

Behavioral Risk in Adolescents and Adults

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Types of Risk

- No Risk
- Reward Risk
- Behavioral Risk

No Risk

Action and outcome are known.



Reward Risk

Action is known; outcome is not.



Behavioral Risk

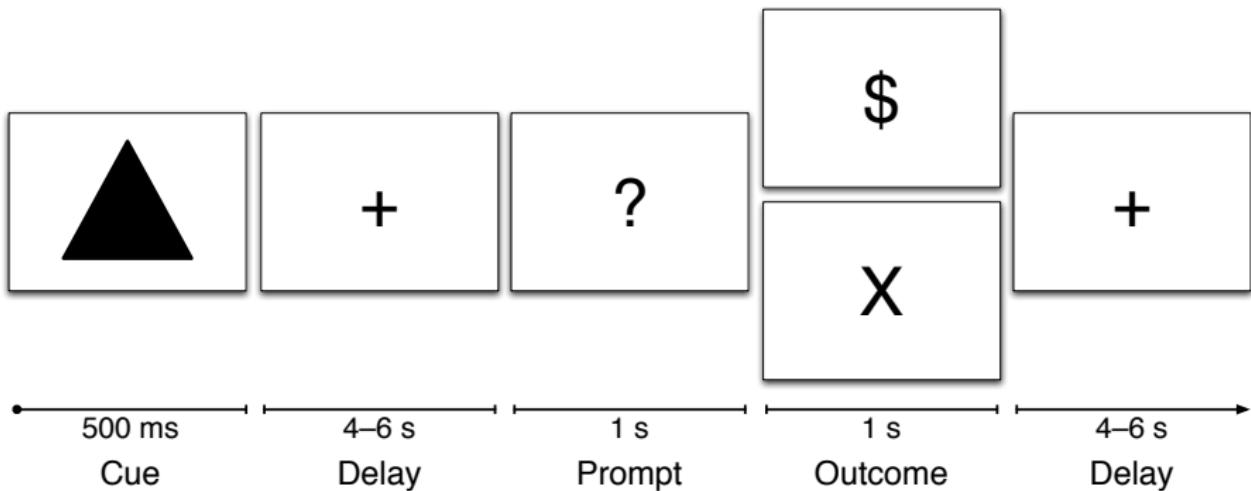
Action is unknown.



Stimuli

	Stimulus	Response	Probability
Behavioral risk		Left or Right	50%
Reward risk		Left	50%
		Right	50%
No risk		Left	100%
		Right	100%

Monetary DM Task



Goals

- How is Behavioral Risk (BR) represented neurally in adolescents?
- Do adolescents respond differently to BR than adults?
- Is BR processed differently in adolescents who are healthy, have psychiatric diagnoses, or have a history with cannabis abuse?

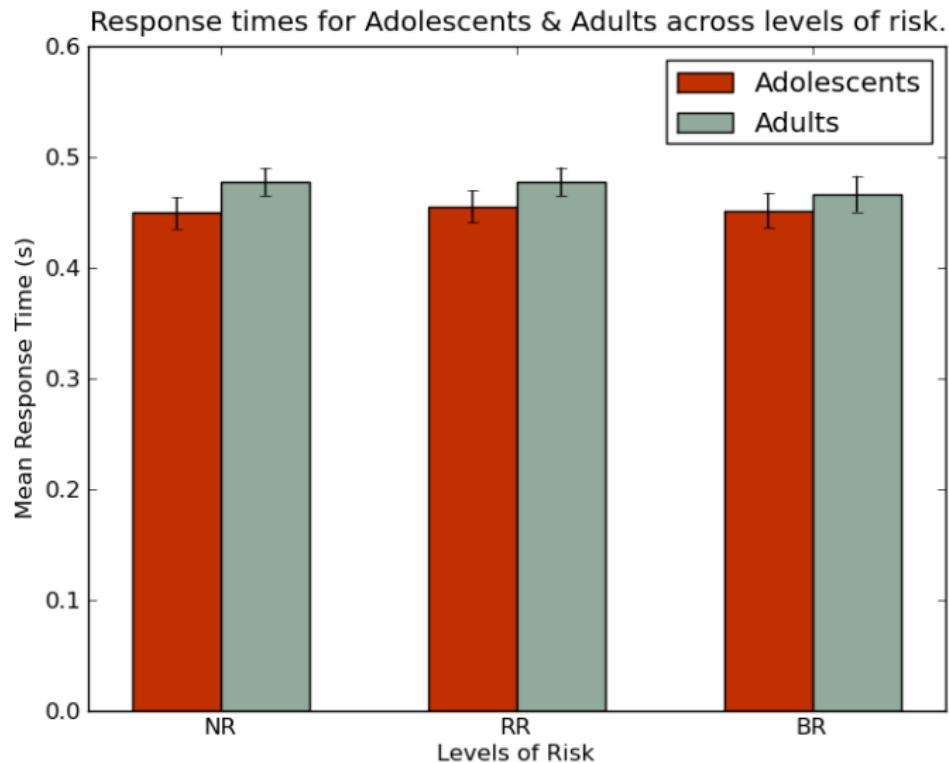
Why adolescence?

- Interesting developmental period
- Elevated risk-taking compared to child- and adulthood
- Increased rates of mortality, depression, suicide, and unprotected sex
- Attenuated executive-processing of risks or heightened response to rewards?

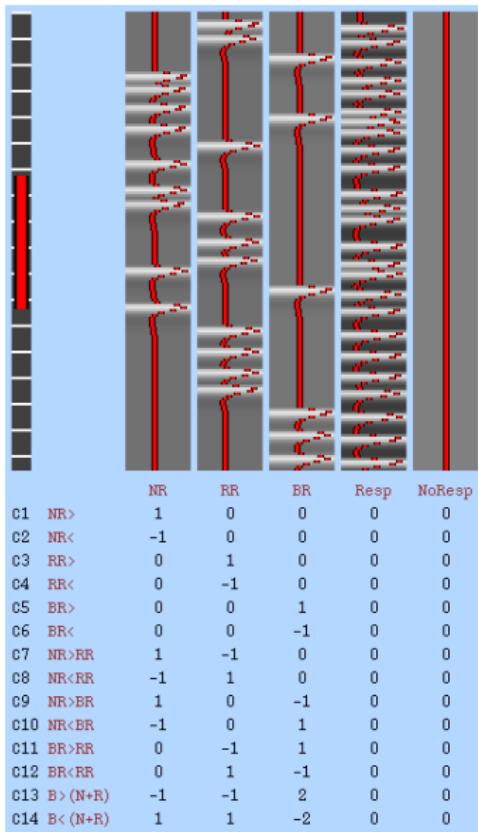
Participants

	Total	Males	Females	% Females
Adults	22	—	—	—
Controls	34	13	21	0.62
Hi-risk	30	18	12	0.4
Cannabis	21	17	4	0.19
Total:	107	48	37	0.44

