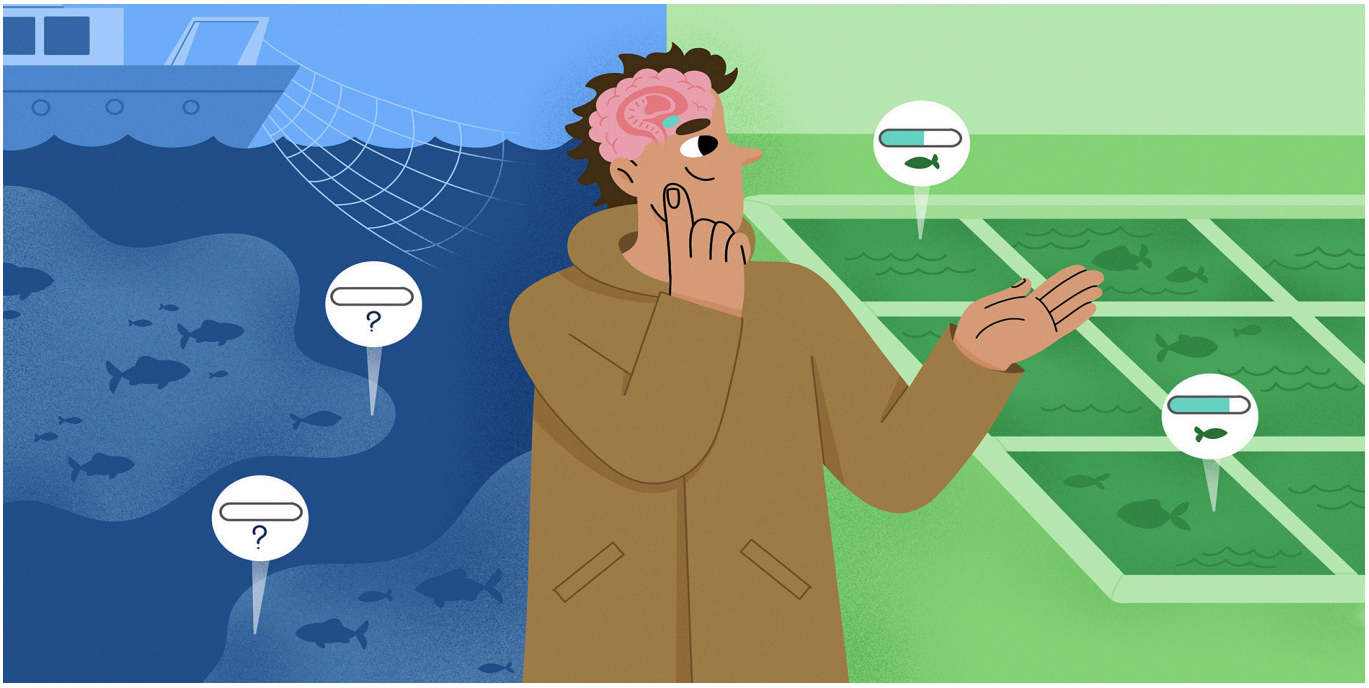
frontiers | Frontiers for Young Minds

NEUROSCIENCE AND PSYCHOLOGY
Published: 05 March 2024
doi: 10.3389/frym.2024.1151409



WHAT'S MINE? WHAT'S OURS? HOW THE BRAIN THINKS ABOUT SHARED RESOURCES

Ashley Zappe [1*], ***Mario Martinez-Saito*** [2] ***and Sandra Andraszewicz*** [3,4]

[1] *Psychology Department, EMMA Lab, New Mexico State University, Las Cruces, NM, United States*

[2] *Center for Cognition and Decision Making, Institute of Cognitive Neuroscience, HSE University, Moscow, Russia*

[3] *Chair of Cognitive Science ETH Zurich, Zurich, Switzerland*

[4] *Singapore-ETH Centre, Future Resilient Systems, Singapore, Singapore*

YOUNG REVIEWERS:

LOLA

AGE: 9

Why do people not always choose to take care of the Earth? This study looked at how people's brains decide to take care of nature, like fish in the ocean. The scientists made a game that was like going fishing, and they used brain-scanning technology to see what was happening in people's brains while they played. The scientists discovered that when people thought they were fishing with other people, they took more fish than when they were alone. The brain scan showed that a part of the brain was working differently, too. This study helps us understand how people's brains work when they make decisions about nature. If we know more about how our brains think about nature, we can find better ways to protect our planet. This study also shows how different types of science, like Earth science and brain science, can work together to help solve important problems for the world.

