# Norm change and cooperation under collective risk in a long-term experiment

Giulia Andrighetto

*DySoC / Exeter Webinar Series, 2021*

*October 21st 2021*

Institute for FUTURES STUDIES

MÄLARDALEN UNIVERSITY SWEDEN

CNR ISTC
ISTITUTO DI SCIENZE E TECNOLOGIE DELLA COGNIZIONE

Aron Szekely, Collegio Carlo Alberto, Italy

Francesca Lipari, Universidad Carlos III de Madrid, Spain

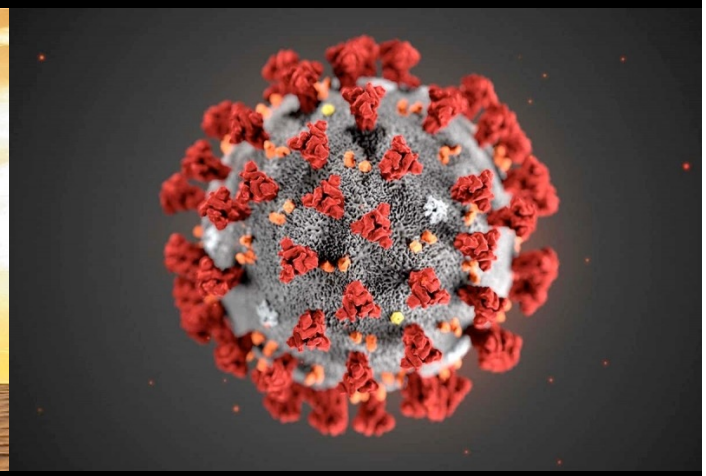
Alberto Antonioni, Universidad Carlos III de Madrid, Spain

Mario Paolucci, National Research Council of Italy

Anxo Sanchez, Universidad Carlos III de Madrid, Spain

Luca Tummolini, National Research Council of Italy

# Social life, global challenges and social norms



# Social norms



Social norms are a key concept in the social sciences,  referred to as the “grammar” (Bicchieri, 2006), the “cement” (Elster, 2009) or the “glue” (Gelfand, 2018) of society.

*but their empirical foundation is still limited.*



# Social norms

Informal and shared behavioural rules that prescribe what individuals ought or ought not to do, and they are followed because of social expectations and potentially social sanctions (Bicchieri, 2006; Ostrom, 2005; Elster, 2009).

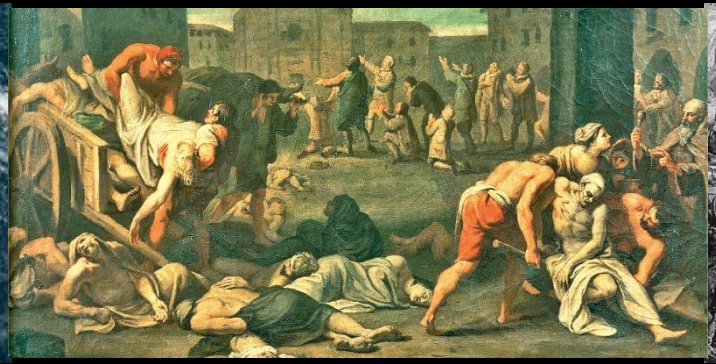
Empirical Expectations (EE) people's beliefs about what others will do.

Normative Expectations (NE): people's beliefs about what others think that one ought to do.

**Behaviour+ Expectations -> Social Norms**

On this account, social norms can be said to exist if we observe both behaviour and corresponding expectations and they can be said to influence behaviour if people respond to both empirical and normative expectations (Bicchieri 2006; 2017).

# Collective risk as determinant of norm change


Tightness-Looseness theory of culture posits that societies that experienced high threats - either ecological threats or manmade threats - develop tight cultures with **strong norms** promoting social coordination for organizing social life (Gelfand et al. 2011).

- 30 day experiment (june-september 2018)
- Allow norms to crystallise
- Decide *in situ*
- *More diverse population*


Do changes in collective threats affect the strenght of social norms and increase cooperation?

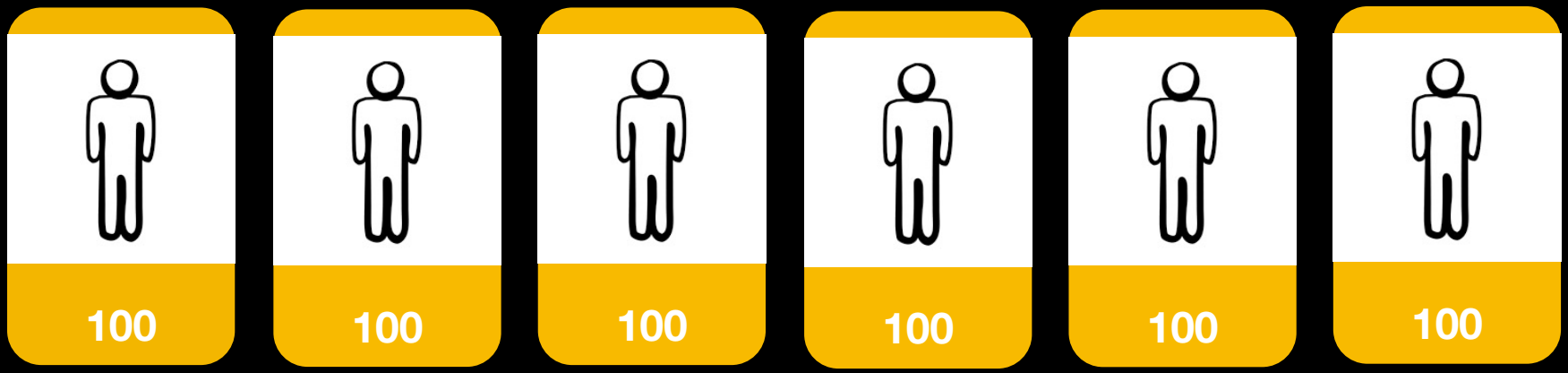
Szekely, A., Lipari, F., Antonioni, A. *et al.* Evidence from a long-term experiment that collective risks change social norms and promote cooperation. *Nat Commun* 12, 5452 (2021).

