IV. The role of emotions in Reasoning & Judgment

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IV. Reasoning & Judgment

A. Introduction

General assumption in Western thought is that emotion and affect interfere with rational thought.

For example: Freud thought that emotional responses require resources leading to non-adaptive responses.

“…neither a man nor a crowd nor a nation can be trusted to act humanely or to think sanely under the influence of a great fear.” (Russell, 1901)

Emotional responses are the “fatal flaws” in human reasoning (Koestler, 1978)?
Alternatively,

“feelings point us in the proper direction, take us to the appropriate place in a decision-making space, where we may put the instruments of logic to good use” (Damasio, 1994, pp. xii-xiii)

Dialogue from *I, Robot*

Susan Calvin: What happened to you?
Detective Del Spooner: Headed back to the station. Normal day, normal life. The driver of a semi fell asleep at the wheel. Armless, legless, wild and kids, working as a deliverer (NM). He died. The car hit him, the driver’s name was Harold Lloyd like the film star, but no relation. He was killed instantly. His terrified onboard was sitting in the passenger’s seat. Never really met him. Can’t forget.

Detective Del Spooner: What happened to your arm?
Susan Calvin: He took it out, he wanted to be human. What has a kind of reflex, what has a kind of thought, what has a kind of feeling. I made up my own mind, I made up my own mind to be like a human.

Detective Del Spooner: Did he say what he was thinking?
Susan Calvin: I assumed he was thinking, I assumed he was thinking, I assumed he was thinking.

Detective Del Spooner: All right, what now?
Susan Calvin: Can’t assume, cannot assume, cannot assume.

Detective Del Spooner: I said all right. what now?
Susan Calvin: I programmed the robot to be a human.

Detective Del Spooner: I thought you were saved.
Susan Calvin: The robot’s brain is a difference engine. It’s reading vital signs. It must have done...
C. Logic with Emotion

Blanchette (2006)

Staff members at a university were asked to judge the validity of logic problems.

Two Types of Problems

<table>
<thead>
<tr>
<th>Neutral</th>
<th>Emotional</th>
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<tbody>
<tr>
<td>If a child eats too much sugar, then he has behavioral problems.</td>
<td>If a child has been sexually abused, then he has behavioral problems.</td>
</tr>
<tr>
<td>If you want to catch a bus, then you run.</td>
<td>If you see a fire, then you run.</td>
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After reading a premise, participants were asked to judge the validity of arguments:

For example:

If a child has been sexually abused, then he has behavioral problems.

Does the following conclusion follow:

A child was sexually abused, therefore he will have behavioral problems

(modus ponens – valid)

For example:
If a child has been sexually abused, then he has behavioral problems.

Does the following conclusion follow:
A child was not abused, therefore he does not have behavioral problems
(denying the antecedent - invalid)


For example:
If a child has been sexually abused, then he has behavioral problems.

Does the following conclusion follow:
A child has behavioral problems, therefore he was sexually abused
(accepting the consequence - invalid)


For example:
If a child has been sexually abused, then he has behavioral problems.

Does the following conclusion follow:
A child does not have behavioral problems, therefore he was not sexually abused.
(modus tollens - valid)
Reasoning errors were more frequent for emotional than for neutral arguments.

D. Reasoning under Uncertainty
Tversky & Kahneman (1987) Framing Studies
Imagine that the United States is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimates of the consequences of the programs are as follows:

Framing Studies (cont)
If program A is adopted, 200 people will be saved.
If Program B is adopted, there is a 1/3 probability that 600 people will be saved, and a 2/3 probability that no people will be saved.
Program A was selected 72% of the time.
- people are risk averse when a problem is framed as a gain.
Framing Studies (cont)

If Program A is adopted, 400 people will die.

If Program B is adopted, there is a 1/3 probability that nobody will die, and a 2/3 probability that 600 people will die.

Program B is selected 78% of the time.
- people are risk seeking when a problem is framed in terms of a loss.

Framing Studies

Framing and cortical activity
De Martin et al. (2006)
1) Framing effect was associated with amygdala activity
2) Orbital and medial prefrontal cortex activity predicted reduced framing effects

Conclusion: Emotional processes responsible for the framing effect.

E. Choice under deprivation

People are often held accountable for the poor decisions they make, even when they make those decisions under non-optimal circumstances.
- emotional context
- framing effects
- deprivation (limited time, resources, money)

Two examples of poor decisions under deprivation
Angry Birds
Shah, Mullainathan, & Shafir (2012)

Participants played a video game similar to Angry Birds. They had a limited number of shots, but more shots could be earned with good performance.

Poor participants: 30 shots per round
Rich participants: 150 shots per round

Two conditions
- Borrowing: allowed to borrow shots from next round at a 100% interest rate.
- No Borrowing

Results:

- Poor participants spent more time aiming than rich participants, and thus earned more points per shot than the rich.