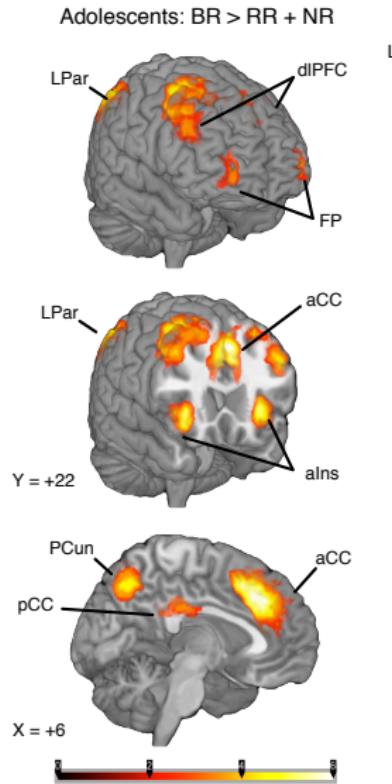
Behavioral Data



Decision Model

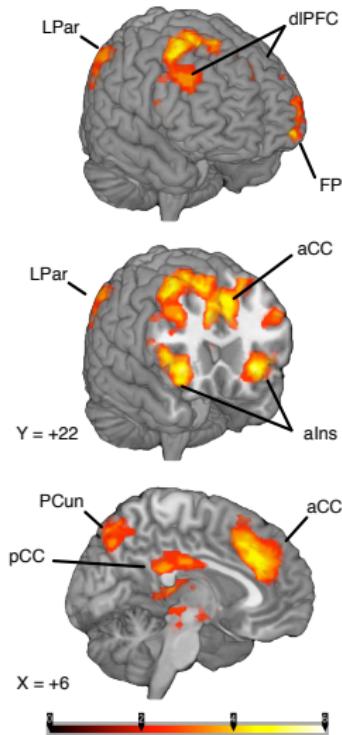


Results: Behavioral Risk in Adolescents



Results: Behavioral Risk in Adults

A. Adults: BR > RR + NR

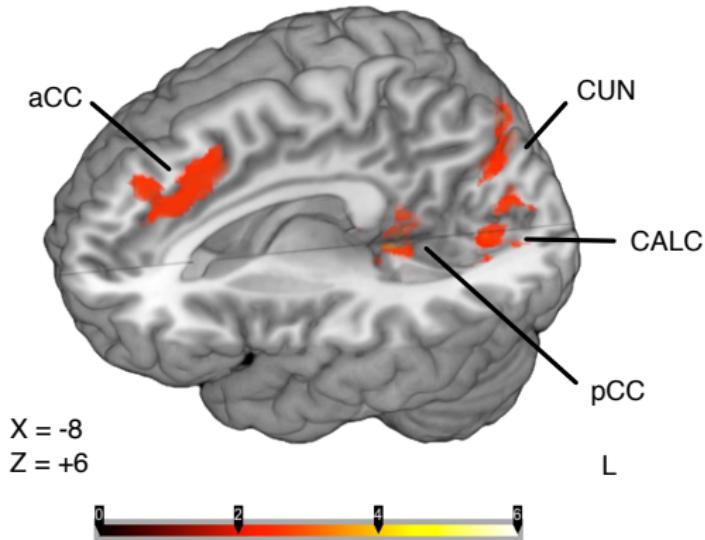


Different scanning parameters for Adolescents and Adults

- 3T v 4T scanners
- Session duration: 6 vs 10 m
- Number of trials
- Despite this, we contrasted the groups directly.

Results: Adolescents v Adults in BR

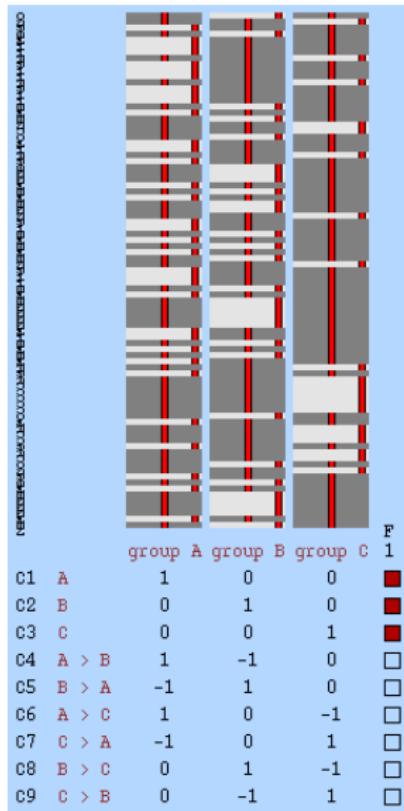
B. Adults > Adolescents: BR > RR + NR



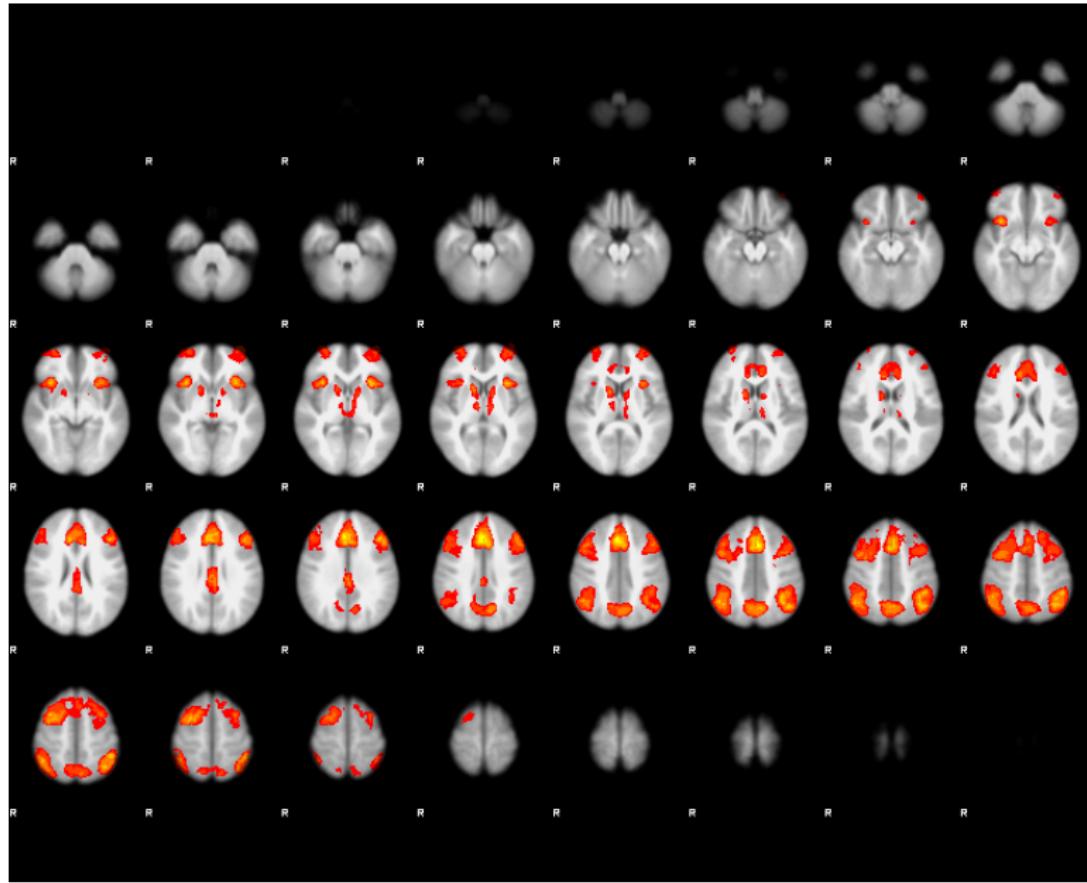
Summary of BR in Adolescents & Adults

- BR elicits same network in adolescents and adults
- Adults show greater activation in the aCC, pCC, and parietal regions
- Adolescents' reduced activation in aCC fits with choice-selection in other risky economic tasks (eg, Wheel-of-Fortune)

