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How our dreams prepare us to face our fears

Researchers from UNIGE and HUG demonstrate how the fears we experience in our dreams prepare us to tackle anxiety-provoking situations once we're awake.

Do bad dreams serve a real purpose? To answer this question, researchers from the University of Geneva (UNIGE) and University Hospitals of Geneva (HUG), Switzerland, – working in collaboration with the University of Wisconsin (USA) – analysed the dreams of a number of people and identified which areas of the brain were activated when they experienced fear in their dreams. They found that once the individuals woke up, the brain areas responsible for controlling emotions responded to fear-inducing situations much more effectively. These results, which are published in the journal *Human Brain Mapping*, demonstrate that dreams help us react better to frightening situations, thereby paving the way for new dream-based therapeutic methods for combating anxiety.

Neuroscience has been taking an interest in dreams for a number of years, focusing on the areas of the brain that are active when we dream. The scientists employed high-density electroencephalography (EEG), which uses several electrodes positioned on the skull to measure brain activity. They recently discovered that certain regions of the brain are responsible for the formation of dreams, and that certain other regions are activated depending on the specific content within a dream (such as perceptions, thoughts and emotions). “We were particularly interested in fear: what areas of our brain are activated when we're having bad dreams?» states Lampros Perogamvros, a researcher in the Sleep and Cognition Laboratory headed by professor Sophie Schwartz in the Department of Basic Neurosciences, Faculty of Medicine, UNIGE, and senior clinical lecturer at HUG's Sleep Laboratory.

Brain areas active during frightening dreams

The scientists from Geneva placed 256 EEG electrodes on 18 subjects whom they woke several times during the night. Each time the participants were woken up, they had to answer a series of questions such as: ‘Did you dream? And, if so, did you feel scared?’

“By analysing the brain activity based on participants' responses, we identified two brain regions implicated in the induction of fear experienced during the dream: the insula and the cingulate cortex”, explains Perogamvros. The insula is also involved in evaluating emotions when awake, and is automatically activated when someone feels afraid. The cingulate cortex, for its part, plays a role in preparing motor and behavioural reactions in the event of a threat. “For the first time, we've identified the neural correlates of fear when we dream and have observed that similar regions are activated when experiencing fear in both sleep and wakeful states”, continues the Geneva-based researcher.



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Lampros Perogamvros, a researcher in the Sleep and Cognition Laboratory in the Department of Basic Neurosciences in the Faculty of Medicine at the University of Geneva, and senior clinical lecturer at Center for Sleep Medicine, HUG.

High resolution pictures



Virginie Sterpenich, a researcher in the Department of Basic Neurosciences at UNIGE.

Do dreams prepare us for our waking lives?

The researchers then investigated a possible link between the fear experienced during a dream and the emotions experienced once awake. They gave a dream diary to 89 participants for the duration of a week. The subjects were asked that each morning upon waking, they note down whether they remembered the dreams they had during the night and to identify the emotions they felt, including fear. At the end of the week, they were placed in a magnetic resonance imaging (MRI) machine. “We showed each participant emotionally-negative images, such as assaults or distressful situations, as well as neutral images, to see which areas of the brain were more active for fear, and whether the activated area changed depending on the emotions experienced in the dreams over the previous week,” says Virginie Sterpenich, a researcher in the Department of Basic Neurosciences at UNIGE.

The researchers were particularly interested in the brain areas traditionally involved in managing emotions, such as the insula, amygdala, medial prefrontal cortex and cingulate cortex. “We found that the longer a someone had felt fear in their dreams, the less the insula, cingulate and amygdala were activated when the same person looked at the negative pictures”, says Sterpenich. “In addition, the activity in the medial prefrontal cortex, which is known to inhibit the amygdala in the event of fear, increased in proportion to the number of frightening dreams!”

These results demonstrate the very strong link between the emotions we feel in both sleep and wakefulness. They also reinforce a neuroscientific theory about dreams: we simulate frightening situations while dreaming in order to better react to them once we’re awake. “Dreams may be considered as a real training for our future reactions and may potentially prepare us to face real life dangers,” suggests Perogamvros.

Dreams: a new therapeutically?

Following the revelation of the potential function of dreams, the researchers are now planning to study a new form of dream therapy to treat anxiety disorders. They are also interested in nightmares, because – unlike bad dreams, in which the level of fear is moderate – nightmares are characterised by an excessive level of fear that disrupts sleep and has a negative impact on the individual once awake. “We believe that if a certain threshold of fear is exceeded in a dream, it loses its beneficial role as an emotional regulator,” concludes Perogamvros.

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