THE THINGS WE SHARE

Have you ever noticed, in a classroom, that kids usually sharpen their own pencils, but the jar of "classroom pencils" that anyone can use does not get sharpened very often by anyone? Or maybe you have seen that people will pick up trash around their own houses but not in a public park? It seems that the brain works differently when it makes decisions about taking care of things that everyone uses. A recent study helped us understand more about this.

PRIVATE RESOURCE

A resource owned and controlled by one person or a small group of people.

COMMON RESOURCE

A resource that provides users with benefits but is open for anybody to use and nobody in particular controls it.

A **private resource** means something that belongs to one person, and that person does not have to share it. It could be something like your own house or your own pencil. But when something is available for everyone to use, like public parks, libraries, forests, playgrounds, oceans, rivers, and even the air we breathe, it is called a **common resource**. Sadly, people do not always take as much care of common resources as they do their own private resources, but we are learning ways to make it easier for people to care for these common resources.

COMMON RESOURCES CAN BE OVERUSED

Sometimes, even when everyone wants to take care of a common resource and agrees to protect it, it can still get damaged or destroyed. For example, in 1992, fishermen in the Atlantic caught so many wild cod fish to sell as food that there were almost no cod left in the ocean. The ocean is a common resource because everyone can use it. The fishermen took out so many cod from the ocean so quickly that these fish did not have a chance to have babies and replenish their populations the next year (Figure 1). Of course, it is not good for anyone if cod become extinct, even for the fishermen! If cod are extinct, the fishermen cannot catch and sell them anymore. But, interestingly, fishermen who raised cod in their own private farms took out the right number of fish, so that their cod populations remained stable. They did not take too many cod from their private resource [1]. So, why do you think people over-fished in the ocean but not in their own farms?

This issue does not just happen with fish—it happens with other common resources that people share, too. It happens when people cut down rainforests that cannot grow back, or when they let cows eat too much grass on common fields that everyone shares, or when they take more water from a river than the rain can replace. It even happens when factories release smog into the air that we all breathe.

NATURAL RESOURCE

Natural materials such as minerals, forests, water, fish, and fertile land that occur in nature and can be used by people.

Of course, it would be better if everyone took good care of common resources. Humans need **natural resources** to survive. But to help people learn how to take good care of common resources, we need to know how people use their brains to make that decision. Scientists

Figure 1

Graph of Atlantic cod stocks. The Y axis shows how many tons of cod were caught, and the X axis shows each year. About 1960, suddenly many more cod than usual were caught. By 1992, there were hardly any cod left in the ocean to catch (Image License: CC BY-SA 3.0).

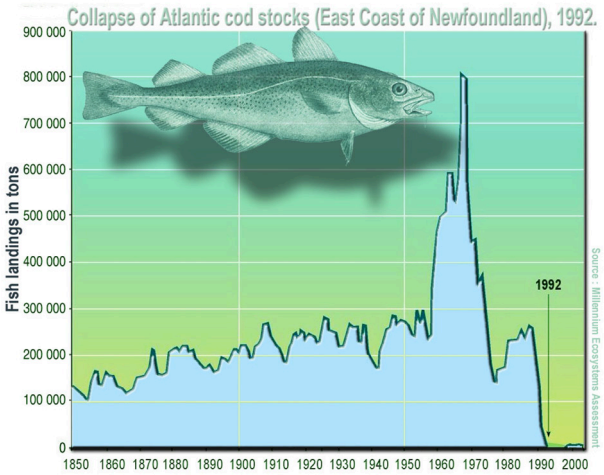


Figure 1

have tried to understand why people treat shared things differently from things they own privately, by studying the brain with a machine called an fMRI. **fMRI** is like a camera that can see inside a person's head. It can show what part of the brain a person is using.

FMRI

A machine that can show what parts of the brain are being used.

THE BRAIN HELPS MAKE DECISIONS

In one study, four scientists worked together to look at some people's brains while the people played a special video game [2]. In the game, the people pretended to go fishing in a lake. The goal was to catch as many fish as possible. The people knew they were playing a video game, but they still decided to catch fish in the same way actual fishermen do in real life. Each round, they had a choice to take out a lot of fish from the lake or just a few. If they took only a few fish, there would be more fish left for the next round, and they could catch even more fish. But if they took too many fish each turn, there would be no fish left, and the game would end early, before they got enough fish to win.