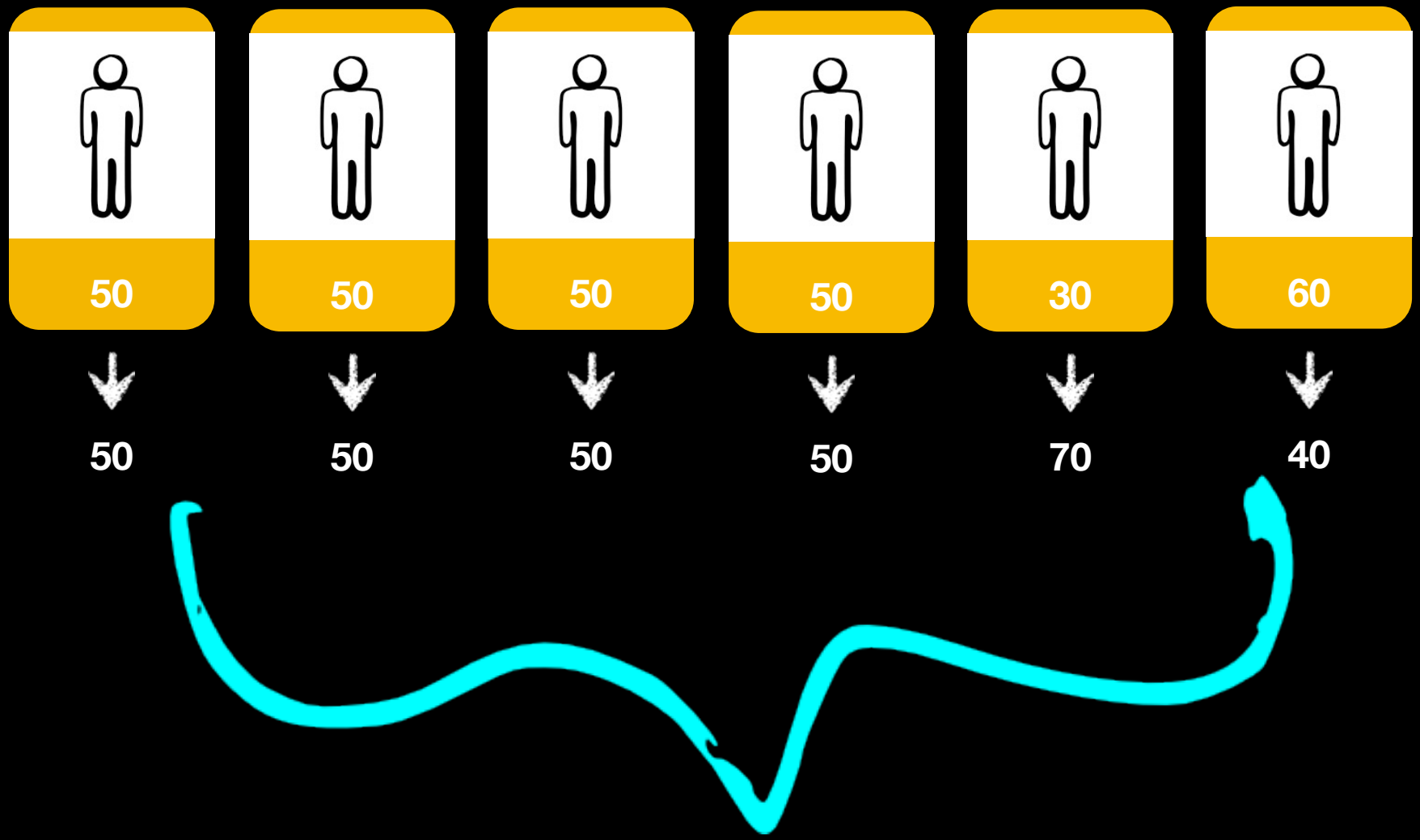
# Collective Risk Social Dilemma Game

- N-person cooperation problem, where N>2 people,
- Players are placed in groups of 6.
- Each player is given 100 tokens.
- They independently decide how many tokens to put in a public pot (0–100).
- If the pot reaches a threshold of 300, players are protected from a "disaster" that has a known probability *p* of occurring and they keep whatever they did not put in the pot.
- If the threshold is not reached, players lose all tokens with a probability p.

Milinski et al. (2008)

