Medical Xpress

New way to measure hear function cuts stress in research animals

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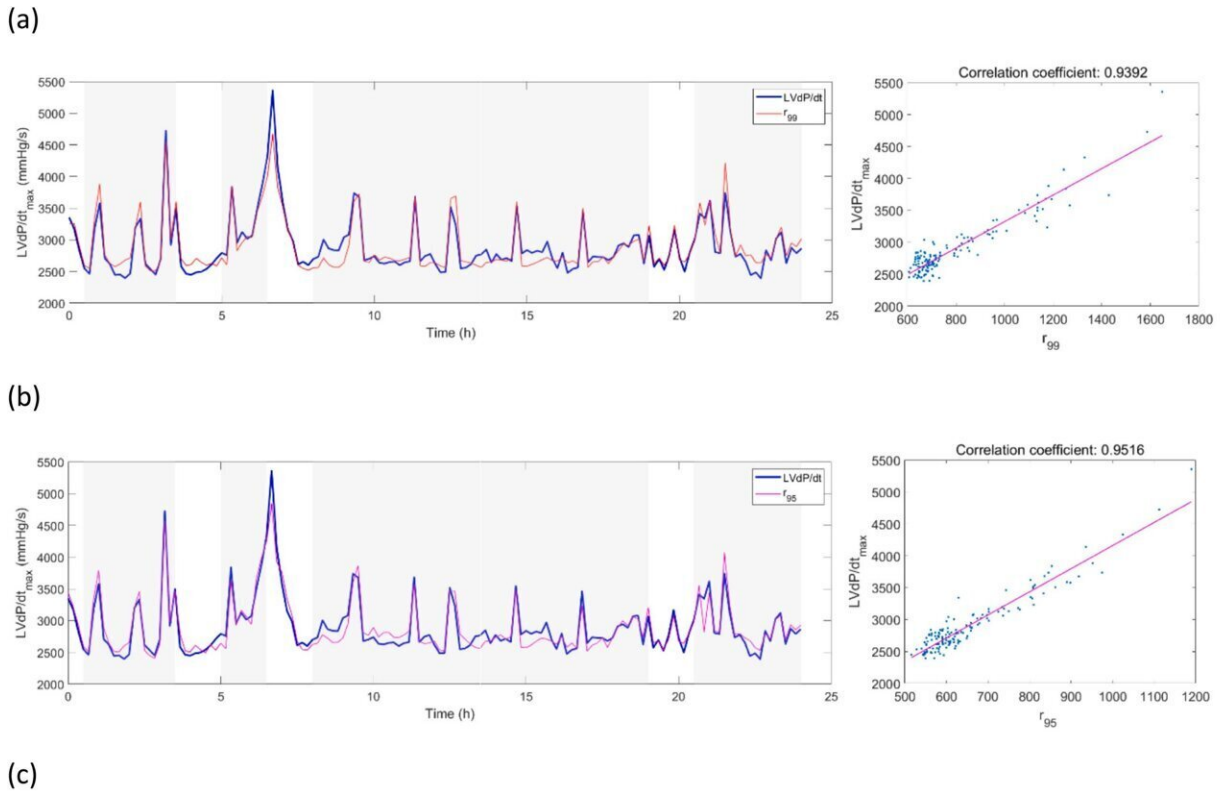

Credit: *Journal of Pharmacological and Toxicological Methods* (2024). DOI: 10.1016/j.vascn.2024.107546

A new way to accurately measure heart function in research animals has the potential to make drug development more ethical and cost effective,

new research suggests.

Published in the *Journal of Pharmacological and Toxicological Methods*, the study from King's College London, the University of Surrey and the Health and Environmental Sciences Institute, provides accurate readings about the heart's function for animal test subjects without using invasive surgery.

Animal research plays a vital role in drug development to test the effectiveness and safety of new treatments before they go to patients, particularly when measuring potential side effects in the heart and cardiovascular system.

Scientists have applied a new mathematical method to weaker signals from a sensor outside the heart to map heart function as accurately as invasive gold-standard measurements.

Usually, scientists typically focus on the peaks and troughs of signals such as blood pressure, but there is a lot of information contained in between those points which is currently overlooked. Devices that collect this data, whether in a research lab or a wearable device in humans, record hundreds of datapoints per beat—but most of the data in this signal is not used.

Their new method, Symmetric Projection Attractor Reconstruction (SPAR) uses these datapoints to look at these well-known signals in a different way.

SPAR, a collaboration between King's College London and the University of Surrey, presents a wider range of indicators of heart health than traditional measurements and data-processing methods, which could tell scientists more about early disease or future risk.

Manasi Nandi, Professor of Integrative Pharmacology and Physiology and co-author of the paper, said "By pairing the power of health data and mathematics, SPAR can present a much more accurate and holistic picture of heart health than what came before it.

"We hope our findings empower researchers to re-think their relationship with cardiovascular signals—from picking up signs of early deterioration that they otherwise would have missed, to making better use of signals from simpler, less invasive devices to minimize stress to research animals."

This cross-sector work comes as medical regulators, including the Medicines and Healthcare products Regulatory Agency, advocate for the increased uptake of non-animal models in drug development, in response to growing ethical concerns and organizations such as the National Center for 3Rs support for scientists to reduce, refine and replace the use of research animals.

The team at King's are now evaluating the accuracy of the method in data from humans to test if drugs may have an adverse effect in patients. This would help stop potentially deadly treatments before they make it onto the shelf, such as the antihistamine Terfenadine which caused fatal heart complications in the late 1990s and some more recent anti-cancer therapies.

Professor Philip Aston, Emeritus Professor of Mathematics at the University of Surrey, said, "This work shows how interdisciplinary research between mathematics and the life sciences can result in significant advances. The SPAR method makes use of all the data that is collected, whereas the commonly used analysis methods only identify a few points on the curve from the data. This application shows the benefit that can be achieved by using all of the data."

Jennifer Pierson, Associate Director for Program development and resourcing at HESI said, "The SPAR model leverages and makes use of existing data and offers new insights and predictions that offer an opportunity to mitigate cardiovascular issues before clinical trials, improving patient safety and streamlining the development of new therapies."

More information: Esther Bonet-Luz et al, Detection of contractility changes in the heart from arterial blood pressure data using symmetric Projection Attractor Reconstruction, *Journal of Pharmacological and Toxicological Methods* (2024). DOI: 10.1016/j.vascn.2024.107546

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