VENTRAL STRIATUM

A brain region that helps with learning and making decisions, by figuring out if something will feel good later.

The scientists watched a part of the brain called the **ventral striatum** (Figure 2). The ventral striatum helps people predict if something good is about to happen [2, 3], and that can help people make a decision. Have you ever decided to do something because you thought it would be fun? Your ventral striatum helped you decide if a decision would lead to something that felt good. The scientists found that the people used the ventral striatum to make decisions about taking more or less fish in the game. But it is complicated.

Figure 2

An image of the middle of the brain, looked at from the side, with the area of the ventral striatum colored in purple. The ventral striatum area can help people make decisions based on whether they think the decision will feel good or bad (Image credit: Chris Zappe).

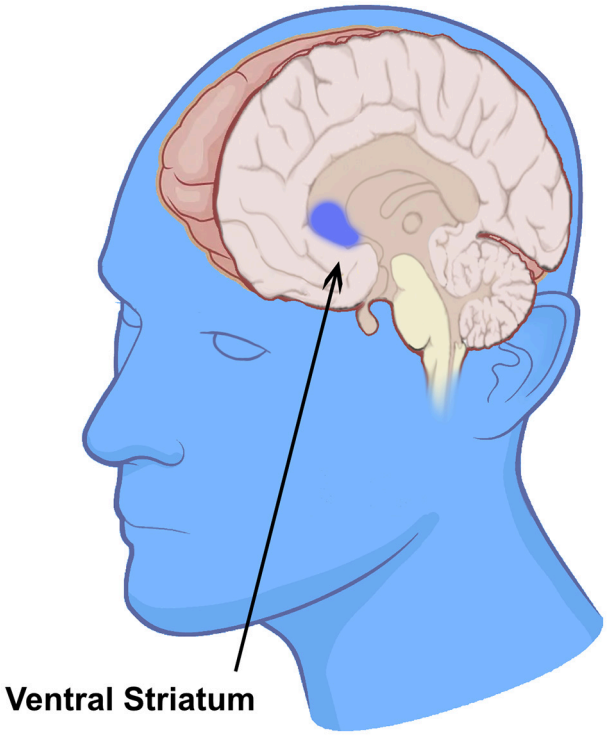


Figure 2

WHAT HAPPENS IN THE BRAIN WHEN DECIDING TO TAKE A RESOURCE?

When people played the fishing game by themselves, their brains worked differently than when they played with other people. When they played by themselves, the fMRI images showed that the ventral striatum expected that they would feel good when they took only a few fish. So, when they played by themselves, they made decisions to ensure the fish would be able to have babies and keep the lake full. This was good for them and good for the lake.

But when other players were also fishing in the game, the lake was a common resource for the players. In this case, the person's brain *did not* make a decision that kept the lake full of fish. Instead, if the other players took many fish, then the person also decided to take extra fish, and the lake ran out of fish quickly. Even though they did not get as many fish this way, they still did it!

When the scientists looked at the brain scans, they saw that the ventral striatum was working differently—almost like it switched to a different mode when other players were in the game. When other players were fishing from the same lake, the ventral striatum did not expect it would feel good to keep the lake full of fish. Instead, the ventral striatum showed that the players expected they would feel good if they took more fish than the other players did, even if it meant the lake would

run out of fish. The person's ventral striatum was comparing what they were getting from the lake to what the other players were getting [2, 4]. It tried to catch up with the other players, instead of doing what was best to keep the lake full of fish.

This is just like what happened with cod in the real ocean in 1992. Many people were fishing and took too many fish. But now we know more about how the brain decides how many fish to take. The fMRI brain imaging showed us that, when other people are sharing a resource, the ventral striatum "switches modes" to focus on what other people are doing, and that can lead to a decision to take too much of the resource.

Before this study, it might have been easy to think that people were just extra greedy sometimes, or maybe just careless and forgetful about taking too many fish. But the way the ventral striatum helps make the decision suggests that the motivation to take too much may come from **social comparison** in the brain [4]. This means that people do not take extra *just* because they want extra, but they take extra when part of the brain is comparing what they took to what other people took.

SOCIAL COMPARISON

Social comparison is when people decide whether something is good or not by looking at what other people have or are doing.

