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# The Role of Interactions Between the Cortex and the Amygdala in Risky Decision-Making



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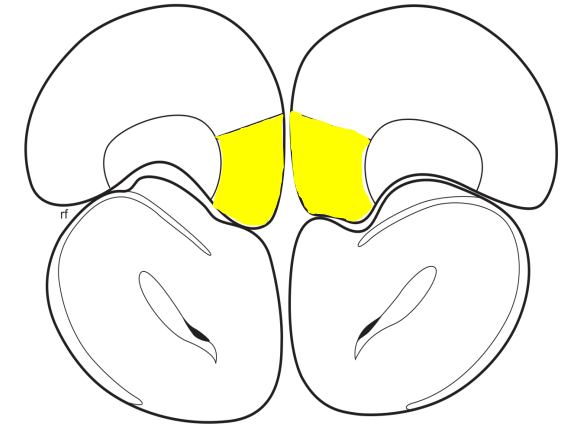
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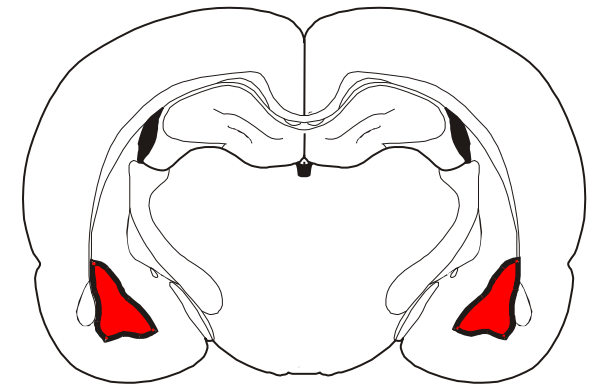