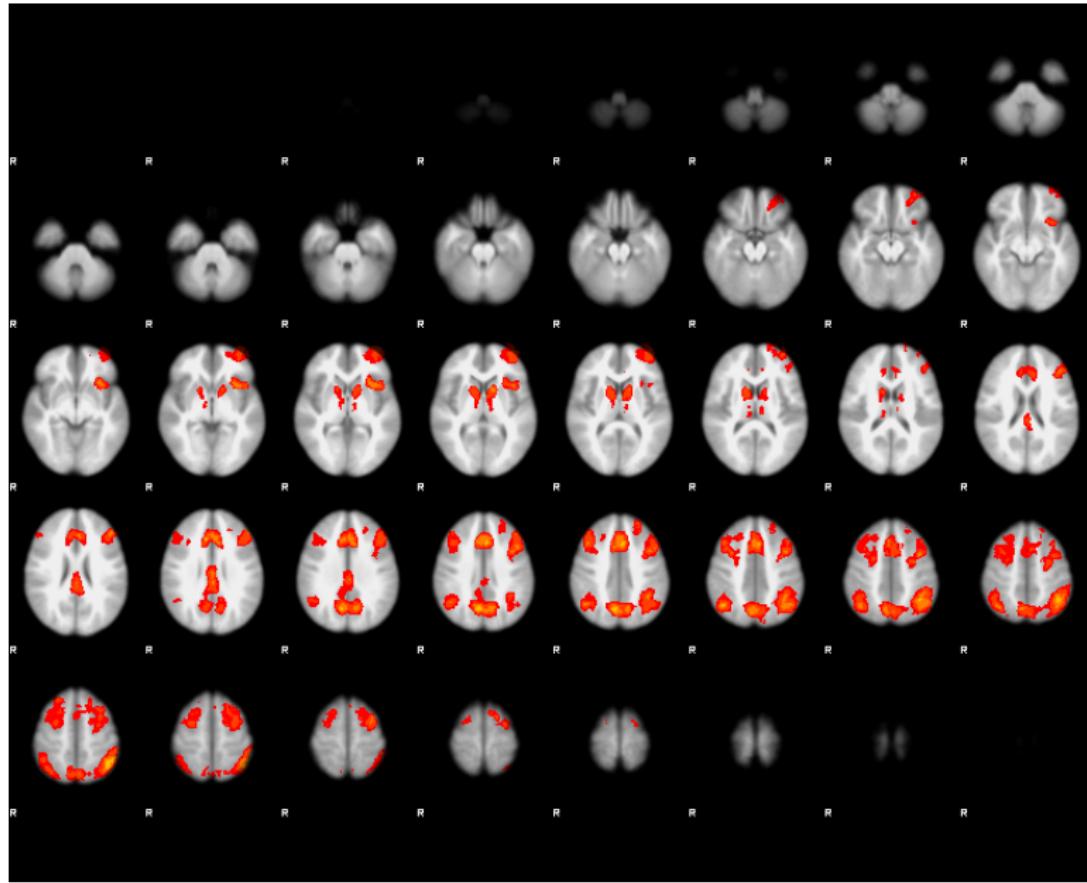
3 Group Model: A) CTRL, B) HR, C) CUD



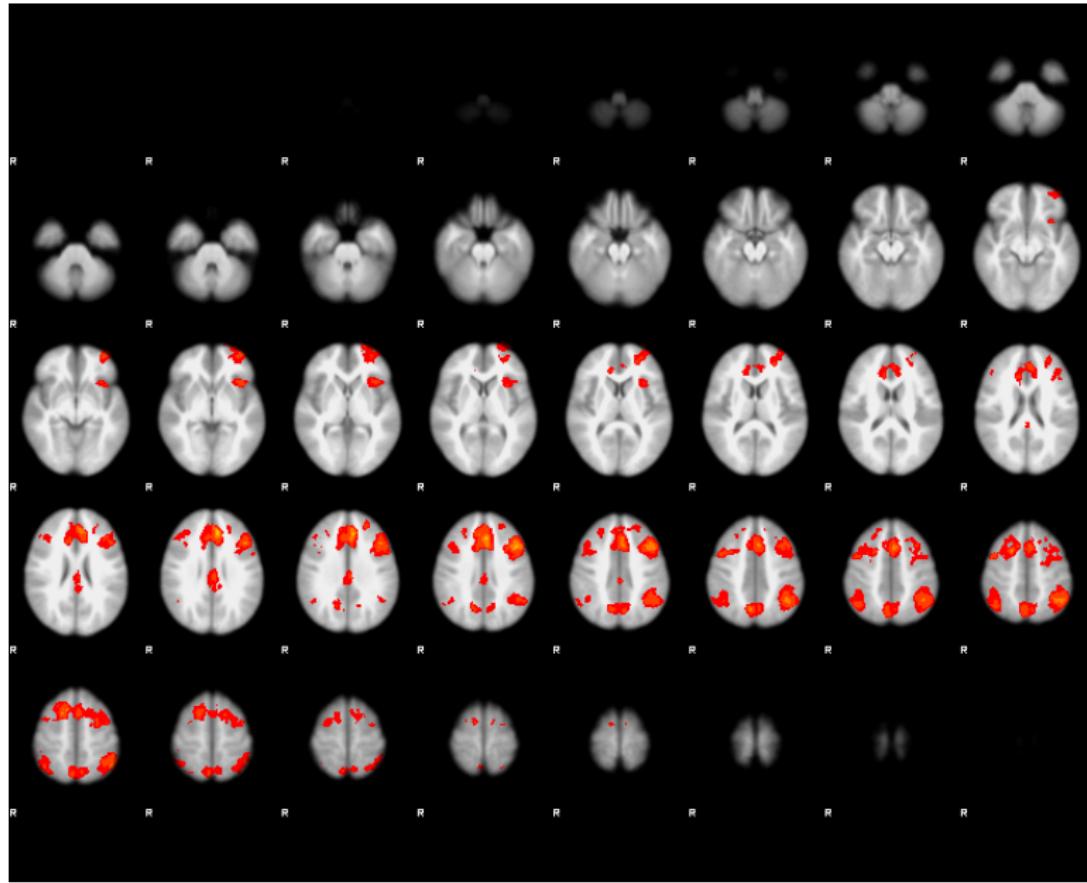
Results: 3 Group: Control



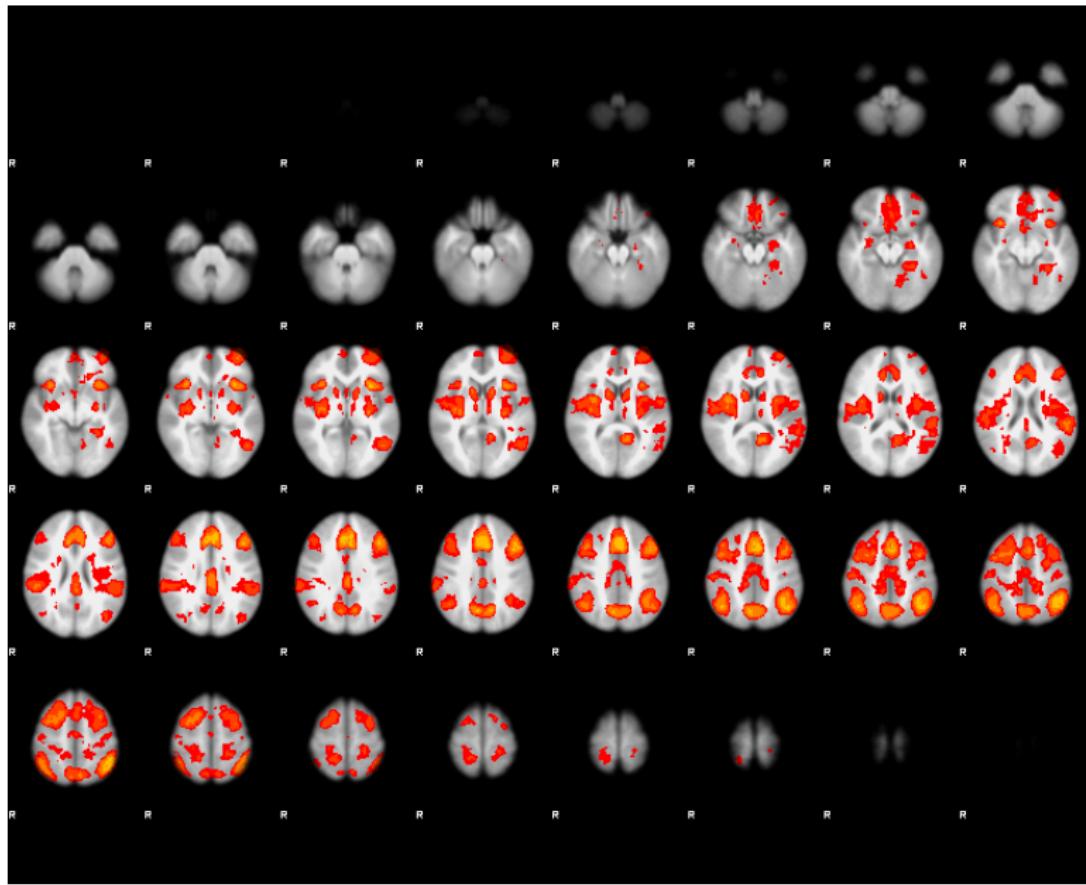
Results: 3 Group: HR



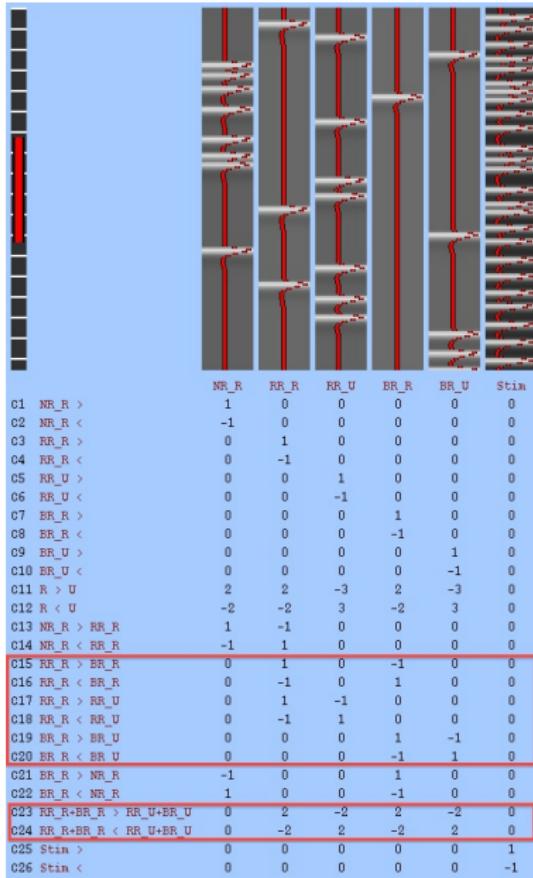
