

Decision Making & Emotion: Experimental design

Dr Dana Samson

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Room C80 – Drop in hours
Monday 1.30-2.30pm
Tuesday 3-4pm

Today

Aims:

- to discuss the neural response to fairness through 2 published studies
- to discuss the ways in which processes of interest have been isolated with the chosen contrasts (practical level)

Objectives: At the end of the lecture

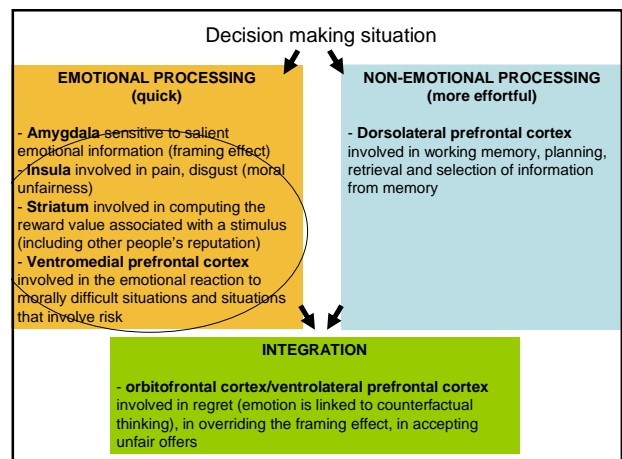
- you should have a better understanding of the (possible) functional roles of the reward system in response to fairness
- you should be able to critically examine the choice of contrasts in fMRI studies

- Part 1: Quick reminder
- Part 2: Paper 1
- Part 3: Paper 2

I. Quick reminder

Quick reminder

- Evidence for the emotional involvement in decision making under uncertainty
 - emotion and risk taking
 - emotion and the framing effect
 - regret and decision making
- Evidence for the emotional involvement in social decision making
 - **fairness and decision making**
 - emotion and moral decision making

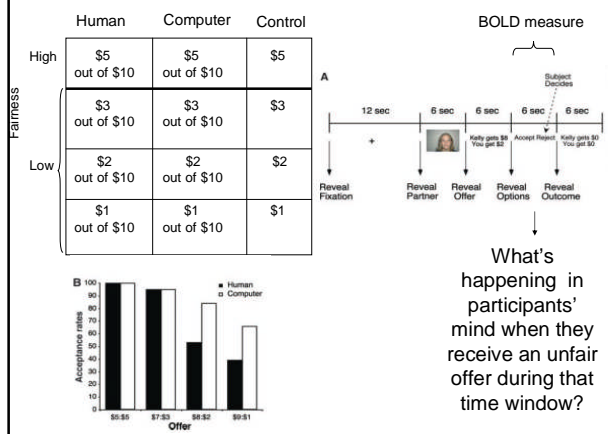


The Ultimatum Game

Andrew £50 – You £50
 Steven £55 – You £45
 Patrick £60 – You £40
 Mike £70 – You £30
 Tim £80 – You £20
 Simon £95 – You £5
 Oliver £98 – You £2
 Henry £99 – You £1
 Mark £100 – You £0

Paper 1

(Sanfey et al., 2003, Science)



(Sanfey et al., 2003, Science)

- (receiving) human unfair offer

?

(Sanfey et al., 2003, Science)

- (receiving) human unfair offer

→ INPUT: number processing and holding offer in mind
 → valuation of outcomes for self: self receives little or nothing
 → valuation of outcomes for other: other receives a lot or nothing
 → self/other comparison: other potentially more (jealousy/disgust?)
 → reject decision
 → anticipation of receiving NO money because of decision

(Sanfey et al., 2003, Science)

- (receiving) human unfair offer MINUS (receiving) human fair offer
- (receiving) human unfair offer MINUS (receiving) computer unfair offer
- (receiving) human unfair offer MINUS (receiving) control low amount
- (receiving) human unfair 9/1 split MINUS (receiving) human unfair 8/2 split

→ Insula is more activated in all 4 contrasts, what kind of processing can the insula be associated with?

