

TRAINING STAY - FINAL REPORT

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During my training stay in Dr Iannetti's laboratory I have been in full charge of a psychophysical experiment to investigate possible interactive effects among pain, audition and vision, and actively participated in an electrophysiological experiment investigating the cognitive modulation of pain. This experience has been invaluable, as has allowed me to be exposed to a top-level scientific environment of scientists working on different and interesting problems.

My PhD project focuses on investigating the possible correlations between the use of metaphors in language and the neural basis of sensory perception, combining classical linguistic research approaches with physiological methods to study the function of the nervous system in humans.

In the months before the start of my training stay, I used a linguistic corpus of two billion tokens to collect different typologies of linguistic synaesthesias. Synaesthesias are a particular kind of metaphors, in which words specifically related to different sensory systems (i.e. olfaction, vision) are combined (for example: "warm colour", "delicate taste", etc.). Interestingly, the most frequent synaesthetic pairings I observed in this corpus-based analysis seem to parallel the results of some psychophysical experiments on multisensory interactions (see e.g. Marks 2004, Lederman & Klatzky 2004 in *The Handbook of Multisensory Processes*, Arieh & Marks 2008 *Int. J. Psychop.*).

Building on this observation, I wanted to verify the hypothesis of possible congruencies between linguistic synaesthesias (expressions such as "painful sound", "hurting music") and interactive effects between stimuli belonging to different sensory modalities. Thus, I designed a multisensory experiment using nociceptive, auditory, and visual stimuli. The experiment tested the presence of interactive effects between the occurrence of nociceptive stimuli and the participants ability to discriminate the intensity of auditory and visual stimuli.

The main hypothesis of the experiment was that psychophysical results were matching the observed occurrences of linguistic synaesthesias, i.e. that noxious stimuli would have been able to produce a greater influence on the ability to discriminate the intensity of auditory than of visual stimuli (in other words, that pain would have been a better "distractor" for audition than for vision). Preliminary analyses on the results seem to confirm this hypothesis.

Crucially, to carry out the experiment, I learned how to use a radiant heat high-power infrared laser. The introduction of laser stimulators in sensory physiology has revolutionized the study of the nociceptive system, as laser pulses activate *selectively* and *rapidly* nociceptive free nerve endings belonging to A δ and C fibres located in the superficial epidermal layers, without coactivating deeper, touch-related non-nociceptive fibers.

Furthermore, during the last three weeks of my training stay, I participated in an EEG experiment investigating the placebo effect and the cognitive modulation of pain. I actively participated in this experiment, thereby learning how to record high-density EEG responses to laser stimuli in humans.

The staff of Iannetti's Laboratory has a long-term experience in the use of the multimodal approach and in delivering auditory, visual and noxious stimuli. Their knowledge and advice allowed me to design the right experiment to test the presence of interactive effects among different modalities.

Furthermore, I have learnt how to use the laser to elicit painful sensations and to collect high-density EEG data. Since, my home department has recently bought a high-power infrared laser, I will be able to use it and to carry out my research project on the perception of pain.

Importantly, thanks to this training stay, I will be able to transfer the methodology I have acquired to my home laboratory and to share the knowledge I have gained with my colleagues.