Modelling Decision-Making in a Transdiagnostic Sample to Investigate Disorder Specific and Disorder General Alterations

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Background

- Decision making – governed by two distinct strategies: habitual (**model-free**) and goal-directed (**model-based**)[1]
- Altered in a wide range of psychiatric illnesses,[2,3] which link to their specific symptoms
  - Major Depressive Disorder (MDD)[4,5]
  - Obsessive-Compulsive Disorder (OCD)[6,7]
  - Schizophrenia (SCZ)[8,9]

Aim: Identify **disorder-specific** and **disorder-general** decision making alterations and understand their symptom associations.

Hypothesis

- MDD - mix of model-free and model-based decisions
- OCD patients would exhibit more model-free decisions
- SCZ patients would be random in their choices.
- Decision-making impairments would correlate with symptoms within each group - cooccurring symptoms showing similar trends.

Methods

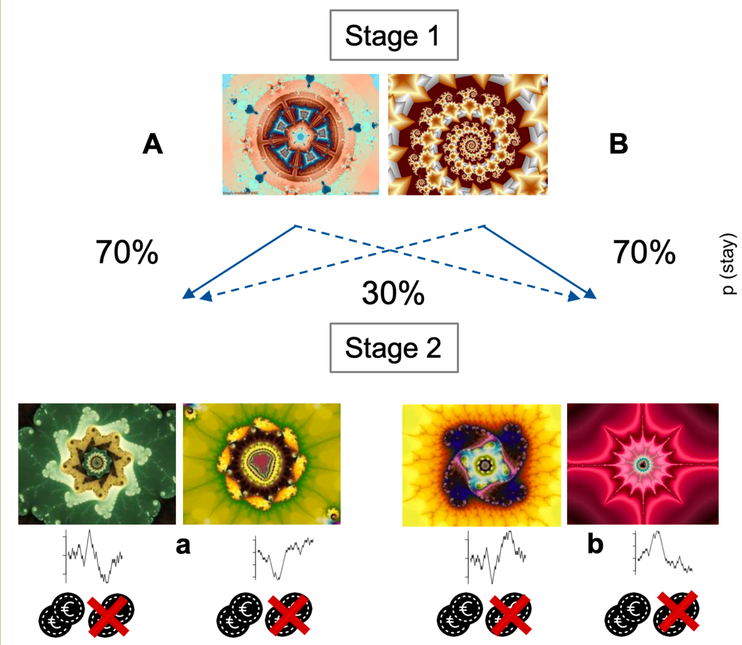
- **Sample size: MDD** (N = 23, 14F), **OCD** (N = 25, 20F), **SCZ** (N = 27, 8F), **healthy controls** (N = 25, 10F)
- **Clinical scores:** HAMD, PANSS, Anhedonia: Chapman, Y-BOCS, OCI-R
- **Cognitive score:** BACS
- **Behavioral stay probability analysis**
- **Computational modelling:**
  - **Hierarchical Logistic Regression**[10]: subject-level beta estimates for **reward** (model-free) and **reward x transition** (model-based)
  - **Hierarchical Bayesian Modelling:** learning rate – stage 1 & 2 (**α-1**, **α-2**), choice randomness – stage 1 & 2 (**β-1**, **β-2**), perseverance (**π**) and model-weights (**ω**)

Results: Hierarchical Logistic Regression

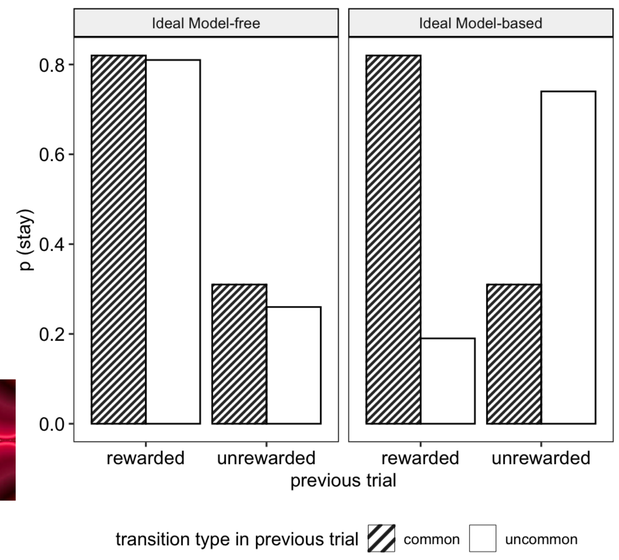
- All participants favored model-free over model-based decision making strategy
- Group differences within model-free decisions: MDD and OCD displayed more model-free behavior than SCZ
- No group differences in model-based decisions

