Psychological Aspects

Decision Supports Systems 2017/18, Lecture 07

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Subjective Probability

- decision making is a process of assessing alternatives based on
  - values (EMV)
  - preferences (EU)
- EMV and EU can be data-driven

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- sometimes we have no data to base our estimates of the distribution on
- we perform subjective judgments
- subjective judgments can be translated into probabilities
- we base the subjective judgments on beliefs

Example

Tom W. is of high intelligence, although lacking in true creativity. He has a need for order and clarity, and for neat and tidy systems in which every detail finds its appropriate place. His writing is rather dull and mechanical, occasionally enlivened by somewhat corny puns and by flashes of imagination of the sci-fi type. He has a strong drive for competence. He seems to feel little sympathy for other people and does not enjoy interacting with others. Self-centered, he nonetheless has a deep moral sense.

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Rank the nine areas below in terms of how similar Tom W. is to the prototypical graduate student of each area.

- business administration,
- computer science,
- engineering,
- humanities and education,
- law,
- library science,
- medicine,
- physical and life sciences,
- social science and social work.

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When making such assessments we are victims of **heuristics** and **biases**

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Heuristics

- What are heuristics?
  - simple, efficient rules which people often use to form judgments and make decisions
  - mental shortcuts that usually involve focusing on one aspect of a complex problem and ignoring others
  - generally work well, but they can lead to systematic deviations from logic, probability or rational choices
  - **the resulting errors are called "cognitive biases"**
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- Tversky and Kahneman proposed the following heuristics:
  - availability,
  - representativeness,
  - anchoring and adjustment

Availability Heuristics

- **immediate examples** that come to a given person's mind when evaluating a specific topic, concept, method or decision.
- *if something can be recalled, it must be important!*
- hence, people tend to heavily weigh their judgments toward more recent information, making new opinions biased toward that latest news

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- examples:
  - after seeing news stories about child abductions, people may judge that the likelihood of this event is greater.
- leads to biases, such as illusory correlation

Regression to the mean

The flight instructor had been in the habit of praising students for good landings and scolding them for poor ones. He observed that after receiving praise for a good landing, a pilot's subsequent landing tended to be worse. Conversely, after a pilot received a scolding, his next landing tended to be better. The instructor concluded that scolding was effective feedback and that praise was not

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- Regression towards the mean:
  - if a variable is extreme on its first measurement, it will tend to be closer to the average on its second measurement—and if it is extreme on its second measurement, it will tend to have been closer to the average on its first

Representativeness Heuristics

- Example:
  - *Linda is 31 years old, single, outspoken, and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in anti-nuclear demonstrations.*
  - Which is more probable:
    - A: Linda is a bank teller.
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- RH happens when it is assumed that specific conditions are more probable than a single general one.
- leads to biases
  - base rate fallacy
  - conjunction fallacy
  - insensitivity to sample size

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  - A: 512
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- once an anchor is set, other judgments are made by adjusting away from that anchor, and there is a bias toward interpreting other information around the anchor.

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- example:
  - the initial price offered for a used car sets the standard for the rest of the negotiations, so that prices lower than the initial price seem more reasonable even if they are still higher than what the car is really worth

Anchoring and Adjustment

- anchoring is extremely difficult to avoid
- example
  - in one study students were given anchors that were obviously wrong. They were asked whether Mahatma Gandhi died before or after age 9, or before or after age 140. Clearly neither of these anchors can be correct, but the two groups still guessed significantly differently (average age of 50 vs. average age of 67)
- influencing factors have been found:
  - mood (sad people are more likely to use anchoring than people with happy or neutral mood)
  - experience (while experience can sometimes reduce the effect, even experts are susceptible to anchoring)
  - personality (high in agreeableness and conscientiousness are more likely to be affected by anchoring, while those high in extroversion are less likely to be affected)

