Pocket-sized biomedical technology to become smarter Volkswagen Foundation supports mobile health expert Professor Walter Karlen

The Volkswagen Foundation is supporting the Ulm scientist Professor Walter Karlen with more than 940,000 euros from the funding initiative "Momentum - funding for first-time researchers". The engineer has headed the Institute of Biomedical Engineering at Ulm University since 2021. Karlen conducts research in the field of mobile health on so-called Medicine Wearables, i.e. portable technology for recording health data. The funding will give the 46-year-old researcher the opportunity to further develop the content and strategy of his research. One of his speciality is auditory sleep stimulation.

Many people use smartwatches or fitness trackers to keep an eye on their health and physical performance. Such sensor-equipped wearable systems are also used in medical research to obtain data for the diagnosis and treatment of diseases. "The problem is that most wearables only collect data and use benchmarks for evaluation that are based on populations and are not individually tailored to each person," says Professor Walter Karlen. With the support of the Volkswagen Foundation, the engineer wants to personalise such systems and make them more interactive - by physiological stimulation and an AI-based evaluation of the reactions. "Our aim is to provide users with personalised medical assistance," says the Swiss scientist, who studied at the École Polytechnique Fédérale de Lausanne (EPFL) and completed his doctorate there on the use of wearables in sleep research. Karlen's methodology is based on reinforcement learning, which ensures that the system continuously learns through feedback loops and thus optimises itself.

The first field of application for this new technology is sleep enhancement, more specifically the development of wearables for auditory sleep stimulation. Acoustic signals are used to intensify deep sleep and thus improve the quality of sleep. During his time as an assistant professor at ETH Zurich (2014 - 2020), where Walter Karlen established the Mobile Health Systems Lab and served as its director, the scientist launched the SleepLoop project. A special headband was developed for this purpose - equipped with electrodes to measure brain activity, a sound generator and a microchip - which enabled it to be used at home under everyday conditions. The clinically tested development, the effectiveness and success of which was reported in a study, resulted in a spin-off. Karlen is still involved in tosoo AG, a spin-out of the ETH project.

With his successful application "Rethinking Medical Wearables", which was approved by the Volkswagen Foundation, Karlen wants to build on this research thematically, but refine his methods and content. The "Momentum" funding initiative is aimed at first-time professors in an early phase after taking up their first tenured professorship. The money can be used to finance both material resources and Human Resources - for a maximum funding period of six years. Karlen would like to use the money - totalling more than 940,000 euros - to expand his team. This includes a postdoctoral position, a programmer and a researcher position to help coordinate studies and teaching, so that the mobile health expert has more time for strategic reorientation, which also requires his own scientific work. "My goal is to develop a system over the next three to four years that is capable of detecting individual physiological patterns and also recognising rare clinical pictures," emphasises the scientist from Ulm.

The Volkswagen Foundation's "Momentum - Funding for First-time Researchers" funding initiative

The Volkswagen Foundation is Germany's largest private non-profit foundation for the promotion of science. Its "Momentum" funding initiative is aimed at professors at universities, three to five years after taking up their first lifetime professorship. Funding is provided for the strategic further development of their own subject, whether in research or teaching. In the current round of calls for proposals, the foundation has approved 11.3 million euros for a total of 12 new projects. Information is available online at: https://www.volkswagenstiftung.de/de/foerderung/foerderangebot/momentum-foerderung-fuer-erstberufene

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Further information

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