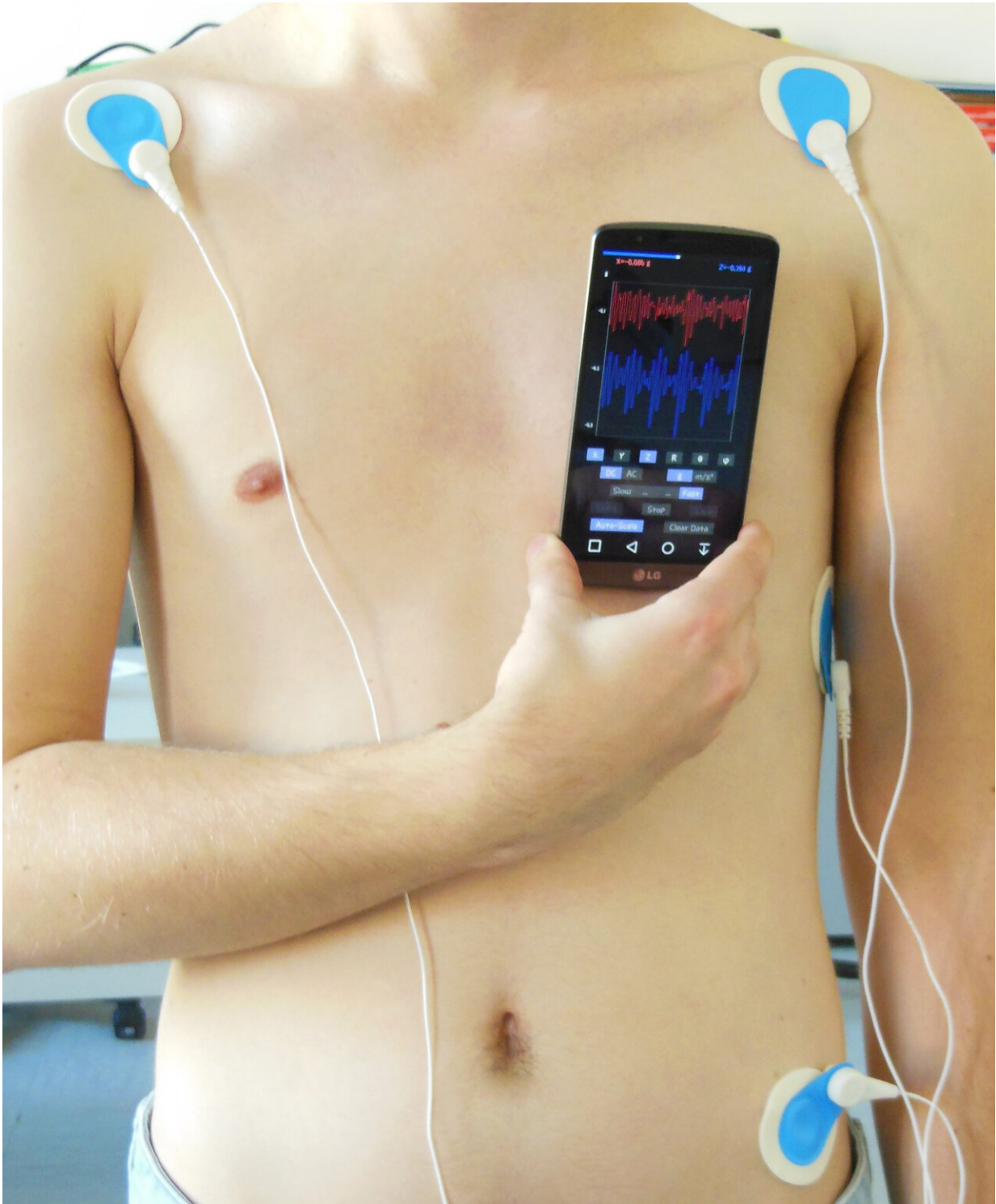


Detecting mental and physical stress via smartphone

November 21 2019



The smartphone used as an instrument readily available, for simple self-monitoring of one's health. Credit: Politecnico di Milano

Can we use our smartphones without any other peripherals or wearables to accurately extract vital parameters, such as heart beat rate and stress level? The team led by Professor Enrico Caiani of the Department of Electronics, Information and Bioengineering at Politecnico di Milano has shown that it is possible to do so, using the accelerometers inside a smartphone.

In fact, they can be used to acquire a signal associated with mechanical—cardiac activity, generated by heart's vibrations at every beat, which can be felt by simply placing the telephone on particular parts of the body.

In this study we focused on positioning of the [smartphone](#) on the abdomen, at the belly-button, as part of an application scenario that looks at brief daily acquisition lasting 30 seconds, in a [prone position](#), before getting out of bed in the morning. By suitably processing this signal, measurements can be acquired of the heart beat rate and status of activation of the sympathetic-vagal balance, associated with the [stress level](#).

By means of an experimental protocol, which calls for acquisition for each subject in base conditions and during a stressed state induced by mental calculation, it is possible to check the capacity of the indicators measured by the smartphone to capture the increase in stress, on the one hand, and, on the other hand, to determine the best correspondence of the results with the same observations made using an electrocardiogram taken at the same time.

This study, carried out in collaboration with the team led by Professor Gianfranco Parati of the I.R.C.C.S. Istituto Auxologico Italiano, in the Department of Cardiovascular, Metabolic, and Neurological Sciences at Ospedale San Luca in Milan, was recently published in *Sensors*, the leading [open access](#), peer-reviewed international magazine, on science

and technology for sensors and biosensors.

This result opens new horizons and possibilities for using the smartphone as an instrument readily available, for simple self-monitoring of one's health.

More information: Landreani et al, Assessment of Ultra-Short Heart Variability Indices Derived by Smartphone Accelerometers for Stress Detection, *Sensors* (2019). [DOI: 10.3390/s19173729](https://doi.org/10.3390/s19173729)

Provided by Politecnico di milano

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