Moral and Social Foundations of Beliefs about Scientific Issues: Case of GM Food and Vaccination

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Objectives

1) How do different moral and social framings of scientific facts affect the likelihood of belief change?
2) How can we model and predict belief change?
3) What are the mechanisms of belief change?

Approach

Most efforts to increase public acceptance of scientific facts have focused on providing transparent factual information. While this is very important, evidence is mixed about the effectiveness of mere facts for increasing acceptance (Abrahamse et al, 2005; Nyhan et al, 2014).

Here, we view belief change as a product of a complex adaptive system composed of cognitive and social processes that interact and reinforce each other. We develop a quantitative framework based on insights from statistical physics to integrate moral considerations and social signals in order to describe and predict belief change. In the model, moral and/or social dissonance can lead to belief change, but more so if a particular type of dissonance is important (parameter *w* in our model) and if they pay attention to the belief updating process (parameter β).

In two longitudinal studies, we experiment with different interventions that present facts about the safety of childhood vaccines and GM food (focal beliefs) along with related moral concerns or social signals.

Data

	Study 1	Study 2
Population	Amazon MTurk	US nationally representative
Sample	N=720 skeptics	N=948 skeptics
Data collection	3 waves of 14 days.	3 waves over 30 days.
Intervention	In wave 2	In waves 2 and 3

Interventions (between-subject experiment):
- Scientific fact + different moral or social framings
- Controls: Scientific fact or Nothing

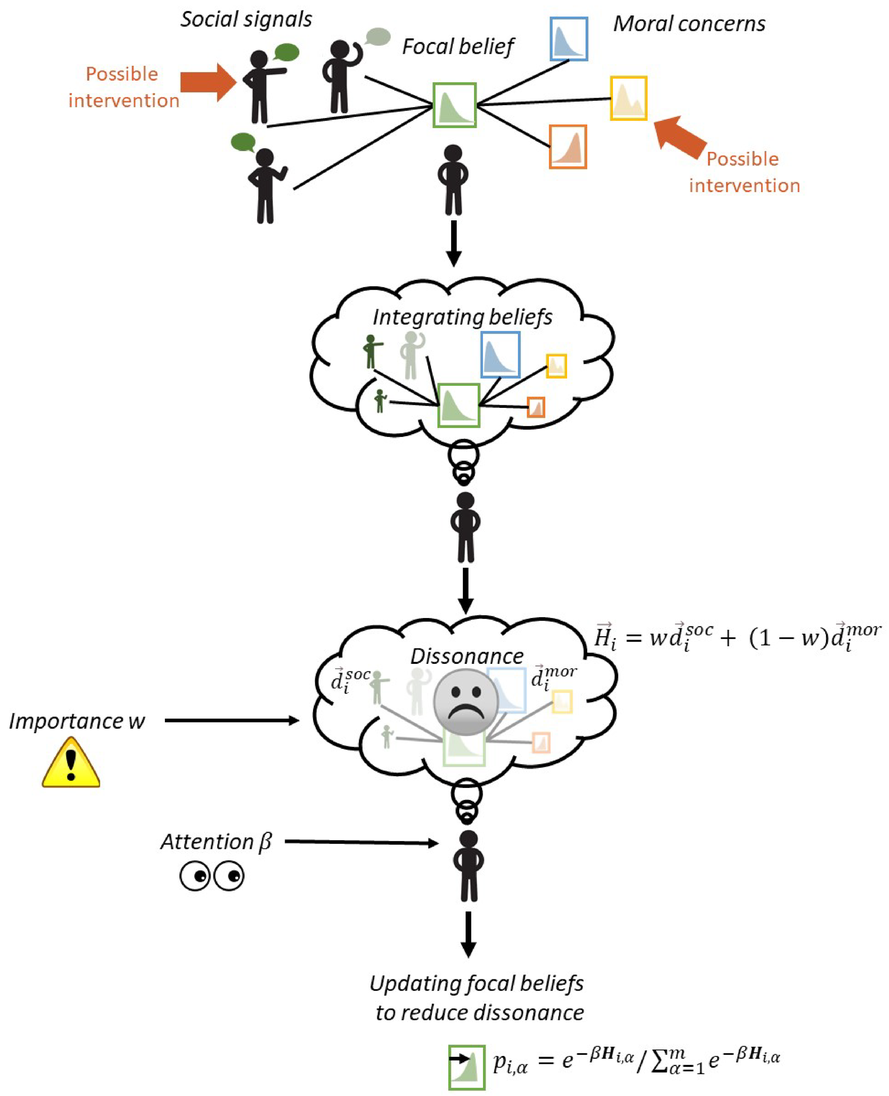
Analyses

Objective 1) We used a mixed linear model with fixed effects being the experimental group, initial focal belief, initial change in these beliefs in pre-experiment waves, average moral and social beliefs, gender, education, presence of children up to 12 years of age in the households, and political ideology, and time between waves as a random effect.