Results: 3 Group: CUD



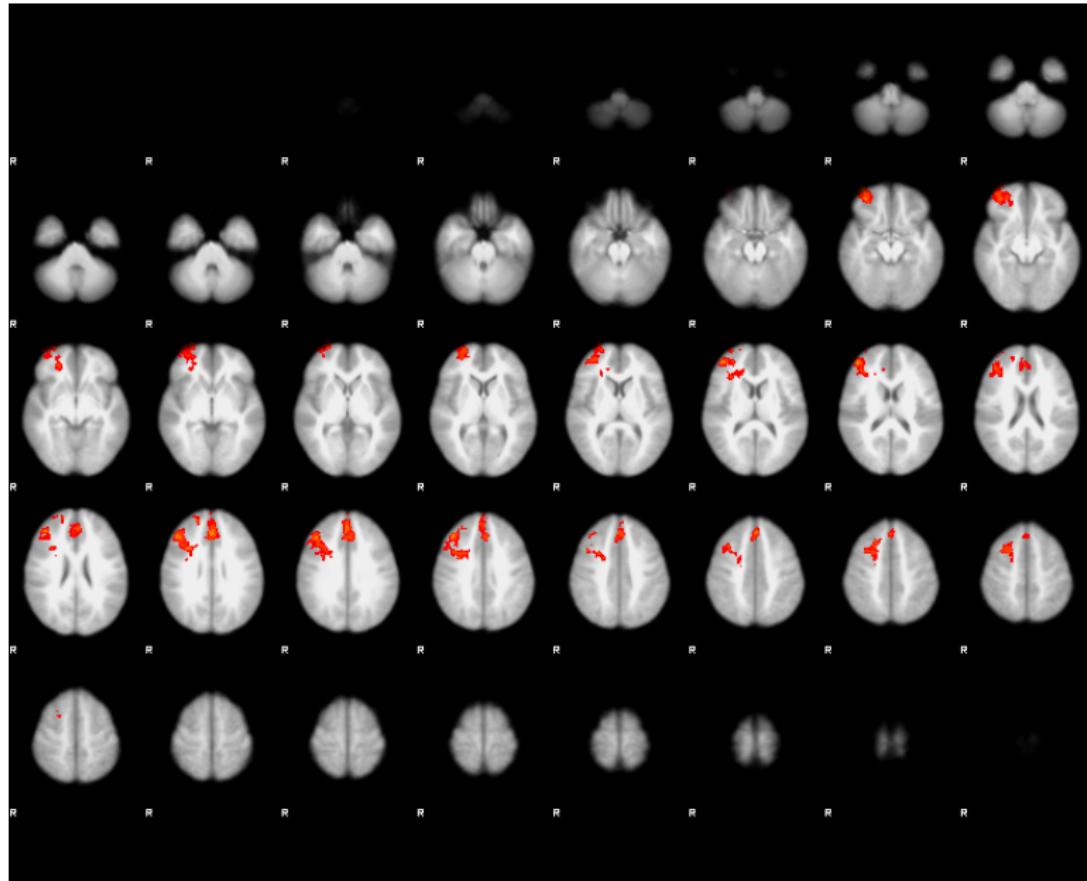
Results: 3 Group: F-test



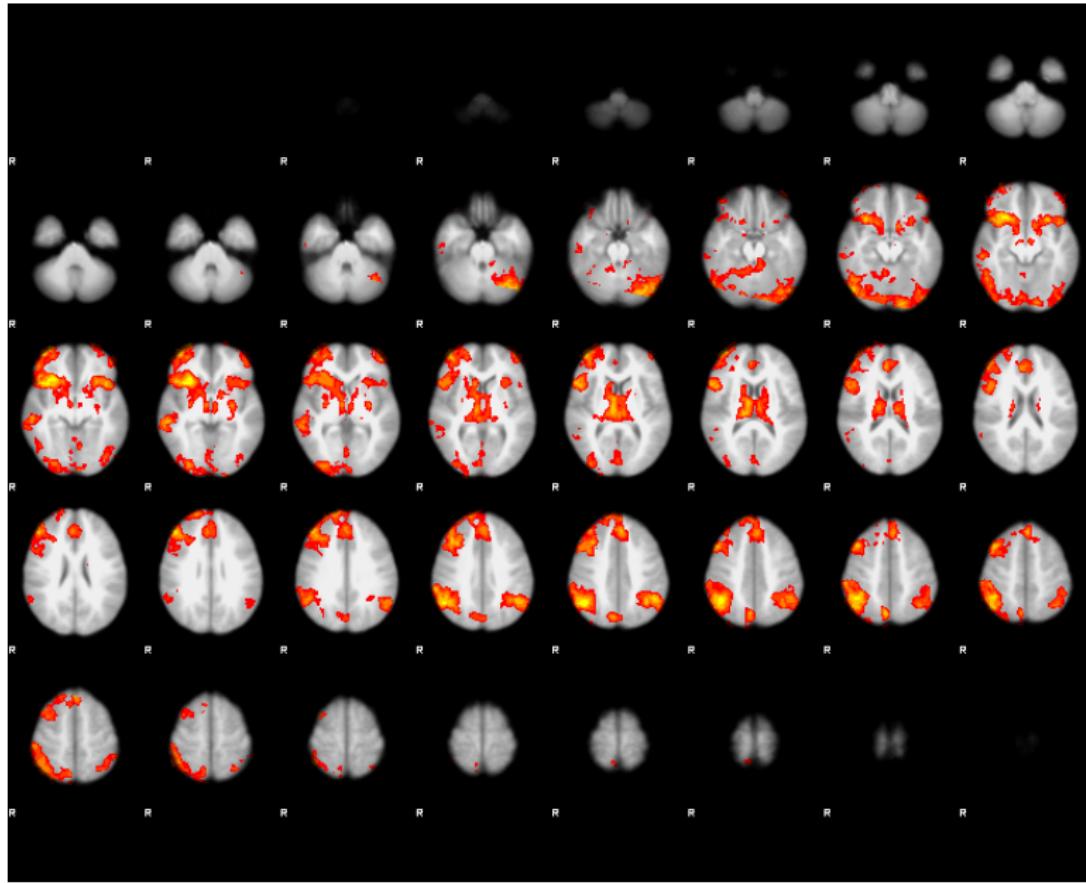
Outcome Model



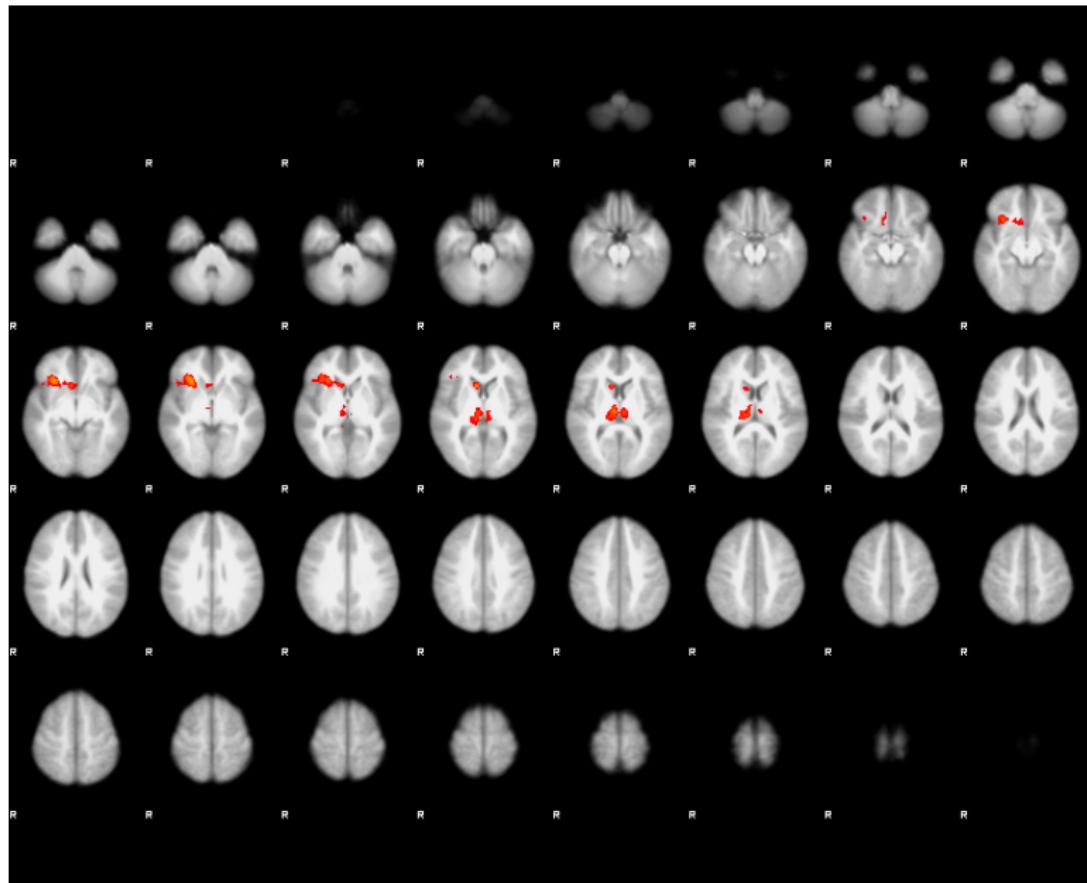
BR Rewarded > RR Rewarded: Adolescents