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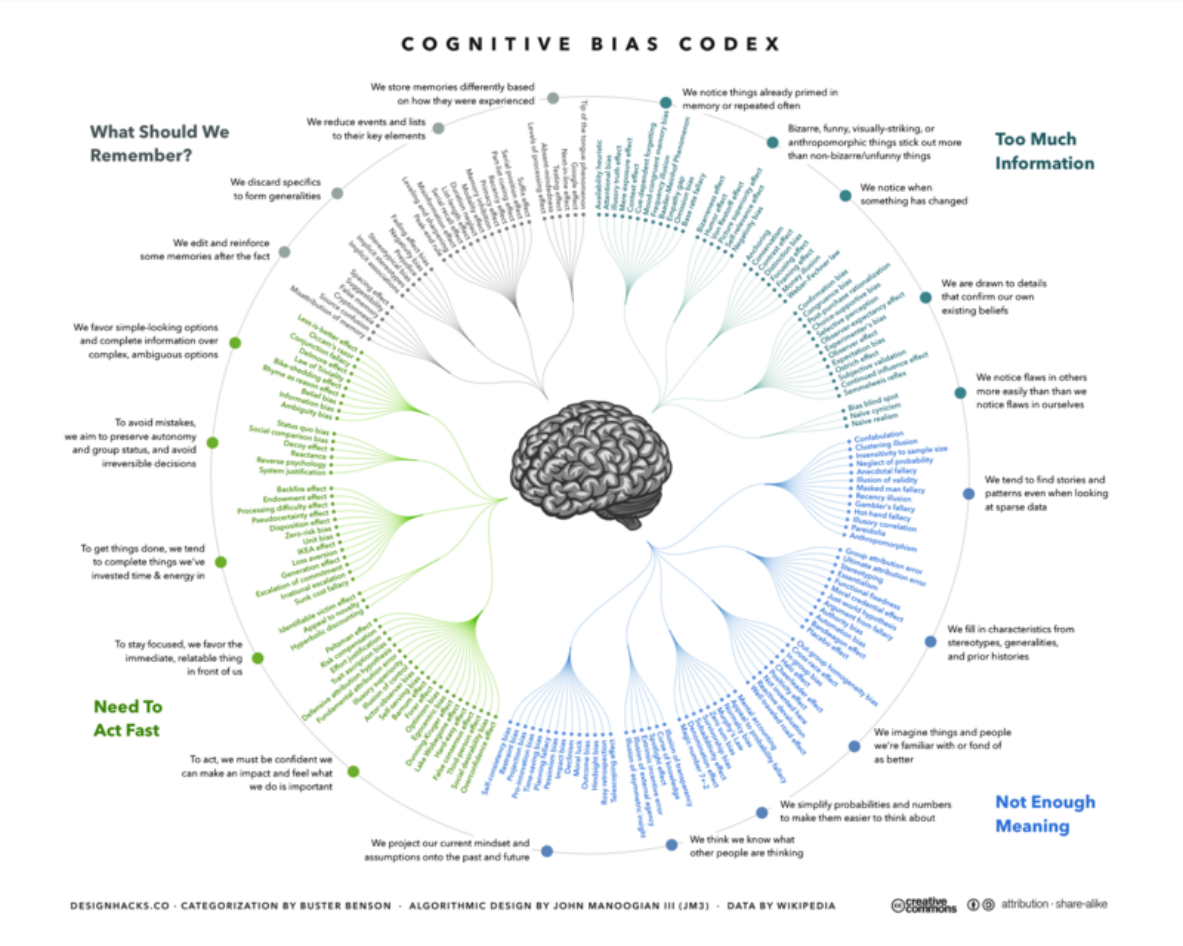
Biases

- biases are tendencies to think in certain ways that can lead to systematic deviations from a standard of rationality or good judgment
- biases that are a consequence of heuristics are **cognitive biases**



Illusory correlation

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- other examples?
  - vaccination vs. autism (Andrew Wakefield faked the data)

Base rate fallacy

- *A group of police officers have breathalyzers displaying false drunkenness in 5% of the cases in which the driver is sober. However, the breathalyzers never fail to detect a truly drunk person. One in a thousand drivers is driving drunk. Suppose the police officers then stop a driver at random, and force the driver to take a breathalyzer test. It indicates that the driver is drunk. We assume you don't know anything else about him or her. How high is the probability he or she really is drunk?*

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- 1 driver is drunk, and it is 100% certain that for that driver there is a true positive test result, so there is 1 true positive test result
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- BRF = if presented with related **base rate information** (i.e. generic, general information) and **specific information** (information pertaining only to a certain case), the mind tends to ignore the base rate and focus on the specific

Conjunction fallacy

- remember the Linda case?
- CF occurs when it is assumed that specific conditions are more probable than a single general one

