PADOVA
neuroscience
CENTER

15 JANUARY 2026 3:00 pm
SALA SEMINARI VIMM
(Via Giuseppe Orus 2, Padova)

PNC SEMINARS

A talk by Sabrina Brigadoi and Mariagrazia Ranzini
(University of Padova)

FNIRS APPLICATIONS IN CLINICAL AND COGNITIVE NEUROSCIENCE

Functional near-infrared spectroscopy (fNIRS) is a non-invasive optical technique used to monitor cortical functional activity. Oxy- (HbO) and deoxy-hemoglobin (HbR) are the main absorbers of light in the red and near-infrared range, while other human tissues are relatively transparent to light at these wavelengths. Changes in the measured light intensity emitted by a source placed on the scalp and backscattered to a detector placed nearby can be used to recover changes in HbO and HbR concentration occurring in the superficial cortical layer.

fNIRS is a cost-effective, portable, easy-to-use, silent and non-invasive cortical imaging technique, which allows unconstrained movements of participants. Therefore, it is ideal in settings requiring participants to move (e.g., study functional activity during tasks requiring movement), to behave in everyday-life settings (e.g., children playing, etc.) or in clinical context at the cot/bed-side.

In this seminar, we will show some exemplary applications of fNIRS in two different contexts: in clinical settings, in the neonatal intensive care unit, to study preterms, and in lab-based settings to study the neural correlates of numerical cognition and motor action across the lifespan.

"Padova Neuroscience Center – PNC"
email: administration.pnc@unipd.it; phone: +39 (0)49 8212623
www.pnc.unipd.it

Preterm newborns are more prone to experience glycemic variability at birth, due to an immaturity of the glucose control system, which develops during the last trimester of pregnancy. Glucose is usually measured twice a day with a heel-prick sampling and glucose control is then performed based on operational thresholds, by administering glucose boluses or changing the diet. This type of glucose control does not consider the individual brain's health. However, several studies show an association between glucose variability at birth and neurodevelopmental outcome. We will present some results of the BabyGlucoLight project, which aims to study, for the first time, how brain hemodynamics changes, at the individual level, during hypoglycemic events and how brain hemodynamics is impacted by glucose variability in preterms. Furthermore, we will present the on-going Prometeus project, which aims to individualize preterm nutritional diet based on both cerebral hemodynamics and metabolites concentration (glucose, lactate and ketone bodies).

fNIRS is useful also to study the neural correlates of cognition and action in ecological contexts. In our lab, we use fNIRS to investigate numerical cognition in an embodied perspective. Action accounts of cognition highlight how cognition is built upon sensorimotor experience. In the context of numerical cognition, it is still largely unknown how the sensorimotor system contributes to number processing and mathematical abilities across the lifespan. We will present some results from the GRINP project, through which we investigated common frontoparietal activity during both number comparison and hand grasping, and how this common activity varies as a function of individual differences in mathematical expertise. Also, we will present the ongoing NumAct project, aimed at investigating the development of intermingled processes between number and hand grasping across the lifespan, specifically, in children, in young adults, and in the elderly.

Biography

Sabrina Brigadoi obtained her Master's degree in Bioengineering in 2010, and in 2014 she was awarded her PhD in Psychological Sciences from the University of Padova. She then worked as a research associate at University College London (UCL), and is currently an Associate Professor at the Department of Developmental Psychology and Socialization at the University of Padova.

Over the past 14 years, Sabrina Brigadoi has worked to develop and improve the usability of functional near-infrared spectroscopy (fNIRS), using this technique to study cognitive processes in various populations, ranging from infants to the elderly. More recently, she has started applying this technique in clinical settings to monitor brain function in preterm populations. This has led to the implementation of several projects, one of which is funded by the Italian Ministry of Health, to study how brain haemodynamics in very preterm infants react to changes in glucose concentration, which is an important issue for this population.

Mariagrazia Ranzini graduated in Psychology in 2004 and obtained a PhD in Psychology from the University of Pavia in 2010. She worked as a postdoctoral researcher at the University of Bologna, University of Padua, and Université Libre de Bruxelles (ULB). From 2020 to 2023, she was a Marie Curie Fellow (Individual Fellowship) at the University of Padua. Since 2025 she has been serving as Associate Professor at the Department of General Psychology (DPG) at the University of Padova.

Mariagrazia Ranzini's scientific research focuses primarily on the field of cognitive psychology. Her main research area is numerical cognition, specifically investigating how attention, memory and action processes contribute to the mental representation and processing of numerical, spatial and temporal quantities. She also studies synesthesia, embodied cognition, attention deficits and calculation deficits. She conducts her research using behavioural investigation methods, such as analysing accuracy, reaction times and eye movements, as well as the effects of prismatic adaptation and optokinetic stimulation, and hand kinematics. She also employs neuroimaging techniques (EEG, MEG, fNIRS): in particular, she has recently initiated a series of studies on the neural correlates common to quantity processing and manual actions (e.g. pointing, grasping objects) using functional near-infrared spectroscopy (fNIRS).