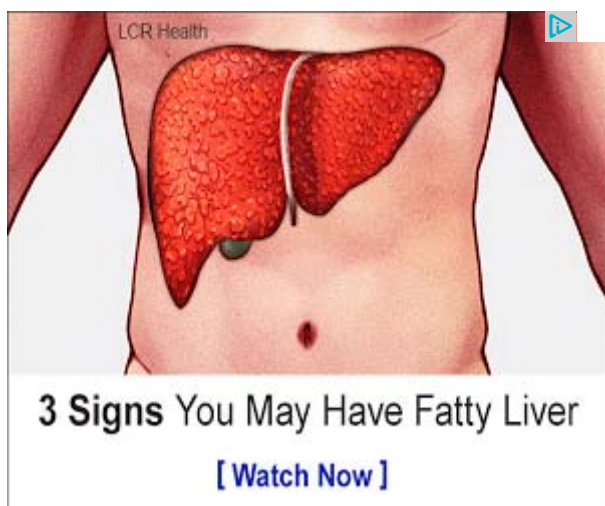


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Our Senses Can't Learn Under Stress

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Summary: Stress may impede perceptual learning and performance, a new study reports.

Source: RUB.

Stress is part of our everyday lives – while some thrive on it, it makes others sick. But what does stress do to our senses?

When we train them, we can sharpen our senses thereby improve our perceptual performance. The stress hormone cortisol completely blocks this important ability. In the current issue of *“Psychoneuroendocrinology”*

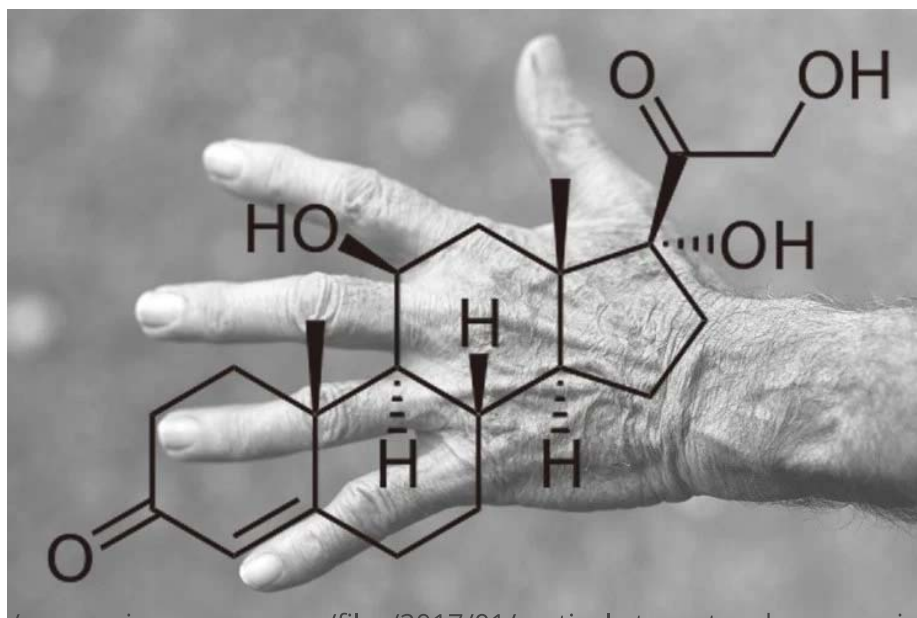
neuroscientists of the Ruhr University Bochum (RUB) report on this finding.

“Previous research has already shown that stress can prevent the retrieval of memories. But now we have discovered that it also has a major effect on our perception and perceptual learning,” explains Dr Hubert Dinse, one of the authors of the study.

Tactile sense in training

In their study, researchers investigated how the sense of touch of 30 study participants could be changed after a training phase. Half of them received a medium dose of the stress hormone cortisol, while the other half received a placebo drug.

To make training comparable across all participants, the researchers employed the well-established approach of passive finger stimulation. Previous studies and several therapy approaches have shown that this method leads to an improved tactile acuity.



(<https://i1.wp.com/neurosciencenews.com/files/2017/01/cortisol-stress-touch-neurosciencenews-public.jpg>)

To make training comparable across all participants, the researchers employed the well-established approach of passive finger stimulation. Previous studies and several therapy approaches have shown that this method leads to an improved tactile acuity. NeuroscienceNews.com image is for illustrative purposes only.

Tactile performance was assessed using the so-called “two-point discrimination threshold”. This marker indicates how far apart two stimuli need to be, to be discriminated as two separate sensations – the closer they are, the better the sense of touch.

No learning effect after cortisol

The placebo group improved their tactile acuity, as expected, by about 15 percent. In contrast, the cortisol given to the other group blocked almost all the stimulation-induced improvement. Cognitive psychologist Prof Dr Oliver T. Wolf explains: “Our data show that a single dose of cortisol not only disrupts memory in the hippocampus, but it also has a substantial effect on the plasticity of sensory areas of the brain.”

Cortisol blocks synaptic connections

In previous studies on a cellular level, neuroscientists have demonstrated that cortisol suppresses the strengthening of synaptic connections, and therefore the plasticity of the brain – its ability to learn. The team led by Hubert Dinse therefore suggests, their results could also explain by cortisol-induced suppression of synaptic plasticity.

Effects on clinical treatments

The results of the study could also affect clinical treatments. Corticosteroids, of which cortisol is one, are often used in the treatment of immunological and neurological diseases. However, the effects on perceptual learning observed in this study may counteract rehabilitation efforts, which rely on just these mechanisms. It is therefore necessary to find out which effects the clinical treatment with these substances has on learning mechanisms in the brain.