# Overview



- Big rewards tend to come at a risk
- Cost-benefit analysis required to determine optimal actions
- mOFC and BLA implicated in value-based decision-making (Izquierdo, 2017; Stolyarova et al, 2017)



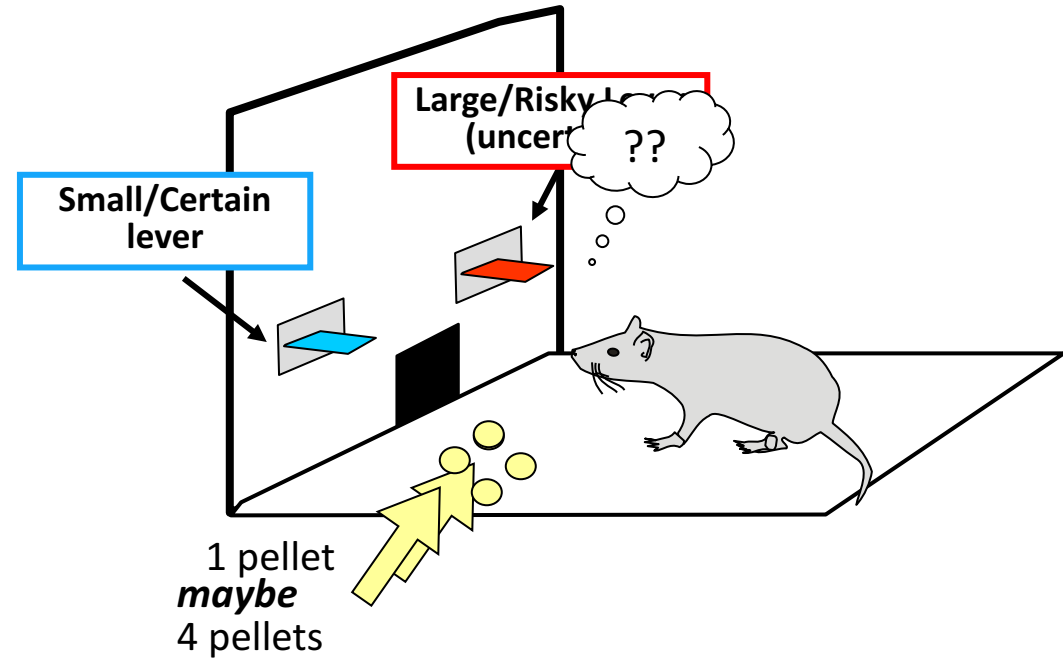
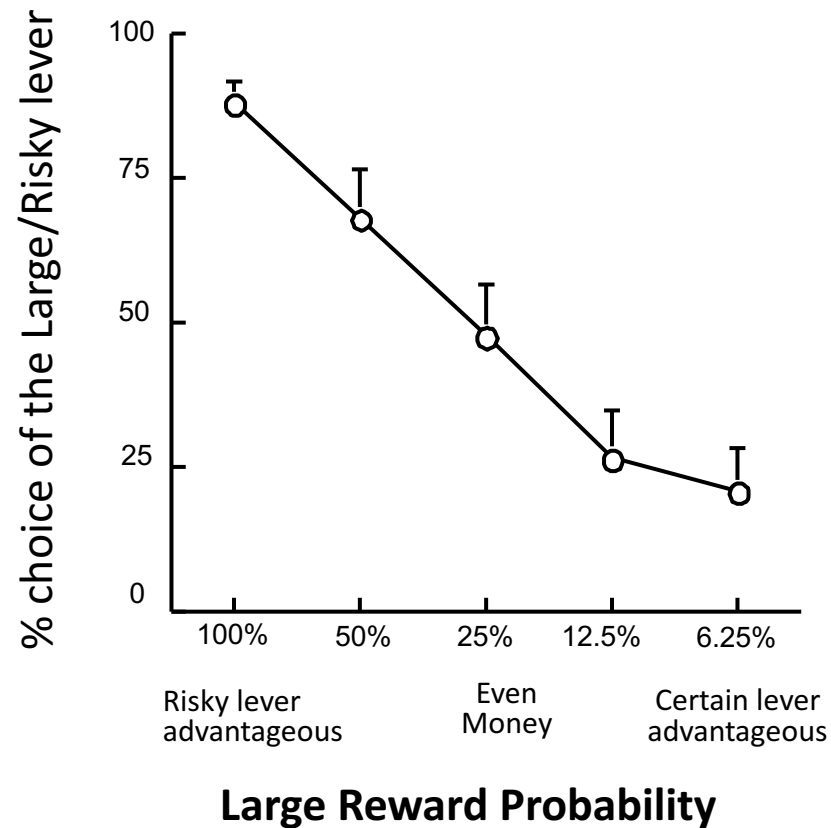
Medial Orbitofrontal Cortex



