: present design & discuss.

Day 2　　　　**Dr. Teuni ten Brink (SGG - C020)**　　　　　　　**5-7-2022**

10-12am　　Lecture: Rehabilitation of visuospatial neglect – The need for replication

Methodological topics: randomized controlled trial, replication, pre-registration, and meta-analysis.

Literature

McIntosh, R. D., Brown, B. M. A., & Young, L. (2019). Meta-analysis of the visuospatial aftereffects of prism adaptation, with two novel experiments. Cortex, 111, 256–273. https://doi.org/10.1016/j.cortex.2018.11.013

Day 3 **Prof. Muireann Irish (SGG - C020)** **6-7-2022**

9-11am   Lecture: The future of memory – what have we learned from the dementias?

This lecture will be provided online and can be watched together from Utrecht Science Park or from home

Literature

Irish, M., & Piguet, O. (2013). The pivotal role of semantic memory in remembering the past and imagining the future. Frontiers in Behavioral Neuroscience, 7(MAR), 1–11. https://doi.org/10.3389/fnbeh.2013.00027

Renoult, L., Irish, M., Moscovitch, M., & Rugg, M. D. (2019). From Knowing to Remembering: The Semantic–Episodic Distinction. Trends in Cognitive Sciences, 23(12), 1041–1057. https://doi.org/10.1016/j.tics.2019.09.008

Further reading

Irish, M., Addis, D. R., Hodges, J. R., & Piguet, O. (2012). Considering the role of semantic memory in episodic future thinking: Evidence from semantic dementia. Brain, 135(7), 2178–2191. https://doi.org/10.1093/brain/aws119

Irish, M., Hodges, J. R., & Piguet, O. (2013). Episodic future thinking is impaired in the behavioural variant of frontotemporal dementia. Cortex, 49(9), 2377–2388. https://doi.org/10.1016/j.cortex.2013.03.002

Irish, M., Mothakunnel, A., Dermody, N., Wilson, N. A., Hodges, J. R., & Piguet, O. (2017). Damage to right medial temporal structures disrupts the capacity for scene construction—a case study. Hippocampus, 27(6), 635–641. https://doi.org/10.1002/hipo.22722

Day 4 **Prof. Muireann Irish (SGG - C020)** **7-7-2022**

9-11am   Consultancy time with Prof. Muireann Irish. Each group briefly presents their intended study.

The consultation will be online and can be attended together at Utrecht Science Park or from home

1-4:30pm   Group work: complete experimental task; give global description of the test procedure to the other group who forms the test population. On the basis of the other group's description & presentation, prepare performance. One member should try to act as the disordered patient. The other members are closely matched controls.

4:30-7pm   Optional: Grand Opening Summer School 2022 at the Centraal Museum Utrecht

Day 5   Prof. Muireann Irish (SGG - C020)   8-7-2022

9-11am   Lecture: Try to see it my way - Social cognition in frontotemporal dementia

This lecture will be provided online and can be watched together from Utrecht Science Park or from home

Literature

Shaw, S. R., El-Omar, H., Roquet, D., Hodges, J. R., Piguet, O., Ahmed, R. M., … Irish, M. (2021). Uncovering the prevalence and neural substrates of anhedonia in frontotemporal dementia. Brain, 144(5), 1551–1564. https://doi.org/10.1093/brain/awab032

Strikwerda-Brown, C., Ramanan, S., & Irish, M. (2019). Neurocognitive mechanisms of theory of mind impairment in neurodegeneration: A transdiagnostic approach. Neuropsychiatric Disease and Treatment, 15, 557–573. https://doi.org/10.2147/NDT.S158996

Further reading

Irish, M., Hodges, J. R., & Piguet, O. (2014). Right anterior temporal lobe dysfunction underlies theory of mind impairments in semantic dementia. Brain, 137(4), 1241–1253. https://doi.org/10.1093/brain/awu003

Strikwerda-Brown, C., Ramanan, S., Goldberg, Z. L., Mothakunnel, A., Hodges, J. R., Ahmed, R. M., … Irish, M. (2021). The interplay of emotional and social conceptual processes during moral reasoning in frontotemporal dementia. Brain, 144(3), 938–952. https://doi.org/10.1093/brain/awaa435

1-5pm   Group work: data collection (run experiments) and analyses

Day 6   Prof. Olaf Blanke (SGG - C020)   11-7-2022

10-12am   Lecture: Multisensory and cognitive mechanisms of bodily self-consciousness

Literature

Review: Blanke, O., Slater, M., & Serino, A. (2015). Behavioral, Neural, and Computational Principles of Bodily Self-Consciousness. Neuron, 88(1), 145–166. https://doi.org/10.1016/j.neuron.2015.09.029

Noel, J. P., Pfeiffer, C., Blanke, O., & Serino, A. (2015). Peripersonal space as the space of the bodily self. Cognition, 144, 49–57. https://doi.org/10.1016/j.cognition.2015.07.012

Moon, H. J., Gauthier, B., Park, H. D., Faivre, N., & Blanke, O. (2022). Sense of self impacts spatial navigation and hexadirectional coding in human entorhinal cortex. Communications Biology, 5(1), 1–12. https://doi.org/10.1038/s42003-022-03361-5

1-3.30pm   Group work: discuss how to write a short paper on the collected data. Incorporate your findings in a new model on cognitive functioning.

