

Title: Reward vs. Punishment: The effects of primary liquid incentives on cognitive control

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Recent research has begun to uncover the behavioral and neural mechanisms that underlie interactions of motivation and cognitive control; however, an important question that remains to be addressed is whether rewards and punishments exhibit the same or different motivational effects. In this experiment, reward and punishment effects were directly compared, in separate sessions, while human participants performed task-switching during fMRI scanning. In the reward condition, fast and accurate performance on incentive-cued (I) trials was rewarded with delivery of pleasant liquid, while neutral liquid was delivered if performance criteria were not met. In the punishment condition, neutral liquid was delivered if performance criteria were met, while failure was punished via delivery of aversive liquid. Between-groups analyses compared subjects who performed the reward task to subjects who performed the punishment task during their first fMRI session. Both groups showed similar behavioral effects in multiple measures of task performance (reward rate, incentive cue effect (I vs. non-incentive (NI) cued trials), and incentive context effect (NI vs. baseline trials)). Preliminary neuroimaging results show increased sustained activity for the punishment group in left insula, caudate, and left middle frontal gyrus, while the reward group showed greater event-related activity in several regions, including thalamus, striatum, insula, cerebellum, fusiform gyrus, and right DLPFC. Neural response to neutral liquid delivery indicates that many regions respond to the outcome indicated by the liquid (left DLPFC, right insula/IFG, putamen) while response in gustatory cortex indicated which liquid had been delivered. Additional analyses will focus on within-subject and individual difference effects.