# Example 1

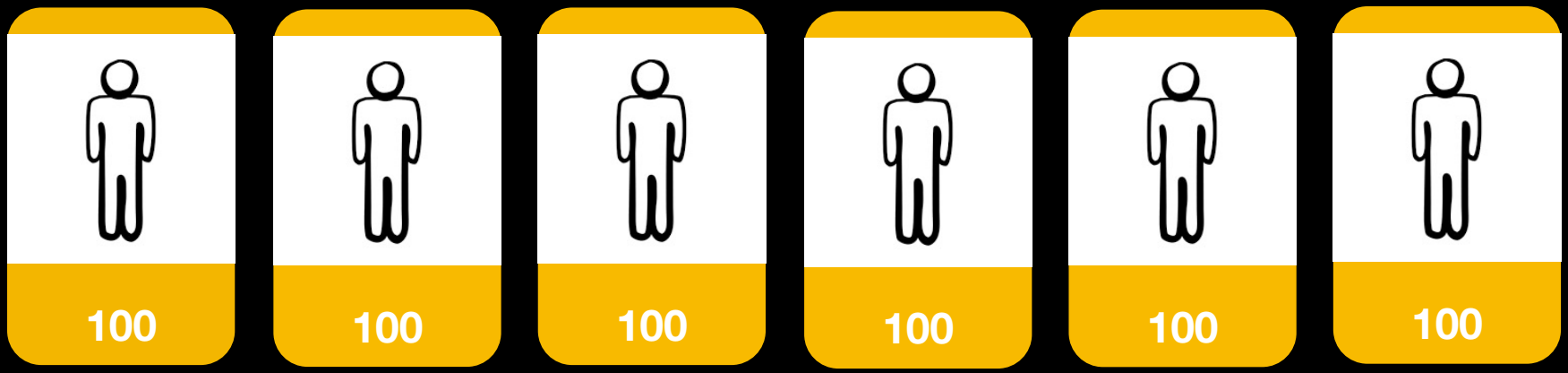


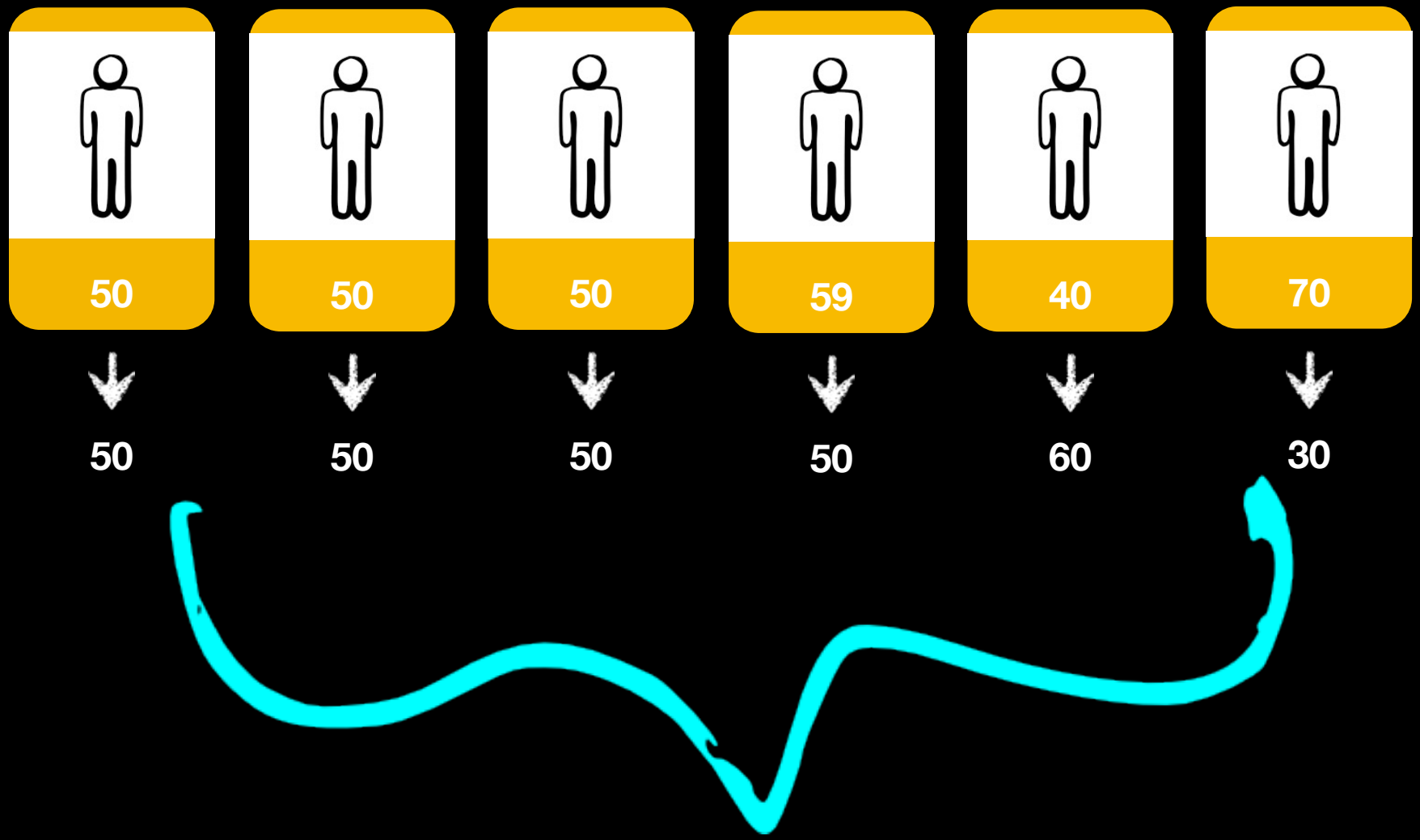



**310**

**Catastrophe avoided!**

# Example 2

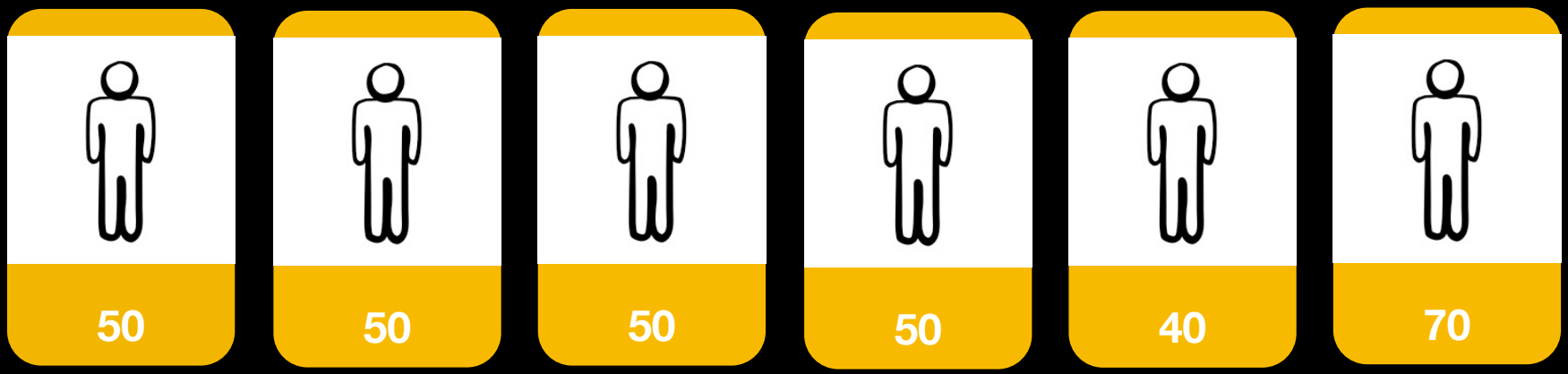





**290**

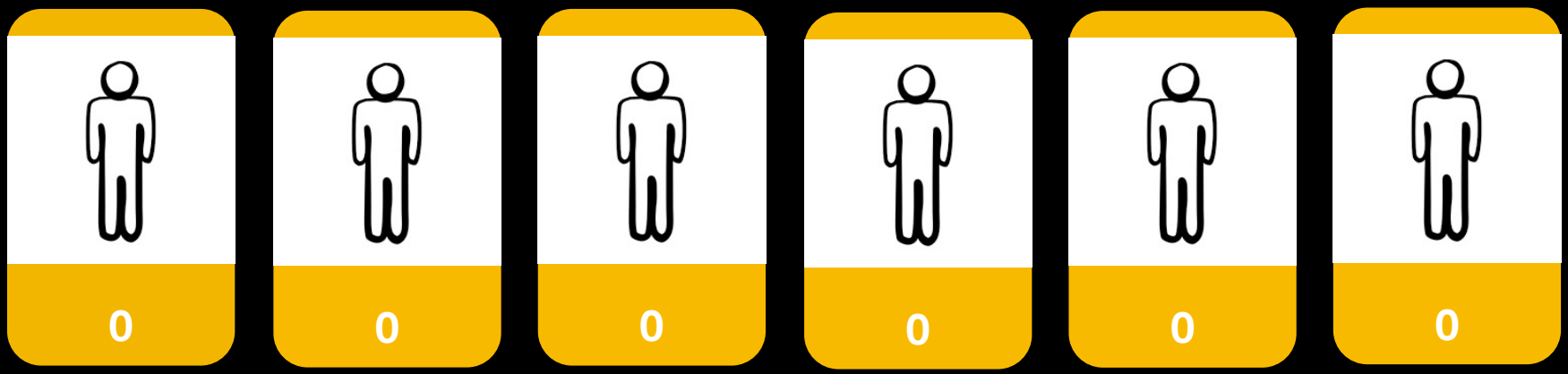
**p (disaster)=0.6**

## If the disaster does NOT occur:




**Players keep for themselves what they did NOT put in the collective pot**

# If the disaster DOES occur:




**Everyone looses everything!**

# Treatments

| Round | 1-14 | 15-28 |
|---|---|---|
| **Treatment 1** (n148 ) | p(disaster) = 0.9 | p(disaster) = 0.6 |
| **Treatment 2** (n138) | p(disaster) = 0.6 | p(disaster) = 0.9 |

**4 treatments:**

**The within-subjects treatments change the risk probability (0.9 or 0.6).**

**The between-subjects treatments vary the ordering.**

# Hypotheses (1/2)

1. Cooperation is related to individuals' empirical and normative expectations (**Hypothesis 1**)-> Existence of the norm.
2. Cooperation changes based on manipulated empirical and normative expectations (**Hypothesis 2**) -> Causal effect of social norms on behaviour.

# Hypotheses (2/2)

3. Punishment is targeted towards norm non-contributors (**Hypothesis 3**) -> Enforcement of social norms.

4. Stronger norms and greater cooperation when the collective risk is higher and slower behaviour change after a change in risk when social norms are stronger (**Hypothesis 4**) -> Effect of collective risk on norm strenght and cooperation and resilience of social norm supported behaviour.

# Social norm strength

Consistency - do people agree in their expectations?

Accuracy - are their expectations accurate?

Specificity - are these expectations “narrow” or “broad”?

