
Guts and Fairness: How Bacteria May Influence Your Behaviour



By [Hilke Plassmann](#) , INSEAD

Evidence that the tiny organisms in our gut impact our social decisions.

Every day, we make many decisions that affect not just ourselves but also the people around us. A few examples: Navigating different opinions at a team meeting, tipping wait staff at a restaurant, picking a weekend activity with friends, or choosing between conventional and sustainable but more expensive products.

Traditionally, researchers have focused on self-interest, social norms and cognitive processes to explain how we make decisions in social contexts. A new study by my colleagues* and I suggests another piece of the puzzle may literally reside in our gut.

We are not talking about the metaphorical gut feeling – that intuitive hunch that people often claim to fall back on. Our [study](#), published in the *Proceedings of the National Academy of Sciences Nexus*, shows that the gut microbiome – the trillions of bacteria and other microorganisms in our intestines – affects our social decisions. Specifically, we found that increased

bacterial diversity in the gut induced by our dietary intervention was associated with a heightened sense of social fairness when making financial decisions.

The experiment

Our study focused on a specific type of social decision-making called altruistic punishment. This refers to the willingness to forgo personal gain to penalise unfair behaviour, in the same way that consumers boycott companies to make a stand against discriminatory practices.

We hypothesised that altering the gut microbiome composition could alter levels of dopamine and serotonin, two brain chemicals linked to reward-based cognition and behaviour. Such changes could in turn affect social decision-making related to perceptions of fairness.

To test our hypothesis, we used a classic task in behavioural economics called the “ultimatum game”. In this game, one person proposes how to split a given sum of money with another person. The latter can either accept or reject the offer, and if he rejects, neither player gets the money.

Typically, offers perceived as unfair are rejected, reflecting people’s sense of fairness and a desire to punish bad behaviour even at the expense of personal monetary gain. This is contrary to what standard economic theory suggests: A rational person would accept any amount, even if it is much less than what the co-player proposes to keep for himself.

We carried out a randomised, placebo-controlled experiment on 101 participants at a German university over two identical sessions. Participants arrived at the first session in a fasted state and submitted fecal and blood samples. They then carried out several behavioural tasks, including the ultimatum game. They had to decide whether to accept or reject 20 offers, each proposed by a different person, ranging from €0 to €5 out of €10.

After playing the game, participants were randomly assigned to one of two groups. The intervention group was given a commercially available supplement containing probiotics (beneficial bacteria) and prebiotics (food for beneficial bacteria) to be taken daily for seven weeks. The other group received a placebo. Seven weeks later, all participants underwent a second, identical session where they played the ultimatum game again.

The gut and our sense of fairness

In line with our hypothesis, the intervention group showed a greater tendency to refuse unfair offers compared to the placebo group. The gut composition of the former also became more diverse, and this effect was starker among participants with **higher amounts of body fat** and an unbalanced gut microbiome. The latter, as you may know, has been linked with obesity and other clinical conditions such as depression and autism.

We then looked for mechanisms that might connect gut microbiome changes with social behaviour by measuring levels of precursors to dopamine and serotonin in participants' blood samples.

We found changes in the levels of tyrosine, a dopamine precursor, in the intervention group. Intriguingly, individuals with a more unbalanced baseline gut microbiome were more likely to experience a fall in tyrosine levels. They were also more likely to engage in altruistic punishment than participants with more balanced guts.

Unlike previous research which merely uncovered correlations between gut microbiome composition and social behaviour, our study is the first to demonstrate causality. Put simply, we found that the microbiome may influence social behaviour by affecting the level of dopamine precursors.

Not just along for the ride

Since **Ivan Pavlov** famously observed that gastric and pancreatic secretions in dogs started with the anticipation of being fed, we have known that **the gut and brain interact** with each other in important ways. But until this study, we didn't know that our gut bacteria can impact the gut-brain axis and, through the process, our decision-making behaviour.

Moreover, people are probably unaware that dietary supplements, which constitute a multi-billion-dollar industry, can change the composition of the gut microbiome and lead them to behave in unforeseen ways in social situations.

Our study opens exciting possibilities for understanding the complex connection between our gut, brain and behaviour. For example, future research could study possible links between the gut microbiome and personality factors and genetic dispositions. They could well prove to be more than just a gut feeling.

*[Marie Falkenstein](#), Sorbonne Université; [Marie-Christine Simon](#), [Aakash Mantri](#) and [Bernd Weber](#), University of Bonn; and [Leonie Koban](#), Centre de Recherche en Neurosciences de Lyon.

Find article at

<https://knowledge.insead.edu/career/guts-and-fairness-how-bacteria-may-influence-your-behaviour>

About the author(s)

Hilke Plassmann is the Octapharma Chaired Professor of Decision Neuroscience and an Associate Professor in INSEAD's Marketing area. She is the Co-Director of the **Business Foundations Certificate**, a programme INSEAD offers in collaboration with Sorbonne Université, and the Principal Investigator of the Social Affective Neuroscience Team at Sorbonne Université's Brain and Spine Institute. She also co-directs a biannual **Summer School on Neuroeconomics** for PhD students and a **Summer Executive Programme** on how neuroscience can advance management for business executives.

About the research

"[Impact of the Gut Microbiome Composition on Social Decision-Making](#)" is published in *PNAS Nexus*.