Insensitivity to sample size

- *A certain town is served by two hospitals. In the larger hospital about 45 babies are born each day, and in the smaller hospital about 15 babies are born each day. As you know, about 50% of all babies are boys. However, the exact percentage varies from day to day. Sometimes it may be higher than 50%, sometimes lower.*
- *For a period of 1 year, each hospital recorded the days on which more than 60% of the babies born were boys. Which hospital do you think recorded more such days?*
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- C: 56%, A,B: 22%
- right answer: B

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- occurs when people judge the probability of obtaining a sample statistic without respect to the sample size
  - small sample sizes allow extreme cases, which are less possible with bigger samples

Framing effect

- 2 treatments (A and B) for a deadly disease for 600 people

Framing	Treatment A	Treatment B
Positive	Saves 200 lives	A 33% chance of saving all 600 people, 66% possibility of saving no one.
Negative	400 people will die	A 33% chance that no people will die, 66% probability that all 600 will die.

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- FE = people react to a particular choice in different ways depending on how it is presented; e.g. as a loss or as a gain.
- People tend to avoid risk when a positive frame is presented but seek risks when a negative frame is presented (cf risk avoidance/seeking as strategy)

Framing effect

- Prospect theory
  - a loss is more significant than the equivalent gain,
  - a sure gain (certainty effect and pseudocertainty effect) is favored over a probabilistic gain,
  - a probabilistic loss is preferred to a definite loss.

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- One of the dangers of framing effects is that people are often provided with options within the context of only one of the two frames

Distinction bias

- tendency to view two options as more distinctive when evaluating them simultaneously than when evaluating them separately

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- example
  - comparing two very similar high-end TV sets next to each other in a store
  - the quality difference may appear great
  - the consumer puts more value on the more expensive TV set
  - as she will be watching one TV at a time, the cheaper would provide a similar experience at a lower price

Decoy effect

A	B	
price	$400	$300
storage	30GB	20GB

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A	B	D	
price	$400	$300	$350
storage	30GB	20GB	15GB

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- happens when people tend to have a specific change in preference between two options when also presented with a third option that is **asymmetrically dominated.**
  - when it is inferior in all respects to one option; but it is inferior in some respects and superior in others to the other option

Inattentional Blindness

[basketball video]

Inattentional Blindness

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- when we construct the influence diagrams, decision trees and other tools for modeling decisions we are focusing at the problem at hand. We use our knowledge and problem understanding to build the possible choices.
- however, we can be non-intentionally blind

Confirmation bias

- the tendency to search for, interpret, favor, and recall information in a way that confirms one's preexisting beliefs
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- Cherry picking (related effect)
  - the act of pointing to individual cases or data that seem to confirm a particular position, while ignoring a significant portion of related cases or data that may contradict that position
  - a major problem in public debate
    - should we privatize the national railway company?
    - should we introduce school uniforms?

We use our intelligence to defend our beliefs

- *While in South Africa, Mahatma Gandhi focused on racial persecution of Indians and ignored those of Africans. His behaviour was one of being a willing part of racial stereotyping and African exploitation.*
- do you believe this?

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- we have beliefs about many things
- when we encounter a new information we should be asking
  - should I believe this? (is there enough evidence to support this claim?)
- instead, we ask ourselves
  - must I believe this? (am I forced to change my beliefs?)

We use our intelligence to defend our beliefs

- *there is solid evidence of recent global warnig due mostly to human activity such as burning fossil fuels.*
  - agree?
  - disagree?

