

Motivated reasoning and cultural cognition about political debates informed with science: mitigating social groups polarization -

Impact of the perceived social/value positioning of the expert spokesperson uttering scientific arguments on nuclear/renewable energy policy mix

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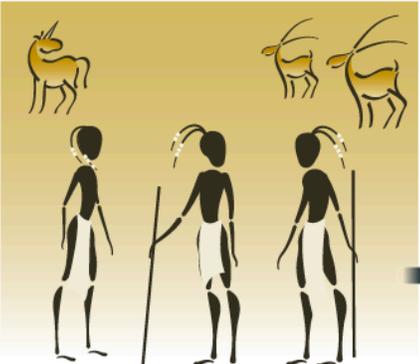
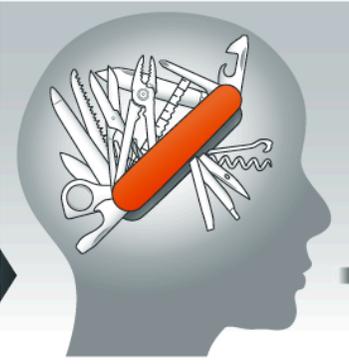
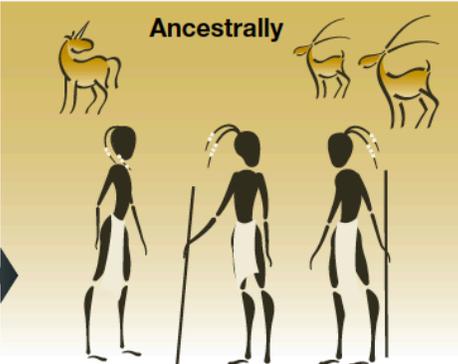
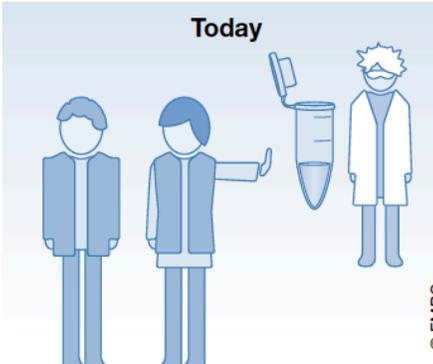
Science communication about controversial political issues should take into account people mode of reasoning

- The way scientific facts about major political issues are communicated to the general public often overlooks people's tendency to not simply assess the accuracy of well-grounded arguments. People often reflect by using motivated reasoning (definition, further).
- Exposition to more scientific facts does not always lead to average attitudes which get more centered towards the scientific consensus. Example of climate change issues
 - “ Increased communication about science issues is assumed to help public opinion moving toward the scientific consensus. However in the U.S.A. , in the case of climate change, public polarization has increased in recent years, not diminished.” (2012 , Hart Nisbet)

Human cognition evolved into a system not able to process well scientific information spontaneously

manque un mot ou reformler sur human being

- With evolution of cognition, **human beings**, some disadvantages appeared relative to the treatment of scientific data. Cognition is not likely to form easily accurate scientific beliefs (Marie et al., 2020).

| Ancestral challenges | Evolved intuitive systems | Typical outputs | |
|--|---|--|--|
|  <p>Benefitting from communication without being deceived</p> |  <p>Trust calibration mechanisms</p> |  <p><i>'Trust people you know'</i></p> |  <p><i>'Scientists look cold and cunning'</i></p> |
| <p>Persuading others of one's rationality/commitment</p> | <p>Myside bias</p> | <p>Partiality in favor of one's own and one's group opinions</p> | <p>Cherry picking of scientific data</p> |
| <p>Forming quick inferences about species' properties</p> | <p>Naïve essentialism</p> | <p><i>'Species have essences'</i> <i>'Some species are natural, others aren't'</i></p> | <p><i>'GMOs meddle with natural essences, they're weird and disgusting'</i></p> |
| <p>Better to err on the side of caution than miss fatal threat</p> | <p>Threat over-sensitivity Agency-detection</p> | <p><i>'This could be a plot'</i></p> | <p><i>'Lobby X is probably behind it'</i></p> |

Marie et al., 2020 : illustration

Figure 1. From ancestral challenges to evolved intuitive systems to misbeliefs about scientific facts.

Motivated reasoning distorts evaluation of arguments and science

- Motivated reasoning is reflecting on reflecting arguments / information with an a priori (before reaching the outcome of cognition) preference to reach a special conclusion.
 - The motivation manque either be can either reaching accuracy regarding evidence, or reaching a desired conclusion, whatever the accuracy of the outcome of reasoning may be . (Kunda,1990)
- Even if the average tendency in cognition is to try and get good representation of reality, precision about scientific debates interests an individual only to the extent that the individual sees accuracy as helpful to reach their targets.
 - Often people, who accept misinformation about science-informed issues, don't really seek precision but they seek more the apparent plausibility of an argument because main goal is for social interaction and argumentation. (Morisseau et al. , 2021).
- Reasoning is not aim at reaching neutral accuracy or truth but it is aimed at providing each individual with arguments that support their a priori beliefs, views and behavior. This is the theory of the argumentative nature of reasoning. (Mercier & Sperber, 2011)

Cultural cognition explains in part polarized opinion that is social group based.