ABOUT THIS NEUROSCIENCE RESEARCH ARTICLE

Funding: Scientists from the fields of neuroinformatics and cognitive psychology, as well as from the Neurological Clinic Bergmannsheil collaborated on this research project. They were all funded by a grant to Collaborative Research Centre 874 from the German Research Foundation (Deutsche Forschungsgemeinschaft, DFG)

Source: Hubert Dinse – [RUB \(http://news.rub.de/\)](http://news.rub.de/)

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Abstract

The stress hormone cortisol blocks perceptual learning in humans

Cortisol, the primary glucocorticoid (GC) in humans, influences neuronal excitability and plasticity by acting on mineralocorticoid and glucocorticoid receptors. Cellular studies demonstrated that elevated GC levels affect neuronal plasticity, for example through a reduction of hippocampal long-term potentiation (LTP). At the behavioural level, after treatment with GCs, numerous studies have reported impaired hippocampal function,

such as impaired memory retrieval. In contrast, relatively little is known about the impact of GCs on cortical plasticity and perceptual learning in adult humans. Therefore, in this study, we explored the impact of elevated GC levels on human perceptual learning. To this aim, we used a training-independent learning approach, where lasting changes in human perception can be induced by applying passive repetitive sensory stimulation (rss), the timing of which was determined from cellular LTP studies. In our placebo-controlled double-blind study, we used tactile LTP-like stimulation to induce improvements in tactile acuity (spatial two-point discrimination). Our results show that a single administration of hydrocortisone (30 mg) completely blocked rss-induced changes in two-point discrimination. In contrast, the placebo group showed the expected rss-induced increase in two-point discrimination of over 14%. Our data demonstrate that high GC levels inhibit rss-induced perceptual learning. We suggest that the suppression of LTP, as previously reported in cellular studies, may explain the perceptual learning impairments observed here.

“The stress hormone cortisol blocks perceptual learning in humans” by Hubert R. Dinse, Jan-Christoph Kattenstroth, Melanie Lenz, Martin Tegenthoff, and Oliver T. Wolf in *Psychoneuroendocrinology*. Published online December 9 2016 doi:10.1016/j.psyneuen.2016.12.002

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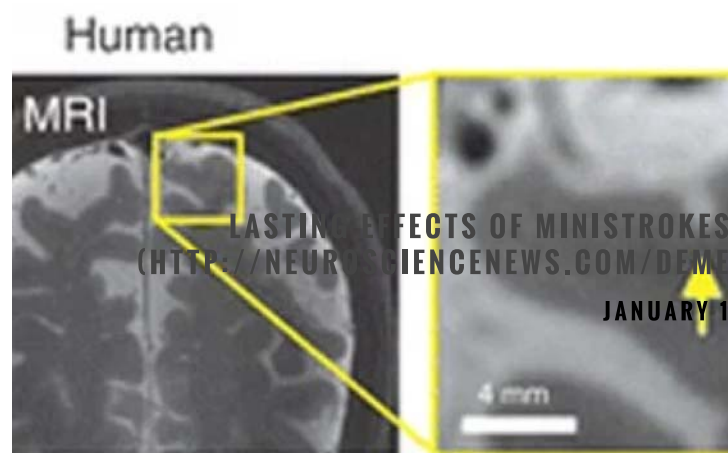
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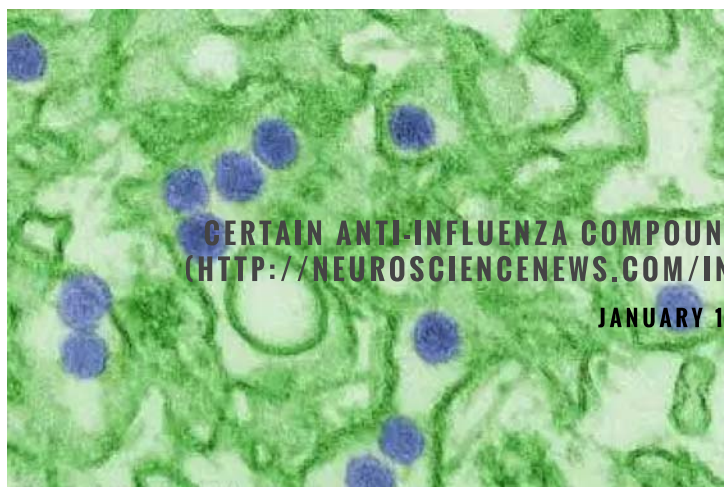
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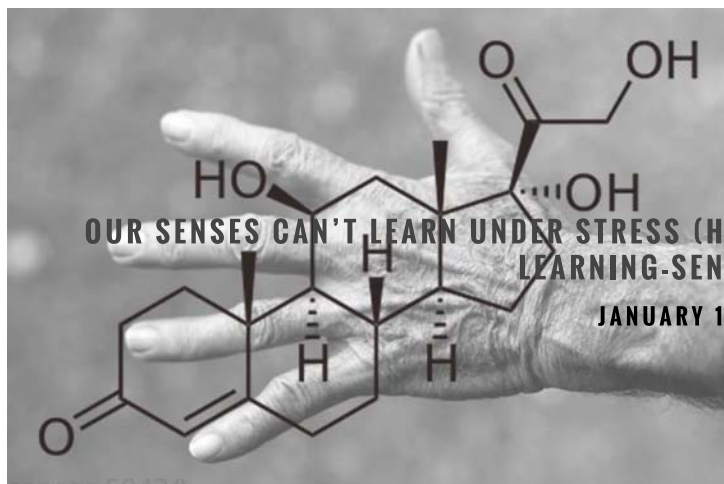
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