Norm strength = consistency x accuracy x specificity

# Contribution decision

# Personal normative beliefs


(Bicchieri, Lindemans, & Jiang, 2014)

# Empirical expectations

**How much did the other 5 people in your group contribute?**

Use the boxes below to indicate **how much you think the other people in your group contribute**. Put the highest value in the box at the top and then rank the contributions in descending order. You can input the same value for multiple people. In that case the ordering for those people does not matter. We will rank the contribution of the other people in your group in this round and compare each of them to your respones. For every reponse that you estimate completely correctly you get 15 points. This means that you can earn up a maximum of 75 points. The less accurate your response is the less points you receive. If your response differs from the true values by more than 15 points then you receive 0.

points

points

points

points

points

# Normative expectations

**How much do the other 5 people in your group think that you should contribute?**

Use the boxes below to indicate **how much the other people in your group think that you should each contribute**. Put the highest value in the box at the top and then rank what you think other people believe you should all contribute. You can input the same value for multiple people. In that case the ordering for those peoeple does not matter. We will rank how people in your group responded to the question two screens ago ('How much should each person in your group contribute?') and compare each of them to your respones. For every reponse that you estimate completely correctly you get 15 points. This means that you can earn up a maximum of 75 points. The less accurate your response is the less points you receive. If your response differs from the true values by more than 15 points then you receive 0.

points

points

points

points

points

# Causal effect of social expectations

**How much will you contribute if most of the other people in your group:**

| | |
|---|---|
| contribute **at least** 50 points and think that you should each contribute **at least** 50 points | points |
| contribute **at least** 50 points and think that you should each contribute **less than** 50 points | points |
| contribute **less than** 50 points and think that you should each contribute **at least** 50 points | points |
| contribute **less than** 50 points and think that you should each contribute **less than** 50 points | points |

# Third party punishment

**How many points do you deduct from the person you are matched with if he or she contributed:**

| | |
|---|---|
| less than 50 points | points |
| 50 points | points |
| more than 50 points | points |

Next

**How many points do you think that others in this experiment deducted from the person they are matched with if he or she contributed:**

| | |
|---|---|
| less than 50 points | points |
| 50 points | points |
| more than 50 points | points |

# Feedback

**Contribution decision**

You started with an endowment of **100 points**. **You contributed 20 points** to the collective pot and **your group contributed a total of 210 points**. The full list of contributions in your group is shown below. Others' contributions are ordered randomly.

| **Contributions by your group members** |
|---|
| 20 points - Your contribution |
| 50 points |
| 50 points - Automatic decision |
| 20 points - Automatic decision |
| 50 points - Automatic decision |
| 20 points - Automatic decision |

This means that **your group did not collect enough points** to reach the threshold. The computer drew the number 1 so **you all lost your points**.

**Scenario specific contribution**

You started with an endowment of **100 points**. **You contributed 20 points** to the collective pot and **your group contributed a total of 210 points**. The full list of others' contributions is exactly as in the above table.

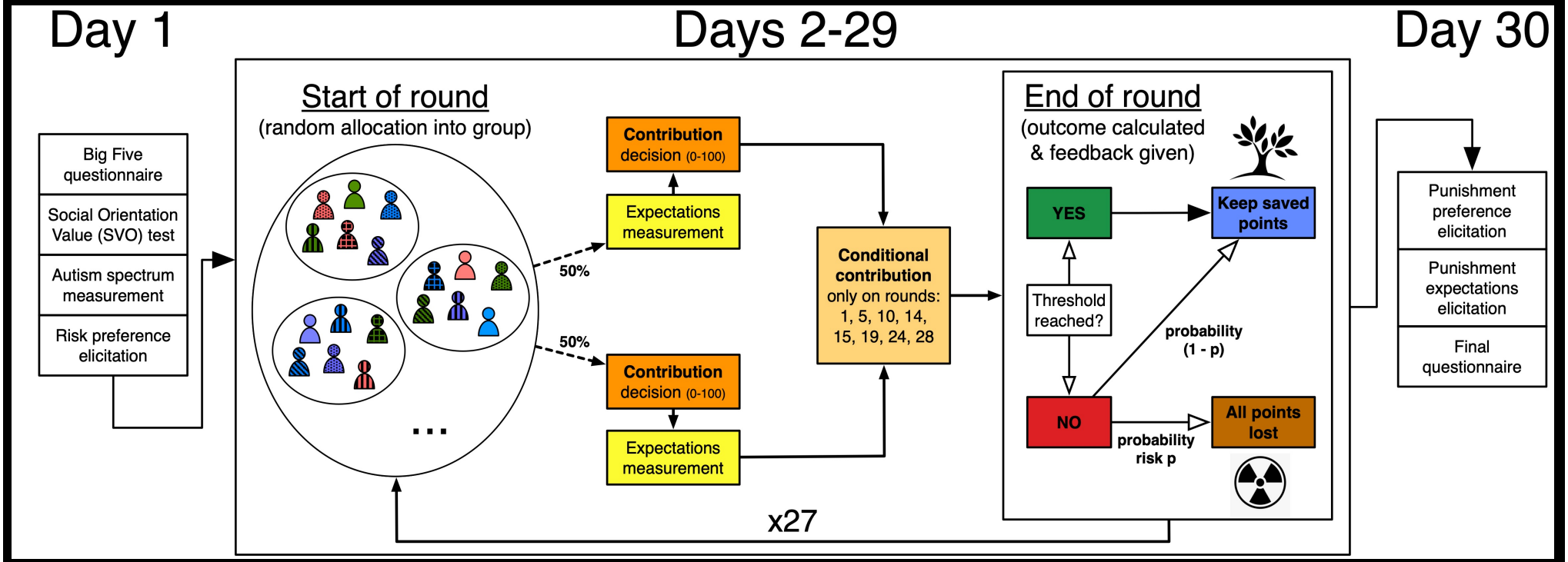
This means that **your group did not collect enough points** to reach the threshold. The computer drew the number 10 so **you all keep the points that you did not contribute**.

Your earnings from your contribution decisions in this round are therefore **80 points** (= 0 points + 80 points).

# Psychological measures

- Big Five (John, Donahue, & Kentle, 1991)
- Social Value Orientation (Murphy, Ackerman, & Handgraaf, 2011)
- Risk Preferences (Eckel & Grossman, 2002)
- Autism Spectrum Quotient (Baron-Cohen, Wheelwright, Skinner, Martin, & Clubley, 2001)

**These allow us to identify individual-level predictors for norm adoption, compliance, and breaking.**


Day 1
Days 2-29
Day 30
Big Five questionnaire
Social Orientation Value (SVO) test
Autism spectrum measurement
Risk preference elicitation
Start of round
(random allocation into group)
50%
50%
...
Contribution decision (0-100)
Expectations measurement
Contribution decision (0-100)
Expectations measurement
Conditional contribution only on rounds: 1, 5, 10, 14, 15, 19, 24, 28
End of round
(outcome calculated & feedback given)
YES
Keep saved points
Threshold reached?
probability (1 - p)
NO
probability risk p
All points lost
x27
Punishment preference elicitation
Punishment expectations elicitation
Final questionnaire

# Pre-registration

Pre-registered design, hypotheses, and analysis

Centre for Open Science (https://cos.io/prereg/)

CENTER FOR
OPEN SCIENCE

# Results

# H1: Social norms and contribution

H1: Cooperation is related to individuals' empirical and normative expectations (Existence of Social Norms)

| | Dependent variable: Contribution | | | |
|---|---|---|---|---|
| *Independent variables* | **Model 1** | **Model 2** | **Model 3** | **Model 4** |
| Empirical expectations | 0.590*** | 0.477*** | 0.479*** | 0.447*** |
| | (0.105) | (0.103) | (0.101) | (0.098) |
| Normative expectations | 0.521*** | 0.212** | 0.214** | 0.224** |
| | (0.116) | (0.081) | (0.079) | (0.076) |
| Personal beliefs | No | Yes | Yes | Yes |
| Preferences and psychological variables | No | No | Yes | Yes |
| Additional controls | No | No | No | Yes |
| Constant | -7.324 | -14.968** | -19.383** | -16.212* |
| | (6.613) | (5.149) | (7.802) | (7.847) |
| $R^2$ | 0.22 | 0.31 | 0.34 | 0.35 |
| Observations | 7433 | 7433 | 7433 | 7433 |