HOW DOES YOUR BRAIN DECIDE?

Even though this study used a video game for fishing, the brain probably works the same way when deciding about other common resources such as forests, rivers, or even when to sharpen common pencils in the classroom. The more we know about how the brain makes these decisions for common resources, the better we can help people's brains make good decisions that take care of natural resources in the real world. This study used both brain science and Earth Science to learn something new. More studies will be needed to find real-world ways to help people make better decisions, but this new discovery is a step in the right direction.

In the meantime, you can notice how your own brain is making decisions. Do you ever compare yourself to other people? Do you ever let what someone else is doing or what someone else has influence your decisions? In those situations, can you think of ways to keep focused on what is really important when you make decisions?

ACKNOWLEDGMENTS

This research was partially supported by the National Research Foundation, Prime Minister's Office, Singapore under its Campus for Research Excellence and Technological Enterprise (CREATE) programme.

ORIGINAL SOURCE ARTICLE

Martinez-Saito, M., Andraszewicz, S., Klucharev, V., and Rieskamp, J. 2022. Mine or ours? Neural basis of the exploitation of common-pool resources. *Soc. Cogn. Affect. Neurosci.* 17:837–849. doi: 10.1093/scan/nsac008

REFERENCES

1. Myers, R. A., Hutchings, J. A., and Barrowman, N. J. 1997. Why do fish stocks collapse? The example of cod in Atlantic Canada. *Ecol. Applic.* 7:91–106. doi: 10.1890/1051-0761(1997)0070091:WDFSCT2.0.CO;2
2. Martinez-Saito, M., Andraszewicz, S., Klucharev, V., and Rieskamp, J. 2022. Mine or ours? Neural basis of the exploitation of common-pool resources. *Soc. Cogn. Affect. Neurosci.* 17: 837–849. doi: 10.1093/scan/nsac008
3. Izuma, K., Saito, D. N., and Sadato, N. 2008. Processing of social and monetary rewards in the human striatum. *Neuron* 58:284–294. doi: 10.1016/j.neuron.2008.03.020
4. Luo, Y., Eickhoff, S. B., Hétu, S., and Feng, C. 2018. Social comparison in the brain: a coordinate-based meta-analysis of functional brain imaging studies on the downward and upward comparisons. *Hum. Brain Mapp.* 39:440–458. doi: 10.1002/hbm.23854

SUBMITTED: 05 April 2023; **ACCEPTED:** 13 February 2024;
PUBLISHED ONLINE: 05 March 2024.

EDITOR: Ryan E. B. Mruczek, College of the Holy Cross, United States

SCIENCE MENTORS: Nikki Honzel

CITATION: Zappe A, Martinez-Saito M and Andraszewicz S (2024) What's Mine? What's Ours? How The Brain Thinks About Shared Resources. Front. Young Minds 12:1151409. doi: 10.3389/frym.2024.1151409

CONFLICT OF INTEREST: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

YOUNG REVIEWERS

LOLA, AGE: 9

Lola loves ballet, music, math, reading, school, and spending time with her friends. In the winter, you can often find her on the ski hill, and in the summer she is usually floating on the river, going on a cool hike, or spending time with a friend. Lola hopes to be a physicist when she grows up.

AUTHORS

ASHLEY ZAPPE

Ashley Zappe completed her M.A. in experimental psychology at New Mexico State University. Her research is based in cognitive psychology and explores how our brains make decisions in social contexts. She enjoys reading very old books, hiking, teaching kids which wild plants are edible, and thinking about thinking. *ashleyz@nmsu.edu

MARIO MARTINEZ-SAITO

Mario is a research fellow at the Institute of Cognitive Neuroscience at HSE University. His research involves cognitive science, consciousness, philosophy of mind, cybernetics, and complex systems.

SANDRA ANDRASZEWICZ

Dr. Sandra Andraszewicz is a cognitive scientist at the ETH Zurich (Switzerland) and a co-principal investigator at the Future Resilient Systems II within the Singapore-ETH Center (Singapore). She has many years of experience in research and transferring the best scientific practices to applied behavioral science problems. She has worked with various regulatory agencies and business partners in banking, insurance, FinTech, and pharma. Sandra's work focuses on decision making in complex environments, such as crises and risky situations. She has worked on a framework of social and psychological resilience in face of complex decision problems.