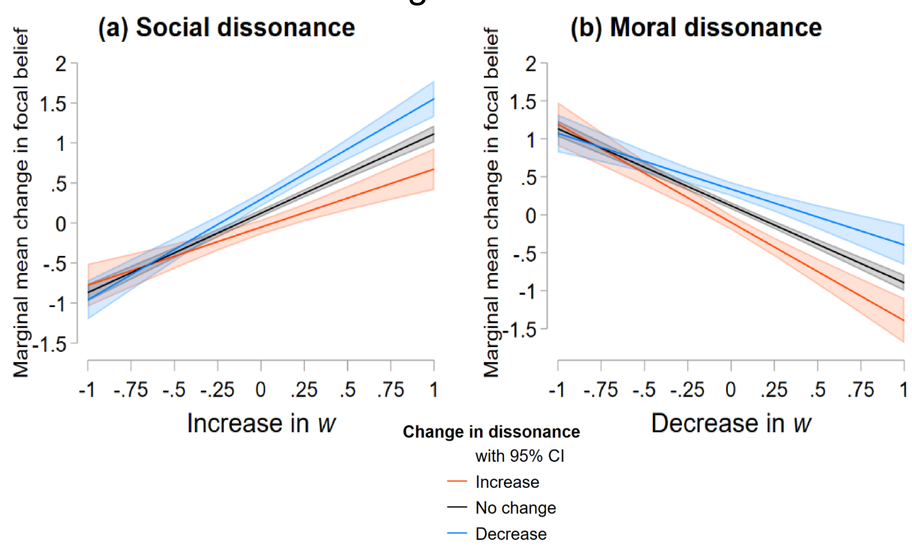
Objective 3) We fit parameters *w* and β separately for each experimental group on a random half of participants. Parameters determined by fitting were used to predict the answers of the other half of participants. The results presented are the average of 50 different random splits.

Objective 2) We split the participants in quantiles with different levels of belief change and fit parameters *w* and β using grid search through a range of possible parameter values. This results in a total of 38 groups we use to investigate mechanisms of belief change.

Why do people change their minds?



Main result: Given large enough importance of that dissonance and attention to belief updating, individuals with higher decreases in social and moral dissonance show more change in their focal beliefs.



Conclusion: People are more likely to accept scientific facts when educational interventions present the facts in a way that lowers people's social and moral dissonance. Our quantitative model of belief dynamics explains and predicts belief change after different interventions.

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Social signals

1) Family and friends
2) Online community
3) Medical doctors
4) Scientists
5) Online experts
6) Governmental Agencies
7) US general public
8) Journalists

Moral concerns

1) Care
2) Fairness
3) Loyalty
4) Authority
5) Purity
6) Liberty

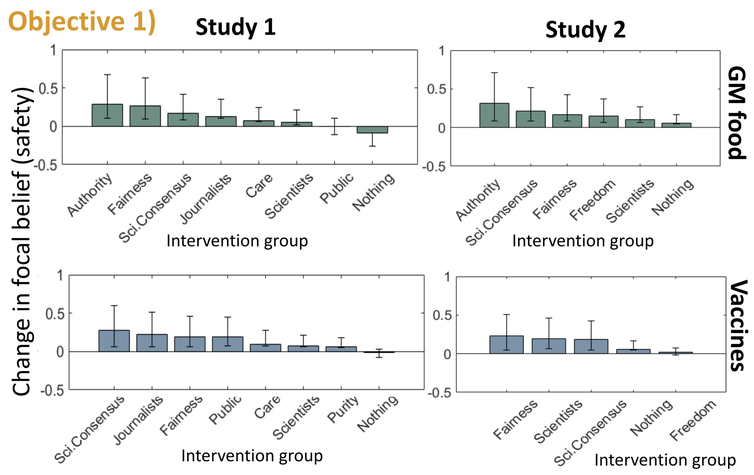
Rules for Integrating beliefs

We compare three different rules for integrating social signals and moral concerns into overall moral and social fields. Each of these rules has been described in the literatures on semantic (Gigerenzer, et al., 1999) and social belief integration (Hoppitt & Laland, 2013):

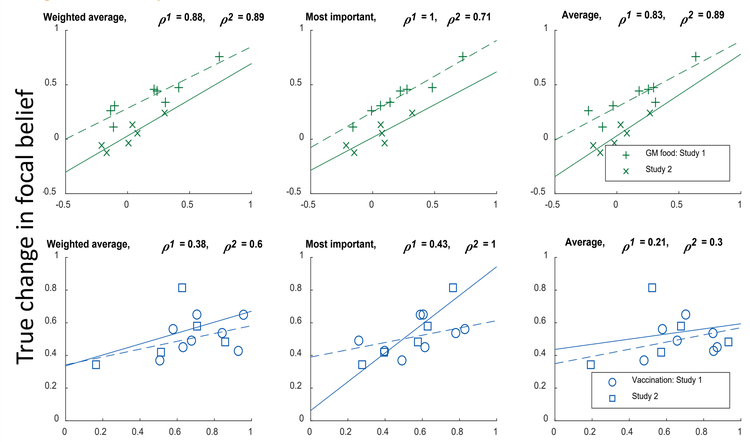
- Simple average
- Weighted average
- Most important

Additional results

Objective 1)



Objective 2)



Objective 3)