Behavioral underpinnings of Obsessive Compulsive Disorder

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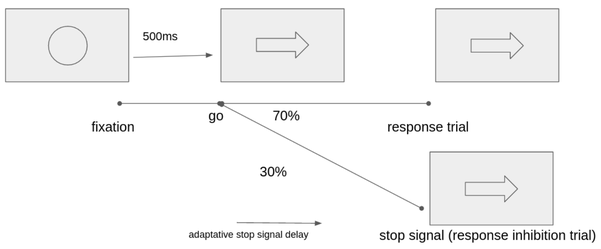
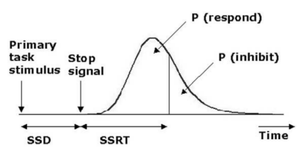
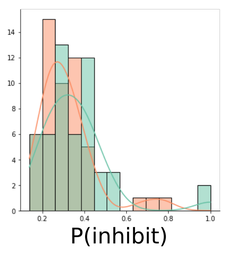
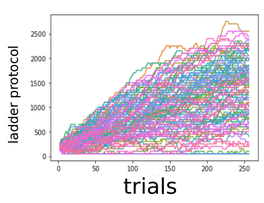
Understanding what specific behavioral phenomena are affected in psychiatric disorders comprises one of the biggest efforts and challenges of the medical and neuroscientific fields. Obsessive compulsive disorder (OCD) has been advanced as a good candidate psychopathology for this field of research. It is a well characterized, often long-lasting disorder in which an individual has uncontrollable, reoccurring thoughts (obsessions) and/or behaviors (compulsions) that they feel the urge to continuously repeat.
Some heavily studied phenomena, thought to be affected in OCD, are those of reversal learning and behavioral/impulse inhibition. In the Neurocomp study, we recruited a sample of 50 OCD and 50 healthy volunteer subjects and administered behavioral tasks thought to involve these two behavioral phenomena. We find that in both previously used tasks and in novel paradigms, capturing behavioural differences in an OCD sample is extremely more complex than what it has been advanced to be in the past.

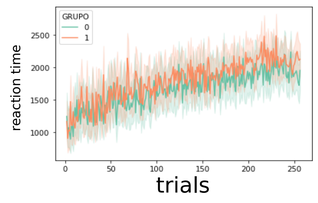
To investigate the role of behavioral inhibition in OCD, we used a stop signal reaction time task (SSRTT).



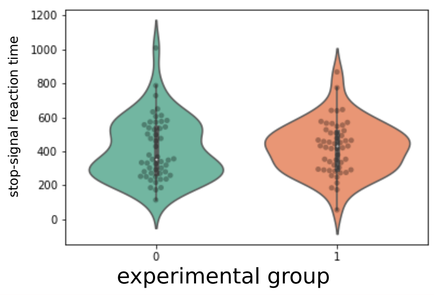




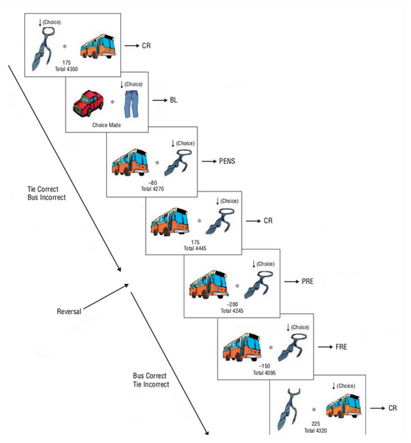


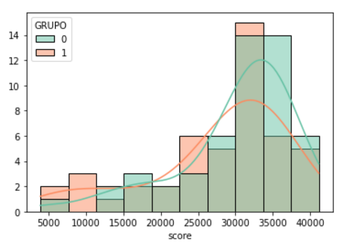


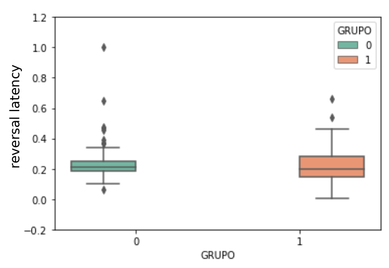
This task has been known to show increased SSRT between OCD and healthy subjects, however, after selecting participants that met performance suitable for analysis, no significant differences were found between the two groups.



We measured delays in reversal using a classical reversal learning task (RLT). The RLT belongs to the family of the most widely used tasks in OCD research.

