

# **A mobile phone or an MP3 player tells if you're sleeping soundly**

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Finnish researcher Väinö Virtanen has developed a method for analysing snoring sounds by using a PC with a microphone connection and a wireless microphone. The objective was to create an application that could be used at home to monitor snoring. By utilizing this technology, researchers from Tampere University of Technology and the University of Helsinki have investigated sleep disorders and further refined related screening technologies. The collaboration has already spawned the smart alarm clock HappyWakeUp that was launched last year. It is the first health-promoting mobile phone application in the world.

In spring, the research team received funding from the Finnish Funding Agency of Technology and Innovation Tekes to create a sleep diagnostics service concept. Based on the technology developed by Virtanen and his colleagues, the team created a service that enables at-home screening of sleep disorders. The service was recently released on the Internet. "People can record their sleep all through the night with a mobile phone or an MP3 player. Analysis of the recording reveals the presence of abnormal sleep structures", says Virtanen. Sleep specialist Dr. Tapani Salmi MD PhD at Helsinki University Hospital emphasizes that this is a significant medical breakthrough that will shed new light on sleep structures and events during sleep.

## **What do the sounds of the night reveal?**

The new HomeSleep application is based on the same innovation as the

smart alarm clock. "The microphones of new consumer electronics devices are sensitive, process audio signals efficiently and have a large storage capacity. The microphone is placed in the bed to record the sounds produced by the sleeper's movements, such as rustle. Movements during sleep are the key in evaluating sleep quality and the prevalence of restlessness", says Salmi.

Sleep disorders are so common that they are bordering on national epidemic, but they are difficult and expensive to diagnose. Some recordings are conducted at sleep laboratories and some at home with medical research equipment. Salmi says that compared to the existing methods the new method is both affordable and easy to use. When [snoring](#) is recorded, the microphone is placed as close to the sleeper's mouth and neck as possible. Restless legs and movements are detected by fixing the device to a pyjama leg or placing it under the sheets. "The recording is performed at home using a minimally invasive device, which results in natural and undisturbed sleep. From a medical standpoint it is also very important that the recording is easily repeated."

The storage capacity of applicable devices is sufficient for recording raw data for over 10 nights. The recorded data is transferred to a home PC for analysis and graphical output. The analysis software is available on the Internet at the website <http://www.sleeprecording.com>. A basic analysis is free of charge.

The results of the analysis show if the recording was successful and if the findings indicate the presence of any sleep abnormalities. A further analysis is carried out if the user wants to see a numerical illustration of the number of sleep disturbances that occur per night. An analysis of seven nights costs 10 euros, which is some hundred times cheaper than any other method of sleep measurement. The developers of HomeSleep are hoping to attract sponsors and advertisers to make the analysis available to consumers free of charge. However, Salmi emphasises that

at-home sleep screening is not intended to be used as a substitute for diagnosis and treatment by a medical professional. "You can take the results to the doctor's or they can be used to supplement other sleep quality measurements. If there is reason to suspect sleep-related illnesses or symptoms, it is always best to consult a doctor."

The HomeSleep method was showcased, among others, at the Congress on Sleep Medicine in the United States last summer and at the World Congress of Neurology in Thailand in October. The developers hope that the new application will benefit, for example, developing countries and cases where health care services do not cover [sleep](#) measurements, because there are millions of applicable recording devices worldwide.

Source: Tampere University of Technology

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