

# Feeling of agency predicts choice

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## Introduction

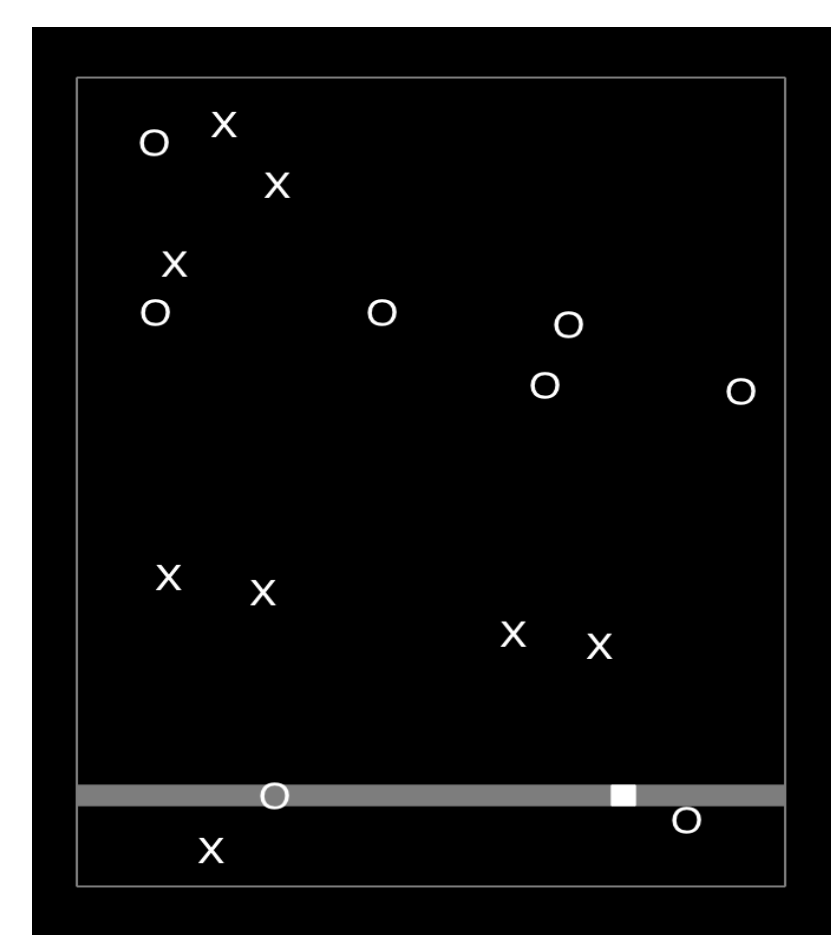
The two experiments presented here address the question of whether the feeling of agency influences our choice behavior, or whether choice is driven only by reward or outcome.

The feeling of agency refers to the feeling of being in control (Blakemore & Frith, 2003). Subjects played a “space pilot” game in which Xs and Os scroll down a screen, and they use the mouse to catch Xs and avoid Os. Xs explode to indicate they were successfully caught.

