

SHORT TERM SCIENTIFIC MISSION REPORT

COST-STSM-ECOST-STSM-TD0904-150513-031545

Purpose of the STSM

The aim of the current short-term scientific mission was to build upon the collaboration with Dr. Massimiliano Di Luca and Dr. Saber Sami with the outcome of acquiring new EEG analysis techniques and finalizing our project ‘Resolving temporal discrepancies across the senses’. The project itself investigates how the human nervous system adapts to small temporal discrepancies across the senses using both EEG and behavioural measures to understand the underlying mechanisms.

Description of the work carried out during the STSM

During the period spent in Dr. Massimiliano Di Luca’s lab, we worked on the EEG analysis and interpretation of the existing behavioural data.

In addition to the pre-processing techniques I was familiar with I also learnt the best methods for extracting ERPs and also became familiar with time-frequency analysis – its assumptions and benefits. By gaining an understanding of the initial properties of the physiological data for the clean subjects we were able to begin to work out the story our data tells.

Description of the main results obtained

We predicted that, in order for the brain to resolve continuous, small temporal discrepancies across the senses it could update the temporal relationship between the two sources of information in two possible ways: Either by decreasing the speed of processing of the first signal and/or increasing the magnitude of the neural response to it (see Yu, Stein et al., 2009), or by speeding up the second component in the adapting pair (Navarra, Hartcher-O’Brien et al., 2009). The main finding to emerge from the current study is that when using a behavioural RT measure, coupled with EEG, for our setup, the auditory component changes in accordance with the predictions outlined above and in agreement with the physiological data of Yu et al. After adaptation to a delay of 150ms, the reaction time responses to the unisensory auditory test stimuli slowed down after adaptation to AV (relative to a synch baseline) and speed up after adaptation to VA. This pattern of responses appears to be mirrored in the change in amplitude of the auditory

ERP to the same signal. These findings suggest that the behavioural changes observed in temporal recalibration may be the result of modulation of the neural response at the cortical level.

Future collaboration with host institution (if applicable)

The COST STSM allowed us to strengthen the existing collaboration with Dr. Di Luca and to extend that budding collaboration with Dr. Sami. As the project continues, it is probable that other collaborations will emerge to realize the full potential of the project.

Foreseen publications/articles resulting or to result from the STSM

The aim is to write up the work and submit to J Neurosci. We will keep TIMELY initiative updated as to the progress of this and acknowledge the funding support in any publication to emerge.

References

- Navarra, J., Hartcher-O'Brien, J., Piazza, E., & Spence, C. (2009). Adaptation to audiovisual asynchrony modulates the speeded detection of sound. *Proceedings of the National Academy of Sciences, USA*, **106**, 9169–9173.
- Yu, L., Stein, B., & Rowland, B. (2009). Adult plasticity in multisensory neurons: short-term experience-dependent changes in the superior colliculus. *Journal of Neuroscience*, **29**, 15910-15922.