Basolateral Amygdala

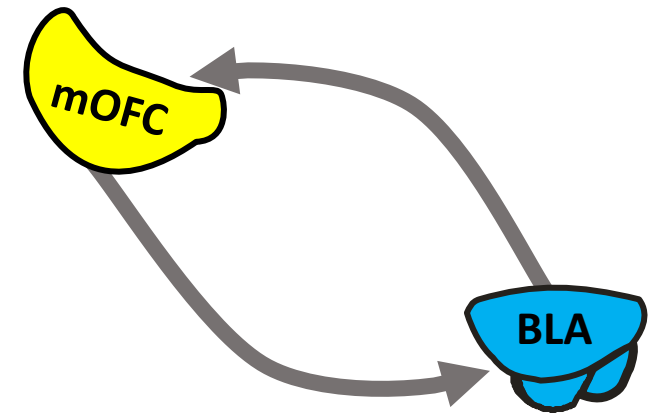
# Measuring risky decision-making

## Probabilistic Discounting Task



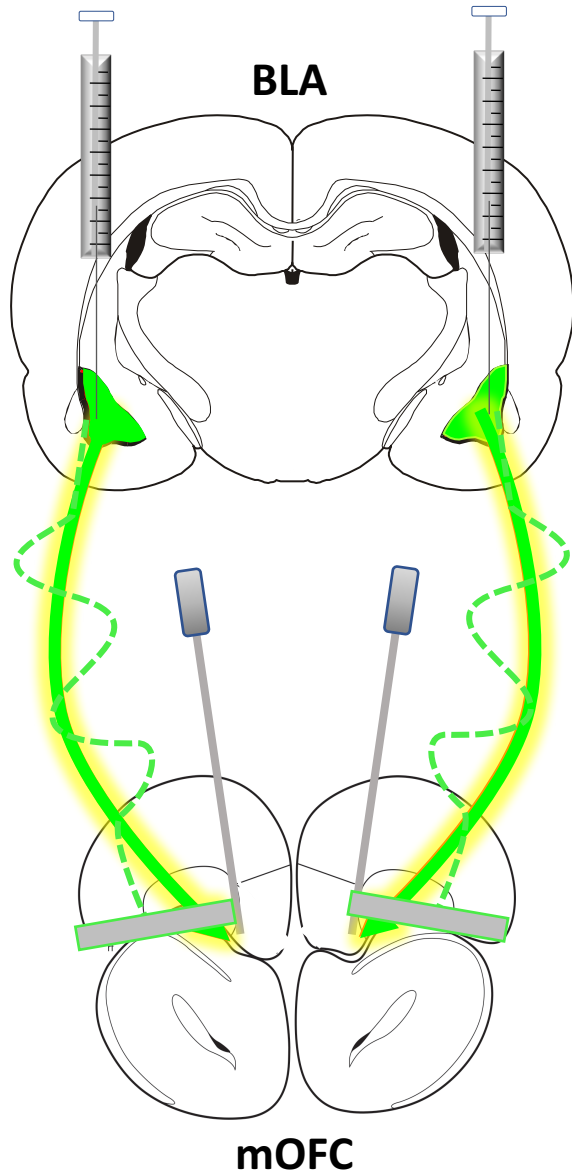
# mOFC and BLA involvement

- Damage to and inactivation of the **mOFC** *increases* risky choice (Bechara et al, 1994; Clark et al, 2008)
- Inactivation of the **BLA** *decreases* risky choice (Ghods-Sharifi et al, 2009)
- mOFC and BLA are anatomically connected through a bidirectional pathway (Izquierdo, 2017; Stolyarova et al, 2017)



*How are the reciprocal pathways between the mOFC and the BLA involved in regulating risky decision-making?*

