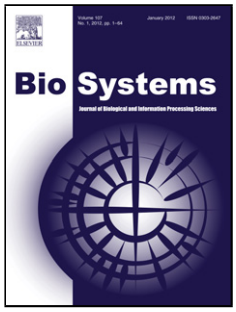

Title: A Cortical Network Model of Cognitive and Emotional Influences in Human Decision Making

Author: Azadeh Hassanejad Nazir Hans Liljenström

PII: S0303-2647(15)00097-0
DOI: http://dx.doi.org/doi:10.1016/j.biosystems.2015.07.004
Reference: BIO 3586

To appear in: *BioSystems*

Received date: 4-3-2015
Revised date: 8-7-2015
Accepted date: 8-7-2015

Please cite this article as: Nazir, A.H., Liljenstr*ddoto*m, H.,A Cortical Network Model of Cognitive and Emotional Influences in Human Decision Making, *BioSystems* (2015), http://dx.doi.org/10.1016/j.biosystems.2015.07.004

A Cortical Network Model of Cognitive and Emotional Influences in Human Decision Making

Azadeh Hassanejad Nazir[a] and *Hans Liljenström*[ab1]

[a]Div of Biometry and Systems Analysis, ET, SLU
P.O. Box 7032, SE-75007 Uppsala, Sweden
azadehhn@kth.semailto:azadehhn@kth.se
hans.liljenstrom@slu.semailto:hans.liljenstrom@slu.se
mailto:hans.liljenstrom@slu.se
[b]Agora for Biosystems
P.O. Box 57
SE-19322 Sigtuna,Sweden
www.agoraforbiosystems.sehttp://www.sigtunastiftelsen.se/agoraforbiosystems
http://www.sigtunastiftelsen.se/agoraforbiosystems

Abstract

Decision making (DM)[2] is a complex process that appears to involve several brain structures. In particular, amygdala, orbitofrontal cortex (OFC) and lateral prefrontal cortex (LPFC) seem to be essential in human decision making, where both emotional and cognitive aspects are taken into account. In this paper, we present a computational network model representing the neural information processing of DM, from perception to behavior. We model the population dynamics of the three neural structures (amygdala, OFC and LPFC), as well as their interaction. In our model, the neurodynamic activity of amygdala and OFC represents the neural correlates of secondary emotion, while the activity of certain neural populations in OFC alone, represent the outcome expectancy of different options. The cognitive/rational aspect of DM is associated with LPFC. Our model is intended to give insights on the emotional and cognitive processes involved in DM under various internal and external contexts. Different options for actions are represented by the oscillatory activity of cell assemblies, which may change due to experience and learning. Knowledge and experience of the outcome of our decisions and actions can eventually result in changes in our neural structures, attitudes and behaviors. Simulation results may have implications for how we make decisions for our individual actions, as well as for societal choices, where we take examples from transport and its impact on CO_2 emissions and climate change.

Keywords: Decision making, emotion-cognition, neural network model, amygdala, OFC, LPFC

[1] Corresponding author
[2] Decision making is abbreviated as DM throughout the text