Jumping to reduce vibrations

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Credit: AI-generated image (disclaimer)

A pioneering use of mini-trampolines is allowing engineers to better understand effects of vibrations caused by human movement on floors and small bridges.

Both footbridges and floors will vibrate perceptibly when people walk across them; how this vibration affects the structure can now be measured by a novel test developed by researchers from Monash

University and Victoria University.

Monash University's Dr Len Koss of the Department of Mechanical and Aerospace Engineering and Associate Professor Vincent Rouillard of Victoria University are using a person jumping on a mini-trampoline to obtain quality structural data for footbridges and floors.

Dr Koss said a mini- trampoline was a convenient way to achieve high-force amplitude at low frequency without the use of motors, hydraulic systems or large revolving masses.

"The combination of the jumper and the mini-trampoline provides a high amplitude force at a low frequency of vibration: this data is often difficult to obtain using existing mechanical or electrical vibration shakers which are much more massive," Dr Koss said.

"The portable nature of a mini-trampoline allows for easier testing and provides measurements of force and response to be measured consecutively using only one accelerometer the devise that measures vibrations."

The use of the jumper/mini-trampoline combination allowed researchers to collect structural data on stiffness, natural frequency and the effective mass of the floor or bridge under test.

"The data collected during testing determined if the motion of the structure would be affected by human movement and whether movement of people on the structure would generate excess vibrations," Dr Koss said.

The researchers are now developing equations that would allow a simple vibration measurement obtained by using the mini-trampoline method to be used to estimate structural stiffness. This would mean a major

breakthrough in structural testing of floors and footbridges.

Provided by Monash University