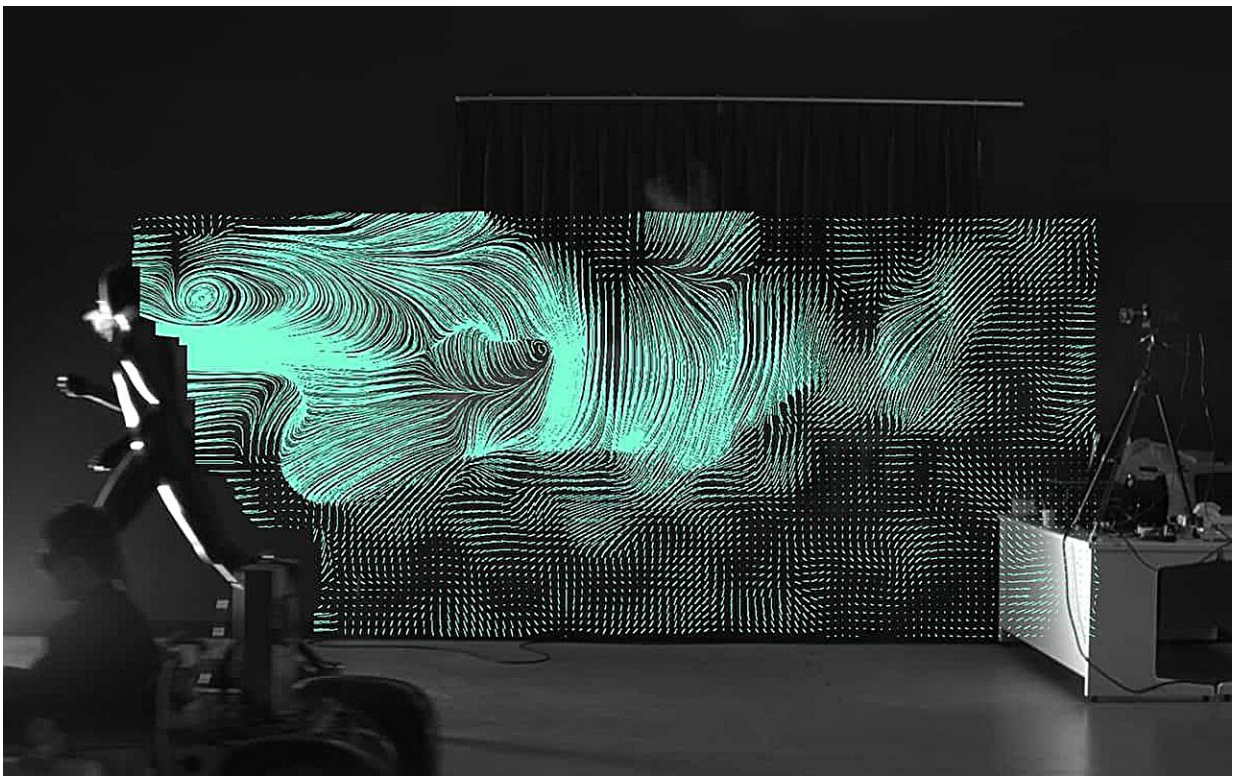
Risk of viral airborne transmission peaks within five seconds of face-to-face encounters, study finds

October 27 2023



Researchers moved a mannequin equipped with a device that emits aerosol particles to examine the number and movement of the particles. Credit: Takeshi Asai, professor emeritus at the University of Tsukuba

The main transmission routes identified initially for the novel

coronavirus infection were droplet and contact transmission. Airborne transmission by aerosol particles was eventually identified as one of the most likely transmission routes. Especially with the relaxation of behavioral restrictions, infections continued to prevail, making prevention and risk reduction during public transportation a major challenge.

In this study, researchers identified the risk of virus exposure by visualizing and measuring the flow field of aerosol particles derived from exhaled air (jet stream) during face-to-face encounters using a mobile full-scale mannequin and a particle-tracking velocimetry system. Subsequently, the researchers compared the differences between aerodynamic characteristics with and without ventilation and their effects on the risk of virus exposure.

The researchers found that, with or without ventilation, the number of aerosol particles peaked within five seconds after face-to-face encounters and then declined rapidly. This was observed during walking, jogging, running, and sprinting activities. The higher the transit velocity, the smaller this peak became, which may be due to the increase in the relative velocity between exhaled air and ambient air that facilitated particle diffusion. Furthermore, the number of aerosol particles in ventilated conditions was significantly lower than that in nonventilated conditions.

The research is published in the journal *Scientific Reports*.

The results indicate that, to reduce the risk of viral infection during face-to-face encounters, measures such as interrupting inhalation, maintaining a physical distance of at least 1 m, and positioning oneself upwind, are effective within five seconds of face-to-face encounters. These findings can help in the management of exposure risk to airborne viruses in general.

More information: Takeshi Asai et al, Peak risk of SARS-CoV-2 infection within 5 s of face-to-face encounters: an observational/retrospective study, *Scientific Reports* (2023). DOI: 10.1038/s41598-023-44967-x