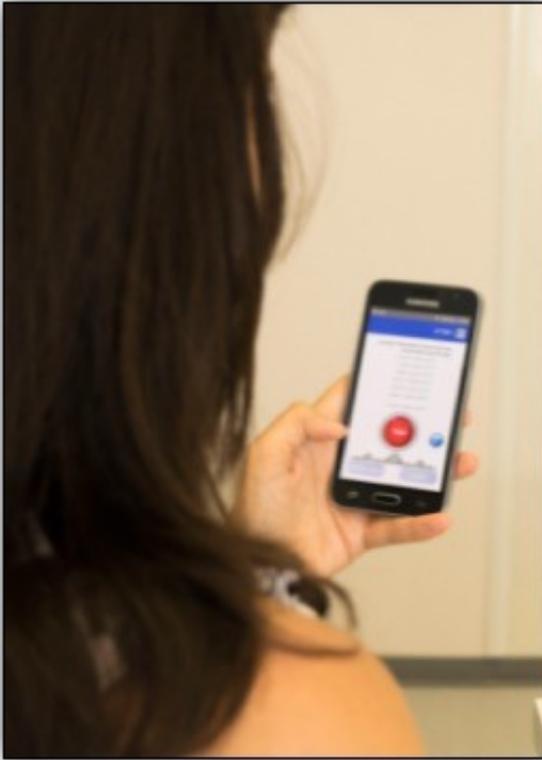# A novel way to diagnose sleep apnea

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Credit: American Associates, Ben-Gurion University of the Negev

Ben-Gurion University of the Negev (BGU) researchers have developed a new system to assess obstructive sleep apnea (OSA) severity while a patient is awake and analyze sleep-wake activity, using his or her smartphone.

According to the American Sleep Apnea Association, it is estimated that

22 million Americans suffer from the malady, with 80 percent of moderate to severe OSA cases undiagnosed.

"We've developed technology that could help diagnose OSA and sleep disorders in a convenient way," says Dr. Yaniv Zigel, head of BGU's Biomedical Signal Processing Research Lab (BSP) and Prof. Ariel Tarasiuk, Ph.D., head of the Sleep-Wake Disorders Unit at Soroka University Medical Center in Beer-Sheva. "The audio-analysis application can record speech signals from awake subjects. Now, we will be able to get a fast, OSA severity estimation without an overnight sleep study."

Currently, patients are diagnosed using polysomnography (PSG) to record brain waves, blood oxygen level, heart rate, breathing, and eye and leg movements overnight. The new system, which does not require contact sensors, can be installed onto a smartphone or other device that utilizes ambient microphones. It both analyzes speech while the user is awake and records and evaluates overnight breathing sounds using new technology that is simpler to use and significantly less expensive than PSG.

Credit: American Associates, Ben-Gurion University of the Negev

"All sleep studies conducted in laboratory or at-home settings currently require subjects to be connected to numerous electrodes and sensors," explains Eliran Dafna, a BGU Ph.D. student in the Department of Biomedical Engineering who developed the breathing-sound system in the BSP lab. "Processing the data on sleep-wake states and corresponding aspects of physiology is time-consuming, tedious and costly because of its complexity and the need for technical expertise. The market is begging for a better solution."

Researchers have tested the new speech and breathing sound analysis systems on more than 350 subjects, along with PSG, in laboratory and at-home settings. They were able to reliably evaluate sleep quality parameters such as sleep-wake activity, snoring severity and OSA using this system.

"We are excited about this non-contact sleep tracking system, which does not require patients to wear uncomfortable monitoring equipment on their body," says Prof. Tarasiuk. "This application can also be very useful for CPAP (continuous positive airway pressure) machine users who want to check the effectiveness of their sleep apnea therapy."

Devices incorporating the speech-analysis system may be portable or stationary, and could be available also in public locations or clinics. The researchers are moving forward to commercialize the system.

Provided by American Associates, Ben-Gurion University of the Negev

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