

Researchers measure effect of war on well-being with smartphones and smartwatches

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In May 2021, while Operation Guardian of the Walls was taking place, Tel Aviv University researchers equipped Israelis with smartwatches and a dedicated mobile application.

The unique study showed that citizens experienced changes in each of the objective indicators of well-being that were monitored—they spent more time looking at their phone screens, their number of steps decreased, their average heart rate decreased, their time without movement increased, their wake time during sleep increased, and their bedtime was delayed.

At the same time, a deterioration was observed in all of the subjective indicators reported by the participants using the app—their mood worsened, their stress levels increased, their number of social gatherings decreased, they spent less time playing sports, their sleep duration was reduced, and their quality of sleep deteriorated.

The innovative study was conducted by a team of researchers from Tel Aviv University, Prof. Erez Shmueli, Prof. Dan Yamin, and Ph.D. students Merav Mofaz and Matan Yechezkel of the Fleischman Faculty of Engineering, Prof. Noga Kronfeld-Schor of the Wise Faculty of Life Sciences and Prof. Haim Einat of the Academic College of Tel Aviv-Yafo. The findings of the study were published in the journal *Communications Medicine*.

Prof. Erez Shmueli explains, "For the past two years, we have been running a huge clinical study in which we equipped nearly 5,000 Israelis from all groups in the population with smartwatches and a dedicated application that we developed, through which we monitored their health on a daily basis."

"The study is called PerMed, short for Personalized Medicine, and its purpose was to diagnose infectious diseases like COVID-19 better and earlier. But in Israel there is never a dull moment, and it provided us with the first opportunity in history to test the changes in the physiological and mental indicators of civilians during wartime, because shortly after we started the experiment, Israel embarked on Operation

Guardian of the Walls."

By May 2021, the researchers had recruited 954 Israelis for the experiment, and equipped them with smartwatches that measured the effect of the war on civilians on the home front. For example, the heart rate of one of the subjects, which was 50 beats per minute at baseline, jumped to 76 beats per minute as soon as the sirens sounded, and returned to normal only after 20 minutes.

During the experiment, the researchers monitored 12 different metrics, some of which were objectively collected from the watches and smartphones, and some of which were reported by the participants using the app.

In all of the indicators, a significant deterioration was observed during the war compared to normal circumstances, in the two weeks before the war. It was much more surprising to discover that immediately after the war, all the indicators returned on average to their previous levels, a figure that demonstrates the mental resilience of Israelis.

However, the researchers noticed a number of significant differences among Israeli citizens: residents of the areas near Gaza, who were subjected to more frequent and dangerous rocket attacks, paid a greater mental and physiological toll than those living in the center of the country, and those living in the center suffered more than those living in the north.

The findings show, for example, that although they are more experienced in such situations, the southerners spent more time (6.2 hours) in front of their screens than the residents of the center (5.3 hours), and the residents of the center spent more time on screens than the residents of the north (5 hours).

A similar trend was also observed in other indices, such as mood (3.24 in the south versus 3.45 in the center and 3.75 in the north, on a scale of 1 to 5), stress (2.8 in the south versus 2.6 in the center and 2.3 in the north, on a scale of 1 to 5), physical activity (20 minutes in the south compared to about 34 minutes in the center and in the north), sleep duration (6.1 hours in the south compared to 6.2 hours in the center and 6.5 hours in the north) and quality of sleep (2.9 in the south compared to 3.3 in the center and 3.5 in the north, on a scale of 1 to 5).

Other significant differences were found between women and men and between [young people](#) and adults—women and young people deviated more from their normal situation during the fighting than men and adults.

Since Operation Guardian of the Walls, there have been additional rounds of fighting between Israel and factions in Gaza, and there has also, of course, been Russia's invasion of Ukraine. According to Prof. Shmueli, wearable technology such as smartwatches has revolutionary potential for monitoring the consequences of modern war on the home front, and for the early detection of and timely assistance to populations in need.

"In the past, wars were fought at the borders," says Prof. Shmueli.

"Today, they are fought deep within the country. Therefore, monitoring the resilience of citizens is crucial, both as groups and as individuals. The state needs to know what happens to its citizens during war, as well as provide special support to groups that are more prone to harm."

"In further research, it will be important to identify individuals who suffered significantly during the war and did not return to normal after it ended. We believe that prompt and focused support for these people may prevent the development of post-traumatic stress disorder."

More information: Merav Mofaz et al, Real-time sensing of war's effects on wellbeing with smartphones and smartwatches, *Communications Medicine* (2023). [DOI: 10.1038/s43856-023-00284-y](https://doi.org/10.1038/s43856-023-00284-y)

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