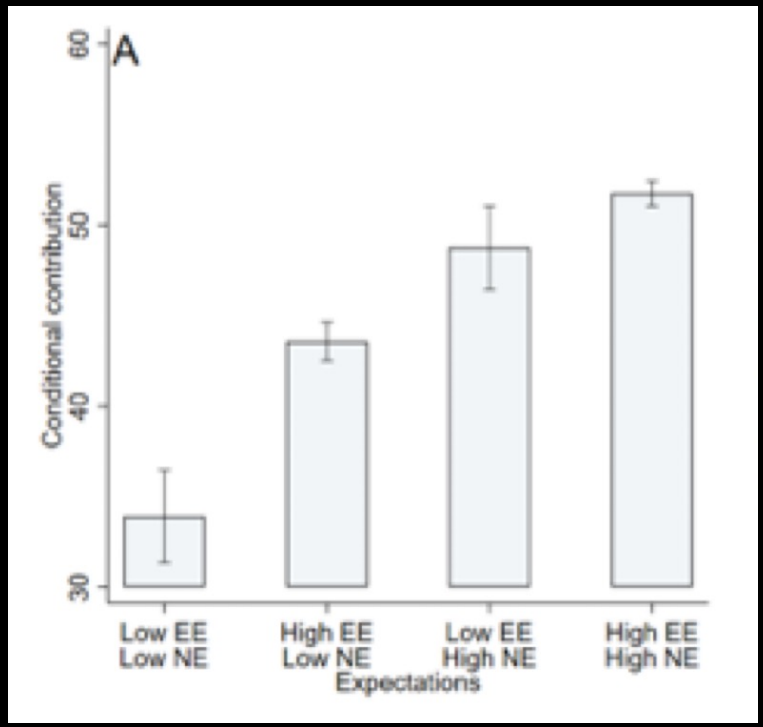
*p<0.05, **p<0.01, ***p<0.001

| Dep. var: contribution | Model 1 | Model 2 | Model 3 |
|---|---|---|---|
| EE | 0.590*** | 0.389*** | 0.335*** |
| | (0.105) | (0.063) | (0.062) |
| NE | 0.521*** | 0.352*** | 0.208** |
| | (0.116) | (0.072) | (0.061) |
| Contribution(t-1) | | 0.572*** | 0.524*** |
| | | (0.032) | (0.034) |
| EE(t-1) | | -0.051 | -0.011 |
| | | (0.052) | (0.049) |
| NE(t-1) | | -0.139* | -0.151** |
| | | (0.055) | (0.048) |
| PNB | | | 0.433*** |
| | | | (0.044) |
| PNB(t-1) | | | -0.160*** |
| | | | (0.045) |
| SVO | | | 0.056* |
| | | | (0.019) |
| Extraversion | | | -0.061 |
| | | | (0.041) |
| Agreeableness | | | 0.005 |
| | | | (0.039) |
| Conscientiousness | | | -0.006 |
| | | | (0.036) |
| Neuroticism | | | 0.013 |
| | | | (0.032) |
| Openness | | | 0.030 |
| | | | (0.029) |
| ASQ | | | -0.019 |
| | | | (0.041) |
| Risk | | | -0.274 |
| | | | (0.175) |
| Female | | | 0.988* |
| | | | (0.475) |
| Other | | | 1.392 |
| | | | (0.726) |
| Constant | -7.324 | -7.234* | -11.152* |
| | (6.613) | (3.477) | (4.325) |
| N | 7433 | 6999 | 6999 |
| $R^2$ | 0.221 | 0.490 | 0.535 |

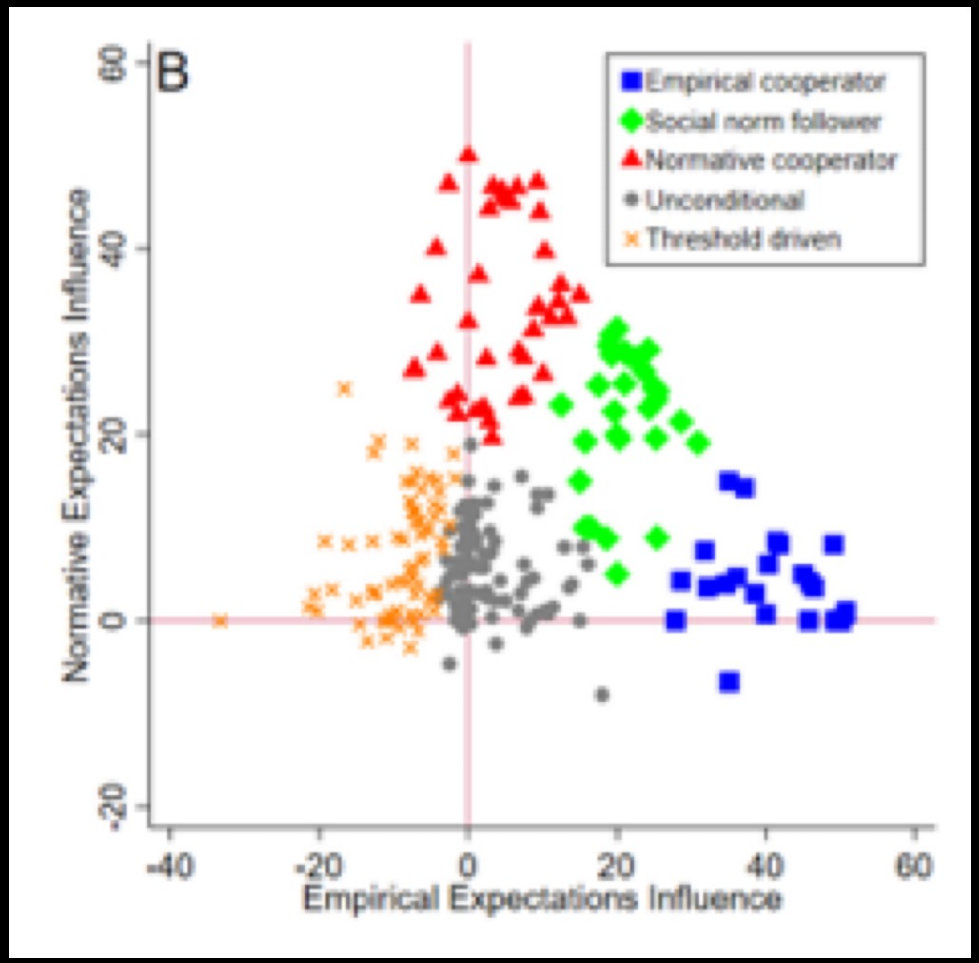
Standard errors in parentheses
Standard errors adjusted for 284 clusters in Model 1 and 282 clusters in models 2 and 3 according to individual
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

# H2: Causal relationship between social norms and contributions

H2: Cooperation changes based on manipulated empirical and normative expectations (Causal effect of Social Norms)