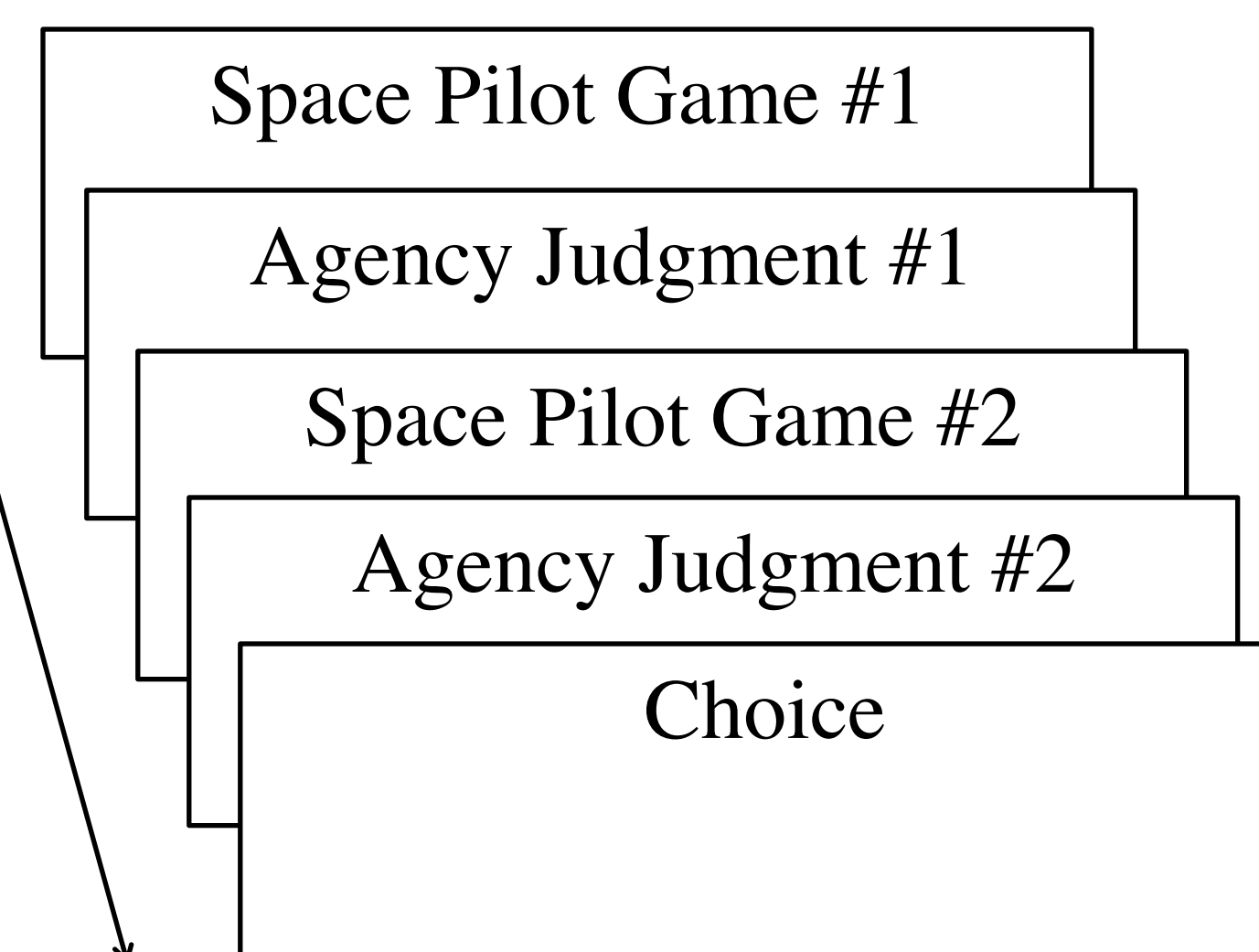
In experiment 1, individuals chose between a *high agency* or *low agency* version of the task. In experiment 2, participants chose between a game that generated *high agency* or *high reward*.