- Cultural cognition : people tend to react to science facts related to social debates in a way that strengthens the ties they have with some social groups. Groups with which they share interests and commitments.
 - “The same groups who disagree on 'cultural issues' — abortion, same-sex marriage and school prayer — also disagree on whether climate change is real and on whether underground disposal of nuclear waste is safe” (Kahan, 2010). Moral/value/cultural group affiliation explains such polarization better than universal cognitive biases which are spread evenly in the population.
which depend on
- Cultural cognition explains different forms of polarization according to the influence of the individual’s affiliation with specific social group values.
 - The values in question are related to the perception of social/collective risk and also related to the group positioning on the equality value spectrum , authority spectrum, individualism spectrum, and community value spectrum. (Kahan 2010, 2013)
 - Identity protective reasoning

Cultural cognition impacts the perceived credibility of expert's speech

- On average people are not knowledgeable enough to assess accurate or technical information on their own. So there is a proclivity to follow reputable experts.
- But in following the views of an expert, people tend to only trust the person that they think are credible. And those are the ones that people feel are sharing their own values. (Kahan, 2010)
- Example : study about attitudes towards vaccination against the Human-papillomavirus (HPV) (Cohen & al., 2010)
 - Since mid-2000's the HPV vaccine has been recommended to girls aged 11-12 y.o., which sparked very polarized political debate. The study investigates how experts ideas influence the debate.
 - Experiment: pro- and cons arguments are designed and matched to a fictional character who acts as an expert and whose appearance and publication titles make them perceived as having different cultural/value outlook.
 - When the fictional speaker which is seen as hierarchical and individualistic is uttering views against the vaccination, persons who are sharing this culture and who are already against vaccination become even more opposed to the vaccine. Same phenomenon (inverse position gets more extreme) happens with people with egalitarian values when expert is seen as egalitarian and communitarian.

Need for improved communication in science in public debates matter

- Current techniques of communication in science are often inefficient
 - Overwhelming people with much robust facts in the hope that truth will win is not realistic
 - If scientific consensus contain arguments that may challenge some cultural groups values, then it can make these groups resist more the objective data and make them support evidence
- Example : during 1st phase of covid pandemics in France, a non negligible share of the population affirm that hydroxychloroquine is an efficient cure, not based on epistemic motives but on an affiliation to an anti-establishment social group. (Morisseau, 2021).
- Science communication about political debates should consider the impact of cultural cognition and social affiliation
 - Scientific data communicated to the general public should adapt to individuals' mode of reasoning
 - The mode of reasoning often relies on signaling one's loyalty to a group of identification

How to mitigate cultural cognition distortion effect on reasoning about science informed debates?

- Literature gap on how to counterbalance cultural cognition (Kahan, 2010)
- One avenue to help the communication of science bringing people to trust more the data and analyze it in a less biased fashion : enable a wide array of experts which are seen as belonging to various value/cultural social groups.
- In the HPV experiment, attitude polarization regarding the generalization of the vaccine was diminished when people faced proponents of vaccination who were perceived as belonging to both their value group (Cohen & al., 2010)
 - Inversion of the matching between culturally affiliated expert and expressed arguments on the matter
 - Individuals tend to assess scientific evidence with a more open minded perspective when they see that an expert from their value group agrees on the evidence

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Research question

To what extent, is it possible to mitigate polarization of attitudes (on political debates dependent on science) due to cultural cognition?

Let's investigate if there is a mitigation effect by introducing experts, proponents of the scientific consensus, who are seen as (not) belonging to a particular cultural/value group.

General hypotheses

- In many debates one can represent the attitudes of the general public (laypersons) in a socio-political debates as a position on a spectrum. The scientific consensus is often somewhere in the middle part of the spectrum scale, somewhere not too far from the average attitude (barycenter) . At each end of the spectrum we find two stereotypes of opinions (polarized attitude).
- H1 : People holding a polarized view on a particular topic, when exposed to the speech of an expert proponent of the scientific consensus, an expert who is seen as belonging to their cultural group, will shift their view towards a more balanced opinion.
- H2 : People holding a polarized view on a particular topic, when exposed to the speech of an expert proponent of the scientific consensus, an expert who is seen as belonging to a group different from their cultural group, will shift their view towards a more extreme opinion or maintain their already extreme attitude.

