

The HealthPAC project received its funding from the EU 7th Framework Programme Marie-Curie FP7-PEOPLE-2013-ITN under IDP Grant agreement nr. 604063



Name ESR and number in HP: Anna Geuzebroek, ESR06

Nationality: Dutch

Research work-package (select): WP 5 (SEE)

Starting date ESR: 01-09-2014

Supervisor and co-supervisor: Albert van der Berg and Jeroen Goossens

Host-institution - Department: RUN - CNS

RESEARCH

RESEARCH PROJECTS AND RESULTS FROM **01/01/2014** UNTIL **31/12/2017** *(use 1-2 pages)*
(for each project give title, its goal(s), the main results and conclusions, with a representative photo/figure which we can use on the Website!

Indicate, where appropriate, Milestone/Deliverable number (see Annex 1 pp 25-26)

Our studies combine behavioural experiments, brain imaging and computational modeling to predict and examine perceptual characteristics of patients with visual field defects. We aim to investigate how scene perception in the first tens of milliseconds works, and what changes if the visual information is incomplete. Our findings can be used for to improve assessment and intervention of post-chiasmatic lesion patients.

Project 1: working on the development of an objective clinical diagnostic measurement to assess SP18: Assessing improved diagnostic measures for hemianopia (8 m; with EYE, PI02 & PI03 and 4 m secondment at PHI). We use a saccadic target-selection task to assess the capabilities of the recovered visual field to compete with the healthy visual field. In the original experimental design we assumed that these patients would show normal visual information processing in their healthy, unaffected visual field and for this reason we decided to use the patients as their own control. However, in the course of the experiment the control experiment in the patient's visual field that was 'unaffected' by the stroke clearly deviated from our original findings in normal subjects. This forced us to perform a control experiment in a healthy control group. Comparing this healthy control group with the patients' behavior shows an abnormal behavior pattern in their 'unaffected' visual field.



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Project 2: *Gist scene perception (replacement for SP20-SP21 due to the drop out of our partner).* In the years 2017 till 2018, I worked on the development of a new protocol to train blindsight within the peripheral visual field. While conventional visual restorative training focus on recovering sight in the para-foveal visual field, a blindsight training will focus on more peripheral areas far within their defects.

This protocol will be based on the theory that there is a so-called visual GIST perception present within the peripheral visual field. The gist phenomenon is the concept that people are able to get an understanding of a whole scene before actually seeing the details. Which might explain how people are able to rapidly orient and assess the possible uses of a space without awareness of the objects it contains. Successful development of a training for this system will improve the overall awareness of patients with visual field defects and will help them avoid collisions during daily life. Therefore, blindsight training would be a great addition to standard rehabilitation, and gives a possibility to adapt training to the defects and needs of the patients.

In previous work we found a new cortical area in the peripheral of V2(referred to as V2a for our purpose) that possibly is directly innervated by direct connection from the koniocellular cells in the lateral geniculate nucleus(LGN). These pathways are able to process scene structure quickly, which might indicate that that they circumvent the primary visual cortex. Consequently this connection is often spared after post-chiasmatic cerebrovascular accidents. This inspires us to develop stimuli to address such pathways. In preparation for the blindsight training and to confirm our ideas we looked first of all closely investigate peripheral involvement in scene perception. This psychophysical study is now further developed into an fMRI adaptation experiment in collaboration with Dr. Koen Haak. I will use a custom-build wide field projection making it possible to project stimuli up to 60-degree eccentricity in the scanner. The aim is to find brain areas that are specifically involved in global summary statistics extraction. In a parallel project, we aim to disentangle different retinal pathways, magno-, parvo-, and koniocellulair pathways, and their contribution to gist recognition of the scene. For this experiment, I implemented an experimental set-up in our lab that allows one to present isoluminance colour stimuli in collaboration with Prof. Dr. Wade. And of course the most exciting work I have done, is the modelling and predicting of behavior of the patients by adapting computer vision models such as the GIST, SIFT, and HOG2x2.

OUTREACH ACTIVITIES

OUTREACH ACTIVITIES FROM 01/01/2014 UNTIL 31/12/2017

(mention your public presentations on open days, participation in general public events, press, etc. etc.: when, what and where).

Your publications: those that have been submitted/published (provide all bibliographic details), and those that you are currently finishing: give title, and foreseen journal, if possible)

Are there any patents? New foreground? Applications for the general public/society?



