This is your brain on bungee jumping: Cliff divers take the leap for science

Enlarge / A study participant has his brain waves recorded as he leaps from the Europa Bridge near Innsbruck, Austria, into a 630-foot abyss. Thank goodness for that bungee cord.

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Right before you work up the nerve to leap off a bungee-jumping platform and plummet toward the Earth, there will be a sharp, measurable increase in your brain activity—almost a full second before you make the conscious decision to jump. A new paper in *Scientific Reports* purports to describe the first time this effect has been measured outside the laboratory.

That telltale signal was dubbed *bereitschaftspotential* (BP)—or "readiness potential" in English—when it was first observed in 1964 by Luder Deecke and Hans-Helmut Kornhuber. Kornhuber and Deecke had subjects make hundreds of voluntary finger movements while otherwise sitting as still as possible in a Faraday cage. The researchers noticed a shift in the electrical voltage in the brain, as measured by electroencephalography (EEG) electrodes placed along the scalp. The effect is often cited in the ongoing, heated debate over whether or not humans truly have free will.

The German and Austrian authors of the current study opted to have their subjects go bungee jumping in hopes of recording

this readiness potential. While bungee jumping has its roots in an ancient ritual on the South Pacific island-nation of Vanuatu as a way to test one's courage, prior studies have shown it results in a sharp rise in concentrations of beta-endorphins right after jumping. (This spike is despite the fact that, the authors note, bungee jumping is statistically less life-threatening than more common activities like bicycling or dancing. Our impulse reactions are not rational.)

Granted, the study had just two participants: both were young (19), male, semi-professional cliff divers who had never gone bungee-jumping before. So even though one assumes they were accustomed to jumping from significant heights, "both participants reported that they had a very strong inner resistance to jump before each trial," the authors write. They added that this should offset most desensitization effects, although they cannot rule it out completely. Most people bungee jumping for the first time apparently experience similar internal resistance, often requiring "an external trigger to overrule their instinct not to jump."

Enlarge / The study’s first author, Marius Nann, prepares the electrode cap which will be used to record the bungee jumper’s brain activity.
Soekadar/Charité
The two men jumped from the 630-foot-high Europa Bridge near Innsbruck, Austria, a total of 30 times. To avoid generating extra signals resulting from muscle movement, they were instructed to keep head motions and blinking to a minimum. The jumpers were also told to relax “the arms and trunk, initiating the jump by coming up on the toes and bending forward.” A portable EEG with a built-in accelerometer was used to record brain activity.

As a baseline, the jumpers also made a similar number of jumps from a height of about three feet in the safety of the laboratory. This is still not a huge number of jumps, given that the recorded EEG signals are averaged for the final results. The authors suggest perhaps using VR technology for further experiments to complement their real-world study.

The researchers conducted the experiment with an eye toward using their findings to improve the current crop of brain-computer interfaces (BCIs), devices which can translate electrical signals in the brain into control commands for electronic devices. The study is a valuable proof of principle, since the results clearly demonstrated that experiencing fear before making a potentially life-threatening action doesn’t have much effect on the readiness potential. That’s good news for quadriplegic patients, for example, who may rely on BCI-controlled neural prosthetics for simple movements like eating or navigating a computer screen.

“Measuring this electrical potential is extremely tricky even under laboratory conditions, since the voltage shift involved is in the range of only a few millionths of a volt,” said co-author Surjo Soekadar of Charite-Universitatsmedizin Berlin. “However, to advance the development of brain-computer interfaces that are suitable for everyday use, we wanted to

study whether the readiness potential could be measured in real-life scenarios. Our results suggest that brain-computer interfaces can remain reliable even when used under extreme emotional stress.”

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