Training Stay Report

As a graduate student I have been working with electrophysiological and psychophysical methods in the field of face perception at the Budapest University of Technology and Economics. With the help of the NENS I had the opportunity to study imaging techniques (namely fMRI), the adaptation of experimental paradigms to fMRI, and the analysis of fMRI data with the SPM5 software. I spent one month at the Regensburg University in Professor Greenlee’s Department of Psychology. Briefly, I would like to describe the project I carried out there.

My topic regards face perception. The role of two occipito-temporal areas, the FFA (Fusiform Face Area) and OFA (Occipital Face Area) in face perception has been widely researched recently (Kourtzy et Kanwisher, 2001, Kovacs et al. 2008). However, the majority of the studies has used one stimulus (gray scale face stimulus) presented on homogeneous background. In everyday life, this situation is less probable than being surrounded by several faces simultaneously. Does the presentation of multiple faces elicit the same neural responses as single faces? To answer this question we carried out a block-designed fMRI study with multiple faces.

We hypothesized that after adapting with female faces the subjects would consider neutral faces more masculine than after adapting with scrambled faces (Fourier phases randomized). To prove that subjects extract the average gender information from the stimuli matrix we ran a psychophysical experiment (N= 15). Our results showed that after adapting with multiple female faces the same test stimuli was considered to be more masculine than after adapting with a male face.

After these psychophysical results we run an fMRI study to test the neural correlates. The subjects (N=7) watched multiple adaptor faces; presented in a circle around (5 ° from the centre) the fixation mark for 4 seconds and then they completed a gender discrimination task for morphed faces.
Our results show that in the FFA adaptation took place after female adaptors compared to scrambled faces, while this effect was not elicited in OFA. These pilot results suggest that adaptation takes place in case of multiple faces, thus, the low-level visual features (for example size, place) do not play a significant role in it. These results will be presented as a poster in the European Conference on Visual Perception 2009. (The fMRI correlates of multi-face adaptation, Krisztina Nagy, Marta Zimmer, Mark Greenlee, Gyula Kovacs)

Another interesting problem to address is the number of simultaneously presented faces (Multifaces). Do more faces elicit higher neuronal activation? To answer this question we showed to the subjects either in the left or in the right hemifield one faces, two or four faces with varying the gaps between them. With this block-designed fMRI study we found that more faces elicit higher activation in the FFA and OFA provided that there are presented in close but not identical positions during the repetitions.

With the NENS Stipend I had the opportunity to gain practical knowledge about running fMRI experiments and study fMRI data analysis. It will enhance my professional development seriously as I have a deep interest in the methodology of fMRI.

I am extremely grateful to Professor Greenlee for his utmost helpfulness and professional guidance.

Abstract for European Conference on Visual Perception 2009

*The fMRI correlates of multi-face adaptation*

Krisztina Nagy, Marta Zimmer, Mark Greenlee, Gyula Kovacs

Adaptation to a given face leads to face aftereffects and currently this topic attracts a lot of attention because it clearly shows that adaptation occurs even at the higher stages of visual cortical processing. However, during our every-day life faces are not appearing in isolation, rather they are usually surrounded by other stimuli. Here we used psychophysical and fMRI adaptation methods to test if we adapt to the gender properties of a multiple face stimulus. As adaptors we used stimuli composed of eight different individual faces, positioned peripherally in a ring around fixation spot. We found, that gender discrimination of a subsequent centrally presented target face is significantly biased as a result of long-term (4
sec) adaptation to either male or female stimulus composites. Similarly to our previous results (Kovacs et al, 2008.) we observed the largest fMRI signal adaptation in the right fusiform and in the right occipital face areas. Our results suggest that humans extract the statistical features of a multiple composite stimulus and this process occurs at the level of occipito-temporal face processing.