## Experiment 1 Method

### Trial Sequence



Space Pilot Screenshot

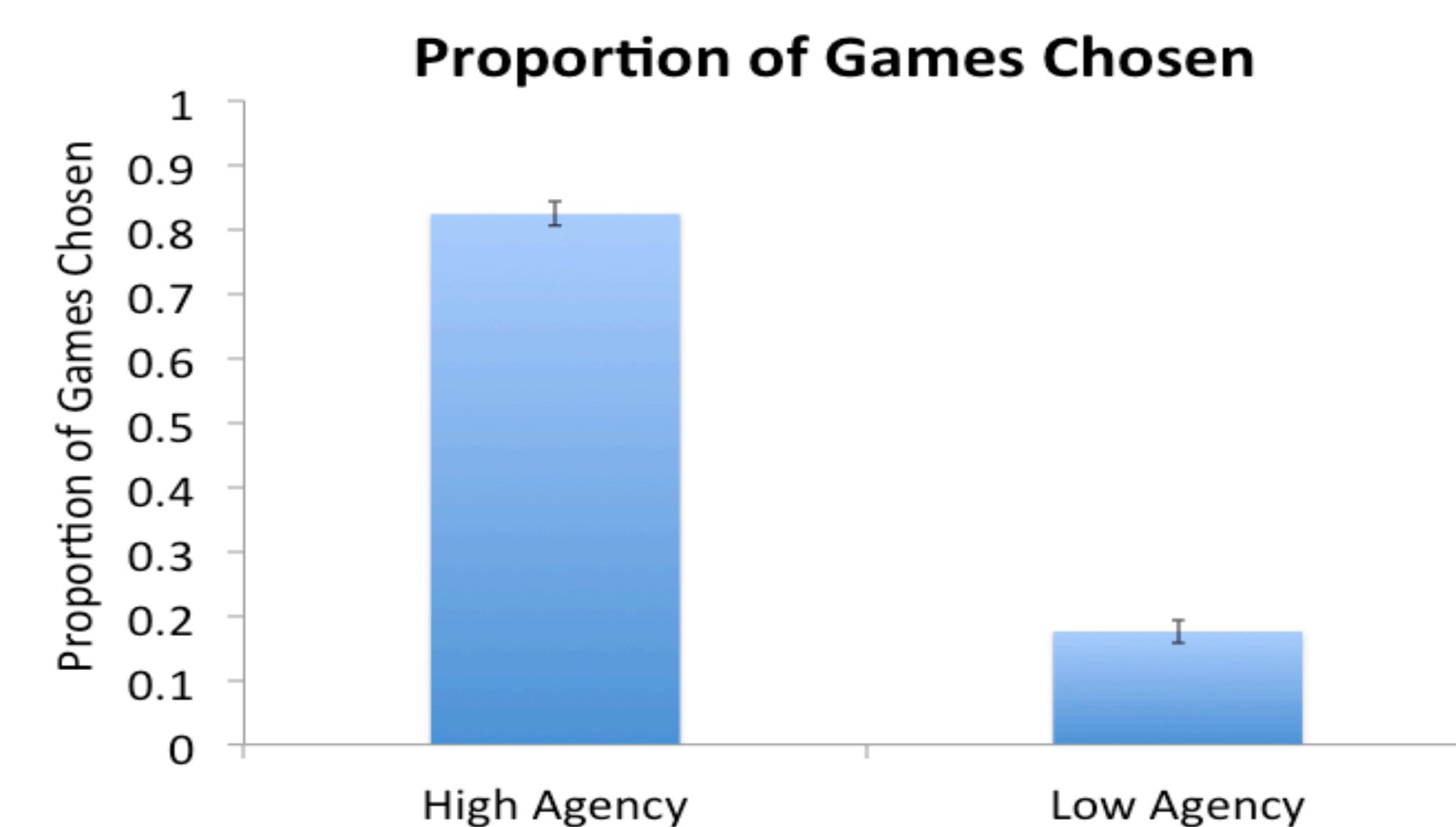
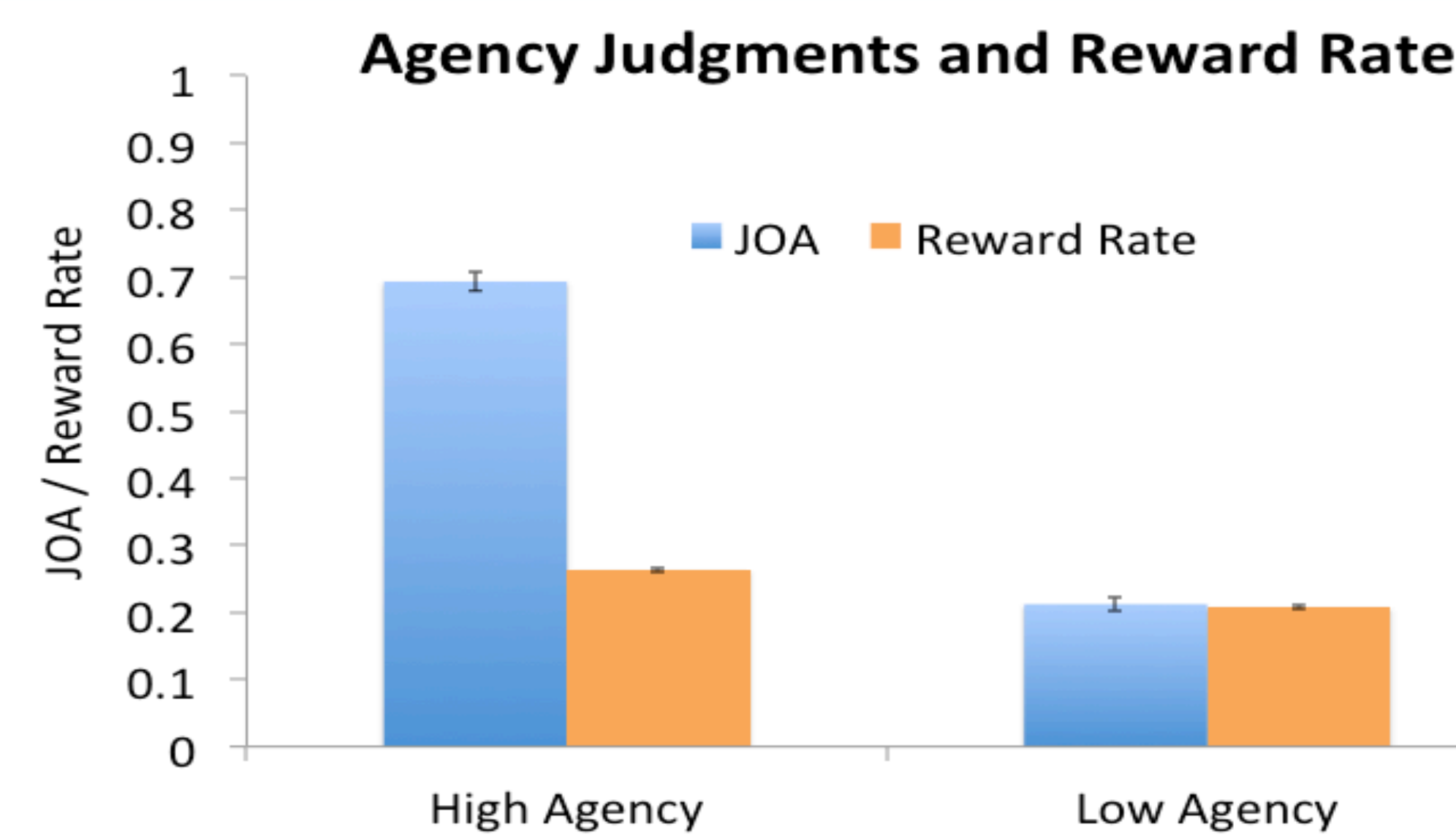