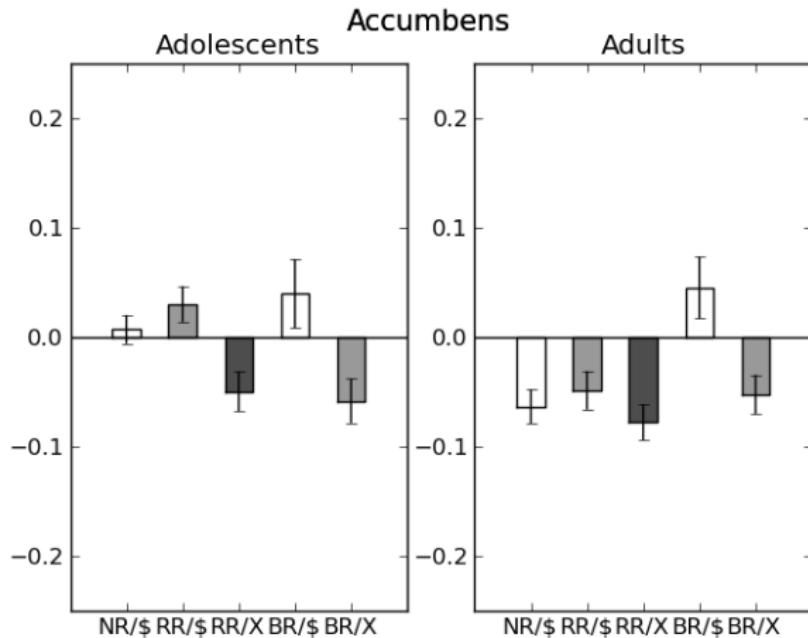
BR Rewarded > RR Rewarded: Adults



BR Rewarded > RR Rewarded: Adults > Adolescents



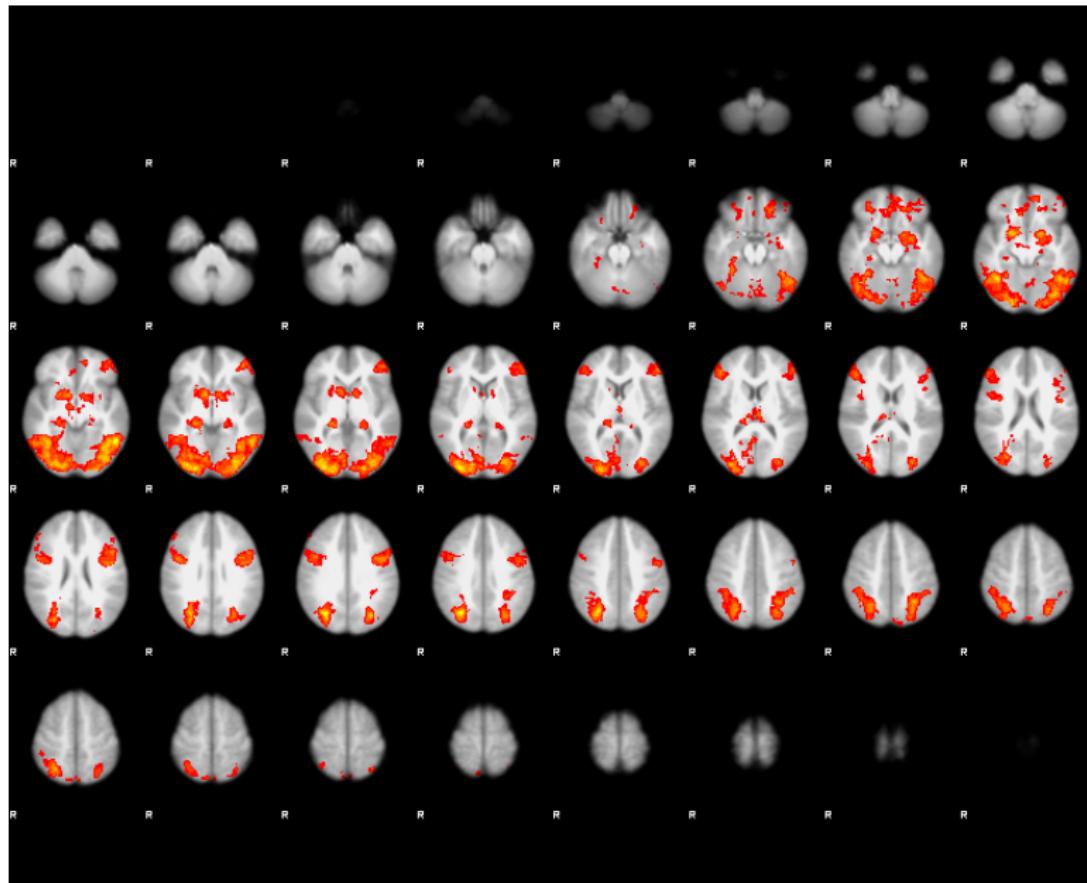
Response to Rewarded & Unrewarded Trials



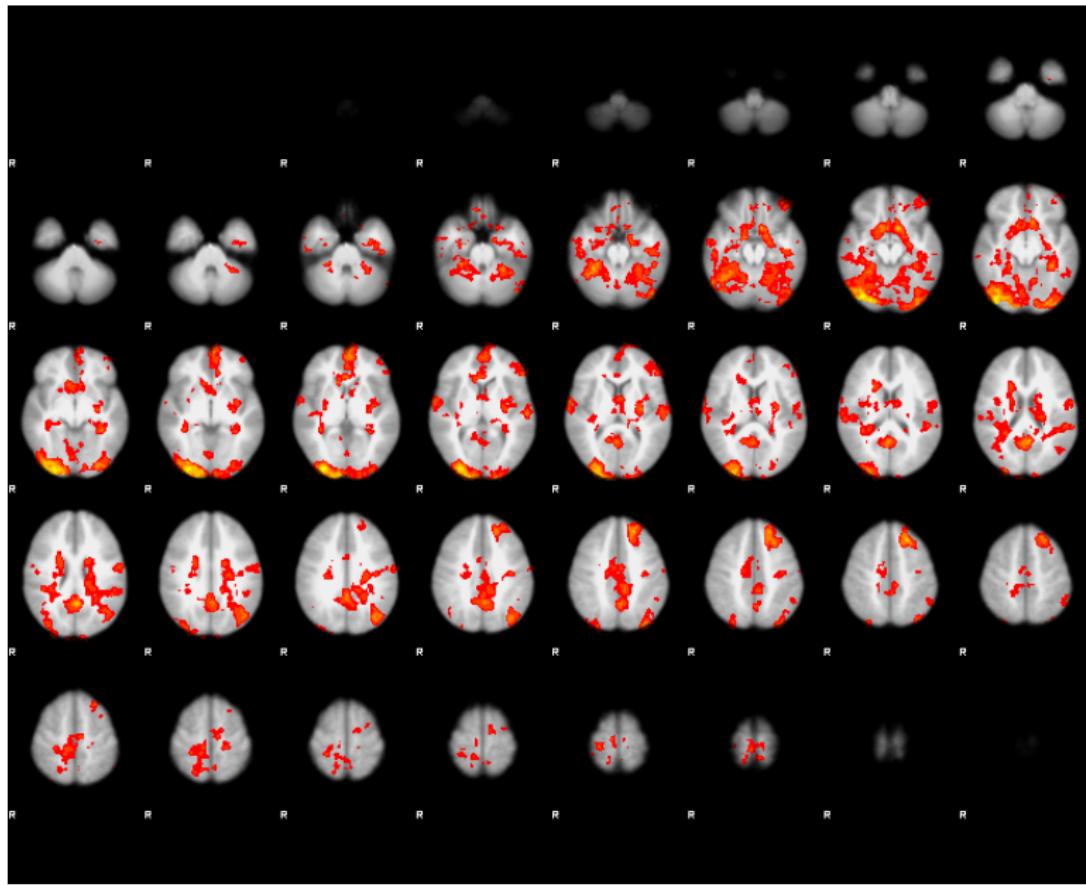
Summary: BR Rewarded > RR Rewarded

- Adolescents: Anterior cingulate, frontal pole, MFG
- Adults: Above + caudate, putamen, nucleus accumbens, thalamus, lateral parietal, precuneus
- Adults > Adolescents: nucleus accumbens, caudate, thalamus, and orbitofrontal cortex

