Friend or Foe

The influence of implicit trust judgments on cooperation in social interactive decision-making

Mascha van 't Wout

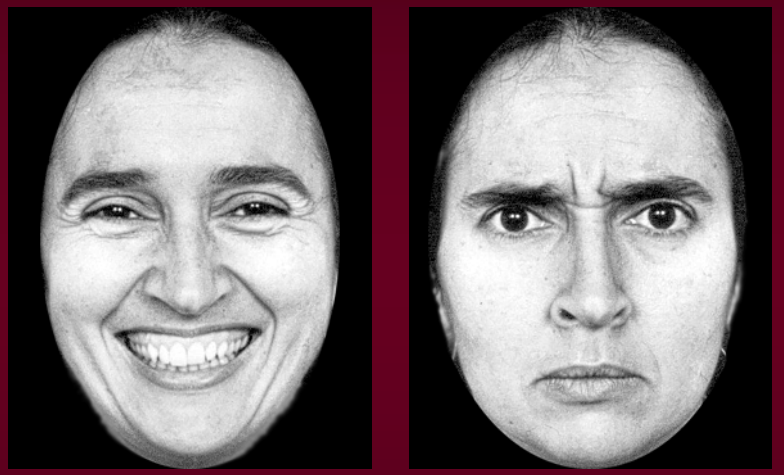
Brown University

Can I trust you?

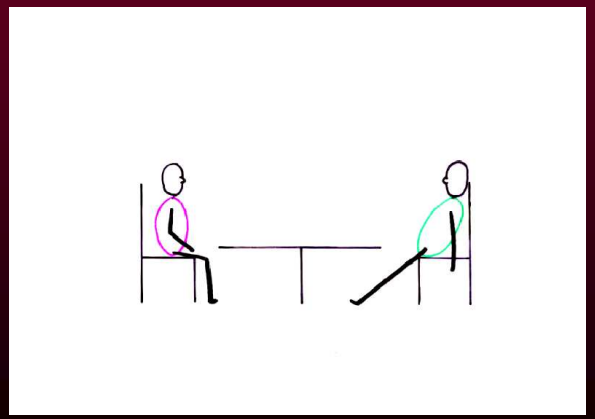
- Reputation
  - One's own experience from previous interactions
  - Explicit moral and social information *unrelated* to the decision (Delgado et al., 2005; Singer et al., 2004)
- But what if this information is absent?
- Regardless people often respond fast when deciding to trust someone or not
- What is the role of quick subjective evaluations of trust (gut level: first impression) on social interactive decision-making behavior?

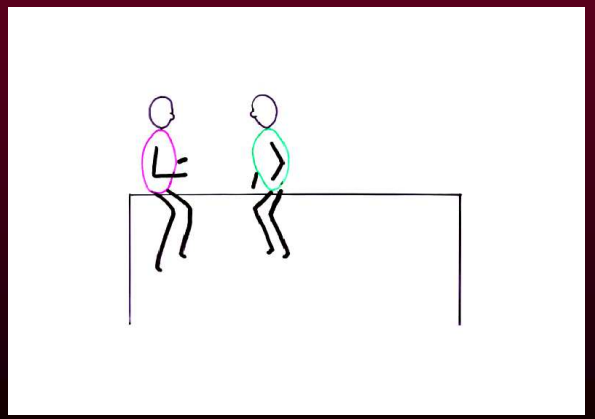
Social and emotional cues

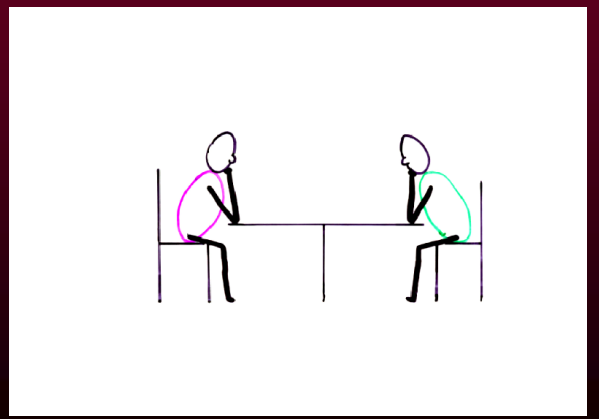
- Important social-emotional signals:
  - Facial expressions
  - Body postures



Ekman & Friesen 1976







Facial features displaying social signals

- Smiling faces are trusted better (Eckel & Wilson, 1999; Scharlemann et al., 2001)
- Faces that resemble oneself are trusted better (DeBruine, 2002)
- Social facial features (attractiveness, likeability, trustworthiness, competence, aggressiveness) are processed fast and effortlessly (100 ms or even within 40 ms) (Willis and Todorov, 2006; Bar et al., 2005)
- These quick evaluative judgments are critical for understanding social interactions which are constantly changing (Frith and Frith,1999)

Trustworthiness as a social signal

- Trustworthiness might be especially important in decision-making, since…
  - it is suggested that detection of trustworthiness is essential for human survival (*Cosmides and Tooby, 1992*) as it gives information about whether another individual is someone to approach or avoid (trust or distrust)
  - it appears to be highly automatic *(Winston et al., 2002; Todorov & Wilson, 2006)*
  - people are in particular efficient in judging the trustworthiness of faces (*Todorov & Wilson, 2006*)

How to objectively test interpersonal trust

- Economic Game Theory
  - ..studies strategic interactions between people
  - ..by using games in which people choose strategies that will maximize their return
  - ..but each decision they make also depends upon the choices and strategies of other individuals
- Take the Trust Game: depending on another person's decision, one's return could be highest by cooperating. But cooperation can also result in loses and is therefore a risky decision. An estimation of how trustworthy you think the other is becomes necessary

The one-shot Trust Game

- Trust Game
  - Two people interact once: trustor and trustee
  - Trustor is endowed with $10 and she can decide how much of $10 to send over to the trustee
  - The amount send over is multiplied by 3 or 4
  - Trustee can decide how much money to send back to trustor
  - When trustee sends back an amount similar or higher than originally invested by trustor trust is repaid
  - When trustee decides to send back less than what was send by trustor trust is abused

→ Example!