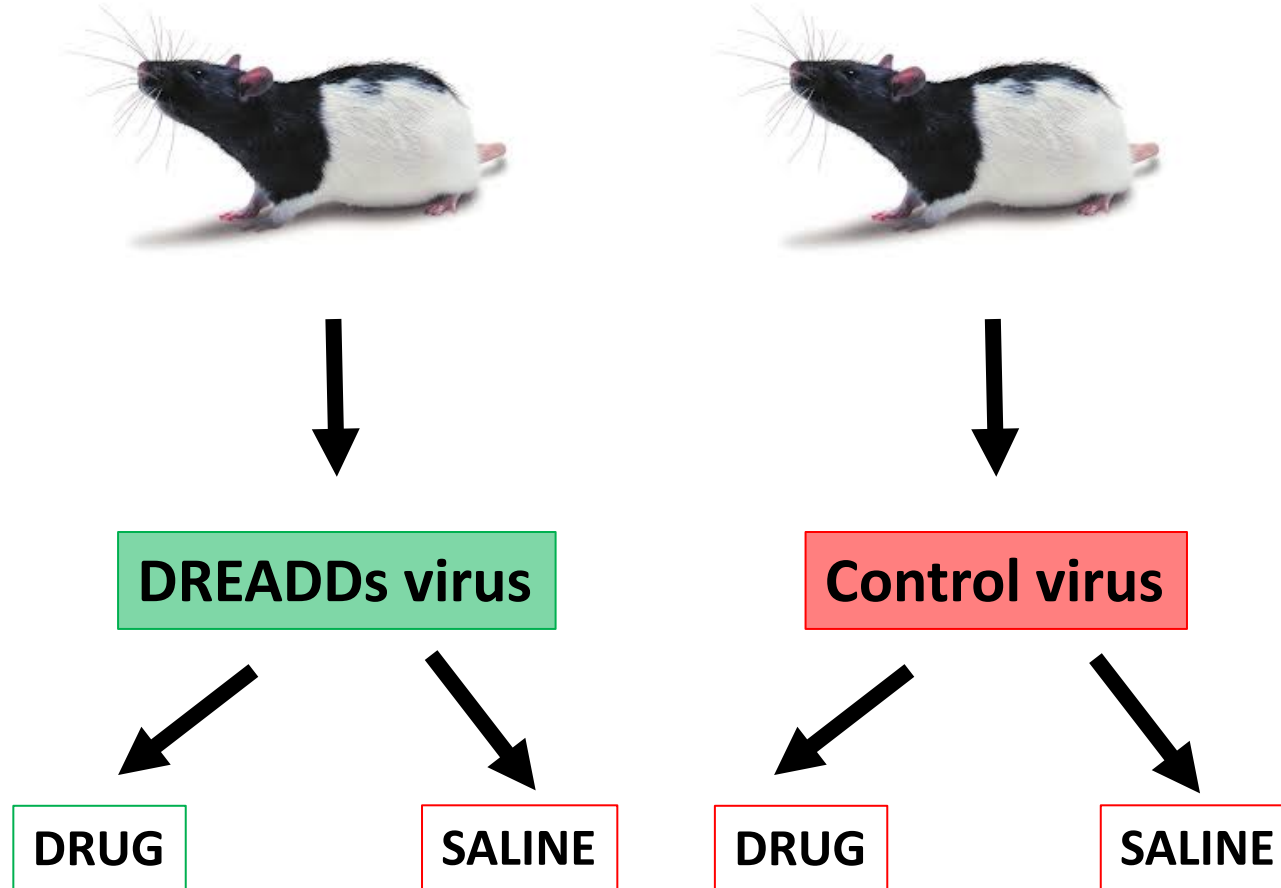
# Manipulating brain circuits



## ➤ Designer Receptors Exclusively Activated by Designer Drugs (DREADDs)

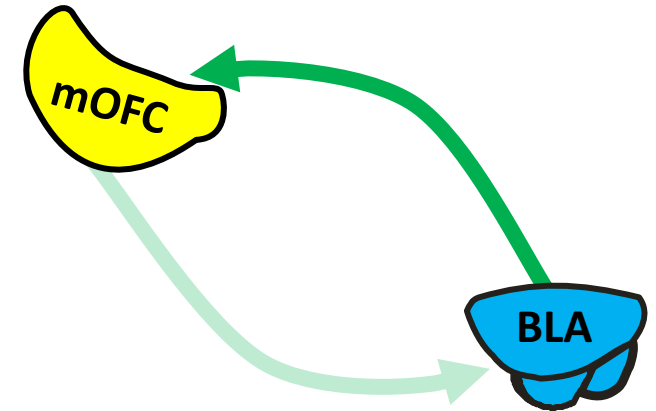
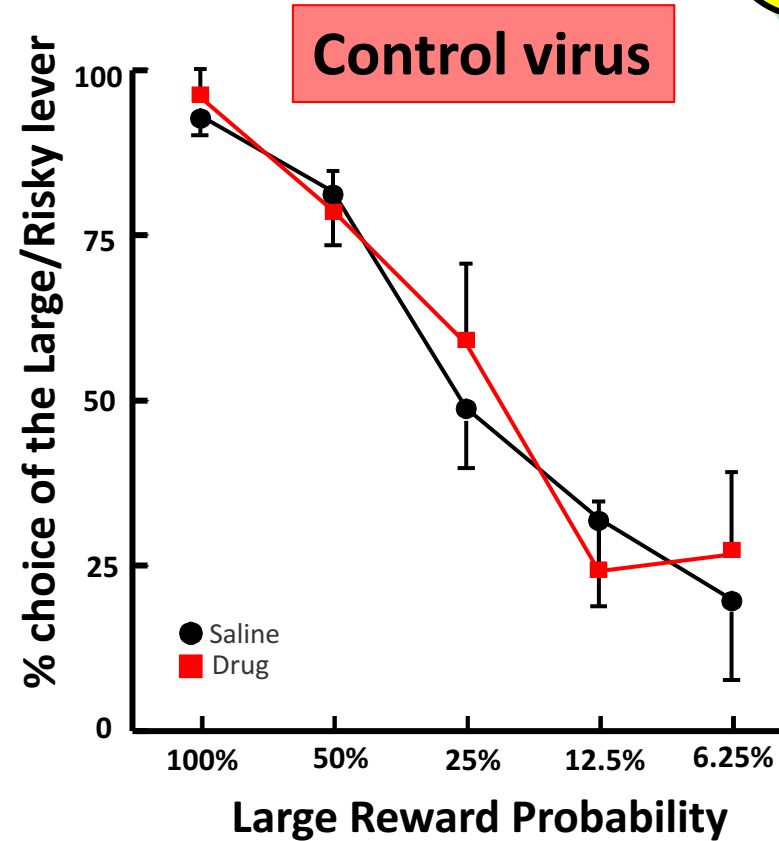
