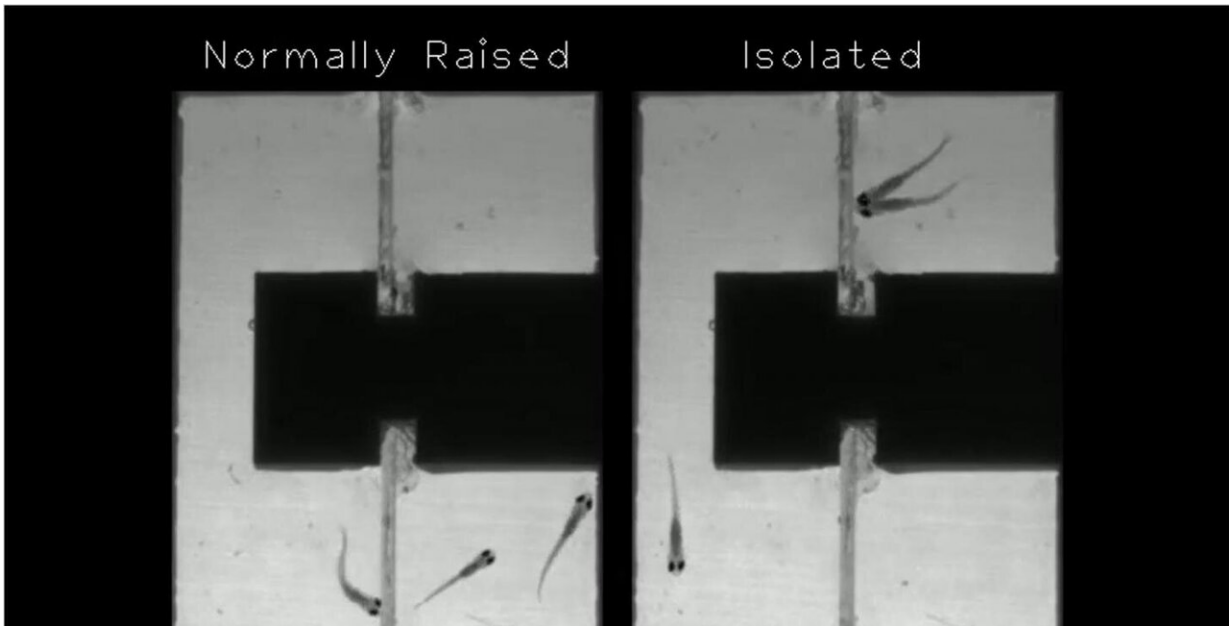


Will lockdown loneliness make us loners?

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Zebrafish raised in isolation display different social preferences from those raised normally. Credit: Tunbak et al 2020

Over the past few months at least half of the world's population has been affected by some form of lockdown due to COVID-19, and many of us are experiencing the impact of social isolation. Loneliness affects both mental and physical health, but counterintuitively it can also result in a decreased desire for social interaction. To understand the mechanics of this paradox, UCL researchers based at the Wolfson Institute and the Sainsbury Wellcome Centre investigated social behavior in zebrafish. Their results are published in *eLife*.

Most zebrafish demonstrate pro-social behavior, but approximately 10% are 'loner' [fish](#) who are averse to social cues and demonstrate different [brain activity](#) than their pro-social siblings. However, even typically social zebrafish avoid social interaction after a period of isolation. Ph.D. students Hande Tunbak and Mireya Vazquez-Prada, Postdoctoral Research Fellow Thomas Ryan, Dr. Adam Kampff and Sir Henry Dale Wellcome Fellow Elena Dreosti set out to test whether the [brain](#) activity of isolated zebrafish mimics that of loner fish or whether other forces were at play.

To investigate the effects of isolation, the researchers isolated typically social zebrafish from other fish for a period of two days and then compared their brain activity to zebrafish who demonstrated aversion to social interaction without having been isolated. The isolated fish demonstrated sensitivity to stimuli and had increased activity in brain regions related to stress and anxiety. These effects of isolation were quickly overcome when the fish received a drug that reduces anxiety.

The differences between loner fish and their siblings were found mostly in the hypothalamus, the region of the brain responsible for social rewards. The loner fish hypothalamus did not demonstrate the same pattern of activation during social exposure as its typical counterparts, indicating that loner fish do not experience rewards in the same way as typical fish during social interactions.

By contrast, 'lonely' fish—those that demonstrated typical social behavior and were isolated—demonstrated hypersensitivity to stimuli and activation of brain regions associated with stress and anxiety. Lonely fish experienced actively negative outcomes from social interaction whereas loner fish simply did not experience reward.

"A detailed view of the zebrafish brain can provide important clues for all of us currently experiencing the effects of social isolation," says Dr.

Elena Dreosti. Our understanding of the neural mechanisms of social behavior are limited, but we do know that zebrafish and humans share a fundamental drive for [social interaction](#) that is controlled by similar brain structures. Although human behavior is much more complex, understanding how this basic social drive arises—and how it is affected by isolation—is a necessary step towards understanding the impact of the social environment on human brains and behavior. The [zebrafish](#), which is completely transparent throughout [early development](#), offers neuroscientists a detailed view of its brain circuitry.

We won't all be loners after lockdown, but we will be anxious upon returning to our normal social lives. As we emerge from lockdown, we should be aware of this new sensitivity and anxiety, but recognize that overcoming it is necessary for returning to a normal, healthy, social existence.

More information: Hande Tunbak et al, Whole-brain mapping of socially isolated zebrafish reveals that lonely fish are not loners, *eLife* (2020). [DOI: 10.7554/eLife.55863](https://doi.org/10.7554/eLife.55863)

Provided by Sainsbury Wellcome Centre

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