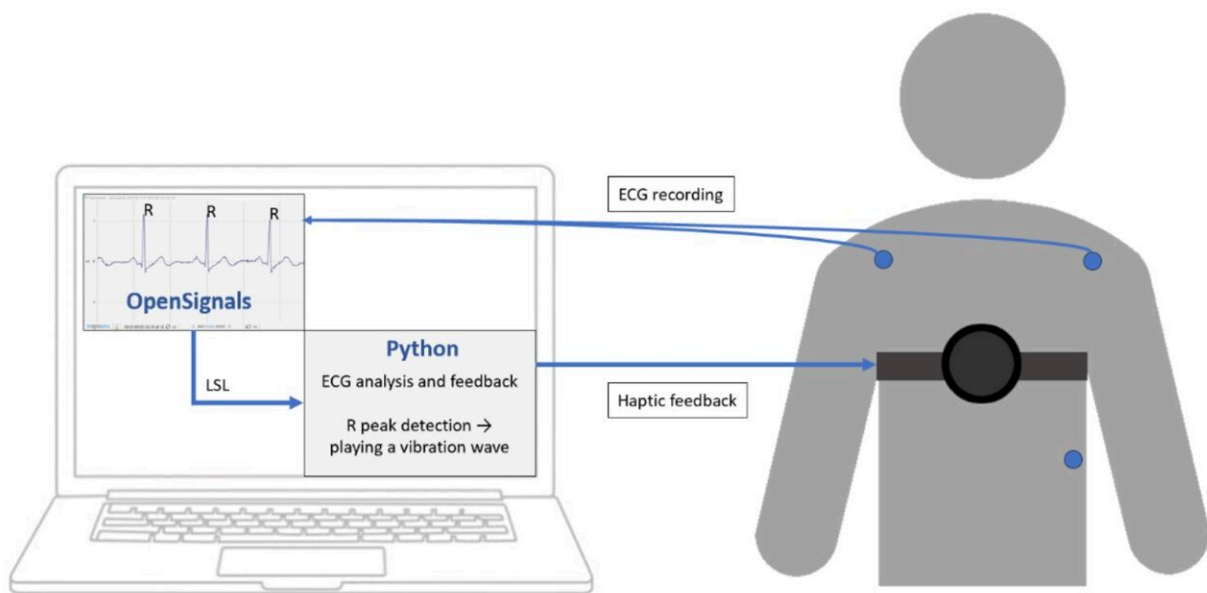


Enhancing the mind-body connection through technology and touch

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This graphic depicts the vibration device which provides haptic stimulation while ecg (electrocardiogram) signal is used to provide precise synchronization. Credit: Ivcher Institute For Brain Cognition And Technology, Reichman University

A recent study [published](#) in *Psychophysiology* by a team of researchers at the Ivcher Institute for Brain, Cognition, and Technology (BCT institute) at Reichman University (Herzliya, Israel) showcases how a novel real-time haptic feedback technology can enhance interoceptive awareness

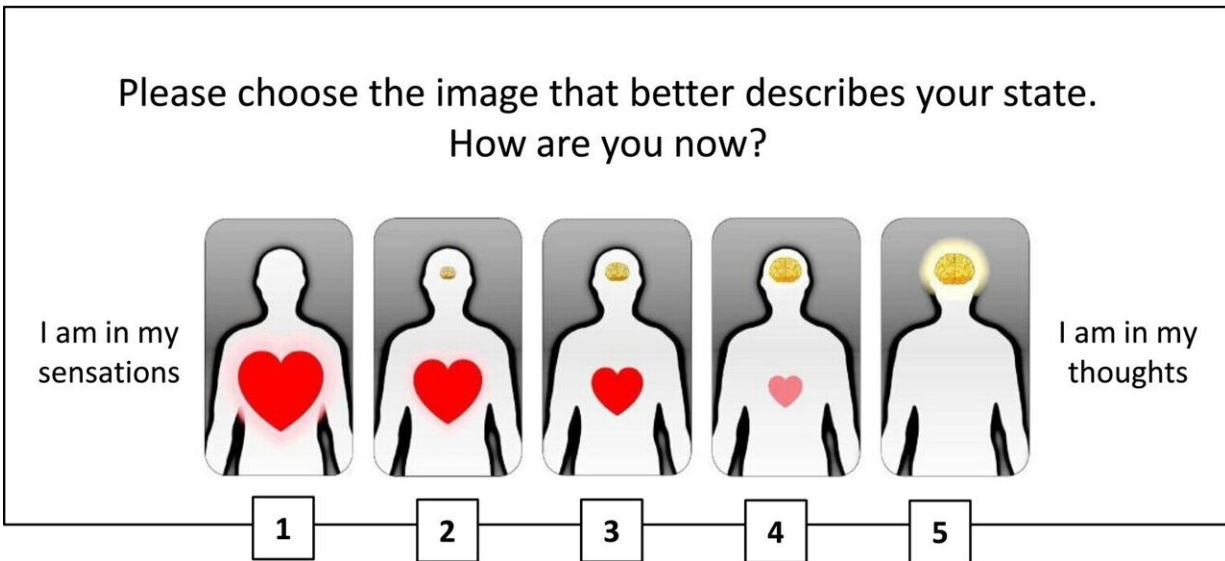
and improve mental and physical health.