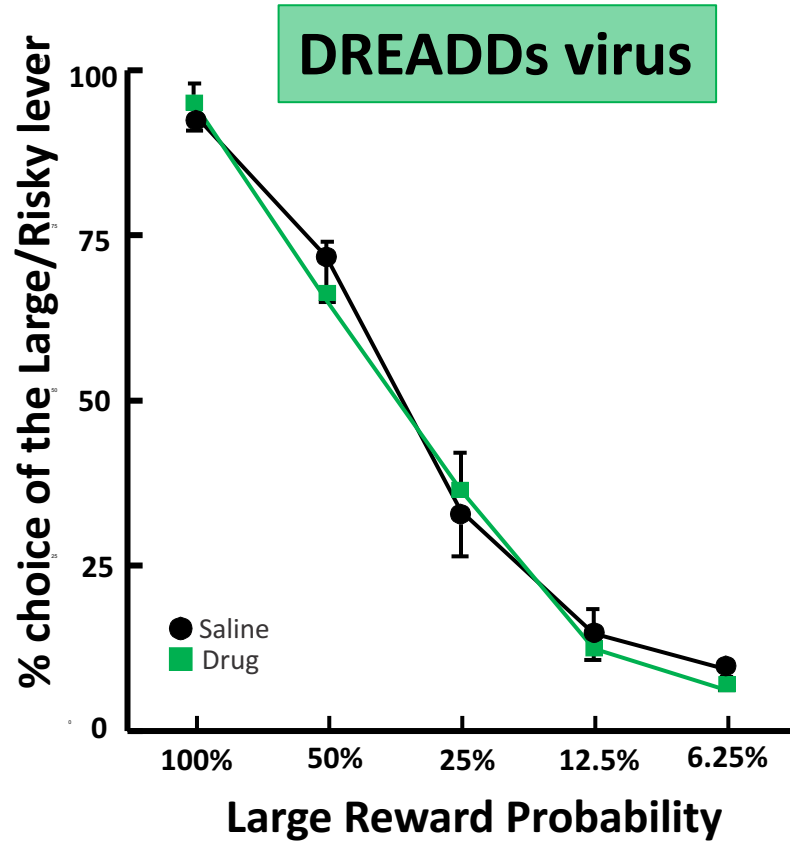
- Infuse DREADDs virus into BLA
- Receptors implanted in the terminals, wait 6-8 weeks for full expression
- Infuse designer drug into mOFC to prevent signal transmission from BLA to mOFC