This is Katie

Your offer to Katie is $4

Press 1 to increase
Press 2 to submit

Your offer was $4
This is now $16

Wait until Katie decides how much to return

Katie decided to keep

You get $6
Katie gets $16

Trustworthiness in the trust game

- N= 58 undergraduate students: 32 women, 26 men
- Trust game in the role of trustor (first player) dividing $10
- Trustees were 79 faces of people who were previously rated on subjective facial trustworthiness
- Trust task: 150 faces
  - Trustworthiness rating (1-7)
  - Recognition memory rating (1-5)

<u>Predictions</u>

1. Relationship between the amount of money transferred on each trial and the rated trustworthiness of that partner
2. People remember faces that abused trust better than faces that repaid trust

Results: trust game

- In 85% of trials subject placed trust, i.e. sent any amount of money to their trustee
- Average amount money sent $3.52 out of $10
- People offer less money at the end of the game then in the beginning ($p=0.001$), but there is no difference in subjective trustworthiness between faces seen in the end and beginning of the game ($p=0.34$)

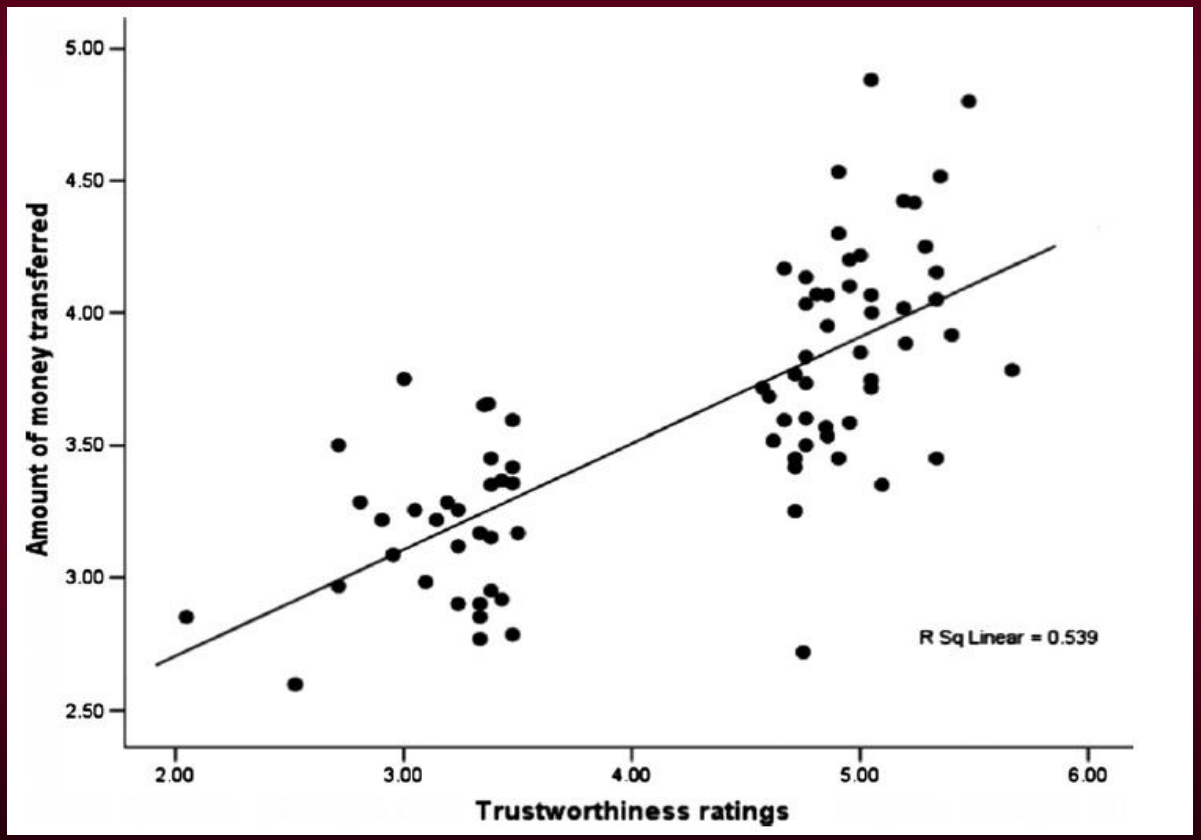
Results: perceived trustworthiness

- Mean trust rating given by subjects was 4.1 (range 2.5-5.6)
- There was a high correlation between given trust ratings and norm trust ratings ($r=0.87$, $p<0.0001$)
- Trust ratings for trusted faces was significantly higher than for not trusted faces ($p=0.0003$)
- Subjective trustworthiness ratings were not influenced by whether the counter player repaid or abused their trust in the game ($p=0.89$)

Results: trust and trustworthiness

- Correlation between norm trustworthiness ratings and decision-making in the trust game

