Correspondence between computational decision-making phenotypes and transdiagnostic clinical symptomatology across development

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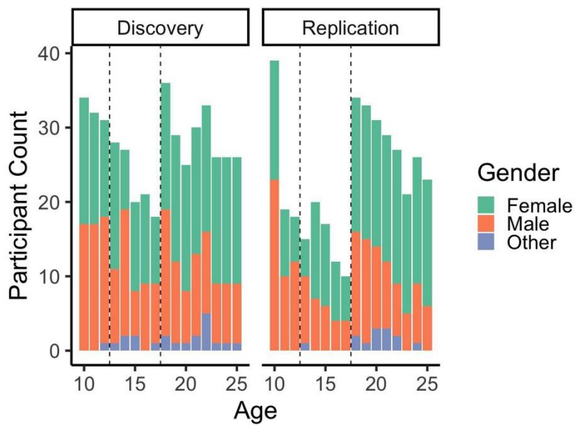
Goal

To characterize developmental changes in computational learning phenotypes and their relationship to transdiagnostic psychiatric symptoms

Study Sample



n= 815 participants (target n=1000),
discovery, n=441
replication n=374.

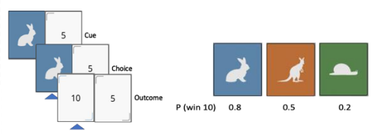
Task Behavior

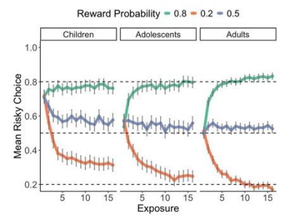
Task design

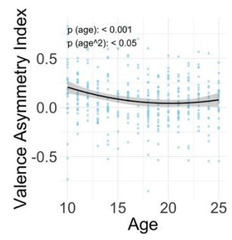
Age-Related Changes in Task Behavior

Age-Related Changes in Computational Model Parameters

Valence Asymmetry Task

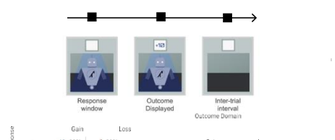


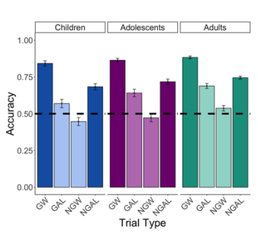


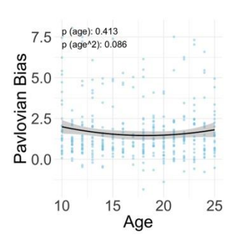


Learning from negative relative to positive prediction errors increases with age

Pavlovian Bias Task

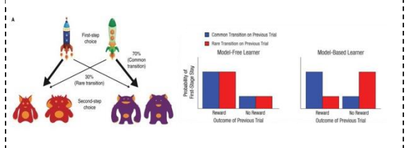


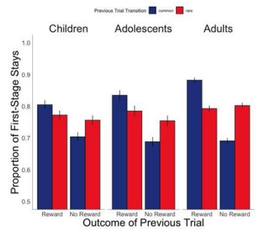


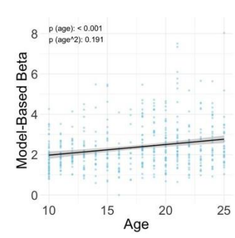


A trend indicating Pavlovian bias was lowest for adolescents

Model-Based/Model-Free Task

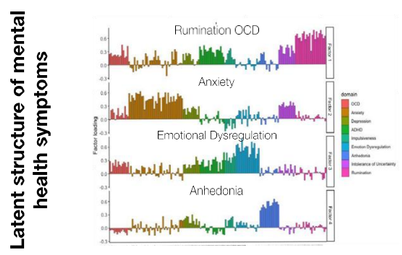


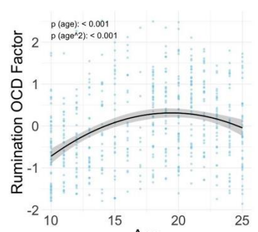


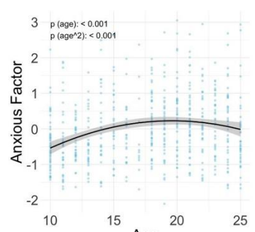


Older participants relied more on model-based learning

Mental Health Symptoms

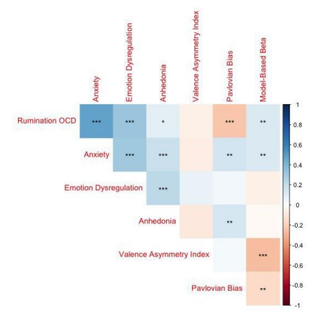






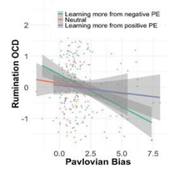
Learning Phenotypes and Symptomatology

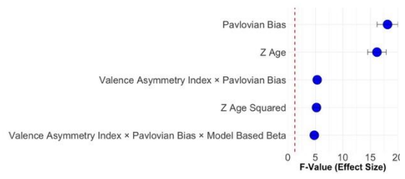
Correlation Matrix



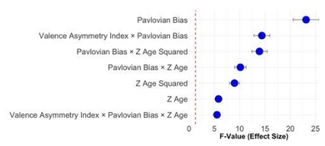
Rumination OCD

Increased learning from negative prediction errors and reduced Pavlovian bias were associated with more severe OCD rumination symptoms.

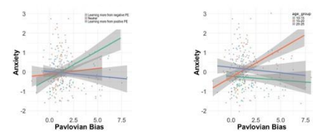




Anxiety



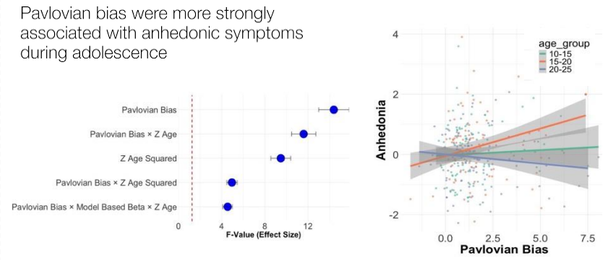
Greater Pavlovian bias was associated with heightened anxiety during adolescence, particularly for individuals with negative learning biases.



Emotional Dysregulation

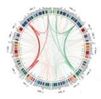
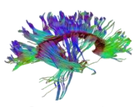
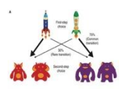
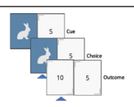
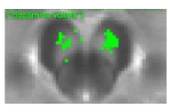
Anhedonia

Pavlovian bias were more strongly associated with anhedonic symptoms during adolescence



Next Steps

What functional and structural changes in the brain underpin these shifts in learning?

Task	Connectivity Index	Behavioral Index	Imaging Modalities
Pavlovian bias 	PFC-Dorsal-Striatum	Reduced Pavlovian interference with instrumental action	 Functional Connectivity  Structural Connectivity
Model-based/ model-free 	PFC-Striatum-Hippocampus	Model based learning	
Valence asymmetry 	mPFC-Amygdala mPFC-Insula	Negative learning rate asymmetry	 Neuromelanin n=120 (55 collected) ages 10-25

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