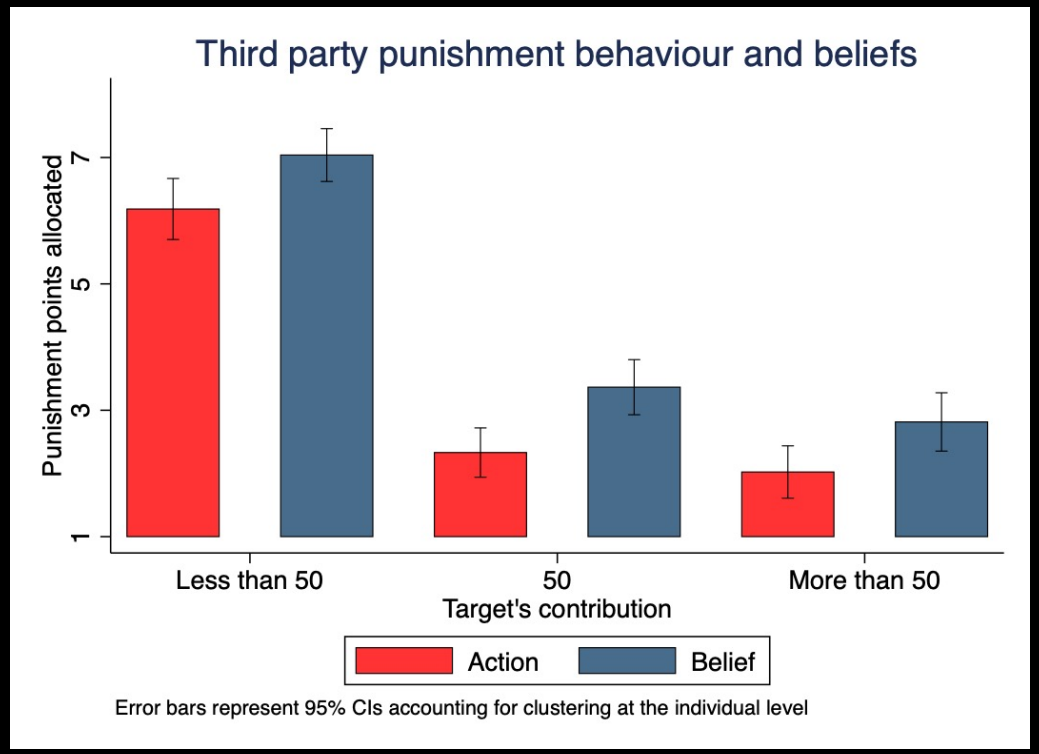


# Behavioral types based on social expectations

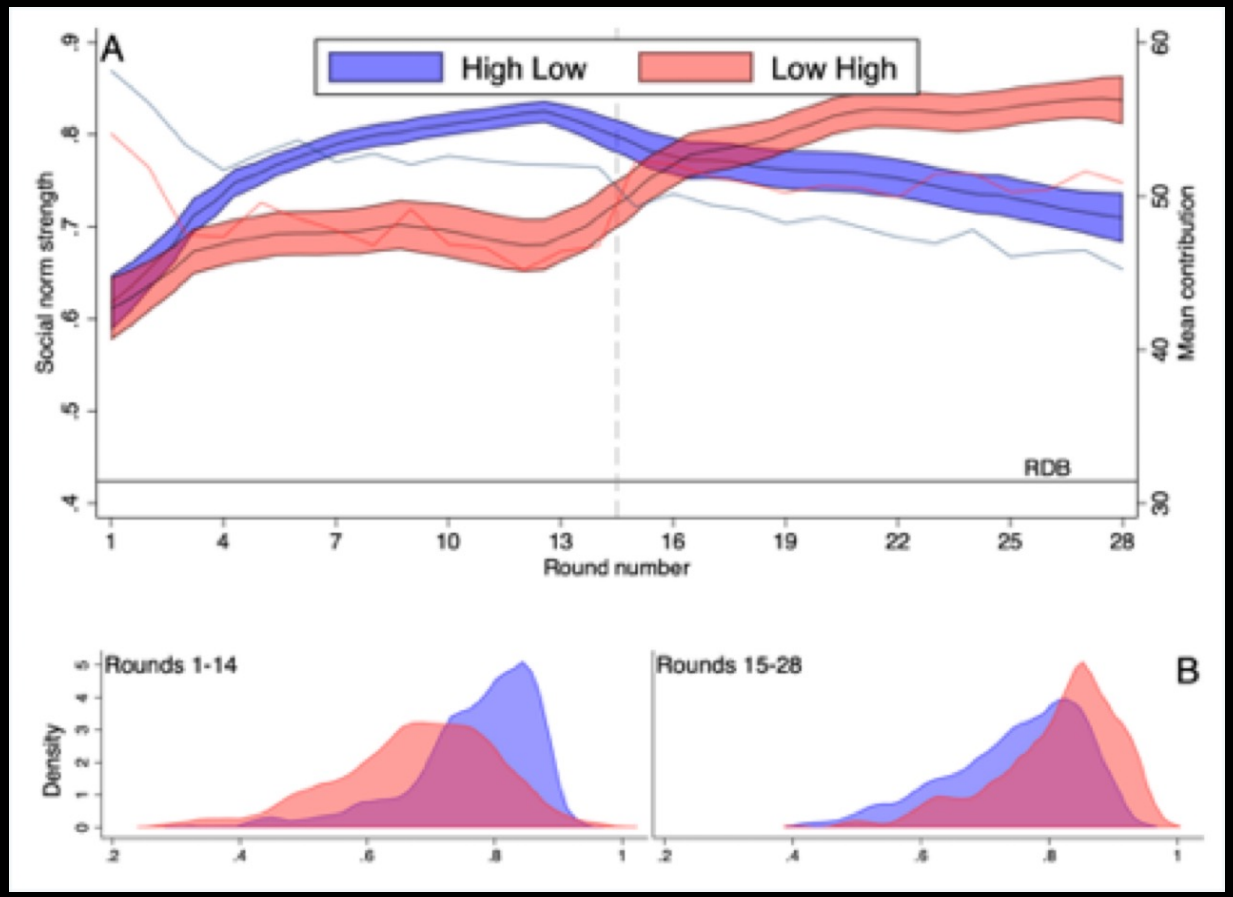


# H3: Enforcement

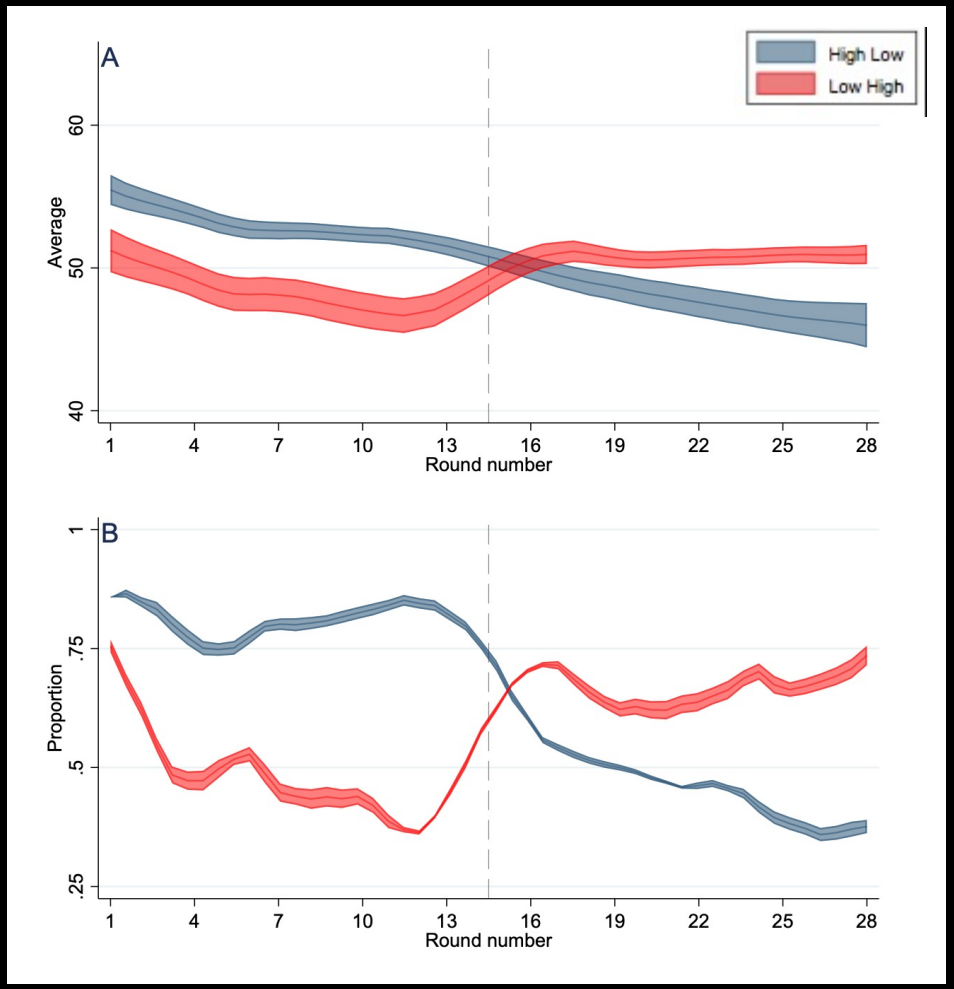
H3:Punishment is targeted towards norm non-compliers (H3a) and subjects anticipate this (H3b).



# H4: Social norm strength in risky environments

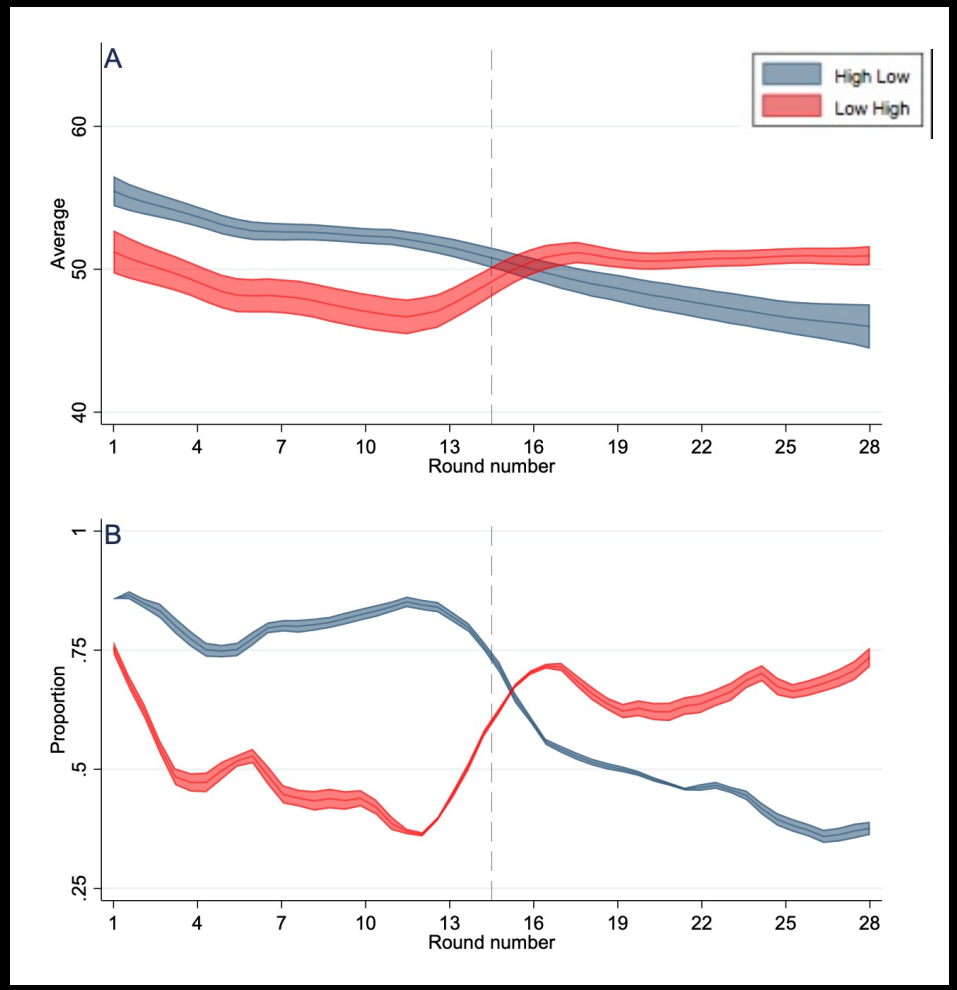


# H4: Contribution and groups reaching the threshold

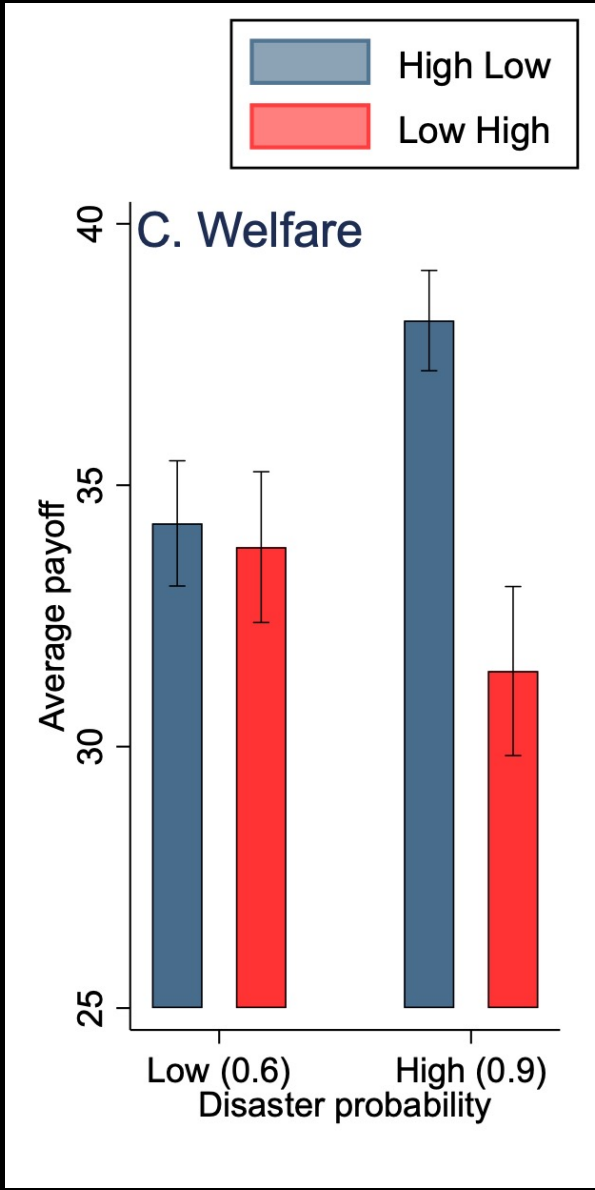


# H4: Inertia effect of social norms

**H4: slower behaviour change after a change in risk when social norms are stronger**



# Payoffs


High Low
Low High
C. Welfare
Average payoff
40
35
30
25
Low (0.6)
High (0.9)
Disaster probability

# Summary of results

- Collective threat causes the evolution of tight norms.
- Higher threat makes people more cooperative
- Stronger norms make behaviour more resistant to change.