- r=0.75, p<0.0001

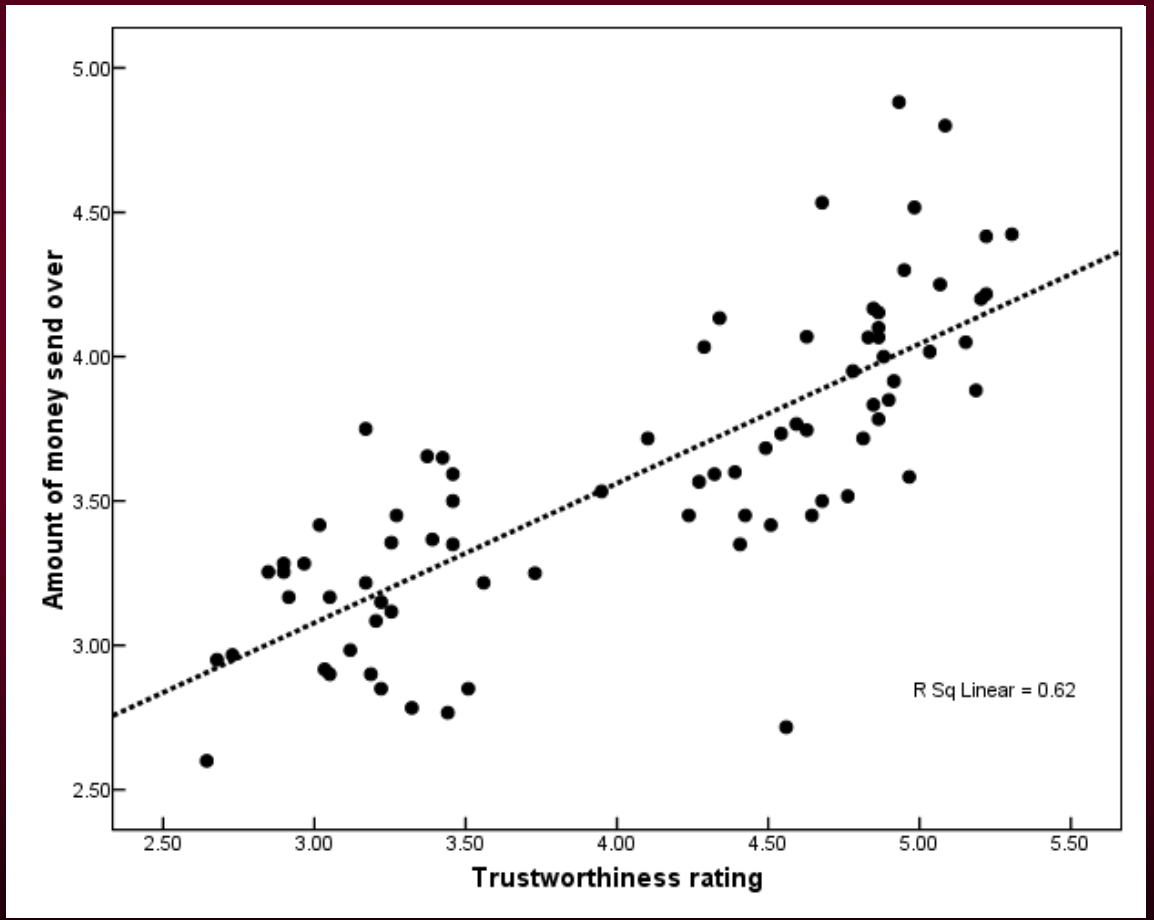


van ’t Wout & Sanfey, 2008

Results: trust and trustworthiness

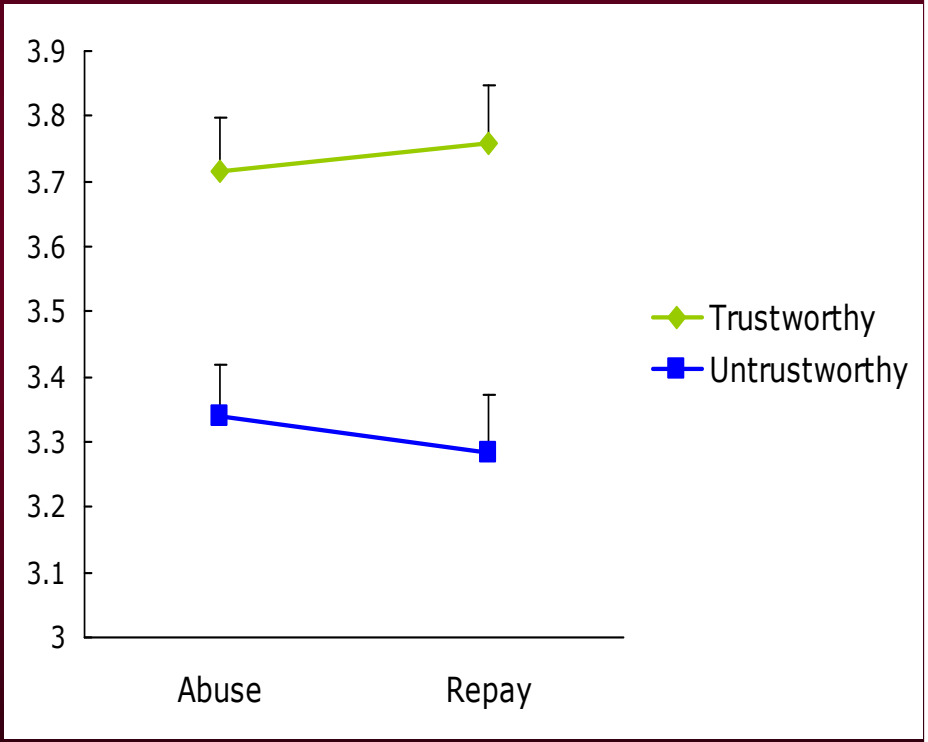
- Relationship between the subjective facial appearance of trustworthiness and behavior in the Trust Game?

- r=0.82, p<0.0001



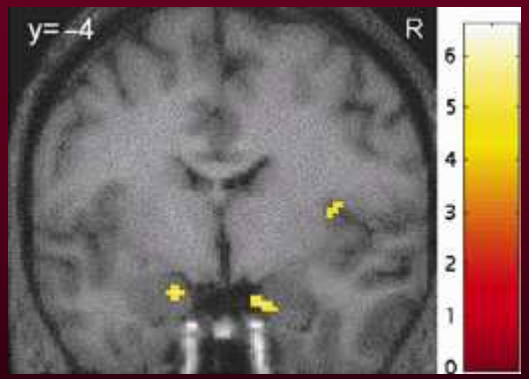
Results: recognition memory

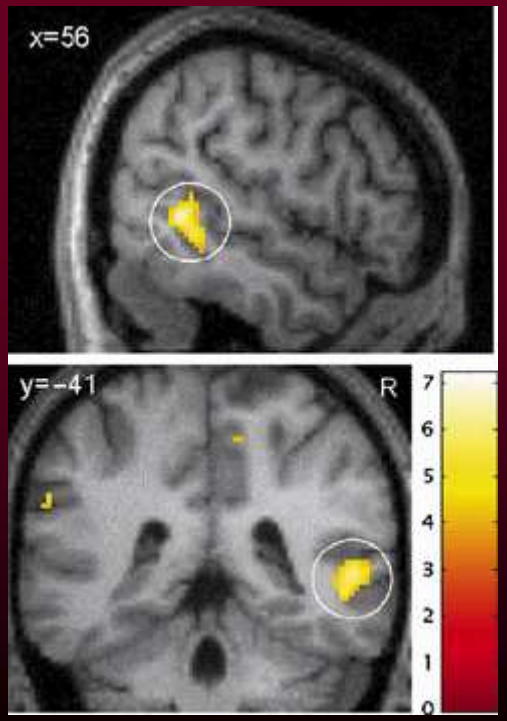
- Main effect of trustworthiness ($p<0.0001$): trustworthy faces were recognized better than untrustworthy faces
- No main effect of outcome (abuse or repay): recognition is not better for faces that abused trust compared to faces that repaid trust ($p=0.92$)
- No interaction between trustworthiness and outcome ($p=0.29$)



Neural correlates of trustworthiness

- Winston et al. 2002
  - Implicit trustworthiness: activation of amygdala, insula
  - Explicit trustworthiness: also superior temporal gyrus