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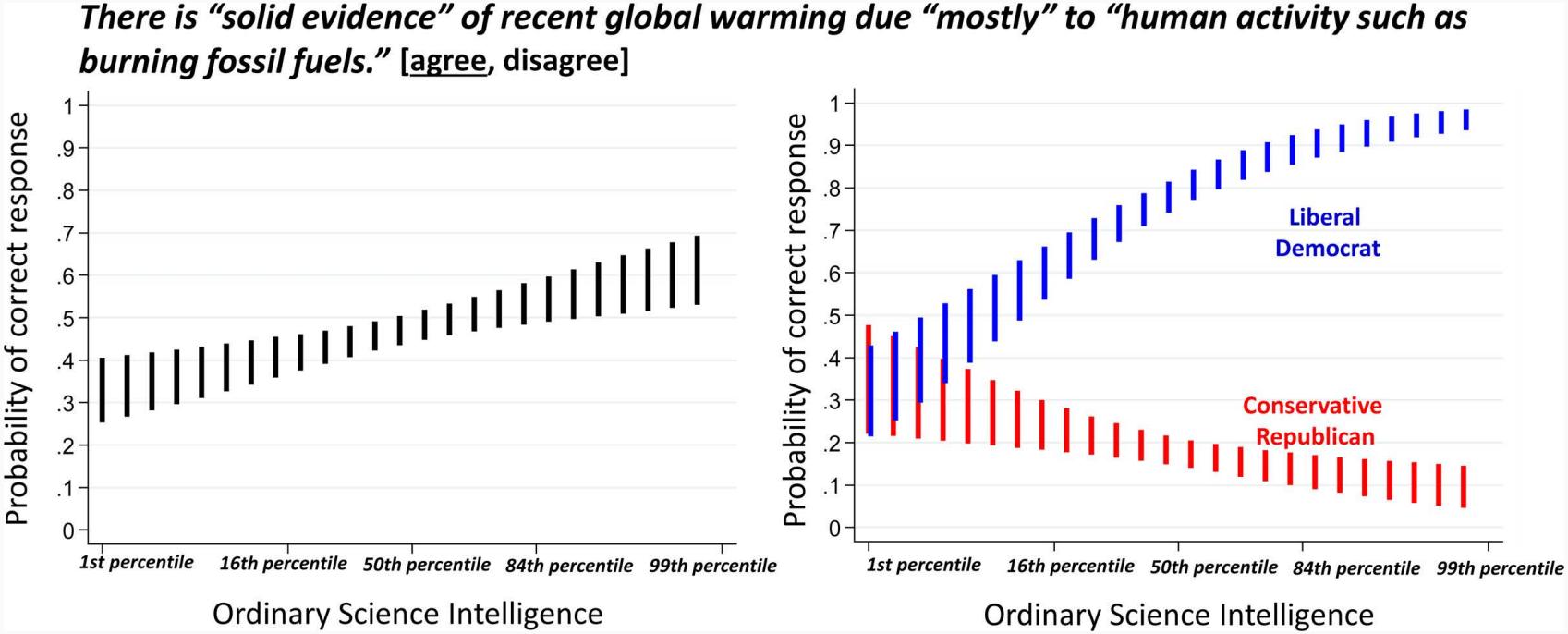

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Cognitive Dissonance

- several types:
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  - Induced Compliance
  - **Free Choice**
  - Effort Justification

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- why?

- this type of cognitive dissonance occurs to a person faced with making a difficult decision
  - often there are aspects of the rejected-object, which appeal to the person
  - the decision *I chose X* **is dissonant** with the cognition that *There are some aspects of Y that I like.*

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Cognitive Styles

- in modeling preferences we mentioned three types of behaviour towards risky choices
  - risk-aversion
  - risk-seeking
  - risk-neutral

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- there are more cognitive styles where decision makers are different between each other
  - optimizing vs. satisficing
  - intuitive vs. rational
  - combinatorial vs. positional

Optimizing vs. satisficing

- Herbert A. Simon coined the phrase "bounded rationality" :
  - human decision-making is limited by available information, available time and the mind's information-processing ability.
- two cognitive styles:
  - **maximizers** try to make an optimal decision
    - take more time to make decisions (evaluate trade-offs carefully)
    - more often regret decisions
  - **satisficers** try to find a solution that is "good enough".

Intuitive vs. rational

- Daniel Kahneman: a person's decision-making is the result of an interplay between two kinds of cognitive processes:
  - an **automatic intuitive system** (called "System 1")
    - a bottom-up, fast, and implicit system of decision-making
    - includes simple heuristics in judgment and decision-making such as the affect heuristic, the availability heuristic, the familiarity heuristic, and the representativeness heuristic.
  - an **effortful rational system** (called "System 2").
    - top-down, slow, and explicit system of decision-making

Combinatorial vs. positional

- Aron Katsenelinboigen:
  - there are two major styles in chess: positional and combinational.
- **The combinational style** is characterized by:
  - a very narrow, clearly defined, primarily material goal; and
  - a program that links the initial position with the final outcome.
- **The positional style** is distinguished by:
  - a positional goal; and
  - a formation of semi-complete linkages between the initial step and final outcome.