Large-scale cooperation is needed to reduce collective risks like those posed by climate change and pandemics.

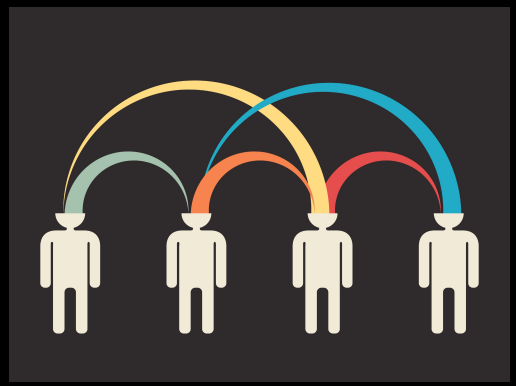
Social norms emerge and sustain cooperation in situations of collective risk and the level of risk influences the strength of the norms.

When risk of a future threat decreases, the strengh of social norms may diminish as well.

Individual differences in the way people react to social expectations.

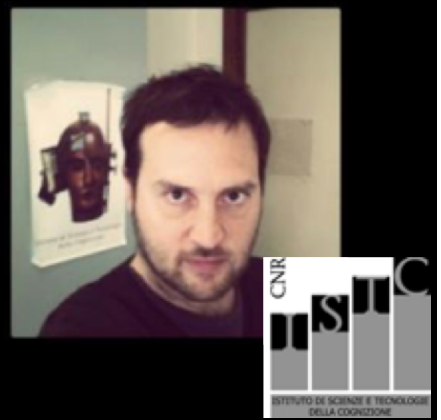
**Individual/Fixed**


**Social/Dynamic**




# Thanks for your attention!

Contact: giulia.andrighetto@gmail.com



# References


- Baron-Cohen, S., Wheelwright, S., Skinner, R., Martin, J., & Clubley, E. (2001). The Autism-Spectrum Quotient (AQ): Evidence from Asperger Syndrome/High-Functioning Autism, Males and Females, Scientists and Mathematicians. Journal of Autism and Developmental Disorders, 31(1), 5–17. https://doi.org/10.1023/A:1005653411471
- Bicchieri, C. (2006). The grammar of society: The nature and dynamics of social norms. New York, NY: Cambridge University Press.
- Bicchieri, C., Lindemans, J. W., & Jiang, T. (2014). A structured approach to a diagnostic of collective practices. Cultural Psychology, 5, 1418. https://doi.org/10.3389/fpsyg.2014.01418
- Bicchieri, C. *Norms in the Wild: How to Diagnose, Measure, and Change Social Norms*. (Oxford University Press, 2017).
- Chen, D. L., Schonger, M., & Wickens, C. (2016). oTree—An open-source platform for laboratory, online, and field experiments. Journal of Behavioral and Experimental Finance, 9, 88–97. https://doi.org/10.1016/j.jbef.2015.12.001
- Cialdini, R., Reno, R. R., & Kallgren, C. A. (1990). A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places. Journal of Personality and Social Psychology, 58(6), 1015–1026. https://doi.org/10.1037/0022-3514.58.6.1015
- Elster, J. (2009). Norms. In P. Hedström & P. Bearman (Eds.), The Oxford Handbook of Analytical Sociology.
- Dave, C., Eckel, C., Johnson, C. & Rojas, C. Eliciting risk preferences: when is simple better? *J. Risk Uncertain.* **41**, 219–243 (2010).
- Gelfand, M. J. et al. Differences between tight and loose cultures: a 33-nation study. *Science* **332**, 1100–1104 (2011).
- Milinski, M., Sommerfeld, R. D., Krambeck, H.-J., Reed, F. A., & Marotzke, J. (2008). The collective-risk social dilemma and the prevention of simulated dangerous climate change. Proceedings of the National Academy of Sciences, 105(7), 2291–2294.
- Murphy, R. O., Ackerman, K. A. & Handgraaf, M. J. J. Measuring social value orientation. *Judgm. Decis. Mak.* **6**, 771–781 (2011).
- Nyborg, K. et al. Social norms as solutions. *Science* **354**, 42–43 (2016).
- Ostrom, E. Understanding Institutional Diversity. Princeton University Press (2005)
- Szekely, A., Lipari, F., Antonioni, A. *et al.* Evidence from a long-term experiment that collective risks change social norms and promote cooperation. *Nat Commun* **12,** 5452 (2021).
- Szekely, A. et al. Dataset for evidence from a long-term experiment that collective risks change social norms and promote cooperation. *OSF* https://doi.org/10.17605/osf.io/wvgk9 (2021).

# Summary statistics

| Variable | Round 1 | | | Round 28 | | |
|---|---|---|---|---|---|---|
| | High-Low | Low-High | Overall | High-Low | Low-High | Overall |
| Number of subjects | 148 | 138 | 286 | 145 | 118 | 263 |
| Age (years) | 30.39 (11.41) | 29.78 (10.54) | 30.09 (10.98) | 30.56 (11.46) | 30.14 (10.64) | 30.37 (11.08) |
| Student (proportion) | 0.53 (0.50) | 0.47 (0.50) | 0.50 (0.50) | 0.53 (0.50) | 0.45 (0.50) | 0.49 (0.50) |
| Female (proportion) | 0.57 (0.50) | 0.51 (0.50) | 0.55 (0.50) | 0.59 (0.49) | 0.54 (0.50) | 0.56 (0.50) |
| Experienced (proportion)[a] | 0.48 (0.50) | 0.37 (0.48) | 0.43 (0.50) | 0.48 (0.50) | 0.39 (0.49) | 0.44 (0.50) |
| Political orientation (1-7)[b] | 3.30 (1.50) | 3.17 (1.43) | 3.23 (1.46) | 3.32 (1.51) | 3.24 (1.47) | 3.28 (1.49) |
| SVO angle[c] | 25.64 (12.52) | 27.86 (12.00) | 26.71 (12.30) | 25.67 (12.57) | 27.25 (12.10) | 26.37 (12.36) |
| Risk[d] | 1.99 (1.39) | 2.25 (1.51) | 2.12 (1.45) | 1.99 (1.40) | 2.24 (1.54) | 2.10 (1.46) |
| ASQ[e] | 18.22 (6.25) | 17.22 (5.26) | 17.74 (5.81) | 18.13 (6.28) | 17.69 (5.36) | 17.94 (5.88) |
| Big Five | | | | | | |
| Extraversion | 26.51 (6.47) | 26.85 (6.61) | 26.67 (6.53) | 26.66 (6.44) | 26.48 (6.83) | 26.58 (6.61) |
| Agreeableness | 34.17 (5.32) | 34.62 (4.96) | 34.39 (5.15) | 34.26 (5.28) | 34.49 (4.94) | 34.37 (5.12) |