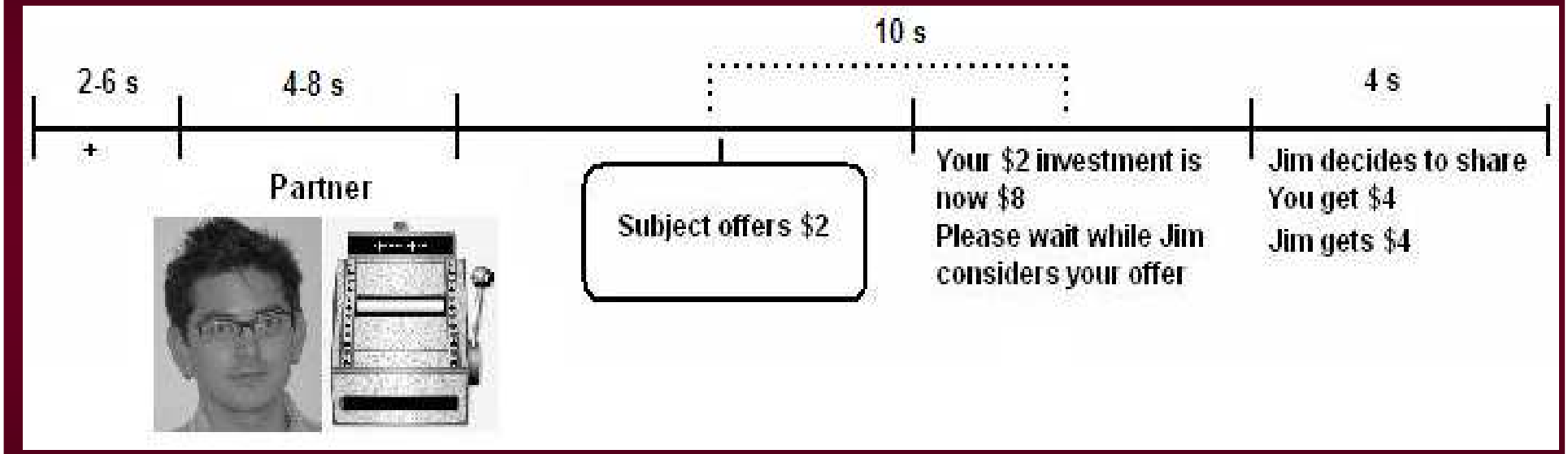


fMRI: trust in the scanner

- Face of partner-offer amount
  - Is activation of brain areas important for social signals of (un)trustworthiness and emotional response and arousal (amygdala, insula) related to amount of money send over to that partner (*Winston et al. 2002; Sanfey et al., 2003*)

- High and low offers
  - Are low offers associated with neural activation related to risk processing (Bechara, Damasio*)*

fMRI: trust in the scanner

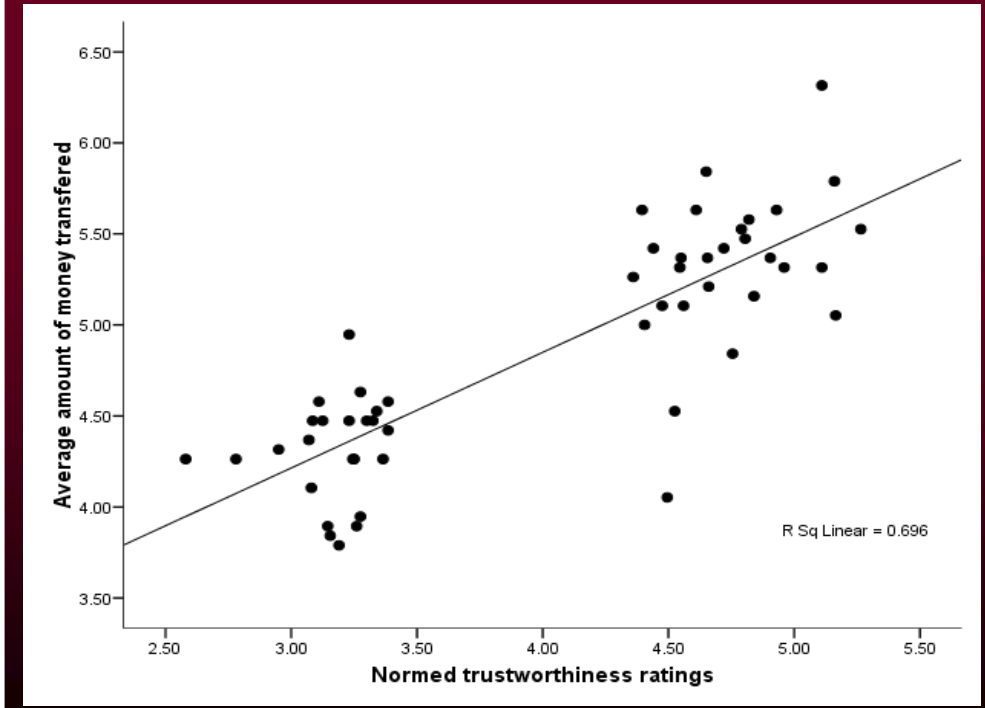


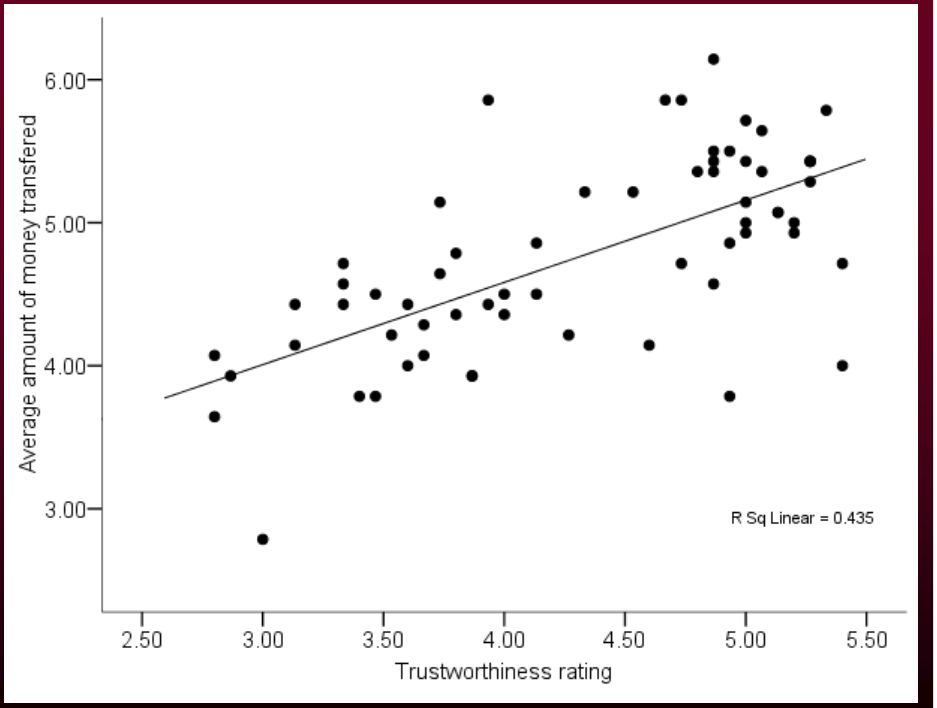
Trust in the scanner: design

- 24 seconds trials
- 32 untrustworthy faces, 32 trustworthy faces, 20 slot machines
- 4 x 8 min runs: every run 16 faces, 5 slot machines
- Before scanning: 3 practice trials
- 3 Shot multiple echo sequence using parallel imaging (epimecho)
- 2000 TR, 25 TE, 42 axial slices, 3 mm slice thickness, 1 mm gap
- 240 fov, 96x96 matrix (2.5x2.5x3 voxel size)

