Iowa Gambling Task

# Agenda

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* Discussion
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# Introduction

Decision-making under imperfect circumstances: not all information is available (like real-life decisions)

**Somatic marker** **hypothesis:** A theory, first advocated by Antonio Damasio and his colleagues, that motivated behaviour is influenced by neural representations of body states (the “somatic markers”), whose reexperiencing can shape behaviour positively or negatively; the hypothesis that evaluation of one’s own body states makes important contributions to decision making

# Hypothesis

Participants will use the emotional and somatic markers to inform their decisions

* Forming a strategy that will lead to higher profit in session 2 compared to 1
* Older individuals are expected to have lower risk tolerance, drawing more selectively from safer decks, earning more money

# Method

**Iowa gambling task:** Computer based card drawing game.

* Start with 2000 DKK and draw cards from 4 different decks.
* Different probabilities for punishment and reward and different values
* Decks A and B net losses, C and D net gains
* 2 sessions of 100 draws each, naïve to number of draws
* Reflection on deck values between sessions

# Results

## Figure 1

* Shows number of draws from each pile in each session
* In session 1 the draws are more spread out, though we see significantly more draws from piles C & D compared to piles A & D
* In session 2 the same, but enhanced, effect can be seen -> play more carefully
* Participants have learnt which decks are profitable, can skip learning phase in session 2 -> **individual plots!**

## Table 1: comparing profitable and unprofitable decks

* Paired samples *t*-tests between A+B and C+D
* More draws from profitable decks in both sessions -> greater effect in session 2
* Earnings increased by ~50% between sessions
* Participants are sticking with their strategies from session 1 in session 2

## End capital

* Testing whether end capital differed from 2000 DKK (result with random draws)
* No difference in session 1 -> deciding on strategy late if at all
* Significant difference in session 2 -> effective strategy
* End capital for session 1 and 2 are correlated -> discovering strategy in 1 leads to profit in 2

## Age and profit: risk tolerance supposedly decreases with age

* More consistently safe players would earn higher end capital
* No significant correlation between age and session 2 end capital
* No evidence for more risk aversion with age
* Age spread in sample is minimal

# Conclusion

* Participants learn to draw mainly from profitable decks
* Therefore, they perform better in session 2 than 1
* Decisions to follow specific strategies may be influenced by somatic markers
* Individual data: after huge loss, participant plays safe
* Age doesn’t bring caution

# Discussion

* To track the manifestation of the somatic markers (learning), a correlation between draw number and option chosen could be used. This would probably show that the later the draw, the higher the likelihood for choosing the safe piles.
* Paralyzed patients can play “correctly” even though they do not have somatic markers to guide them

# Grand perspective™

* Patients with orbitofrontal cortex (contains vmPFC) damage **persevere** with bad decks
* Emotion theories
  + **Cannon-Bard**: According to the Cannon-Bard theory of emotion, we react to a stimulus and experience the associated emotion at the same time.
  + **James-Lange:** Suggested that people first experience a physiological reaction in response to a stimulus in the environment. People then experience some sort of physiological reaction to this stimulus which is then labeled as an emotion.
  + **The Schacter-Singer**: Proposing that physiological arousal occurs first but that such reactions are often similar for different emotions. The theory suggests that the physiological reactions must be cognitively labeled and interpreted as a particular emotion. The theory emphasizes the role that
* **vmPFC:** Contains an index that couples knowledge to emotional/physiological states
  + Emotions can be activated by the same experience again (body loop) *or* through representation in insula and somatosensory cortex without actual physiological changes (as-if: allows prediction and taking action on stimuli before body change)
* Encoding specificity principle (Tulving): Context similarities between the encoding and recall situation will enhance recall-ability. Similarities might be external (time, place) or internal (emotions).
* **Memory modulation hypothesis**: after highly arousing emotional events stress hormones cause amygdala to strengthen consolidation of the memory in other areas (hippocampus, cortex….)
* **Knowlton et al**.: Probabilistic weather prediction task -> Predict the weather from cues. Amnesic patients (hippocampus, no declarative memory of the task, but performance improved), Parkinson patients (basal ganglia, has declarative memory of the task, but no performance improvements).
* **Patient, EVR**: damaged vmPFC, cannot learn from errors, perfect scores on Wisconsin card sorting, does poorly in Iowa
* Amygdala: vmPFC couples amygdala activity and somatic states with experiences or thoughts -> allows predictions of consequences of actions
* Wisconsin card sorting test: clear rules which have to be deduced, but change without warning
* **Tversky and Kahneman**: Somatic markers = loss aversion. You can “feel” the loss in your body, and you don’t want that.
  + Each choice can be framed in different ways, and thereby nudge our somatic markers in either direction.