(Sanfey et al., 2003, Science)

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 → reject decision
 → anticipation of receiving NO money because of decision (pain for paying)

(Sanfey et al., 2003, Science)

- (receiving) human unfair offer MINUS (receiving) human fair offer

→ INPUT: number processing and holding offer in mind → similar
 → valuation of outcomes for self: self receives little or nothing → self receives good amount or nothing
 → valuation of outcomes for other: other receives a lot or nothing → other receives good amount or nothing
 → self/other comparison: other potentially more (jealousy/disgust?) → self and other same: no jealousy
 → reject decision → accept decision
 → anticipation of receiving NO money because of decision → anticipation of receiving some money (pain for paying)

(Sanfey et al., 2003, Science)

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(Sanfey et al., 2003, Science)

• (receiving) human unfair offer MINUS (receiving) computer unfair offer

- | | |
|--|---|
| → INPUT: number processing and holding offer in mind | → similar |
| → valuation of outcomes for self: self receives little or nothing | → similar |
| → valuation of outcomes for other: other receives a lot or nothing | → similar? |
| → self/other comparison: other potentially more (jealousy/disgust?) | → probably no jealousy |
| → reject decision | → less reject decision |
| → anticipation of receiving NO money because of decision (pain for paying) | → less anticipation of receiving no money |

(Sanfey et al., 2003, Science)

• (receiving) human unfair offer MINUS (receiving) computer unfair offer

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(Sanfey et al., 2003, Science)

• (receiving) human unfair offer MINUS (receiving) control low amount

- | | |
|--|--|
| → INPUT: number processing and holding offer in mind | → similar |
| → valuation of outcomes for self: self receives little or nothing | → no option valuation but self receives little |
| → valuation of outcomes for other: other receives a lot or nothing | → no option valuation |
| → self/other comparison: other potentially more (jealousy/disgust?) | → no self/other comparison |
| → reject decision | → no decision |
| → anticipation of receiving NO money because of decision (pain for paying) | → anticipation of receiving some money |

(Sanfey et al., 2003, Science)

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(Sanfey et al., 2003, Science)

- (receiving) human unfair 9/1 split MINUS (receiving) human unfair 8/2 split
- ~~INPUT: number processing and holding offer in mind~~ → similar
- ~~valuation of outcomes for self: self receives little or nothing~~ → self receives a little more or nothing
- ~~valuation of outcomes for other: other receives a lot or nothing~~ → other receives slightly less or nothing
- ~~self/other comparison: other potentially more (jealousy/disgust?)~~ → slightly less jealousy?
- ~~reject decision~~ → reject decision (slightly less)
- ~~anticipation of receiving NO money because of decision (pain for paying)~~ → (slightly less) anticipation of receiving no money because of decision

(Sanfey et al., 2003, Science)

- (receiving) human unfair 9/1 split MINUS (receiving) human unfair 8/2 split
- ~~INPUT: number processing and holding offer in mind~~ → similar
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(Sanfey et al., 2003, Science)

- overall insula could be associated with:

- ~~INPUT: number processing and holding offer in mind~~
- ~~valuation of outcomes for self: self receives little or nothing~~
- ~~valuation of outcomes for other: other receives a lot or nothing~~
- ~~self/other comparison: other potentially more (jealousy/disgust?)~~
- ~~reject decision~~
- ~~anticipation of receiving NO money because of decision (pain for paying)~~

How could you improve the design to narrow down the possibilities?

(Tabibnia et al., 2008, Psychological Science)

		Material Utility	
		High	Low
Fairness	High	\$7.00 out of \$15	\$0.50 out of \$1
	Low	\$7.00 out of \$23	\$0.50 out of \$10

→ only considered paired of trials with same material utility but where in one case the participant "rejects" and in the other s/he "accepts".