# Experimental Design



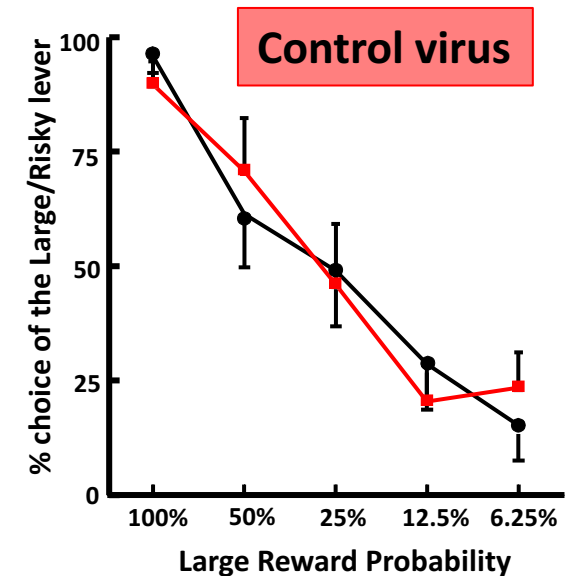
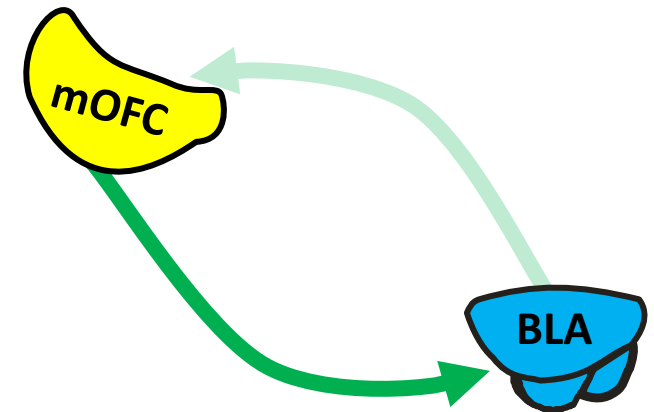
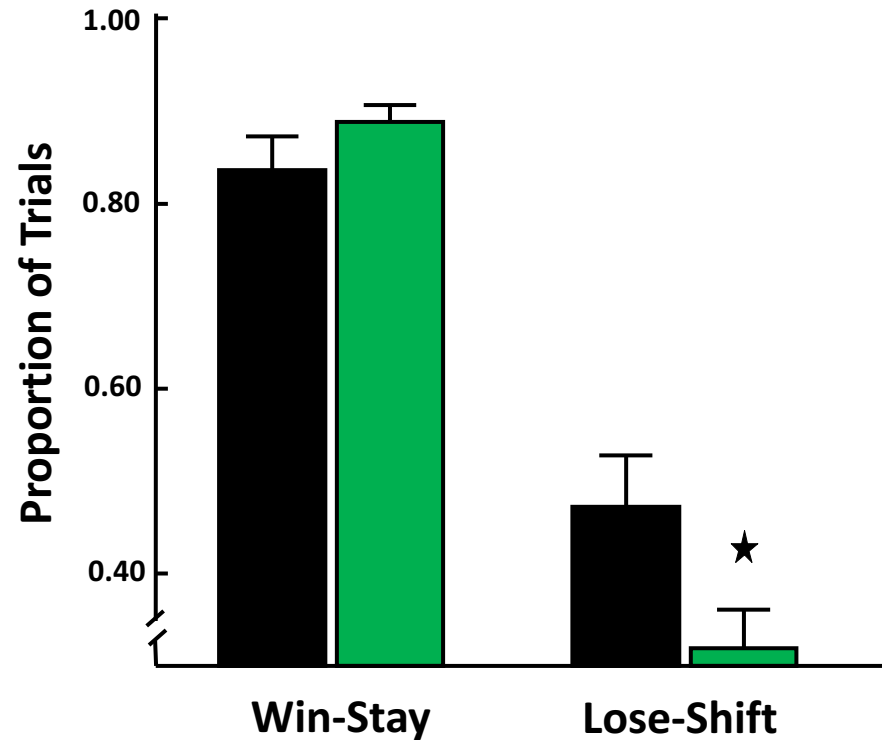
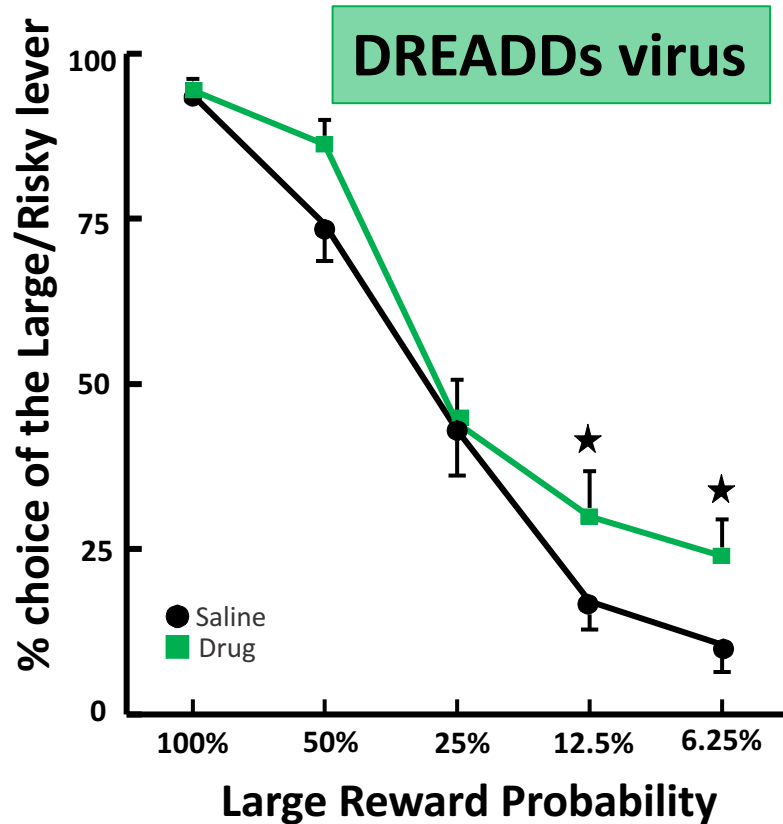
# Results: BLA → mOFC pathway

