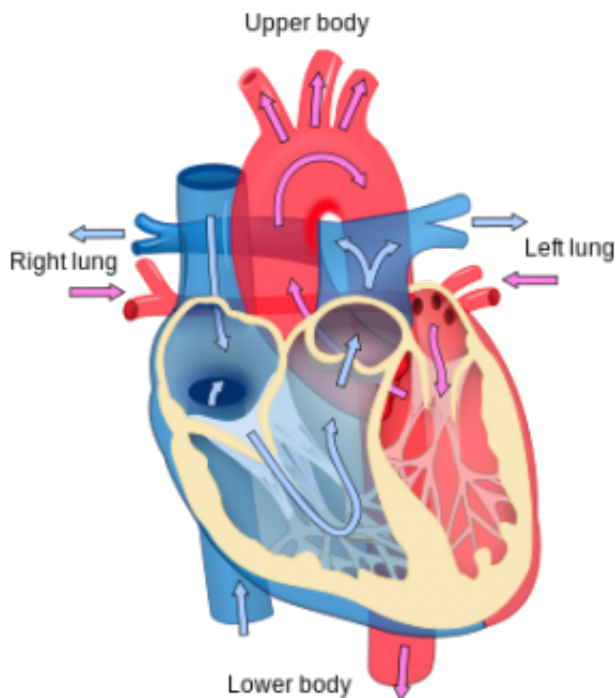


Fear of terrorism increases resting heart rate and risk of death

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Heart diagram. Credit: Wikipedia

A new study of over 17,000 Israelis has found that long-term exposure to the threat of terrorism can elevate people's resting heart rates and increase their risk of dying. This is the first statistics-based study, and the largest of its kind, which indicates that fear induced by consistent exposure to the threat of terror can lead to negative health consequences and increase the risk of mortality.

It is well-documented that international terror outbreaks involve mass psychological trauma, leading to long-term mental [health risks](#) to the exposed population. Previous studies have also shown that in the short term, sudden stressful situations such as earthquakes can increase a person's heart rate and their risk of having a heart attack.

However, whether long-term exposure to the threat of terror can lead to physical health risks in the exposed population has until now remained unknown.

To better understand the health risks associated with the fear of terror, researchers from the Hebrew University of Jerusalem examined the factors affecting basal (resting) heart rates, and studied how these rates changed over the years during annual checkups of healthy Israeli subjects. Israel has been exposed to the repeated stress of multiple wars and terror attacks for over 60 years, with a major impact on the entire society.

The research was conducted by Prof. Hermona Soreq, the Charlotte Slesinger Professor of Molecular Neuroscience at the Hebrew University's Edmond and Lily Safra Center for Brain Sciences ('ELSC') and a member of Israel's National I-Core Center of Excellence for Mass Trauma Research; and postdoctoral fellow Dr. Shani Shenhar-Tsarfaty, a recipient of ELSC and the Israel Ministry of Science's Eshkol Fellowship.

Together with Prof. Yaacov Ritov at the Hebrew University's Department of Statistics and Center for Rationality, they studied 17,300 healthy subjects who underwent an annual general medical exam including blood tests, heart rate and stress tests at the Tel Aviv Medical Center each year. The 10,972 men and 6,408 women in the study were apparently healthy employees attending periodic routine health examinations during the years 2002'2013. The data were collected as

part of the 'TAMCIS: Tel Aviv Medical Center Inflammation Survey.'

The questionnaire covered a wide range of occupational, psychological, and physical factors, including body mass index, blood pressure, fitness, smoking, psychological well-being, anxiety, and fear of terror.

"We wanted to test whether fear of terrorism can predict an increase in pulse rate and increased risk of death," explains Prof. Soreq.

By combining the medical exam data with the questionnaire responses, the researchers found that basal heart rate was affected by physiological characteristics, such as level of physical fitness and inflammation index reflecting the activity of the immune system.

In contrast, an ongoing increase in heart rate was also influenced by psychological characteristics such as fear of terrorism. Through a statistical analysis of 325 different parameters, the researchers found that fear of terror was a major contributor to annual increases in resting heart rate, with 4.1% of study participants suffering from an elevated fear of terror that predicted an increase in their resting heart rates.

While a heartbeat of 60 beat per minute is normal, an increase of up to 70-80 beats per minute was observed in subjects who exhibited an increased fear of terrorism. In other words, for people with an elevated fear of terror, the heart beats faster and the associated risk of heart disease is higher.

Elevated resting heart rate is a predictor of death from cardiovascular disease and death across all causes. As people age, the resting heart rate typically decreases from year to year, and people whose heart rate actually increases annually are more susceptible than others to heart attacks and strokes.

The researchers also examined how the brain alerts the body to the expectation of danger. They administered a blood test to examine the function of acetylcholine, a neurotransmitter involved in responses to stress and which acts as a brake to the inflammatory response.

The results showed that the fear of terror leads to a decline in the function of acetylcholine, and thus reduces the body's ability to defend itself from a heart attack, leading to a greater chance of dying.

"We found that fear of terrorism and existential anxiety may disrupt the control processes using acetylcholine, causing a chronic accelerated heart rate. Together with inflammation, these changes are associated with increased risk of heart attack and stroke," Prof. Soreq said.

The researchers also found that levels of C-reactive protein, a biomarker for inflammation, were elevated in those volunteers who [fear](#) terror and show escalated pulse. This finding further suggests that long-term exposure to terror threats may combine with inflammation to elevate resting heart rates and thus increase the risk of mortality.

The researchers suggest that since information on [heart rate](#) and its time-related changes is easy to follow, the findings may be useful in identifying asymptomatic people who could benefit from primary prevention measures designed to limit increases in cardiovascular mortality risk. These could include vagal stimulation, anti-inflammatory or anti-cholinesterase medications or physical activity.

More information: Fear and C-reactive protein co-synergize annual pulse increases in healthy adults, *PNAS*,
www.pnas.org/cgi/doi/10.1073/pnas.1418264112

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