# BEHAVIORAL AND NEURAL EFFECTS OF CHOICE ON APPETITIVE SELF-REGULATION: AN EXPERIMENTAL TEST OF SELF-DETERMINATION THEORY

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## **INTRODUCTION & METHODS**

### BACKGROUND

- Self-determination theory posits that autonomy promotes intrinsic motivation and goal pursuit, but the underlying mechanism is unclear<sup>1</sup>
- Autonomous goal pursuit feels easier and is associated with fewer and weaker temptations<sup>2-3</sup>
- Value-based model of self-control suggests autonomy may modulate value signals to favor goal-congruent choices<sup>4</sup>
- Cognitive reappraisal is an effective self-control strategy that can be used to increase or decrease affect and subjective value of goal-relevant stimuli<sup>5-6</sup>

### PARTICIPANTS

-N = 117 (73 females), incoming college freshmen (ages 17-19)

### AUTONOMY MANIPULATION

- Writing exercise about a recent choice that demonstrated taking ownership of one's life

### **REGULATION OF CRAVING-CHOICE TASK**

-90 trials -look = 20%, regulate = 20%, choose = 60%



- Choice is a primary means for supporting autonomy, but is not always helpful<sup>7-8</sup>

#### AIMS & HYPOTHESES

- Experimentally manipulate choice during cognitive reappraisal task and measure neural activity
- Choice should improve task goal pursuit, but effect may be moderated by perceived difficulty and individual differences in autonomous motivation
- If distinct, autonomous and controlled goal pursuit should be distinguishable neurally

### RESULTS

### BEHAVIORAL ANALYSIS

#### HOW FREQUENTLY DO PARTICIPANTS CHOOSE TO **REGULATE THEIR CRAVINGS?**

>> CHOSE TO REGULATE ~47% OF THE TIME





DOES PERCEIVED DIFFICULTY & AUTONOMOUS

MOTIVATION DIFFER AS A FUNCTION OF CHOICE?

### NEURAL ANALYSIS

IS AUTONOMOUS GOAL PURSUIT DISTINGUISHABLE NEURALLY?

UNIVARIATE EFFECTS OF CHOICE N = 115, p < .001, k = 60 (cFWE corrected p < .05), voxel size = 2 x 2 x 2mm<sup>3</sup>

>> CHOICE IS ASSOCIATED WITH INCREASED ACTIVATION IN VISUAL & FRONTOPARIETAL CONTROL REGIONS







DOES CHOICE FACILITATE MORE EFFECTIVE GOAL PURSUIT?

MODEL 1 task craving ~ 1 + goal \* choice +

baseline craving + trial + (1 + goal + baseline craving | participant)

t(111) = 1.16, p = .249

b = -0.28, SE = 0.10

\* difficulty

DO EFFECTS OF GOAL AND CHOICE DIFFER AS A FUNCTION OF DIFFICULTY OF GOAL PURSUIT? + goal \* choice \* task difficulty MODEL 2

#### **ARE TASK EFFECTS MODERATED BY AUTONOMOUS MOTIVATION?**

MODEL 3 + goal \* choice \* task difficulty \* autonomous motivation

MODEL	DF	AIC	X <sup>2</sup>	Р
1	13	22844.13	_	_
2	17	22159.90	692.24	< .001
3	25	22150.26	25.63	< .001





MULTIVARIATE NEURAL EFFECTS OF CHOICE

Classified yes-v. no-choice using a logistic regression classifier with 5-fold cross-validation in main effect of Goal

>> PREDICTED CHOICE WITH GREATER THAN CHANCE ACCURACY; HIGHEST WHEN CLASSIFYING LOOK TRIALS ONLY





false positive rate (1 - specificity)

## **CONCLUSIONS & FUTURE DIRECTIONS**

- Choice was associated with lower difficulty, but not consistently with increased autonomous motivation
- Greater autonomous motivation was associated with lower perceived difficulty of goal pursuit during choice
- Greater autonomous motivation was associated with improved goal pursuit but only when participants chose on relatively difficult trials, suggesting more subtle effects in this context
- Autonomous and controlled goal pursuit were distinguishable neurally
- Neural patterns suggest enhanced attentional control could be an underlying mechanism

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