No change in risky decision-making



# Results: mOFC → BLA pathway

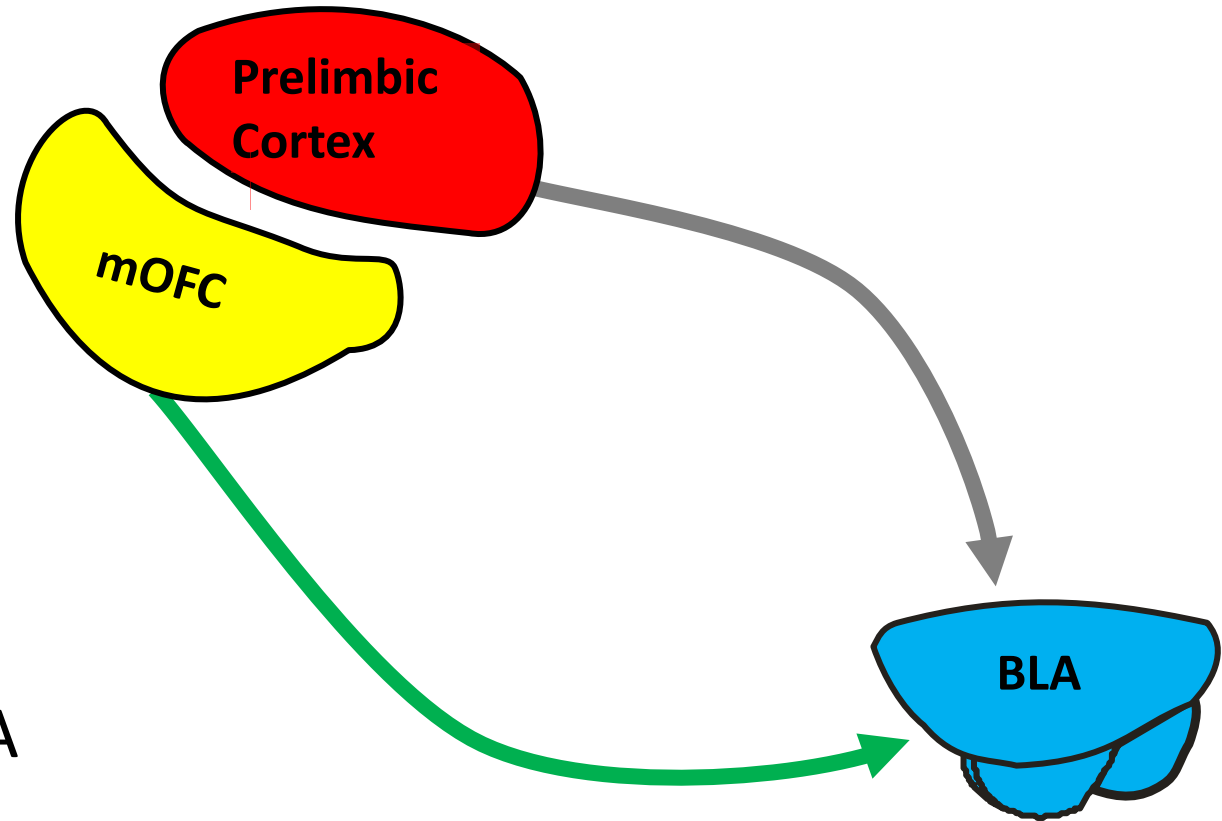
Increase in risky decision-making





# What does this mean?

- Unidirectional mode of communication from mOFC to BLA
- Top-down processing
- Consistent with findings from medial prefrontal cortex to BLA (St. Onge et al, 2012)



# Summary and Implications

- mOFC → amygdala circuitry promotes economic decisions
  - Helps individuals learn from non-rewarded actions in order to update future choices
- Provides insight into maladaptive forms of decision-making observed in addiction