Interoception refers to the processes which facilitate the perception, interpretation, and integration of various signals which originate from within the body. Abnormal, or impaired interoception is associated with numerous psychological disorders such as depression, anxiety, and eating disorders, as well as neurodegenerative diseases. Enhancing interoceptive abilities has shown therapeutic promise for improving mental health outcomes, reducing symptom severity in [chronic conditions](#), and fostering prosocial behaviors.

The study, led by Dr. Olga Dobrushina (MD PhD) investigated the effectiveness of a haptic heartbeat supplementation technology that combines biofeedback and sensory augmentation principles. Users received real-time feedback of their own heartbeats via gentle vibrations delivered to the chest, which closely mimicked the natural sensations of a heartbeat.

"The study involved two groups of 30 participants receiving either the haptic or visual feedback of their heartbeats," says Prof. Amir Amedi, founding director of the BCT Institute. "In the haptic condition, we used a custom-built device that provided the vibrations in synchrony with the participants' own heartbeats, and following the wave of the rise in arterial pressure. The visual feedback condition consisted of an animated beating heart on a screen."

The team analyzed self-reported measures of attentional focus, and assessed the participants in both conditions using a heart rate discrimination task where participants must estimate the timing of their own heart beats, as well as their confidence in their guesses.



Attention rating scale. Specially designed single-item attention rating scale was provided to the participant after the instruction, in the middle of the training and after the training. Credit: *Psychophysiology* (2024). DOI: 10.1111/psyp.14648

"What we were able to see is that after a single session of haptic [heartbeat](#) feedback participants' interoceptive accuracy on the heart rate discrimination task improved significantly, as did their confidence in their interoceptive abilities," Dr. Dobrushina explains.

"They also found the haptic condition much more pleasant, which suggests that matching the sensory characteristics of wearable technology to our innate, natural bodily sensations can enhance user satisfaction, but also the efficacy of interoceptive training" she adds. The results of the experiment also illustrate that the haptic feedback shifted participants' attention towards their bodily sensations, a crucial aspect of interoception.

"This is quite notable as we did not see this shift in the visual feedback condition," Prof. Amedi clarifies. "So it seems that one of the unique

benefits of haptic technology is that it might be able to foster a deeper connection between the mind and the body."

"Abnormal interoception represents a fairly common vulnerability factor for psychopathology," says Dr. Dobrushina. Some strategies for improving interoception like mindfulness training while effective, can be challenging to engage in regularly.

"Using haptic feedback, especially in wearables could overcome these shortcomings," explains Prof. Amedi. "Previous studies have shown that visual feedback of heartbeats outperforms mindfulness training in terms of enhancing interoceptive accuracy, and the [haptic feedback](#) we used, was able to outperform visual feedback."

More information: Olga Dobrushina et al, Interoceptive training with real-time haptic versus visual heartbeat feedback, *Psychophysiology* (2024). [DOI: 10.1111/psyp.14648](https://doi.org/10.1111/psyp.14648)

Provided by Reichman University

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