TITLE: **Functional connectivity, gender differences and altered empathy in individuals with high vs. low traits of emotion dysregulation**

ABSTRACT (max 300 words):
Emotional dysregulation, abnormal empathic abilities, impaired social functioning are consistent clinicalcorrelates of several major psychiatric illnesses. Within this framework, the personality disorders included in Cluster B are characterized by high impulsivity, altered emotional response and empathy. While core features of narcissism and psychopathy consist of emotional detachment and lack of empathy (Eisenbarth et al., 2013), the borderline personality disorder (BPD) displays emotional instability with uncontrolled or exaggerated responses (Donegan et al., 2003). Emotion dysregulation is considered the main factor explaining most of BPD symptoms (Glenn & Klonsky, 2009). Furthermore, very little is known on the phenotypical expression of BPD in males. Since a gender difference in emotional response has been shown at several levels in many studies (e.g., Bianchin & Angrilli, 2012), studying sex effects in high emotion dysregulation populations and BPD may further add to our current knowledge, especially on male borderline. Similarly to other personality disorders, BPD can be assumed to vary as a continuous trait. In line with use-inspired basic research this modeling allows: to better isolate specific psychobiological endophenotypes within a complex pattern of symptoms; to reach a good statistical power and to translate this approach to a clinical setting. Currently, limited information is available on emotional reactivity, empathic pattern and functional connectivity (as measured in Favaro et al., 2012) in individuals selected with high vs low traits of emotion dysregulation. The project aims to select four groups of participants, divided in males/females and high vs low emotional dysregulation, starting from two large samples of community individuals. The selected groups will be tested by measuring both fMRI RS functional connectivity in key regions for emotion regulation and EEG cortical responses to specific emotions elicited by means of validated emotional stimuli (Maffei et al., 2015).

REFERENCES (Max 5):
1) Bianchin, M., & Angrilli, A. (2012). Gender differences in emotional responses: a Psychophysiological study. *Physiology & Behavior*, 105, 925-932.
2) Dziobek, I., Preißler, S., Grozdanovic, Z., Heuser, I., Heekeren, H. R., & Roepke, S. (2011). Neuronal correlates of altered empathy and social cognition in borderline personality disorder. *NeuroImage*, 57, 539–548.
3) Eisenbarth, H., Angrilli, A., Calogero, A., Harper, J., Olson, L. A., & Bernat, E. (2013). Reduced negative affect response in female psychopaths. *Biological Psychology*, 94, 310–318.
4) Favaro, A., Santonastaso, P., Manara, R., Bosello, R., Bommarito, G., Tenconi, E., & Di Salle, F. (2012). Disruption of Visuospatial and Somatosensory Functional Connectivity in Anorexia Nervosa. *Biological Psychiatry*, 72, 864–870.
5) Maffei, A., Vencato, V., & Angrilli, A. (2015). Sex differences in emotional evaluation of film clips: Interaction with five high arousal emotional categories. PLoS ONE, 10(12).

PARTICIPANTS (PI and co-PIs):
PI: **Alessandro Angrilli**
Co-PI: **Angela Favaro** Additional Researcher/Co-PI**: Alessandra Bertoldo**

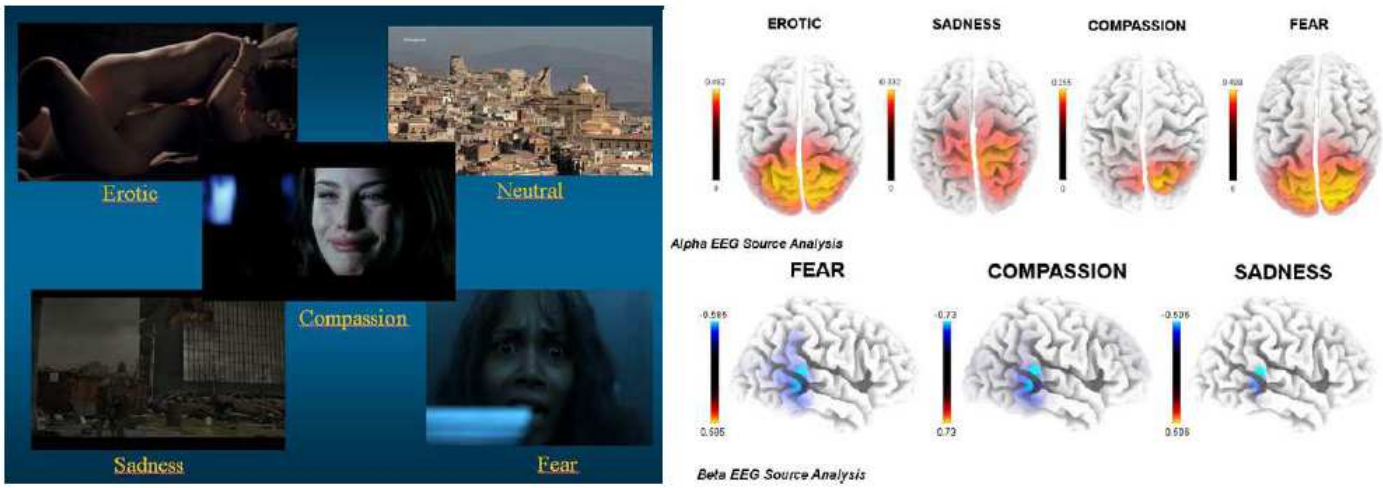
EXPERIMENTAL DATA:

To be acquired	X
Already acquired (ready to be used)	

If data need to be acquired, please provide a brief description of the Experimental setup, methods, instruments and scheduling (e.g. # of subjects, images/signals…): max 300 words

The proposed project includes two experiments, one for each year of research of the PhD candidate. In the first experiment, four groups of 25 participants each, are selected from two large samples (about 300-400 per gender) of community individuals, two groups (males/females) with high and two with low emotion

dysregulation. Groups are selected from extreme percentiles by means of the DERS (Difficulties in Emotion Regulation Scale, Gratz and Roemer, 2004). In the first year of the PhD work, the groups are tested in the psychophysiology lab and EEG is recorded from a high density set up during the presentation of a series of validated emotional film clips (Maffei et al., 2015). Empathy and impulsivity are additionally measured in lab by using the IRI (Interpersonal Reactivity Index; Davis, 1980) and the BIS-BAS (Carver & White, 1994) questionnaires. This experimental design allows to test, in individuals with high emotion dysregulation, the hypothesis of an impaired cognitive empathy and spared affective empathy.



Five screenshots from representative films inducing different emotions (left) and α and β EEG cortical sources(right)

Analysis of EEG allows to localize the cortical sources associated to specific emotional stimuli (fear, sadness) expected to be impaired in high trait individuals. The same participants are involved also in the experiments of the second year. Resting state fMRI is recorded from the four groups to test the hypothesis, in high emotion dysregulation individuals, of an altered connectivity in fronto-limbic regions, i.e. in a network including the amygdala, the orbitofrontal and temporal lobe cortices, and the right insula. Results permit to identify the psychophysiological correlates of emotion dysregulation, to identify the similarities between this trait and the BPD, and to discover the neurophysiological markers of emotion dysregulation. Results will allow to translate tools and methods to clinical diagnosis and treatment (e.g. by Neurofeedback) of personality disorders, but also to applications within the forensic psychology.

ETHICS COMMITTEE:

Obtained	
Conditioned submission*	Expected time response (in months): **2-3 months**
Not required	

* request will be submitted only if a PhD student will be associated to the project