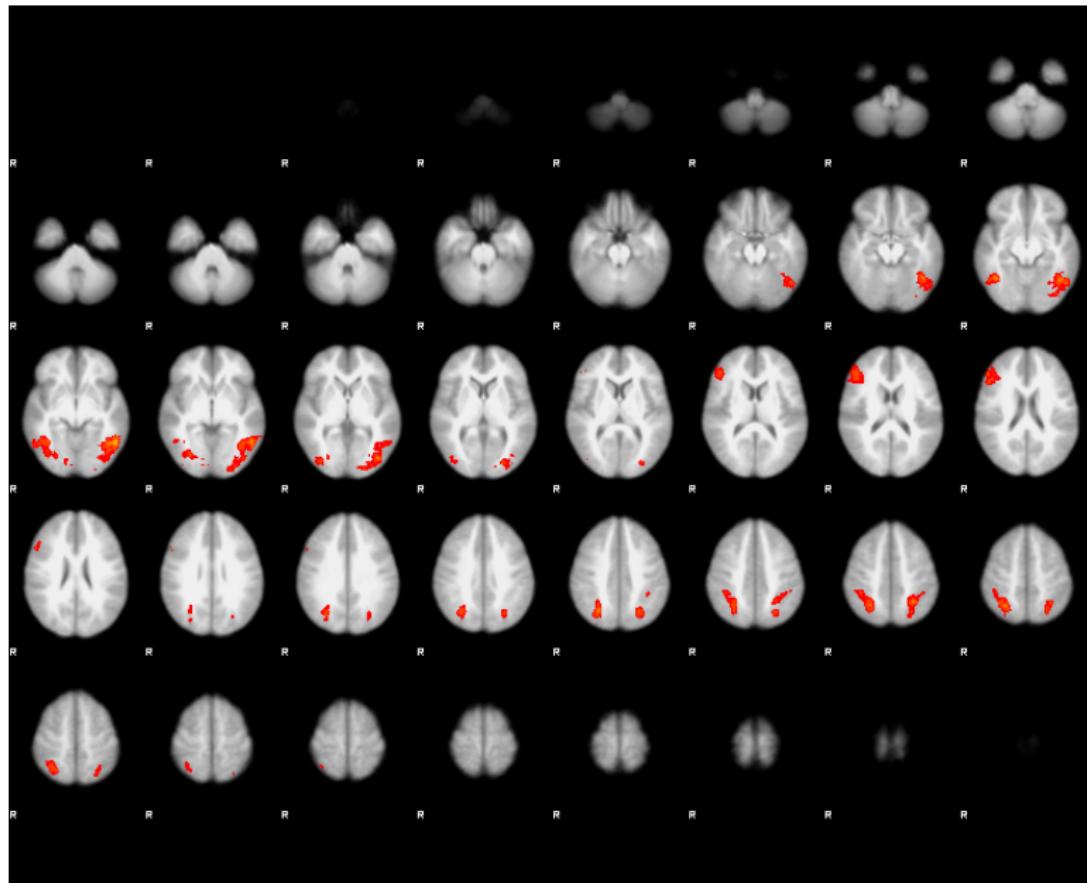
RR+BR Rewarded > Unrewarded: Adolescents



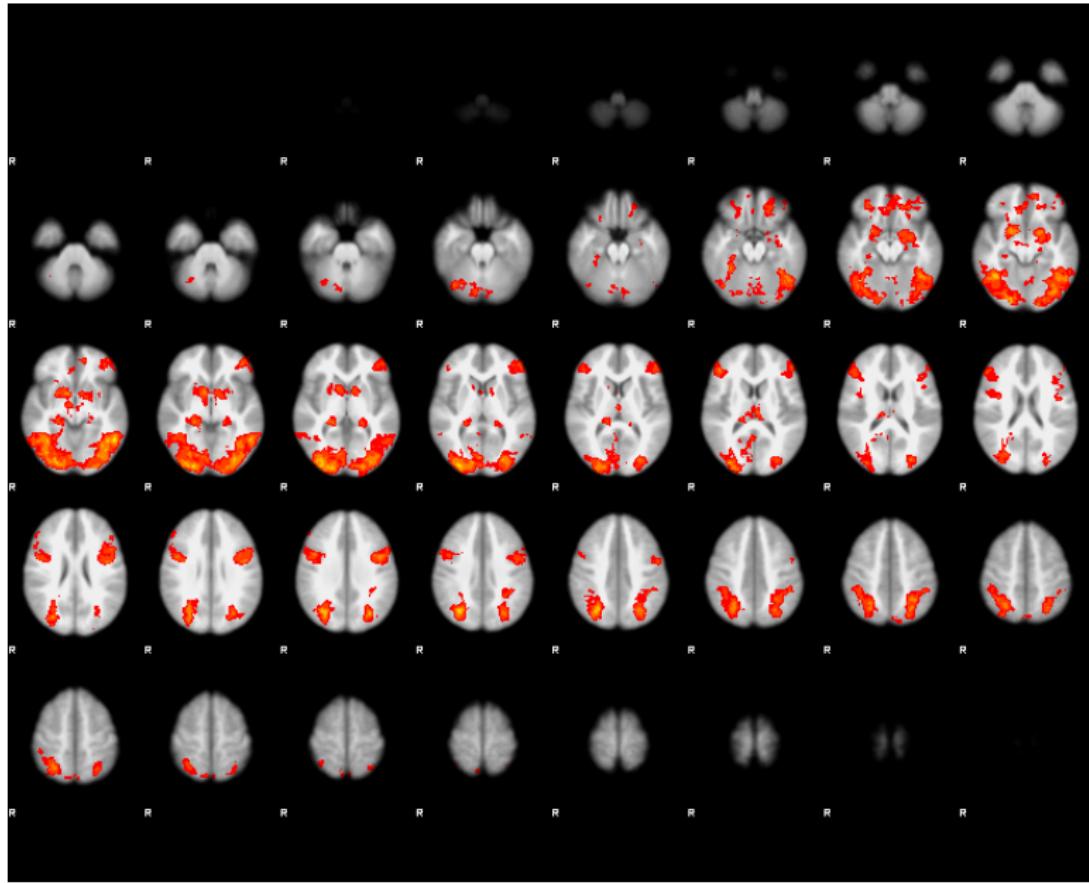
RR+BR Rewarded > Unrewarded: Adults



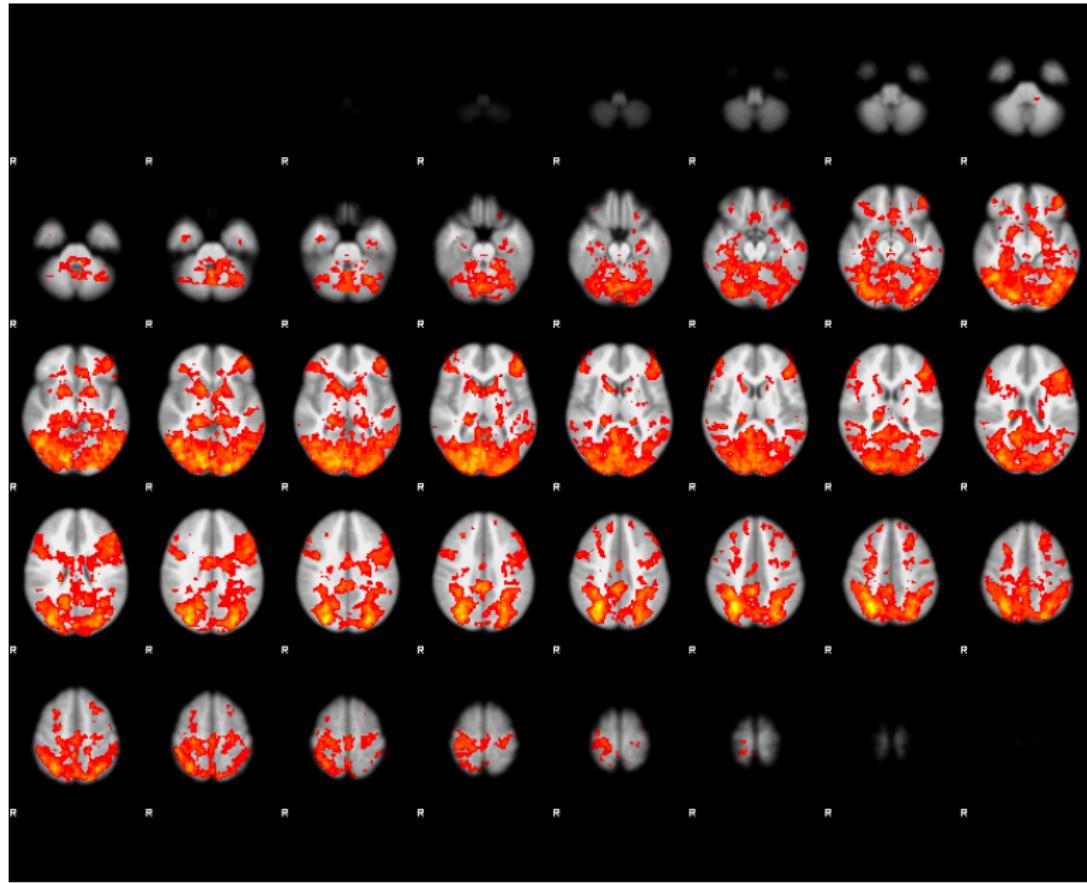
RR+BR Rewarded > Unrewarded: Adolescents > Adults