Experiment : debate about electricity production sources in the energy mix

- In France and in countries where a significant share of the domestic produced electricity comes from nuclear energy , the debate is fierce about what type of electricity sources should be part of the national policies.
 - There is especially a debate about whether and to what extent nuclear energy should be in the public policy mix. This, in the context of the energy transition in France, transition necessary to tackle climate change
- (Pretended) Scientific consensus: a “balanced mix” comprising both nuclear and renewable sources
 - Renewable sources of energy should grow in percentage of total energy produced and consumed. And nuclear energy is a way , during a transition of technology towards more efficient renewable sources, to help not emitting too much carbon-dioxide. For nuclear energy whether maintaining the absolute value in kwh (thus decreasing the share) or maintaining also the share in the mix remains an open question. (from J.M. Jancovici and Réseau de transport d’électricité RTE,to be completed)
à compléter avec argument lemonde et jancovici
- There is a polarized debate in public opinion about allowing or not any nuclear energy in the mix, while the consensus of science recommends to do so .
 - “ In the past, renewable and nuclear energy have largely operated in separate ideological spheres, each dismissive of the other as a suitable energy option. Yet, the required transition to a low carbon economy in a limited timeframe requires a common forum for renewables and other low-carbon options, such as nuclear energy, to cooperate not just coexist. How can this space be created? “ (Iakovleva & al., 2020)

Method : 1/3



- A within subject design
 - French subject, online experiment, representative of population who have the right to vote
- Pre-experiment : measure of each individual's opinion and values:
 - Measure of opinion on energy mix :
 - 3 questions with scales from 1 to 10 (0 prefer not to say, 1 strongly disagree to 9 strongly agree) about agreement with 3 statements A "balanced mix is desirable a policy", B " a mix of only renewable sources of energy is desirable", C " a mix of various sources with an an as high as possible share of nuclear energy is desirable")
 - Measure of their cultural/moral values in general (Moral foundation questionnaire: Metayer & Pahlavan, 2014).

faut lire l'article français voir aussi l'anglais sur ce questionnaire et pro environmentalisme

Method : 2/3

- This leads to splitting participants into 4 or 5 groups among which 3 are important:
 - Neutral group : participants neutral to a balanced mix (scores ranging 4 to 5 on question A, and 4 to 5 on B and C),
 - Polarization pro-renewable group : strongly opposed to a balanced mix while in favor of a 100% renewable mix (score 1 to 2 on question A, 8 to 9 on question B, 1 to 2 on question C)
 - Polarization pro-nuclear group : strongly opposed to a balanced mix while in favor of a high share of nuclear energy (score 1 to 2 on question A, 1 to 2 on question B, 8 to 9 on question C)
- By analyzing the most common profiles of moral values in both polarization group, study will try to synthesize what is the most represented value profile among each of the 3 important groups
- Participants will see a video of a CGI movie featuring a fictitious CGI expert speaker (realistic and human-like). The speakers will vary and be designed in such a way that they will be representative of one of the 3 main groups.
 - The representativeness of the cgi character depends on how they are dressed and on the content of a short fictitious autobiography presentation(background, cv, family, hobbies, home location) made before the speech on scientific consensus
 - There will be a neutral group value expert, a polarization pro-renewable value expert, a polarization pro-nuclear value expert

ajouter thanks to the moral foundation questionnaire

cgi c'est effet spéciaux et pas le générique image de synthèse - voir le smots anglais digital imaging et surtout paper 2010 HPV pour voir comment ils ont

généré des personnages virtuels

Method : 3/3

- Exposition of each participant to the speech by the cgi character presenting the (pretended) scientific consensus
 - “ To produce electricity while not emitting too much carbon dioxide most experts recommend that nuclear energy must be used along renewable energy sources. It is also thought that renewable energy should increase its share in the mix while nuclear energy should have a decreasing share. The extent of these 2 changes in respective share in the mix for renewable and nuclear is still unclear and depends on national and financial circumstances. Overall this position can be called ‘ a balanced mix of energy sources’ ”.
- Exposition to the consensus speech is made according to 2 conditions : either congruent value expert, or different side value expert
- After exposition to the speech, measure of opinion towards energy mix policy
 - each participant of the 3 main groups reveal their attitude about their agreement with the statement “ a ‘balanced mix of energy sources’ to produce electricity is the best policy ” on a scale of 0 to 9.

reformuler ça de façon plus simple pour dire que soit le expert est censé être vu comme du même groupe de valeurs (neutral gp + neutral expert / pro renewable group exposed to pro-renewable expert in terms of apparent value / pro nuclear group exposed to pro nuclear value expert) ou alors non congruent (toutes combinaison individu d'un ds 3 groupes avec expert qui ne sera pas perçu comme du même groupe

could introduce after this measure a control measure to know how each individual of the 3 conditions has perceived the expert they have been exposed to in terms of how the individual feel that the expert is near or far from his value group.

Expected results

- Individuals belonging to a polarized group, when exposed to an expert seen as belonging to a group different from their affiliation value group will display a post-experiment attitude towards energy policy mix as much opposed or more opposed (polarized) than their pre-experiment opinion

coquille towards balanced" energy policy mix

- Individuals belonging to a polarized group, when exposed to an expert seen as belonging to their affiliation value group will display a post-experiment attitude towards energy policy less opposed (extreme) than their pre-experiment opinion

coquilly towards a balanced energy policy mix

- No clear expectations regarding individuals belonging to the neutral group

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Thank you for listening!

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