Trust in the scanner: behavioral results

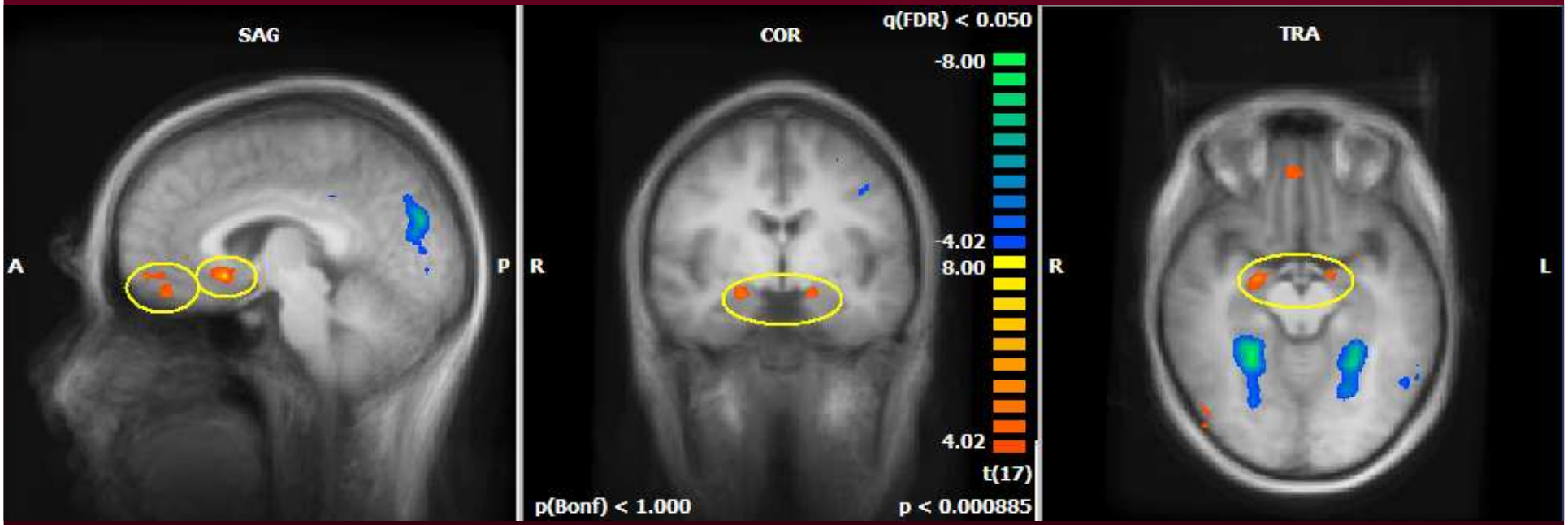
- N=19 (15 females)
- Replicate relationship between subjective trustworthiness and amount of money transferred to a face





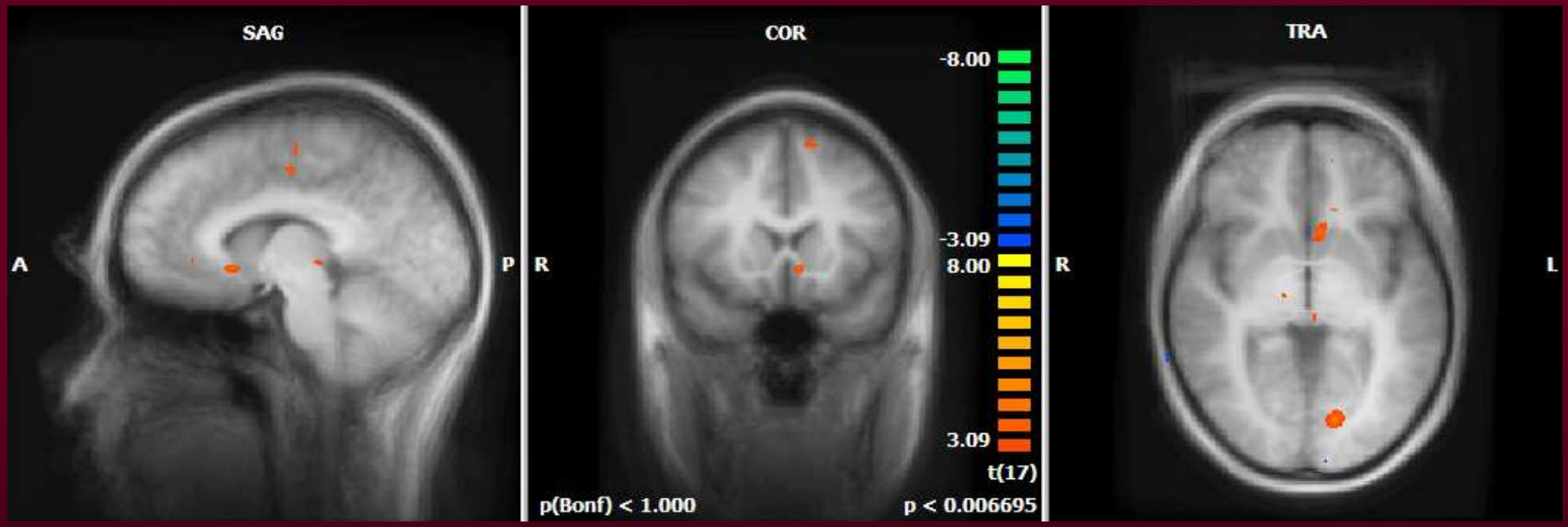
Trust in the scanner: faces vs slots

- Reliable activation in bilateral amygdala, orbitofrontal cortex and putamen in response to the presentation of faces compared to slot machines