We manipulated control by either making the cursor correctly reflect the participant’s mouse movements (which resulted in high feelings of agency) or by introducing noise into the cursor control (which decreased the feeling of agency).

We define reward as the proportion of Xs that explode. Since the number of exploding Xs would be different in the *high agency* and *low agency* conditions based purely on the player’s performance, we adjusted the probability that Xs exploded when touched in the high agency condition to come close to matching the reward rate in the low agency condition. The probability of exploding when touched was 0.5 in the high agency condition and 1.0 in the low agency condition.

Participants also played a control version of the game, which was the normal game without any manipulations.

## Experiment 1 Results



Participants overwhelmingly preferred the high agency game over the low agency game.

Logistic regression analysis revealed that both JOA ( $\beta = 4.19, p < 0.001$ ) and reward rate ( $\beta = 4.75, p < 0.01$ ) increased the probability of an individual choosing the game. The significant  $\beta$  on reward may have occurred because the reward rate was slightly higher in the high than the low agency condition.

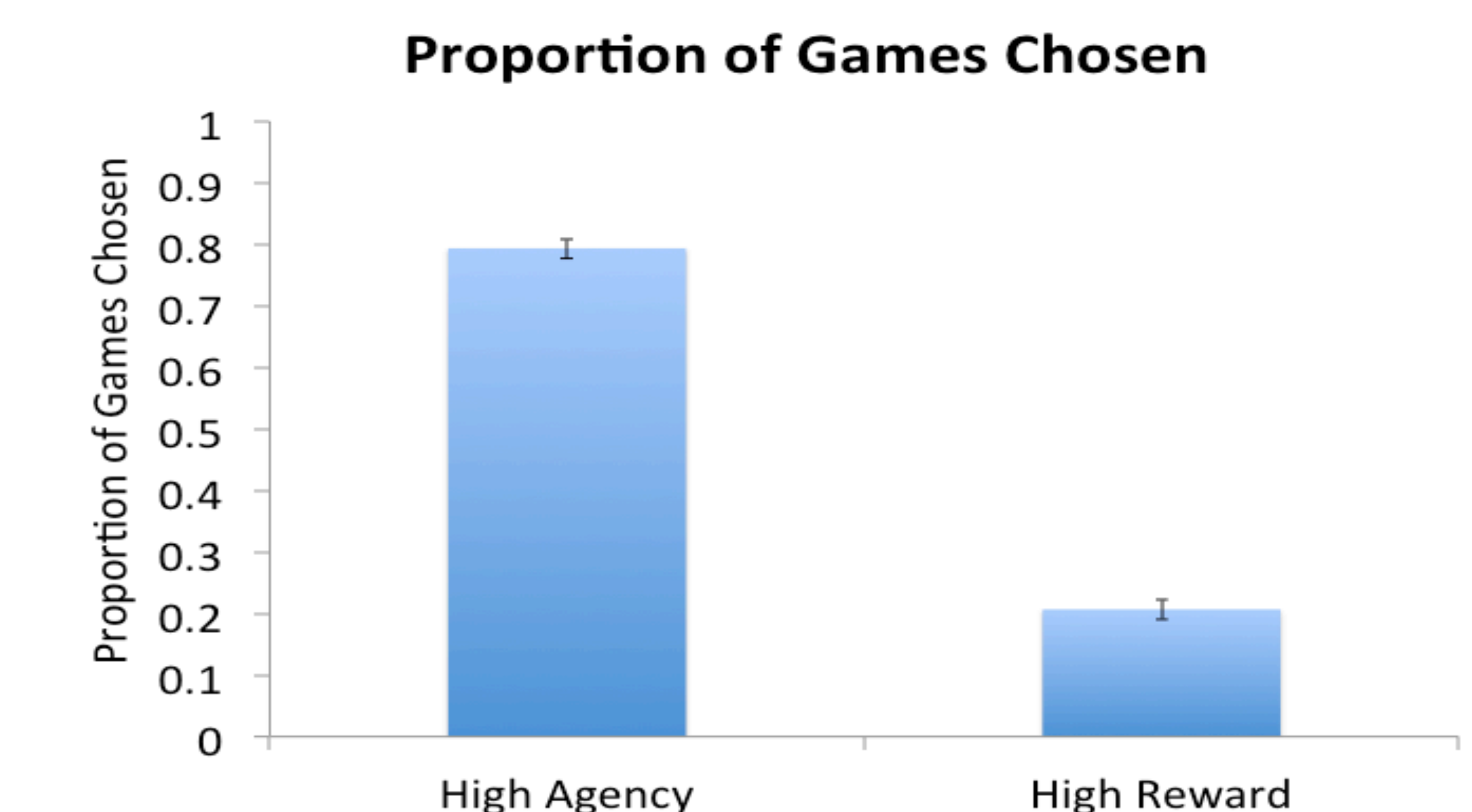
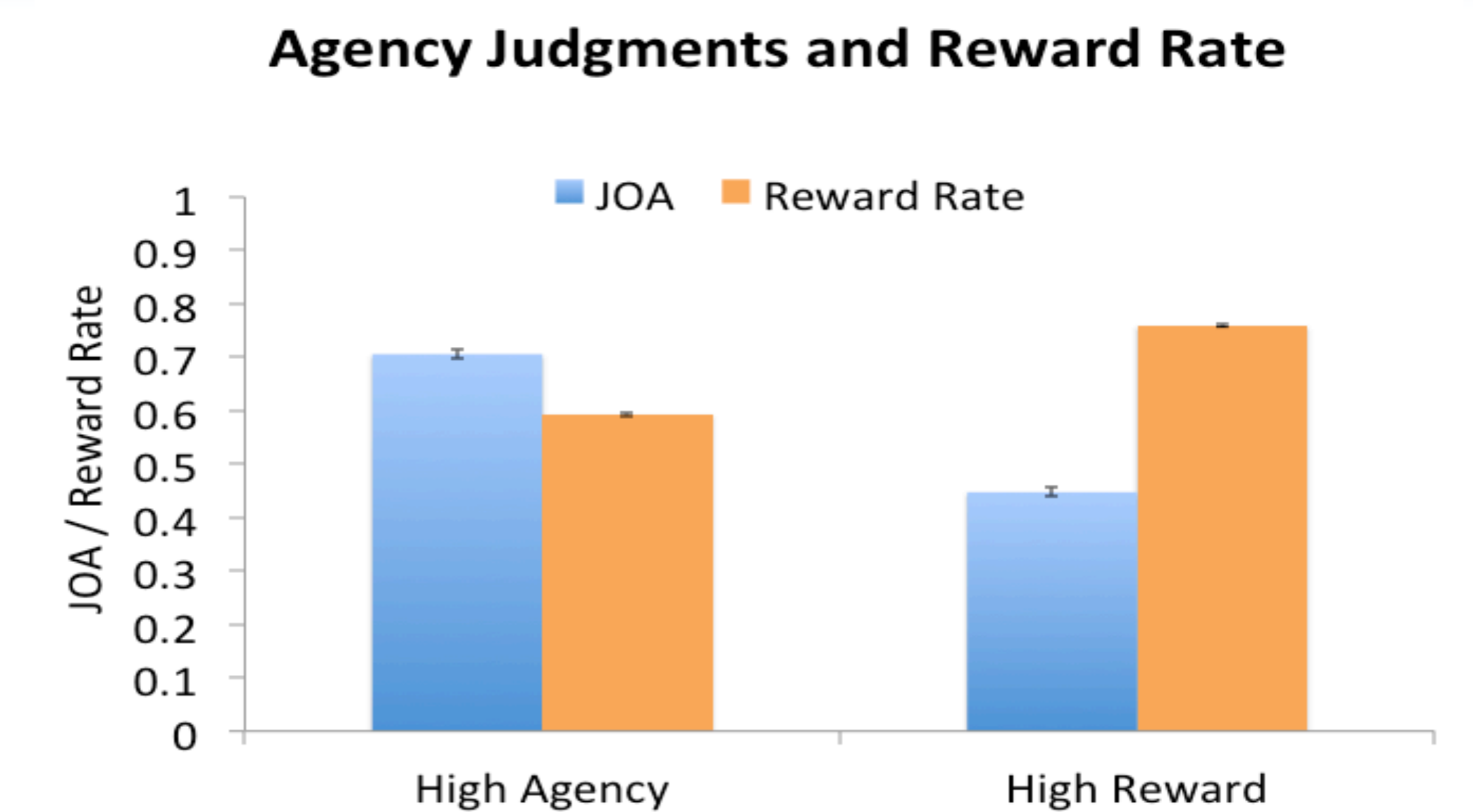
We conducted a second experiment to determine how an individual would choose between a *high agency* and a *high reward* game with low agency.

