



**Research Project Proposal**  
Academic year 2016-2017

<b>Project Nº 14</b>
<b>Title:</b> Visuospatial Integration in Vehicle Driving, Age Related Changes and Rehabilitation Potential. An fMRI and Virtual Simulation Study
<b>Department/ Laboratory:</b> Laboratory of Neuroimage School of Medicine
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<b>Summary</b> <p>Driving is a complex task that requires integration of various cognitive functions to be carried out. Age is one of the major factors associated with cognitive impairment, and subjects over 65 years one of the groups most frequently associated with motor vehicle accidents. In Spain, 12.8% of drivers are older than 65 years, being responsible for 4.7%-7.3% of accidents (Anuario Estadístico 2012, DGT).</p> <p>Visuospatial, temporal and speed discrimination are cognitive functions involved in a complete visual integration that remain unexplored as independent elements affecting driving. They are the substrate of more general cognitive abilities such as perception change in visual objects and motor reaction time which involve attentional, motor, temporal and decision making elements with the consequent impulsivity/inhibition processes. We know that temporal and speed discrimination are affected in older individuals (Merchant et al. 2013, Hutchinson et al. 2014, Scialfa et al. 1991, Yang et al. 2009), limiting their ability to navigate through space and adequately react on time to external stimuli.</p> <p>Therefore we propose the study of these basic aspects of visual perception using psychophysical tests and Functional Magnetic Resonance Imaging (fMRI), while evaluating temporal, spatial and speed discrimination tasks in a group of subjects over 65 years of age, compared with a group of young healthy subjects. The fMRI study will allow us to explore the neural networks responsible for carrying out these tasks. Neuropsychological/cognitive tests will be employed to correlate visuospatial, temporal and speed parameters with the altered brain activity during while executing the three tasks.</p> <p>A virtual driving simulator test will be applied to all subjects to help us correlate our neuroimaging results and the values obtained in each of our discrimination tasks.</p> <p>We also propose in our study a longitudinal arm for rehabilitation in older individuals presenting deficits in our tasks.</p>



### References

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Casutt, G., Theill, N., Martin, M., Keller, M., & Jäncke, L. (2014). The drive-wise project: driving simulator training increases real driving performance in healthy older drivers. *Frontiers In Aging Neuroscience*, 685. doi:10.3389/fnagi.2014.00085

Hoffman, L., & McDowd, J. M. (2010). Simulator driving performance predicts accident reports five years later. *Psychology And Aging*, 25(3), 741-745. doi:10.1037/a0019198

### POSSIBILITY OF PhD

YES \*

\* (PhD grant required)