ABSTRACT

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Title of diploma thesis: **Delineating Pain and Fear Engrams in the Prefrontal Cortex**

Pain is a complex process associated with activation of various brain centres.

According to evidence of imaging studies in humans and rodents the medial prefrontal cortex (mPFC) ranks amongst the brain area consistently activated during painful perception.

The mPFC circuits underlies functionally-distinct processes, such as pain, emotional response, decision-making, attention amongst others. However, the precise contribution of mPFC in pain related function remains to be unknown.

The aim of the study was to delineate how pain and fear are manifested at the cellular level within the regions of PFC. By employing activity dependent neuronal labelling we tested if cellular ensembles activated in pain and fear behaviours within the mPFC are distinct. We investigated a potential use of activity-dependent DREADDs (Designer Receptors Exclusively Activated by Designer Drugs) expression in order to test for the functional role of PFC ensembles in pain and fear behaviour.

Our findings provide the potential insight of the c-Fos expression within the prefrontal cortex (PFC) separately in pain, fear and their comparison. They also propose future experiments for studying ensemble overlap. Our DREADDs approach to test the functional role of PFC in pain and fear behaviour proved not to be effective, and we suggest further optimisation of this method by increasing labelling efficiency and by using appropriate controls. However, if the method appeared to be unsuitable for our experiments again, we would propose using optogenetics potential approach as a next step.