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## THE IMPACT OF AIR POLLUTION ON RUNNER'S TRAINING RESULTS: A CASE STUDY IN KRAKOW

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Air pollution is a growing concern in urban areas worldwide, with significant implications for public health and athletic efficiency. The city of Krakow, like other major cities in the agglomeration, also faces challenges related to improve and monitoring air quality. Pollutants such as sulfur dioxide (SO<sub>2</sub>), particulate matter (PM), and nitrogen dioxides (NO<sub>2</sub>) are prevalent, often exceeding safe levels. These pollutants can have a profound impact on respiratory health, particularly for individuals engaged in intense physical activities like running.

The study aimed to assess the impact of environmental parameters (SO<sub>2</sub>, NO<sub>2</sub>, PM<sub>2.5</sub>) on an athlete's performance.

We used portable device for measuring standard environmental parameters in the direct surroundings to monitoring runner. We also used wearable device for respiratory monitoring and signal acquisition, capable to measure breathing rate (BR), tidal volume (TV) and minute ventilation (MV) Moreover, the mobile application was designed, which is used for showing the environment and respiratory parameters of runner. A series of runs were conducted in various environmental conditions across Krakow to investigate the correlations between air quality and physical performance. Additionally, heart rate measurement was performed using a smartwatch in real time and route of the run was determined.

The study demonstrates that high levels of air pollutants, such as SO<sub>2</sub> and PM<sub>2.5</sub>, may impair respiratory function and athletic performance, highlighting the need for athletes to monitor air quality and for policymakers to improve urban air conditions. The proposed device can find application in monitoring physical activity.