- But, poor participants borrowed more shots, and borrowing hurt their final performance.

“The more focused the poor were on the current round, the more they neglected (and borrowed away from) future rounds.”
Hungry Pigeons
Laude, Pattison, & Zentall (2012)

Pigeons trained to press keys for food
Two levels of food restriction:
  - 75% free-feeding weight (high restriction)
  - 90% free-feeding weight (low restriction)
24 forced trials, and 24 trials in which they had a choice (randomly mixed)

50% reward

75% Reward (optimal choice)

High restriction diet led to more poor choices!

High restriction diet led to fewer rewards (less food)!
Hungry Pigeons (conclusion)

“It appears that pigeons in the high-food-restriction group based their choice on the immediacy of the appearance of the stimulus associated with a high probability of reinforcement, whereas pigeons in the low-food-restriction group based their choice on the overall probability of reinforcement associated with each alternative (p. 889).”

Parallel findings with humans:
Lower income adults discount delayed rewards more steeply than do higher income adults (Green, Myserson, Lichtman, Rosen, & Fry, 1996).
People with higher needs (lower socio-economic status) tend to gamble proportionally more than those with lower needs (higher socio-economic status) (Lyk-Jensen, 2010).

E. Moral Judgment and brain injury

Several lines of investigation have demonstrated impaired moral reasoning following damage to the frontal cortex.
Phineas Gage (see Damasio et al., 1994).
On September 13, 1848, Phineas P. Gage was working outside the small town of Cavendish, Vermont on the construction of a railroad track where he was employed as a foreman. One of his duties involved filling the hole with gunpowder, adding a fuse, and then packing in sand with the aid of a large tamping iron. Gage was momentarily distracted and forgot to pour the sand into one hole. Thus, when he went to tamp the sand down, the tamping iron sparked against the rock and ignited the gunpowder, causing the iron to be blown through Gage’s head with such force that it landed almost thirty yards (27 meters) behind him.
A computer model of the Gage skull showing a reconstruction of the most likely trajectory taken by the tamping rod (gray). The colored fibers represent white matter in the brain and show which ones would have been severed by the rod.

"Gage was fitful, irreverent, indulging at times in the grossest profanity (which was not previously his custom), manifesting but little deference for his fellows, impatient of restraint or advice when it conflicts with his desires, at times pertinaciously obstinate, yet capricious and vacillating, devising many plans of future operations, which are no sooner arranged than they are abandoned in turn for others appearing more feasible. A child in his intellectual capacity and manifestations, he has the animal passions of a strong man. Previous to his injury, although untrained in the schools, he possessed a well-balanced mind, and was looked upon by those who knew him as a shrewd, smart businessman, very energetic and persistent in executing all his plans of operation. In this regard his mind was radically changed, so decidedly that his friends and acquaintances said he was 'no longer Gage.' —Harlow, J.M. (1848)

Damasio argued that this case provided a link between the frontal lobe and practical decision making.

E. Moral Judgment and brain injury (cont)
Green et al. (Science, 2001) fMRI study
The Trolley Dilemma
"A runaway trolley is hurtling down the tracks toward five people who will be killed if it proceeds on its present course. You can save these five people by diverting the trolley onto a different set of tracks, one that has only one person on it, but if you do this that person will be killed. Is it morally permissible to turn the trolley and thus prevent five deaths at the cost of one?"
The Footbridge Dilemma
"The trolley is headed for five people. You are on a footbridge over the tracks next to a large man. The only way to save the five people is to push this man off the bridge and into the path of the trolley. Is that morally permissible?"

Moral personal decisions (footbridge dilemma) led to increased activity in the areas associated with emotion, and reduced activity in areas associated with working memory.

The Trolley Dilemma and A.I.
Bonnefon, Shariff, & Rahwan (2015)

Figure 1: Three trolley situations involving fateful unavoidable harms. (a) The car can stay on course and kill several pedestrians, or swerve and kill one pedestrian. (b) The car can stay on course and kill one pedestrian, or swerve and kill its passenger. (c) The car can stay on course and kill several pedestrians, or swerve and kill its passenger.

How should a self-driving car be programmed to react?
E. Moral Judgment and brain injury (cont.)

- Koenigs (2007) study in Nature: “Would you suffocate a crying baby to protect a group from being found by enemy soldiers?”

Those with ventromedial prefrontal cortex injuries were twice as likely to say “yes” as a control group.

V. Conclusions

What is the impact of emotion on cognition?
1) Some emotional stimuli automatically attract attention
2) Increased attention to emotional stimuli can steal attention for surrounding stimuli, leading to enhanced memory for emotional material at the expense of surrounding neutral material.
3) Emotional content can impair some reasoning and decision processes, but inform judgment.
4) These effects can be understood in the context an emotional appraisal process that requires cognitive resources.