Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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of top targets was tested through viral mediated gene transfer in a sex and pathway specific fashion.

**Results:** CVS induced depressive-like behaviors associated with pathway-specific functional and morphological changes affecting males and females differently. We identified pathway specific transcriptional profiles potentially driving stress responses in males and females. However, these pathways were affected differently by CVS in both sexes. Our pathways-specific gene transfer approach confirmed the contribution of top targets in promoting or rescuing stress phenotypes in males and females while revealing the distinct contribution of both pathways on the expression of anxiety and depressive-like behaviors in males and females.

**Conclusions:** Stress responses in males and females result from pathway-specific changes in the activity of transcriptional programs controlling the morphological and synaptic properties of cortico-accumbal and tegmental pathways in a sex-specific fashion.

**Supported By:** CHIR, NSERC, NARSAD, FROS

**Keywords:** Neural Circuits, Chronic Stress, Transcriptional Signature

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**P242. Anxiety Associated with Perceived Lack of Control Over Stress During the COVID-19 Pandemic Impairs Reward Learning**

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**Background:** Unavoidable stress can lead to perceived lack of control and learned helplessness, a risk factor for depression. Avoiding punishment and gaining rewards involve updating the values of actions based on experience. We examined whether self-reported stress uncontrollability during the first-wave of the COVID-19 pandemic predicted impaired reward-learning.

**Methods:** In a preregistered study, 427 online participants completed a three-armed-bandit probabilistic reward-learning task to maximise monetary reward. Participants chose between three composite-stimuli comprising two images each. The goal was to maximise reward by choosing the target (80% chance of reward; 20% otherwise), which changed half-way through each game. Additionally, participants aimed to avoid electrical shocks or win bonuses post-game. These outcomes were determined by performance in “controllable-games”, but were unrelated to performance in “uncontrollable-games”. Importantly, task difficulty, motivation, and success were consistent across conditions. We tested various reinforcement learning and hidden Markov models (HMMs) to examine cognitive mechanisms underlying controllability effects. We predicted that uncontrollability, especially on shock-games, would impair reward-learning and dampen BOLD-activation in ventromedial-prefrontal cortex (vmPFC).

**Results:** Participants who reported lower subjective control on uncontrollable-games showed worse learning on uncontrollable-games after target reversals, in shock and bonus-games ($z = -3.45, p < 0.001$) Activation in vmPFC associated with expected choice value as predicted by the winning HMM was attenuated in uncontrollable games. Moreover, this effect was greater in those who reported lower sense of control on uncontrollable-games ($F = 6.80, p = 0.012$).

**Conclusions:** Greater perceived stress uncontrollability during the COVID-19 pandemic was associated with impaired reward-learning, and this effect was explained by current anxiety. These results suggest that anxiety promotes imprecision in the representation of the reward structure of the environment, mediating the observed effect of lack of control on reward-learning.

**Supported By:** Swedish Research Council

**Keywords:** Stress Controllability, Reward Learning, Computational Modelling, State Anxiety

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**P243. The Cognitive and Neural Impact of Uncontrollable Stress on Reward-Learning**

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**Background:** Uncontrollable stress leads to learned helplessness, a risk-factor for depression. By manipulating controllability in the laboratory, we aimed to identify the cognitive and neural consequences of perceived lack of control on reward-learning.

**Methods:** In a preregistered fMRI study, 55 participants completed games of a three-armed-bandit probabilistic reward-learning task. Participants chose between three composite-stimuli comprising two images each. The goal was to maximise reward by choosing the target (80% chance of reward; 20% otherwise), which changed half-way through each game. Additionally, participants aimed to avoid electric-shocks or win bonuses post-game. These outcomes were determined by performance in “controllable-games”, but were unrelated to performance in “uncontrollable-games”. Importantly, task difficulty, motivation, and success were consistent across conditions. We tested various reinforcement learning and hidden Markov models (HMMs), examining possible mechanisms underlying controllability effects. We predicted that uncontrollability, especially on shock-games, would impair reward-learning and dampen BOLD-activation in ventromedial-prefrontal cortex (vmPFC).

**Results:** In the first part of the study, we observed that uncontrollable stress impaired BOLD-activation in vmPFC. Specifically, we found that stress uncontrollability predicted worse reward-learning.

**Conclusions:** Greater perceived stress uncontrollability during the COVID-19 pandemic was associated with impaired reward-learning, and this effect was explained by current anxiety. These results suggest that anxiety promotes imprecision in the representation of the reward structure of the environment, mediating the observed effect of lack of control on reward-learning.

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**Keywords:** Reward Learning, Controllability, Stress, BOLD fMRI, Depression