

# Proactive personality has stronger wake-sleep rhythm

January 24 2019

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Proactive zebrafish appear to have a much stronger wake-sleep rhythm than reactive fish. In the most reactive fish, rhythmicity appears to be lacking completely. This is shown with research by Leiden biologists, published in December 2018 in the journal *BMC Biology*.

Just like humans, animals can be divided into [personality types](#). For example, biologists can use standardised tests for zebrafish to determine whether they are proactive or reactive. Proactive fish are more aggressive, take more risks and adopt routine behaviour more quickly. Reactive fish are shy, take less risks, and are more flexible.

## Rhythm increases survival rate

It is known that these types are accompanied by many other characteristics, for example how the animals behave at different temperatures. The Leiden group wanted to know whether the biological clock worked differently in the different types. A robust 24-hour rhythm helps an animal to function properly. In turn, the lack of a good rhythm is often a symptom for all kinds of diseases.

First of all, the biologists showed that all kinds of genes related to the biological clock are expressed differently in the two [personality](#) types of zebrafish. They found a remarkable variation between fish in how the expression of clock genes rises and falls over time. The [gene expression](#) kept pace with activity and the levels of cortisol and melatonin,

hormones known to play an important role in the sleep-wake rhythm. The expression of clock genes in the proactive fish showed a robust rhythm with large differences, while in the most reactive fish a rhythm could hardly be determined.

This pattern was confirmed when the fish were continuously exposed to light and could no longer determine whether it was day or night. The rhythm of the proactive fish changed significantly; the rhythm of the reactive [fish](#) remained unchanged.

## **Lack of rhythm is no condition**

The results shed new light on the [biological clock](#), according to the researchers: there can be a large variation in rhythmicity between individuals within a population. The observed relationships between a proactive or reactive personality type and rhythmicity suggests that it is an integral part of these behavioural styles. And that is striking, says lead author Christian Tudorache. "It was assumed that missing rhythmicity is a condition, but it is a spontaneous phenomenon. This insight can help in personalised medicine: different personality types are differently susceptible to diseases."

But what is the evolutionary benefit of not having rhythmicity? "It is good to have variation in personality types in a population," says Tudorache. "A homogeneous group can react less flexibly to external circumstances, such as predators or a lack of food. In the case of rhythmicity, our hypothesis is that proactive types are rather rigid and inflexible with changes. Perhaps missing a [rhythm](#) is related to more flexibility. Of course, a population also badly needs this characteristic in order to be able to react to changing circumstances."

**More information:** Christian Tudorache et al. Biological clock function is linked to proactive and reactive personality types, *BMC*

*Biology* (2018). [DOI: 10.1186/s12915-018-0618-0](https://doi.org/10.1186/s12915-018-0618-0)

Provided by Leiden University

Citation: Proactive personality has stronger wake-sleep rhythm (2019, January 24) retrieved 27 April 2024 from

<https://phys.org/news/2019-01-proactive-personality-stronger-wake-sleep-rhythm.html>

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