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During the last three years, I have presented my work in several media. In the more traditional ways, I have presented my work on several conferences, in poster and talk format. This included a pitch and poster at the PPC-Philips Reflect Symposium www.ppc-philips.com and a talk at the yearly Neuroscience meeting at York University. But besides those ways, I have been actively involved with several outreach programs. These included the Brain Awareness Week, in which PhD students go to high schools to teach about neuroscience and hopefully make students from the ages of 15 until 18 enthusiastic about our work. Similar to that I have also gone to primary schools in the project Scientist in the Class, to promote science and my work in general and gave a demo during the Donders Open day. Furthermore, I have been DCN PhD representative and organized the Donders Discussions 2016. The Donders Discussions is a scientific conference by and for PhD students, which gives a platform to the Donders PhD students to present their work in a more informal setting.

Publications:

Published:

A.C.Geuzebroek & A.V.van den Berg (2017). Impaired visual competition in patient with homonymous visual field defects, *Neuropsychologia*, 97;152-162

Under review:

A.C.Geuzebroek & A.V.van den Berg (2017). Eccentricity scale-independency for scene perception in the first tens of milliseconds, under review by *Journal of Vision*.

In preparation:

A.C.Geuzebroek, Karlijn Woutersen, Jeroen Goossens & A.V.van den Berg (2017). Predicting scene perception in patients with homonymous visual field defects, data collection completed and due for submission at *Brain*.

Karlijn Woutersen, A.C.Geuzebroek, A.V.van den Berg, & Jeroen Goossens (2017). UFOV in patients with post-chiasmatic lesions; additional diagnostic tool, data collection completed and due for submission.

A.C.Geuzebroek, A.V.van den Berg, & A.R.Wade (2017). Disentanglement of color and luminance signals contribution in scene recognition in the first tens of milliseconds, in progress.

TRAINING ACTIVITIES

TRAINING ACTIVITIES FROM 01/01/2014 UNTIL 31/12/2017 *describe your courses (received and given), (summer)schools, and your Secondments: when, what, and where*



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Schools:

- HealthPAC winter school, Nijmegen
- CosMo Summer school, Juni 2015, Groesbeek
- HealthPAC business school, November/December 2017, Nijmegen and Eindhoven

Courses taken:

- DGCN09 Advanced math, February 2015, Radboud University
- Scientific Writing for PhD Candidates, July 2016, Radboud University
- SOW-DGCN37 Neuroimaging II: Hemodynamics methods, February 2015, Radboud University
- NWI-FMTO21 Neuro-science: optimising cognitive functioning? Sleep, mood and attention, January 2015, Radboud University
- e-Brok, April 2015, Online at EMWO
- Mindfulness-based Stress Reduction, December 2017, Radboud Universiteit

Courses given:

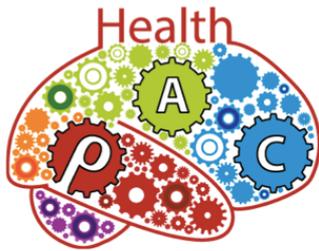
supervised 4 bachelor students during their bachelor thesis, and 3 within the minor Moving Questions. Also, I gave several practical for biomedical students.

Secondments:

- Philips with Raymond van Ee, November 2015 – January 2016, Eindhoven
- York University with Alex Wade, February 2017 – Juni 2017, York

CONFERENCES

CONFERENCES, WORKSHOPS FROM 01/01/2014 UNTIL 31/12/2017
(mention which conferences and workshops you have attended: when and where)



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- **Neurovation symposium**, October 6-7, 2014 in Utrecht
- **Donders Discussions**, October 30-31, 2014 in Nijmegen
- **Donders Discussions**, November 5-6, 2015 in Nijmegen
- **ECVP**, August 28 – September 1, 2016 in Barcelona
- **Reflect symposium of PPC-Philips**, November 13, 2015, Eindhoven
- **Health Tech event**, November 24, 2015 in Eindhoven
- **Seeing Colors**, September 19-21, 2016 in Regensburg
- **NextGenVis winter seminar (fellow ESR marie-curie project)**, May 31 2016, in York
- **VSS**, 19-24 May, St. Pete Beach, Florida

FUTURE CAREER PLANS

Describe your future career plan(s), after the end of the project. Note: the PhD is obtained *after* HP (31/12/2017!), so it's part of the future career plan.



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What are your career plans after obtaining your PhD?

My plans are to obtain a career in academia, hopefully in the field of scene perception and visual navigations combining cognitive research with computer vision. I have a couple of labs in my mind that I would 'ideally' like to work and I have contacted them. I hope that there will be vacancy in these labs in the near future, which I can apply for. Otherwise I might try to contact these same labs and hopefully find a way to write a grant together.