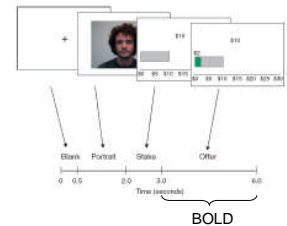


TABLE 1
Likelihood of an Offer Being Accepted as a Function of the Ratio of the Offer to the Stake Size

Ratio of offer to stake	Acceptance rate
50%	97.9%
40-49%	92.3%
30-39%	73.8%
20-29%	44.7%
10-19%	30.8%
<10%	1.4%

Unfortunately no details by utility...

(Tabibnia et al., 2008, Psychological Science)

- Reject unfair offer – rest → Insula activation
 - Reject unfair offer – accept fair offer → Unlike previous study: Insula not more activated
- any ideas why?

Reject unfair

- INPUT: number processing and holding offer in mind
- valuation of outcomes for self: self receives little or nothing
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Accept fair

- similar
- similar
- other receives same amount
- no jealousy
- accept decision
- anticipation of receiving some money

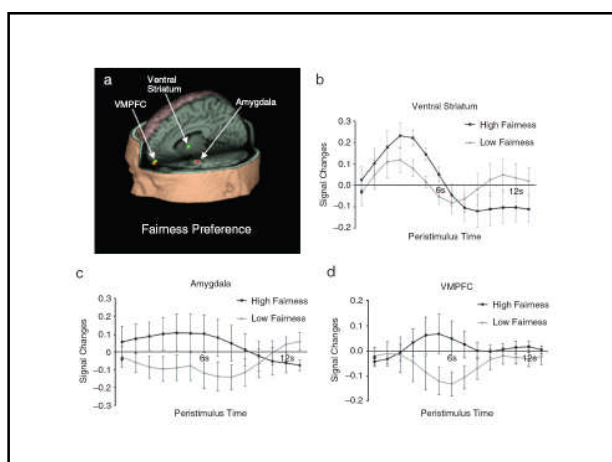
Reject unfair	Accept fair
→ INPUT: number processing and holding offer in mind	→ similar
→ valuation of outcomes for self: self receives little or nothing	→ similar
→ valuation of outcomes for other: other receives a lot or nothing	→ similar
→ self/other comparison: other potentially more (jealousy/disgust?)	→ other receives same amount
→ reject decision	→ no jealousy
→ anticipation of receiving NO money because of decision (pain for paying)	→ accept decision
	→ anticipation of receiving some money
Insula seem to have been activated equally in both cases!	

Reject unfair	Accept fair
→ INPUT: number processing and holding offer in mind	→ similar
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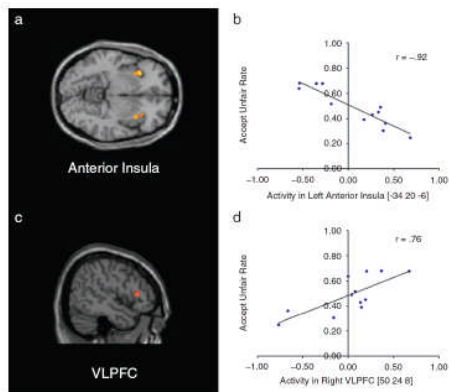
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Check differences in method + statistical power

(Tabibnia et al., 2008, Psychological Science)	
• Accept fair offers – reject unfair offers (for pairs with matched utilities only)	
→ Increased striatum, amygdala and VMPFC activation in response to high fairness (reward)	



(Tabibnia et al., 2008, Psychological Science)	
• Accept fair offers – reject unfair offers (for pairs with matched utilities only)	
→ Increased striatum, amygdala and VMPFC activation in response to high fairness (reward)	
• Accept unfair offer – rest	
• Accept unfair offer – reject unfair offer	
→ Increased right VMPFC (overcoming negative feeling of unfairness)	



Take Home Message

fMRI is all about contrasts:

Decision making entails a collection of processes and it is important to take the time to think about what the contrasts really highlight...