Trust in the scanner: faces

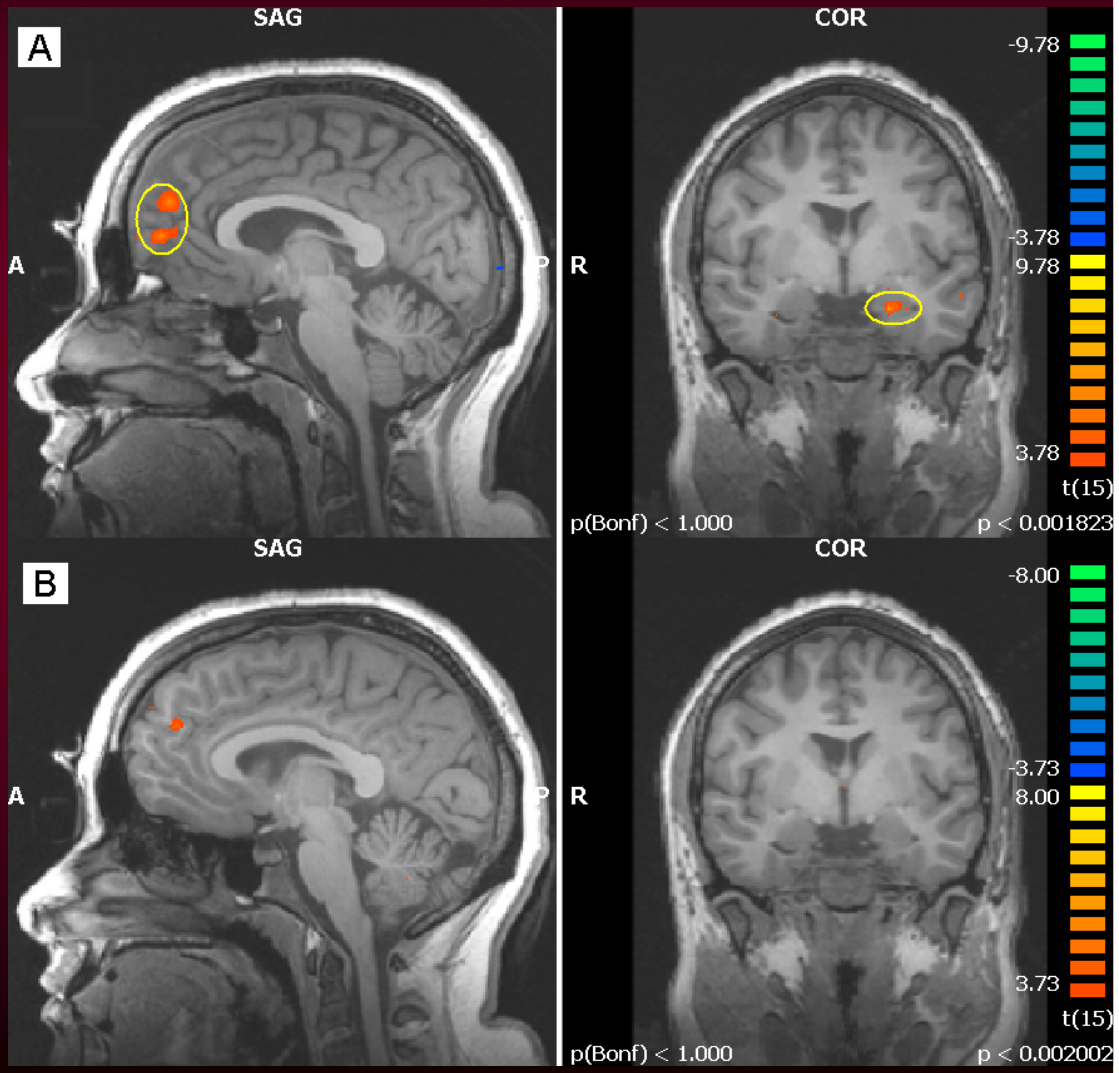
- Comparison trust versus untrustworthy faces
- Not much!



- Compared to previous fMRI studies using passive viewing, trustworthiness in this study might be more relevant?

Trust in the scanner: decisions

- Activation in vmpfc, amygdala for low offers to humans vs. slots (A)
- No such activation for high offers to humans vs. slots (B)
- Low offer is sign of risk and activation might be risky decision-making (Damasio,Bechara)



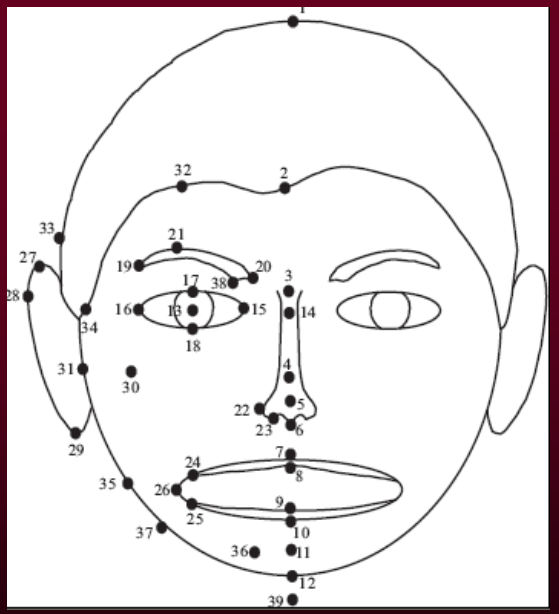
But…what is trustworthiness?

- Are there specific facial features that are important for looking (un)trustworthy?

Neural network model to determine which facial features are important for trustworthiness (Fellous)

Measurement of different facial distances

- Philtrum length related to untrustworthiness
- Pupil-eyebrow distance related to trustworthiness



Why do we judge a book by it's cover?

- Evolutionary reasons?
  - Are people who look more trustworthy indeed more trustworthy?