3.30-5pm   Consultancy time with Prof. Olaf Blanke. Each group briefly explains their experiments and findings and gets feedback on how to deal with this.

Day 7   Prof. Olaf Blanke (LANGEVELD - G224)   12-7-2022

10-12am   Lecture: Complex hallucinations and cognitive impairments in Parkinson's disease

Literature

Clinical case: Arzy, S., Seeck, M., Ortigue, S., Spinelli, L., & Blanke, O. (2006). Induction of an illusory shadow person. Nature, 443(7109), 287–287. https://doi.org/10.1038/443287a

Robotics: Blanke, O., Pozeg, P., Hara, M., Heydrich, L., Serino, A., Yamamoto, A., ... Rognini, G. (2014). Neurological and robot-controlled induction of an apparition. Current Biology, 24(22), 2681–2686. https://doi.org/10.1016/j.cub.2014.09.049

Recent work on Parkinson's disease: Bernasconi, F., Blondiaux, E., Potheegadoo, J., Stripeikyte, G., Pagonabarraga, J., Bejr-Kasem, H., ... Blanke, O. (2021). Robot-induced hallucinations in Parkinson's disease depend on altered sensorimotor processing in fronto-temporal network. Science Translational Medicine, 13(591), 1–13. https://doi.org/10.1126/scitranslmed.abc8362

1-2pm   Group work: prepare presentation.

2-5pm   Clinical excursion to Bartimeus (including cycling)

Day 8   Prof. Albert Postma (RUPPERT – 116)   13-7-2022

10-12am   Lecture: Finding and Loosing things: the neuropsychology of spatial memory.

Methodological topics: single patients against larger control group or against two or three other patients (Crawford statistics), non-inferiority design, lesion overlap methodology, voxel based lesion symptom mapping.

Literature

Biesbroek, J. M., van Zandvoort, M. J. E., Kuijf, H. J., Weaver, N. A., Kappelle, L. J., Vos, P. C., … Postma, A. (2014). The anatomy of visuospatial construction revealed by lesion-symptom mapping. Neuropsychologia, 62, 68–76. https://doi.org/10.1016/j.neuropsychologia.2014.07.013

van Asselen, M., Kessels, R. P. C., Frijns, C. J. M., Jaap Kappelle, L., Neggers, S. F. W., & Postma, A. (2009). Object-location memory: A lesion-behavior mapping study in stroke patients. Brain and Cognition, 71(3), 287–294. https://doi.org/10.1016/j.bandc.2009.07.012

Crawford, J., & Howell, D. C. (1998). Comparing an Individual's Test Score Against Norms Derived from Small Samples. The Clinical Neuropsychologist, 12(4), 482–486. https://doi.org/10.1076/clin.12.4.482.7241

Crawford, J. R., & Garthwaite, P. H. (2007). Comparison of a single case to a control or normative sample in neuropsychology: Development of a Bayesian approach. Cognitive Neuropsychology, 24(4), 343–372. https://doi.org/10.1080/02643290701290146

2-4pm   Seminar: presentations. Presentations should include a) case description, b) design, c) results, and d) conclusion.

Day 9   Prof. Albert Postma & Dr. Teuni ten Brink (SGG - C020)   14-7-2022

9am-1pm   Group work: write a short paper on the collected data. Incorporate your findings in a new model on cognitive functioning.

2pm-5pm   Individual assignment: write a review of paper by one of the other groups

Day 10   Prof. Albert Postma & Dr. Teuni ten Brink (SGG - C020)   15-7-2022

3-5pm   Seminar: feedback reviews, editorial decision on papers

Literature
Arns, M. (2014). Open access is tiring out peer reviewers. Nature, 515(7528), 467–467. https://doi.org/10.1038/515467a

http://www.elsevier.com/journals/cortex/0010-9452/guide-for-authors#2000

https://www.elsevier.com/__data/promis_misc/PROMIS%20pub_idt_CORTEX%20Guidelines_RR_29_04_2013.pdf

5-7pm   Closure & drinks

In the coffee room of the Langeveld Building (Heidelberglaan 1)

* Utrecht Science Park locations

SGG   = Sjoerd Groenmangebouw, Padualaan 14, 3584 CH Utrecht

LANGEVELD = Martinus J. Langeveldgebouw, Heidelberglaan 1, 3584 CS Utrecht

RUPPERT   = Martinus Ruppert gebouw, Leuvenlaan 21, 3584 CE Utrecht