

Breathe deeply to calm your nerves

Richard Béliveau

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American neuroscientists have come up with evidence that the brain circuit responsible for relaxation is stimulated by deep breathing.

Respiration is a basic physiological function, which operates in a totally autonomous fashion, whose role is essentially to supply the body with the oxygen that is indispensable for the functioning of cells. Beyond this necessary role in life, it has been known for centuries that breathing can also greatly influence our mental state; for example, it is well established that slow and deep breathing helps in calming someone who is highly excited or feeling strong emotion, even in extreme cases such as panic attacks. Slow and controlled breathing is also used by practitioners of pranayama in yoga or other forms of meditation to achieve mental tranquility and contemplative states. These slow breathing exercises increase the activity of the parasympathetic nervous system and also decrease the activity of the sympathetic nervous system, resulting in a slowing of the heart rate, decrease in arterial pressure and reaching a calmer state.

SPECIALIZED NEURONS

The mechanisms responsible for the link between deep breathing and relaxation have only recently been identified by a team of neuroscientists at Stanford University in California¹. This group had, in 1991, identified a collection of about 3000 neurons buried deep within the brainstem whose role is to control respiratory frequency, regardless of the specific type of respiration (sigh, laugh, yawning). By using several advanced genetic tools, these researchers were able to determine that this respiratory *pacemaker* contained a subgroup of 175 neurons whose role is to provide the connection between respiration and relaxation. These specialized neurons act as a relay between respiration and the zones of the brain involved in attention and wakefulness: for example, if a person is faced with danger, activation of these cerebral zones will be detected by this group of neurons and respiration will be accelerated to help support a physiological response to this



aggression (fight or flight). The beauty of this mechanism is that it also functions in reverse, i.e. it is possible to influence the level of brain excitation simply by modifying breathing. By inhaling slowly and deeply, the 175 neurons of this relay will signal to the brain that the situation is under control and that it can consequently reduce its vigilance. In a person who is quite excited or in a state of panic, slow and deep breathing can thus act to balance this state of excitation and to gradually establish a sense of calm.

BREATHING EXERCISES

The feeling of calmness and relaxation achieved by several slow respiratory exercises such as in martial arts, yoga, tai-chi or even Qi gong are thus not psychological, but well and truly physiological. This is not, however, too surprising because it is becoming more evident that these types of exercise have a direct beneficial effect on the body aside from their effects on mental well-being. For example, several recent studies have shown that regular practice of yoga and tai-chi are associated with decreases in several risk factors for cardiovascular diseases, including type 2 diabetes, obesity, lipid profile and stress, which are equivalent to the benefits observed with regular aerobic exercises. Breathing slowly and deeply thus provides several advantages, both for the body and for the mind.

⁽¹⁾ Yackle K et al. Breathing control center neurons that promote arousal in mice. *Science* 2017;355:1411-1415.