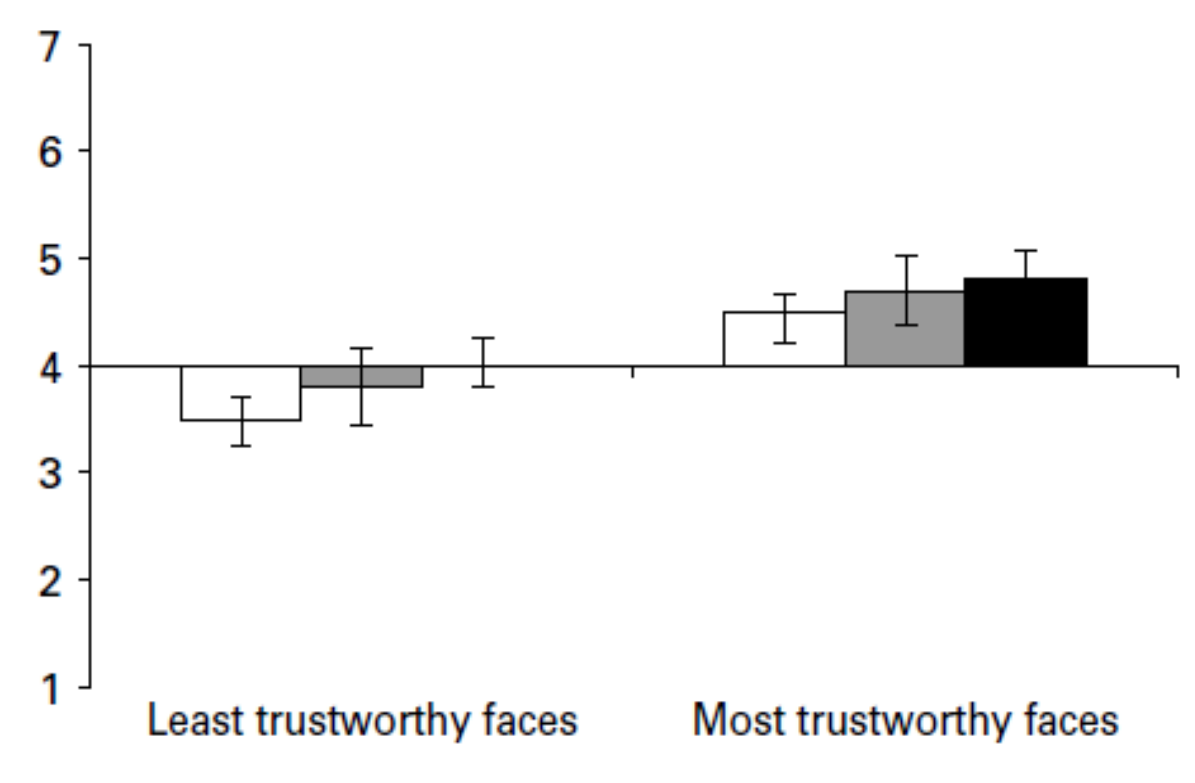
- Are there any consequences?
  - Do people who have difficulties in interpreting social cues decision-making problems?

Schizophrenia: Social-emotional processing

- Schizophrenia is a severe psychiatric illness that affects about 1% of the general population and associated with hallucination, delusions, emotional withdrawal and social dysfunction
- People with schizophrenia show deficits in the processing of social and emotional cues/signs
  - Emotional perception/recognition
  - Emotional expression
- Schizophrenia is associated with abnormal scan patterns when viewing faces

Schizophrenia and trustworthiness

- Schizophrenia patients and their siblings judge faces to be more trustworthy than healthy matched control participants



Schizophrenia and decision-making

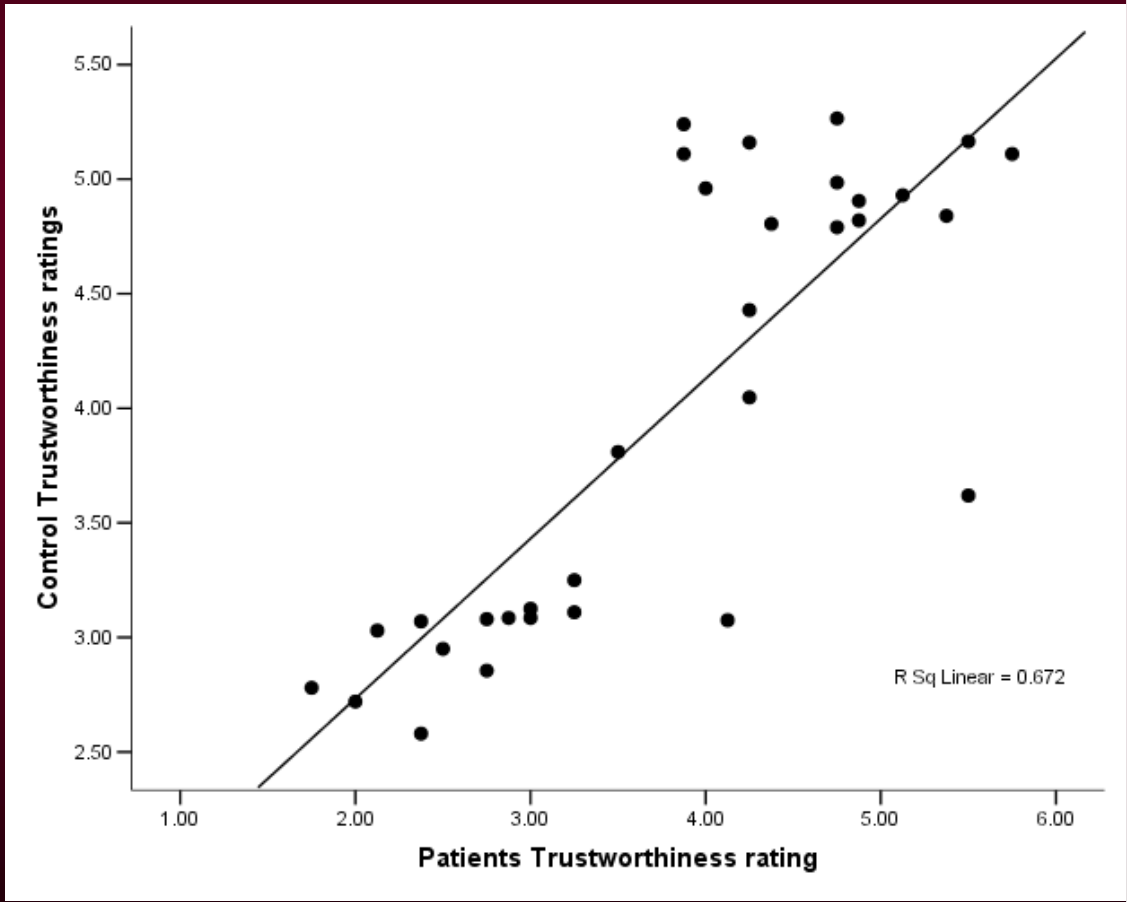
- If indeed social cues such as trustworthiness are important for decision-making
- And patients with schizophrenia patients judge trustworthiness in others differently
- We could expect patients to show aberrant decision-making behavior in the trust game
  - Do patients encode trustworthiness signals only or differently but their decisions are influenced
  - Are patients unable to process trust and don’t incorporate trust signals in their decisions

Schizophrenia and the Trust Game

- Preliminary: 8 patients with a diagnosis of schizophrenia
- Trust Game in role of trustor
- Trustees 32 pictures of faces previously rated on trustworthiness: 16 untrustworthy, 16 trustworthy
- Endowment was $10
- After 10-15 min break: subjective trustworthiness ratings (1-7)