## Experiment 2 Method

For the *high reward* condition, Xs exploded 75% of the time regardless of whether the player caught them. Thus, we increased reward while eliminating the contingency of the reward on the player’s action. This manipulation decreased the JOA and increased the reward rate.

The *high agency* condition was the standard version of space pilot without any agency manipulations. This condition was expected to produce high agency ratings and a moderate reward rate. As is shown in the third figure, the manipulations produced the expected results.

## Experiment 2 Results



Participants overwhelmingly preferred the high agency game over the high reward game.

Logistic regression analysis revealed that only JOA ( $\beta = 4.34, p < 0.001$ ) was positively associated with an individual choosing the game. Reward rate ( $\beta = -0.94, p < 0.01$ ) decreased the likelihood of an individual choosing the game.

## Summary

- Individuals prefer games that yield a high feeling of agency.
- When given the choice between having a high feeling of agency or earning a high reward, individuals choose agency.
- A high reward rate only makes it more likely an individual will choose the game if the reward is contingent on their own action.

## References

- Blakemore, S-J. & Frith, C. (2003). Self-awareness and action. *Current Opinion in Neurobiology*, 23, 219-224.
- Metcalfe, J., Eich, T., & Miele, D. (2013). Metacognition of agency: proximal action and distal outcome. *Experimental Brain Research*, 229, 485-496.