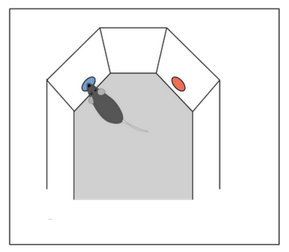


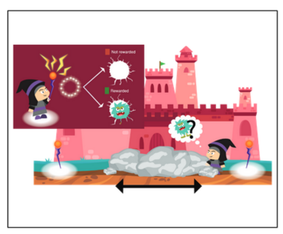


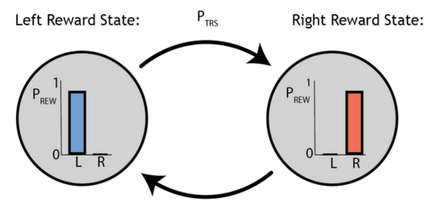


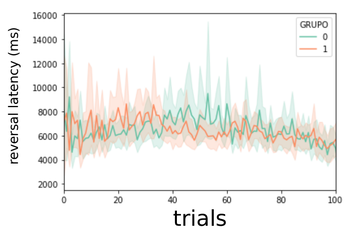
In the past, this task has shown increased reversal latency in OCD subjects, however, in our sample, no significant differences were found between the two groups. This was also true for when we looked at the overall performance, where subjects in both groups performed equally.

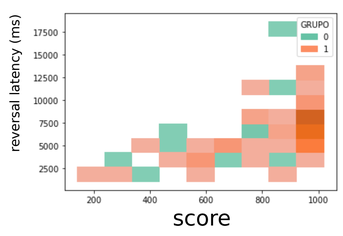
Together with these two widely validated tasks, we applied our own novel, cross-species task - the hidden state foraging task.

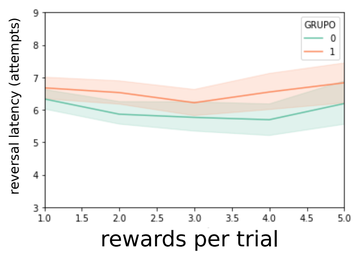


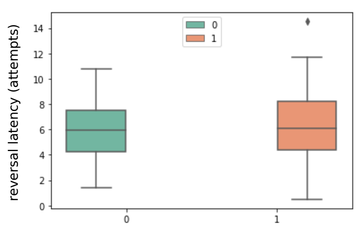




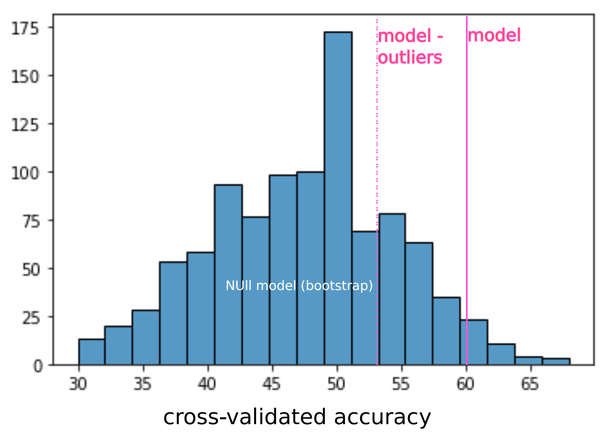








In this task, while there were some interesting patterns in behaviour across groups, none of these differences were significant.



These results were dissapointing, as they do not match previously reported effects in the literature.
In an attempt to reconcile this data with previously found results, a linear SVM classifier was ran. The relevant parameters were extracted from each task (e.g. performance, reaction times, reversal latencies, etc) and fed into this analysis. The output is a 6 fold cross-validated model with an accuracy of 60.7% in distinguishing between the two groups. When compared to our Null model of shuffled labels (with a cross-validation accuracy of 49%), this amounted to p = 0.023.
When looking at the weights of each regressor, while all the tasks contributed in some way, we found that the RLT was the most predictive. However, it was not predictive in its tipically reported measures, but instead in the overall task performance that initially seemed indistinguishable in our RLT analysis in panel 2. Here, a fraction of subjects failed to perform the task successfully and were excluded. This linear SVM analysis revealed that these non-performant subjects actually seem to offer a large portion of the models predictive power, as they all were labeled into the OCD group. When removed, the model dropped its cva to 53.4%, yielding p = 0.089.

In conclusion, we were unable to replicate the findings from the literature using both first order analysis and a more sophisticated linear model. Further analysis are required to understand what the significance of these findings are, both for our project and for the field.

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all code available at https://github.com/quendera -- tiago.quendera@neuro.fchampalimaud.org