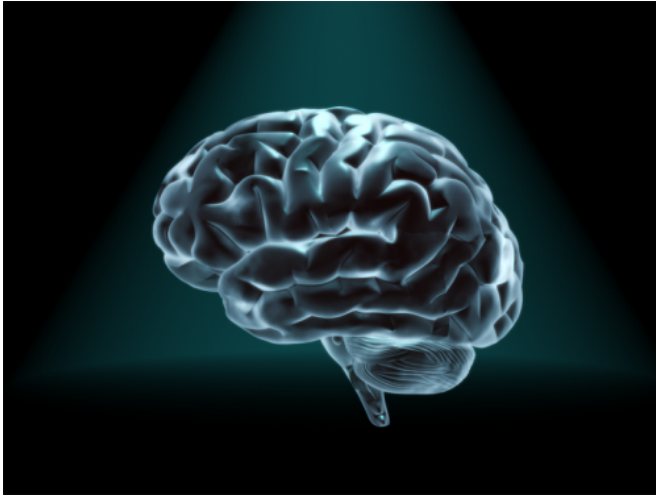


Mapping reveals reactions differ in male and female brains during cardiovascular activity

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Credit: Human Brain Project

A region of the brain that helps to manage body functions including stress, heart rate and blood pressure reacts differently between men and women when presented with certain stimuli, according to a new study from the UCLA School of Nursing.

The findings suggest that cardiovascular diseases also may manifest differently in [women](#) and men, which ultimately could affect how they should be diagnosed and treated.

The study, led by Paul Macey, associate professor of nursing, is published in the journal *Biology of Sex Differences*. In the study, functional MRI, or fMRI, scans were done on volunteers while they performed hand-grip exercises, which raise [blood pressure](#) and heart rate through signals from the brain. Used primarily in research, an fMRI uses [magnetic resonance imaging](#) technology to measure brain activity by detecting changes in the blood flow.

The researchers found that the portion of a brain region called the [insular cortex](#) (which is made up of gyri, or folds) showed differences in activity between men and women. In women, the right side of the front insular gyrus was activated by the hand-grip exercise more than men, who instead had a greater left-side activation of the same region. Women showed a higher resting heart rate than did males, but didn't have as great a [heart rate](#) increase when challenged with the hand-grip exercise.

The hand-grip testing was a follow-on study to earlier published research by Macey and his colleagues of the same brain region using a "Valsalva maneuver." Such a maneuver is performed by attempting to exhale against a closed airway. Participants close their mouths and pinch their noses shut while pressing out as if blowing up a balloon. The Valsalva maneuver leads to changes in blood pressure through "fight or flight" brain responses, which are controlled by a part of the nervous system called the "sympathetic" nervous system. In contrast, the hand grip cuts back on the "rest and recovery" brain responses, called the "parasympathetic" nervous system. The sympathetic and [parasympathetic nervous systems](#) are part of the autonomic or "involuntary" nervous system. In general, the right side of the insular cortex is more sympathetic, and the left side more parasympathetic.

"With the hand grip, the differences were in the left side of the brain, while in the Valsalva study, the differences appeared on the right side, which was a surprise at first," Macey said. "What both studies show, however, is that healthy men's and women's brains respond differently, so we may have to re-evaluate separately in men and women what constitutes a disease state versus a healthy state to see if people are more or less vulnerable to cardiovascular illness according to their sex."

The research also sheds more light on the

functions of the insular gyri. This middle area of the [brain](#) had been difficult to test until recently through imaging techniques, Macey said. Today, the region is studied for its roles in self-awareness and stress, as well as cardiovascular control.

Macey and his colleagues are continuing to map the functions of this area, and make connections between changes and the risks of a wide range of diseases.

More information: Paul M. Macey et al. Sex differences in insular cortex gyri responses to a brief static handgrip challenge, *Biology of Sex Differences* (2017). DOI: [10.1186/s13293-017-0135-9](https://doi.org/10.1186/s13293-017-0135-9)

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