

Research Questions

Other-regarding attitude is the interpersonal attitude towards other individuals. With the help of computational models we try to answer the following questions:

1. What are the mechanisms underlying the expression of attitude towards others?
2. Does observing others' interpersonal behaviour influence our own attitude?

Interpersonal task.

Participants can reduce their own earnings in order to increase or decrease earnings of an unknown other. ①

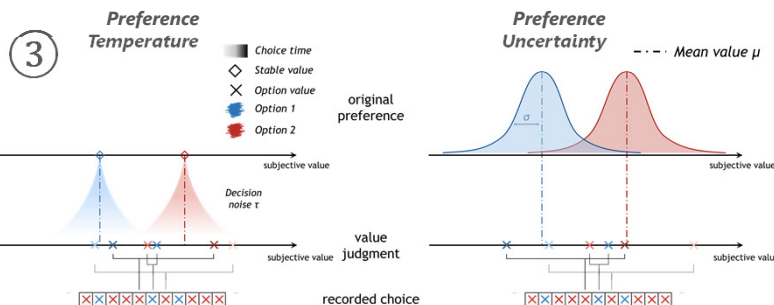
Angle α is used as a proxy of participant's other-regarding attitude¹ ②.

Participants with a positive (negative) α are categorised as 'altruistic', ('spiteful').

1. Attitude expression: uncertainty or noise? Expression of preferences often results in seemingly inconsistent choices.² We test two models that try to explain this choice variability ③:

Preference Temperature. preferences are stable, but decisions are implemented with noise.

Preference Uncertainty. preferences change continuously, gravitating towards a particular state.



Results. Models are fitted using Hierarchical Bayesian estimation³ on data from 245 subjects.

The Preference Uncertainty model accounts for participants' choices better than the Preference Temperature model ($\Delta DIC = -824.51$).

Influence of observation on other-regarding attitude: a computational exploration



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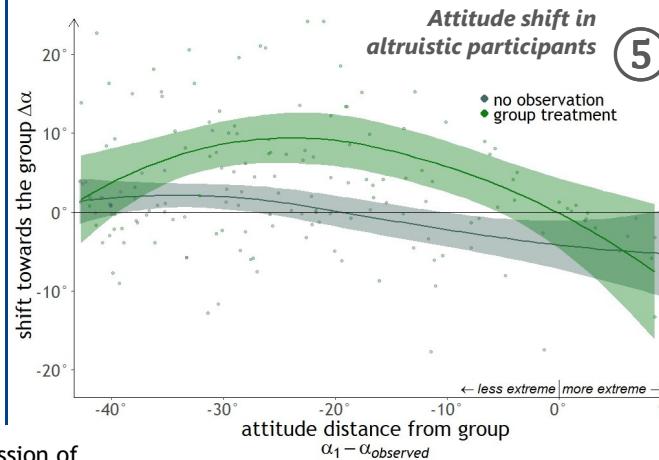
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2. Influence of observation on other-regarding attitude.

Observing others influences one's own preferences in a variety of domains.^{2,4,5} To test influence of observation in our task,

participants predict the choices of a group of previous players ④. Altruistic participants observe an altruistic group ($\alpha_{obs} \approx 45^\circ$), spiteful participants observe a spiteful group ($\alpha_{obs} \approx -45^\circ$).



Results. After observation, attitude shifts towards the observed group (Wilcoxon signed rank test, $p < .001$).

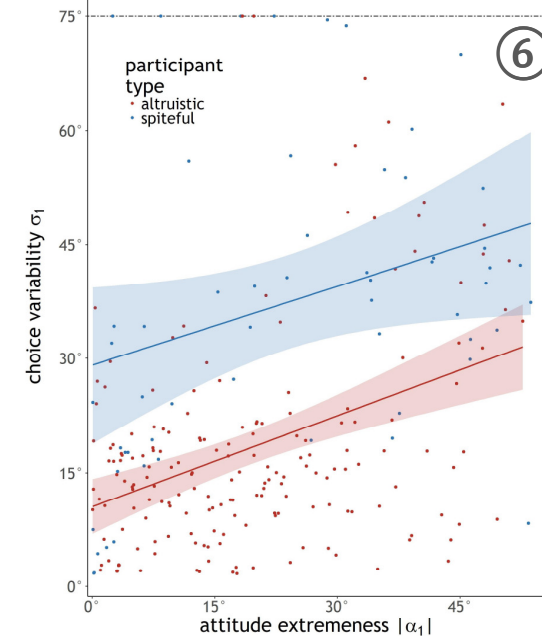
A shift is driven by altruistic participants, whereas spiteful participants appear not to be consistently affected by observation (Wilcoxon rank sum test, $p < .01$).

There seems to be an optimal distance between the participant and the group for the influence of observation ⑤.⁵

Decision task 1 ④

Prediction task

Decision task 2



3. Additional findings. Attitude type and attitude extremeness have a significant effect on choice variability ⑥ (linear regression, $F(2,242) = 41.17$, $p < .001$, adjusted $R^2 = 0.2477$):

Choice variability is higher in spiteful than in altruistic participants ($t = 6.648$, $p < .01$)

The more extreme a participant is, the greater is the choice variability ($t = 5.203$, $p < .01$).

Conclusions

1. The preference uncertainty model suggests that our behaviour is less stable than is commonly assumed in economic theories. This finding is consistent with recent theories holding that value representation in the brain is less defined and more distributed than currently thought.^{6,7}

2. Observing others' behaviour influences other-regarding attitude, but there seem to be important differences between spiteful and altruistic people. These two types of participants could draw upon qualitatively different cognitive mechanisms:

- Altruistic participants could be more influenceable due to greater concerns to adhere to social expectations
- Spiteful participants' more variable behaviour suggests that these participants care less about others' expectations

3. There could be a relation between attitude uncertainty and influence of observation. In particular, people showing extreme other-regarding attitude could be more susceptible to others' behaviour.

1. Murphy, R. O., & Ackermann, K. A. (2014). Social value orientation: Theoretical and measurement issues in the study of social preferences. *Personality and Social Psychology Review*, 18(1), 13-41.

2. Moutoussis, M., Dolan, R. J., & Dayan, P. (2016). How people use social information to find out what to want in the paradigmatic case of inter-temporal preferences. *PLoS computational biology*, 12(7), e1004965.

3. Shiffrin, R. M., Luo, M. D., Kim, W., & Wagnmankers, E. J. (2008). A survey of model evaluation approaches with a tutorial on Hierarchical Bayesian methods. *Cognitive Science*, 32(8), 1248-1284.

4. Devaane, M., & Daunizeau, J. (2017). Learning about and from others' prudence, impatience or laziness: The computational bases of attitude alignment. *PLoS computational biology*, 13(3), e1005422.

5. Chung, D., Christopoulos, G. I., King-Casas, B., Ball, S. B., & Chiu, P. H. (2015). Social signals of safety and risk confer utility and have asymmetric effects on observers' choices. *Nature neuroscience*, 18(6), 912.

6. Yoo, S. B. M., & Hayden, B. Y. (2018). Economic Choice as an Untangling of Options into Actions. *Neuron*, 99(3), 434-447.

7. Meder, D., Koling, N., Verhagen, L., Wittmann, M. K., Schell, J., Madsen, K. H., ... & Rushworth, M. F. (2017). Simultaneous representation of a spectrum of dynamically changing value estimates during decision making. *Nature communications*, 8(1), 1942.

8. Yoo, S. B. M., & Hayden, B. Y. (2018). Economic Choice as an Untangling of Options into Actions. *Neuron*, 99(3), 434-447.