Two-step task

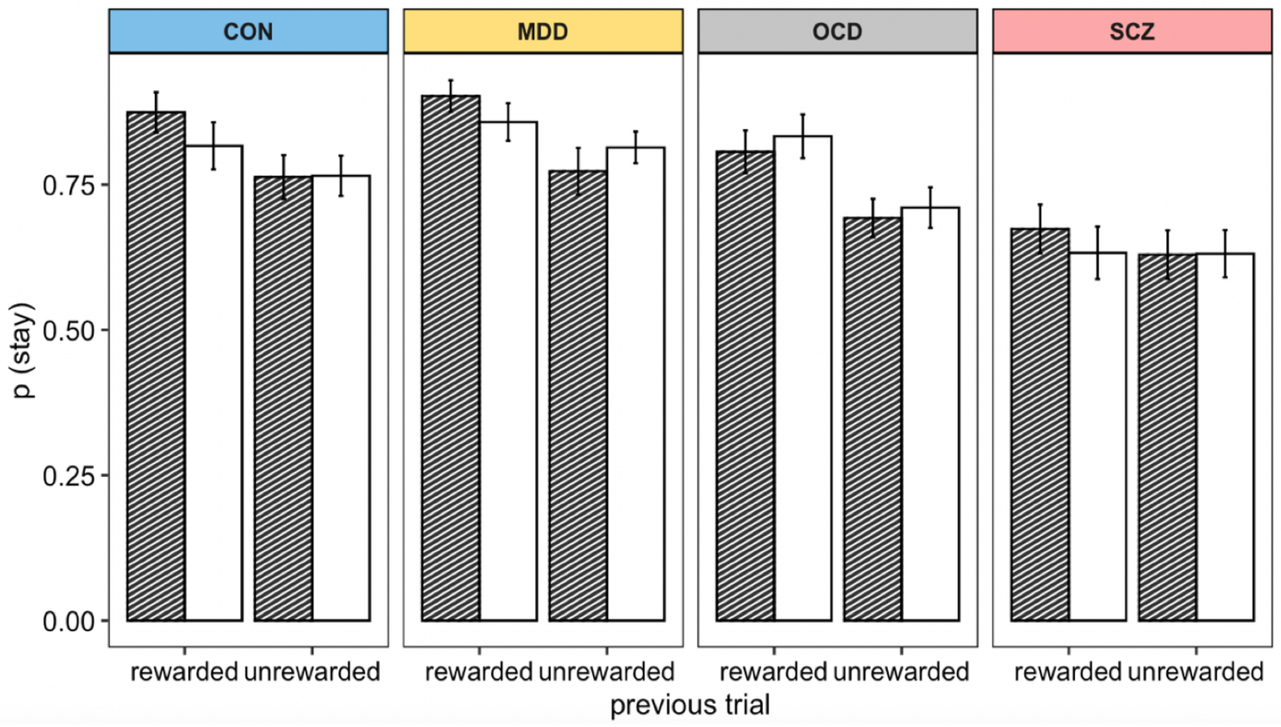
Task



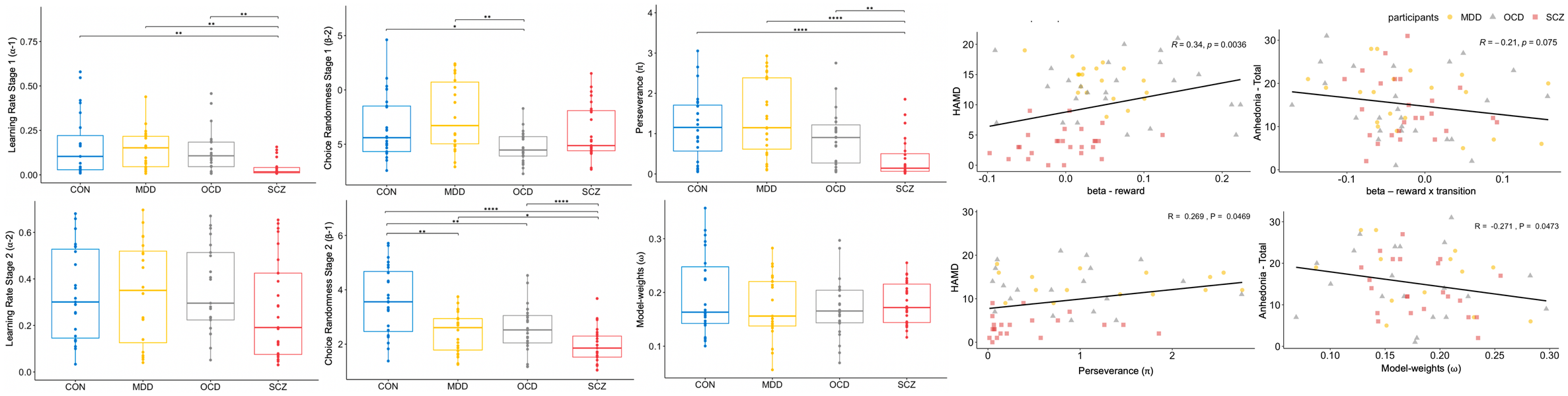
Ideal model-free and model-based decisions



Results: Stay probability analysis



Results: Hierarchical Bayesian Modelling



Conclusion

- Less randomness and more model-based decision making are associated with a reduction of symptoms, especially anhedonia and depressive symptoms
- Anhedonia and depressive symptoms occur in all three disorders, indicating a shared behavioral mechanism underlying these symptoms

Taken together, these findings may provide starting points for behavior-based interventions.

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