# The role of the cortico-basal ganglia circuit in learning and memory: From patient studies to functional neuroimaging

## Results:

During this research project (73/06) we investigated the mechanism underlying implicit contextual learning as well as its neural correlates. Implicit contextual cueing is a learning mechanism in which visual information from our environment is memorized in order to facilitate visual search.

In the first part of our research project we studied the mechanism underlying implicit contextual cueing using eye movement recording. First, we showed that peripheral vision can be used to memorize the context of a target (Van Asselen et al. 2009), whereas in our following study we demonstrated that object-based contextual cueing is associated with shorter fixation durations (Van Asselen et al., 2010). Finally, we showed that when two contextual cues are presented simultaneously, the contextual cueing effect is much larger than when one cue is presented. This effect is associated with fewer fixations and shorter saccade amplitudes, suggesting that a different search strategy is used.

In the second part of this research project we aimed to look at the neural basis of implicit contextual cueing. Therefore, we tested patients with Huntington's and Parkinson's disease with a contextual cueing task and found that these patients are not able to benefit from the repeated contextual information (Van Asselen et al., 2009). Since both of these neurodegenerative diseases affect the basal ganglia, our findings suggest an important role for this brain area. Finally, by using fMRI we demonstrated that the exact neural network that is involved in implicit contextual cueing depends on the type of cues (object or spatial) that are used to guide attention.

## Published work:

*Peer-reviewed publications in international scientific journals*

**Van Asselen, M.**, Almeida, I., André, R., Januário, C., Gonçalves, A., & Castelo-Branco, M. (2009). The role of the basal ganglia in implicit contextual learning: A study of Parkinson's disease. *Neuropsychologia, 47*(5), 1269-1273.

**Van Asselen, M.**, Castelo-Branco M (2009). Long-term implicit memory for peripherally perceived contextual information. *Perception & Psychophysics, 71*(1), 76-81.

**Van Asselen, M.**, Sampaio, J., Pina, A., & Castelo-Branco, M. (2010). Object based implicit contextual learning: A study of eye movements. *Attention, Perception & Psychophysics, 73*(2), 297-302.

**Van Asselen, M.**, Almeida, I., Júlio, F., Januário, C., Bobrowicz Campos, E., Simões, M., Castelo-Branco, M. (2012). Implicit contextual learning in prodromal and early stage Huntington's disease patients. *Journal of the International Neuropsychological Society, 18*(4), 689-696.

**Van Asselen, M.**, Júlio, F., Januário, C., Bobrowicz-Campos, E., Almeida, I., Cavaco, S., & Castelo-Branco, M. (2012). Scanning patterns of faces do not explain impaired emotion recognition in Huntington disease: Evidence for a high level mechanism. *Frontiers in Psychology, 3*: 31.

# Area(s) of interest:

Implicit learning


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