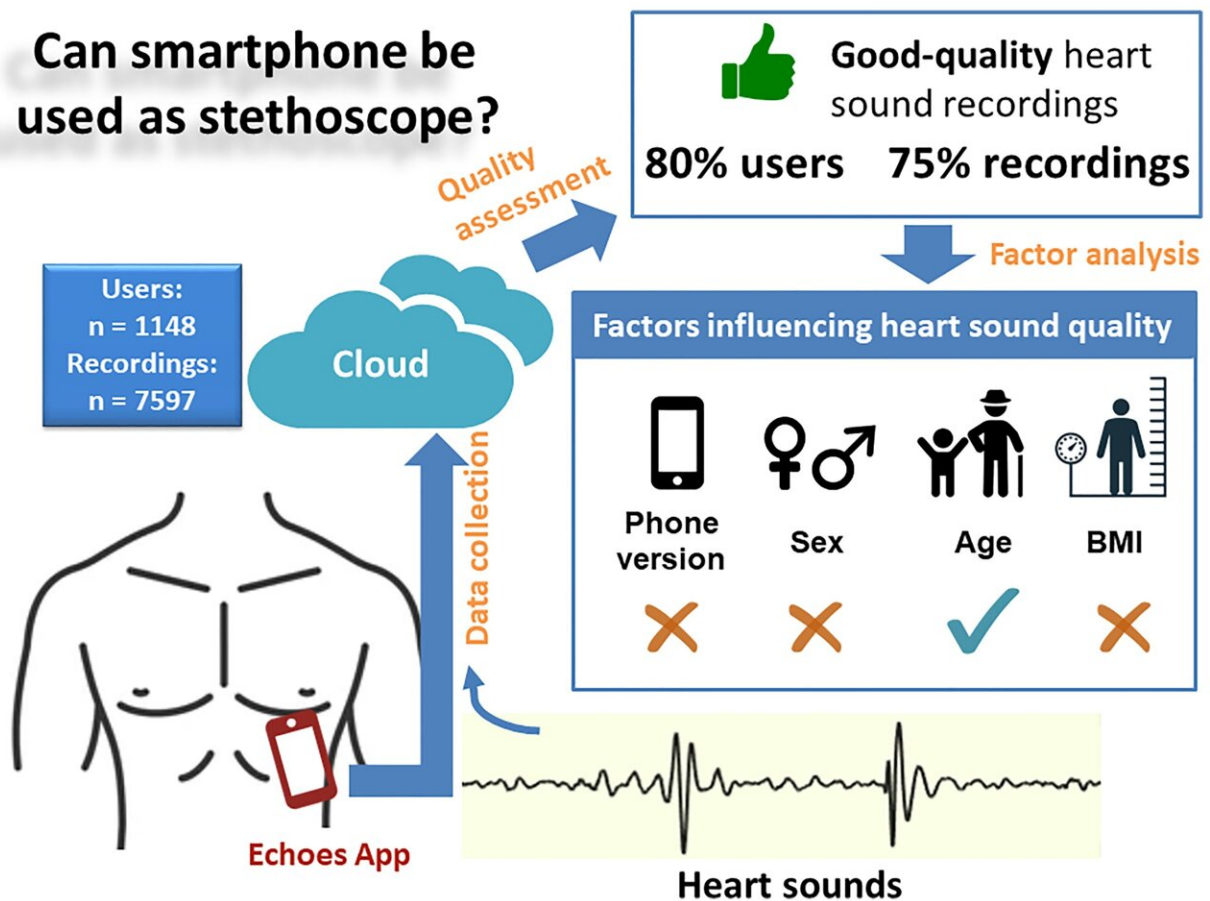


Smartphones show promise as electronic stethoscopes

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Graphical abstract. Credit: *European Heart Journal - Digital Health* (2022). DOI: 10.1093/ehjdh/ztac044

A mobile phone app which records a user's heartbeat could pave the way

for doctors to monitor cardiac patients remotely, new research suggests.

In a study led by King's and Maastricht University, researchers analyzed more than 5,000 heart sound recordings captured on the "Echoes" app and ruled the quality was good enough it could be used by the general population.

Echoes, developed in collaboration with cardiac patients through the British Heart Foundation (BHF) and Evelina Children's Heart Organization (ECHO), and with experts at Cellule Design Studio, uses a smartphone's inbuilt microphone to record heart sounds—users simply hold their phone against their chest, hit record, then save.

Once someone has saved a recording of their heart, it is added to a database for researchers to analyze for [sound quality](#), along with anonymized health indicators provided by the users, to detect sound events and potential clinical markers.

Since launching in May 2021, Echoes has collected more than 100,000 heart [sound recordings](#) and the findings of this latest study, published in the *European Heart Journal—Digital Health*, conclude that sound quality is not affected by the phone version, nor by the user's sex or body mass index (BMI).

"This research proves that mobile technologies are a viable way of recording heart sounds and that in the future, [cardiac patients](#) and doctors could use at-home recordings to check for existence or progression of heart conditions," said lead researcher, Professor Pablo Lamata, Professor of Biomedical Engineering at the School of Biomedical Engineering & Imaging Sciences.

"Echoes was designed to reduce the stigma and anxiety of cardiovascular conditions by giving people the opportunity to record their heart sounds

from their mobile phone, and we have now learned that it can also become a tool to empower patient to manage their own conditions."

Professor James Leiper, Associate Medical Director at the British Heart Foundation, says that "as we enter the age of digital medicine, technology like Echoes could revolutionize the diagnosis and at-home monitoring of heart conditions. Further research is needed to test how the app can be used in tandem with existing heart monitoring techniques. However, if successful, this development could mark an important step towards having heart monitoring tools at your fingertips."

Hongxing Luo, Postdoctoral Researcher, Maastricht University, says that their "study has answered the central question to large-scale applications of using a smartphone microphone as a stethoscope. The results have shown that non-medical users are able to record heart sounds in sufficiently good quality for further processing of the signals. We may be able to extract further features for diagnosis and monitoring purposes in future clinical studies."

Samantha Johnson, Chief Executive, ECHO UK Charity, says that "the ECHO community is made up of children living with heart conditions, their caregivers and the professionals who support them. Being part of the Echoes app development has given patients and caregivers affected by children's heart disease the chance to feed into how they might use the app."

"For children living with heart conditions hearing their own heartbeat and comparing it to family or friends has been fun and opened conversations about their heart conditions. While we wait to see if the app will be used for medical data or treatment, we know that it will be used by many within the community and will get conversations started whist listening to the sound of their own heartbeat."

Researchers hope that in the future, any user (regardless of having a cardiac condition or not) will be able to benefit from learning about cardiac physiology while hearing their [heart](#) sounds through the app—or use Echoes as a meditative tool or to compare their heartbeat before and immediately after exercise.

More information: Hongxing Luo et al, Smartphone as an electronic stethoscope: factors influencing heart sound quality, *European Heart Journal—Digital Health* (2022). [DOI: 10.1093/ehjdh/ztac044](https://doi.org/10.1093/ehjdh/ztac044)

Provided by King's College London

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