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Group Decision making

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- group of people
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- when a decision needs to be taken by a group, different approaches can be used

Consensus decision-making

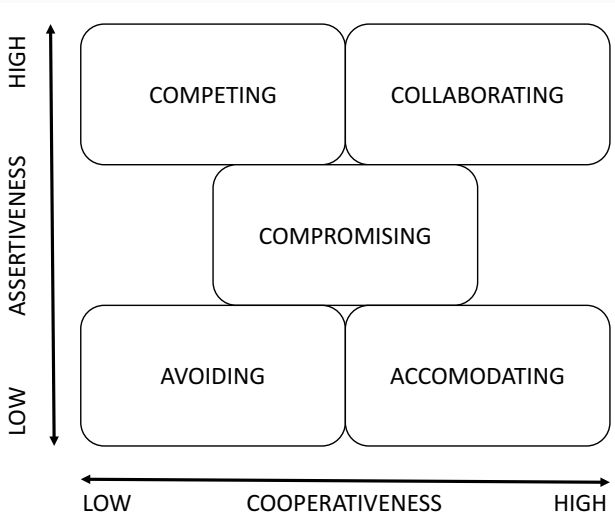
- tries to avoid “winners” and “losers”.
- consensus requires that
  - **a majority approve a given course of action**, but that
  - the minority agree to go along with the course of action.
  - i.e. if the minority opposes the course of action, consensus requires that the course of action be modified to remove objectionable features.
- giving consent does not necessarily mean that the proposal being considered is one’s first choice.

Voting-based methods

- every decision maker can vote for one or more alternatives
- there are several criteria for voting-based methods
- assume each alternative has a utility for each individual
- assume each individual has ranked the alternatives according to the utility
  - plurality voting: each decision maker can vote only for one alternative
  - majority voting: plurality $+ > 50\%$
  - average: rank alternatives by their average utility across decision makers
  - least misery: highest minimum utility
  - most pleasure: highest maximal utility
  - most respected person (a.k.a. dictatorship)

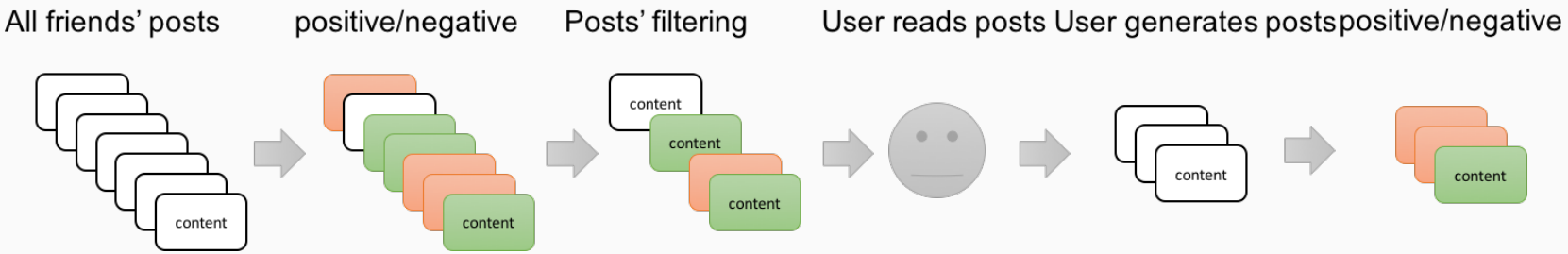
Group Dynamics

- group members can have different personalities
- various models for modeling personality
  - Five Factor Model (Big5)
    - Openness
    - Conscientiousness
    - Extraversion
    - Agreeableness
    - Neuroticism (Emotional Stability)
  - Thomas Killman conflict coping model
- Alexander Felfernig, Martin Stettinger, Ludovico Boratto and Marko Tkalčič (Eds.). (2018). Group Recommender Systems, An Introduction. Springer



Emotional contagion

- one person's emotions and related behaviors directly trigger similar emotions and behaviors in other people
- RQ: does emotional contagion occur outside of in-person interactions?
- Facebook users (N = 689,003)
- 2 experiments:
  - exposure to friends' positive emotional content was reduced
    - group (only emotional content omitted)
    - control group (any content omitted)
  - exposure to friends' negative emotional content was reduced
    - group (only emotional content omitted)
    - control group (any content omitted)



References

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