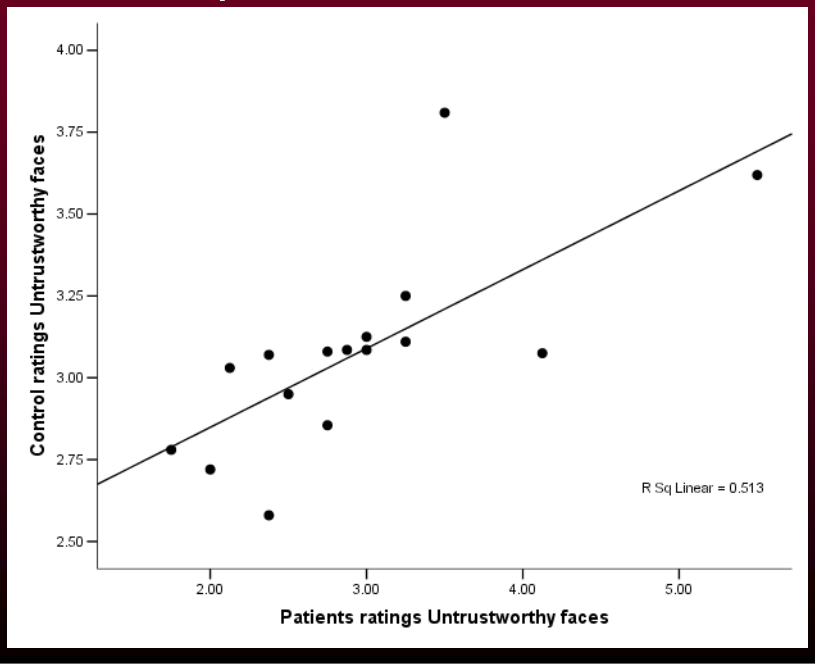
Trustworthiness in schizophrenia: results

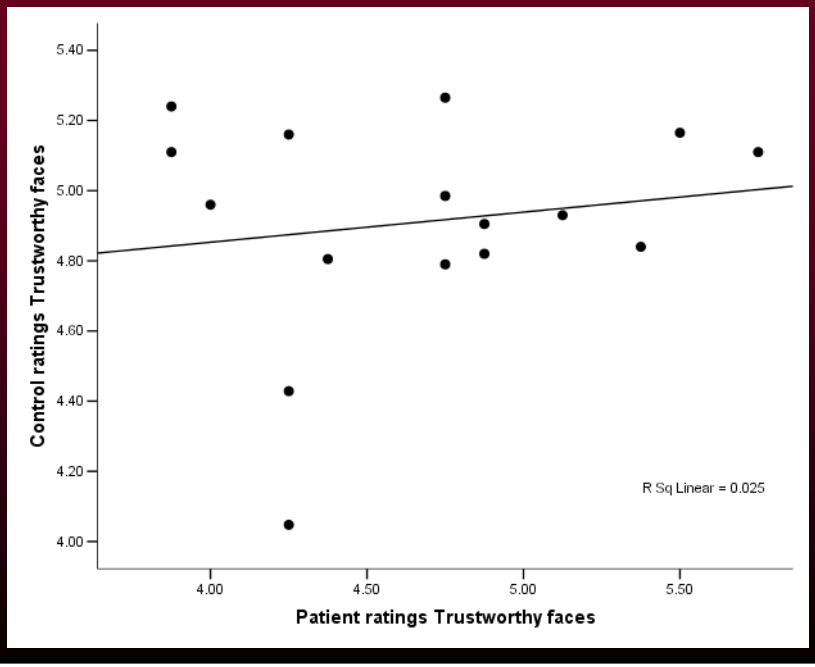
- Across all faces, trustworthiness ratings give by patients correlated with those of the control group: r=0.78, p<0.0001



Trustworthiness in schizophrenia: results

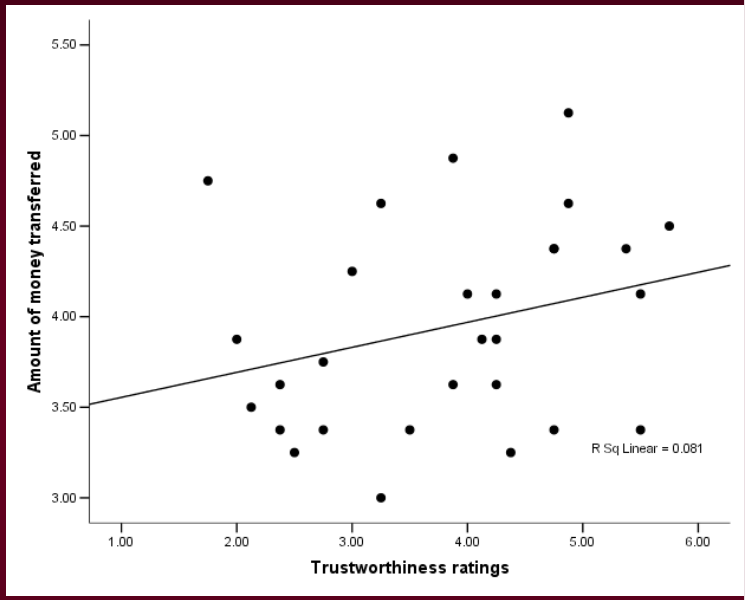
- Separate for un/trustworthy faces
  - Correlation for untrustworthy faces: r=0.84, p<0.0001
  - Correlation for trustworthy faces: r=-0.001, p=0.998





Trustworthiness and Trust Game

- There was no significant correlation between patient's trustworthiness ratings and their money proposals in the Trust Game: r=0.28, p=0.14



- Trend for correlation between ratings from control group and patient's money proposals: r=0.34, p=0.07

- No significant correlations between trustworthiness ratings and money proposals when analyzing trust/untrustworthy faces separately

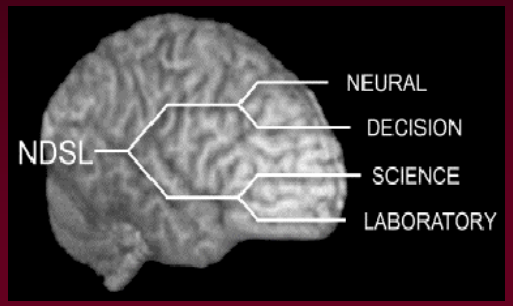
Summary schizophrenia data

- Preliminary!
- Replication of difficulties in recognizing trustworthy faces in particular
- Patients do not incorporate the 'gut level reaction' elicited by the trustworthiness of their partners in their decisions
- This was even true when patients were able to decode the social signal in the face as was the case in untrustworthy faces

General summary

- Trustworthiness is a relevant social-emotional cue that people attend to and base their decisions upon
- Specific features in the faces seem to code for the subjective trustworthiness
- Areas associated with social processing activated during both the viewing of partners and making offers (amygdala, ofc reward and salience/ vmpfc risky decision-making)
- Patients characterized by difficulties in processing social-emotional cues do not show 'gut level' based decision-making

Thanks!



Alan Sanfey
Luke Chang

Jean-Marc Fellous

http://research.sbs.arizona.edu/~ndsl/home.html

Funding:
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Email: mascha_vant_wout@brown.edu

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