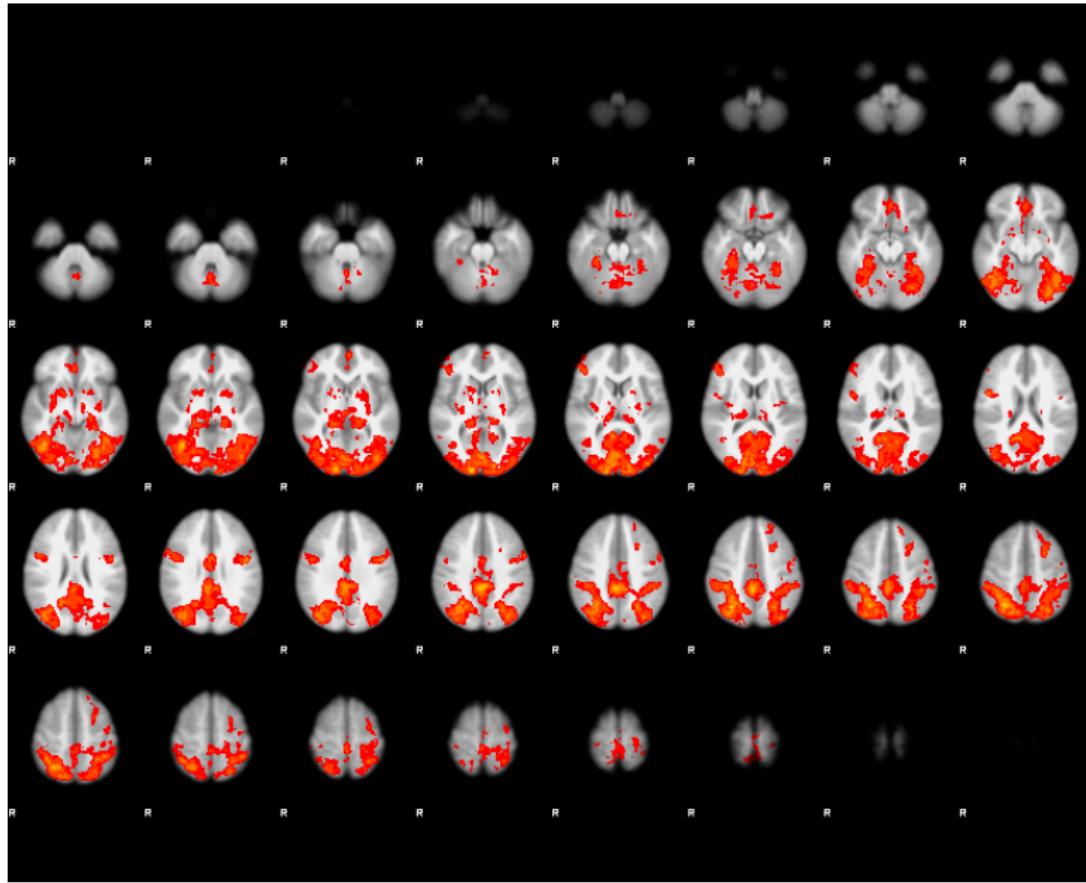
3 Group: RR+BR Rewarded > Unrewarded: CTRL



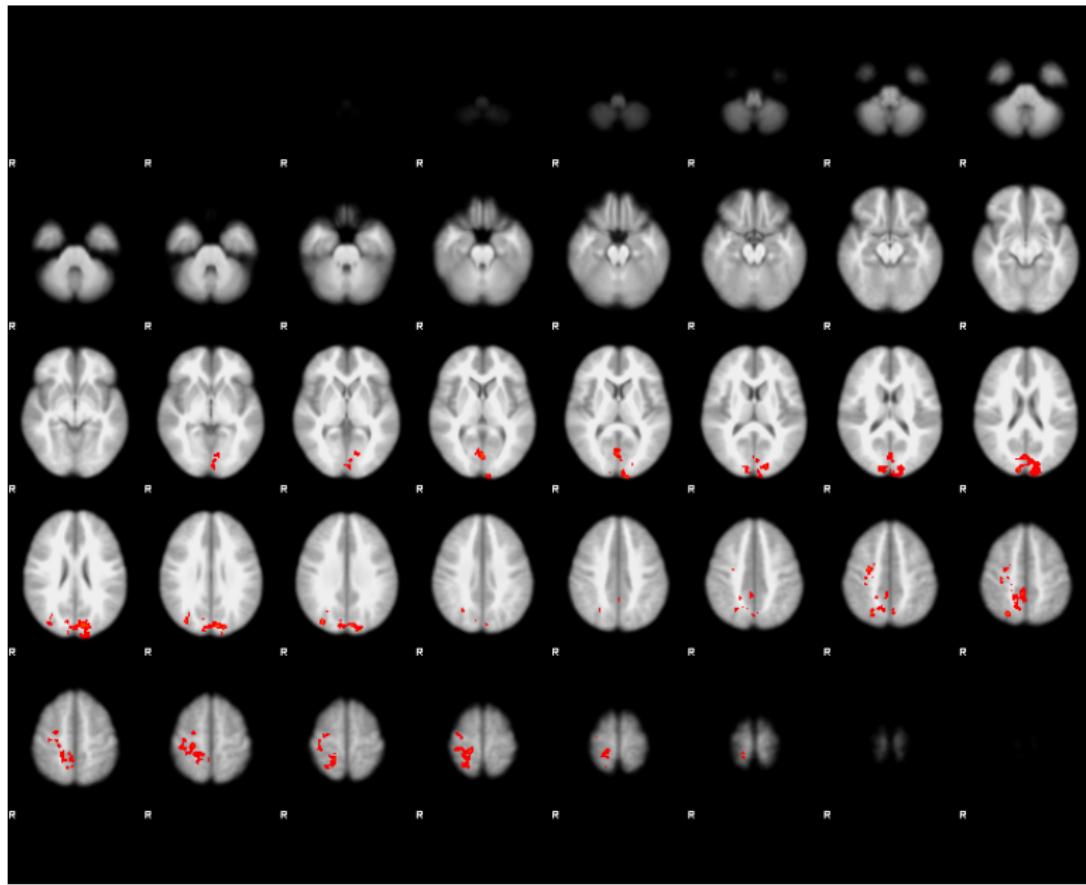
3 Group: RR+BR Rewarded > Unrewarded: HR



3 Group: RR+BR Rewarded > Unrewarded: CUD



3 Group: RR+BR Rewarded > Unrewarded: HR > CTRL



3 Group: RR+BR Rewarded > Unrewarded: CUD > CTRL

