

# The Will to Persevere Induced by Electrical Stimulation of the Human Cingulate Gyrus (2013) *Neuron*



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**Full text:** <https://pmc.ncbi.nlm.nih.gov/articles/PMC3877748/>

## **Abstract**

***Anterior cingulate cortex (ACC) is known to be involved in functions such as emotion, pain, and cognitive control. [...] electrical charge delivery in the***

anterior mid-cingulate cortex (aMCC) elicits **autonomic changes and the expectation of an imminent challenge coupled with a determined attitude to overcome it.** [...] This report provides compelling, first-person accounts of electrical stimulation of this brain network and suggests its possible involvement in psychopathological conditions that are characterized by a reduced capacity to endure psychological or physical distress.

## Quotes & Comments

"The greatest of life's challenges leave us mired in "a sea of troubles," battered by the "slings and arrows of outrageous fortune." (Shakespeare, 1603). It is at such moments that an individual's will to persevere is put to the test. **While some are able to marshal the necessary physical and psychological resources in the face of challenges, others have a pathologically lowered motivation and mental strength for enduring physical or psychological pain.**"

"studies in humans and non-human mammals suggest that the ACC (including its mid-cingulate region) is essential for initiating changes in behavior, making associations between reward and action, determining the action necessary to obtain a goal, and synthesizing information about reinforcers ranging from pain and threatening conspecifics to aversive cues and negative feedback"

Pain and suffering, it appears, can be a powerful motivator for change... What's the old adage? *Suffering produces perseverance; perseverance character; and character, hope.* There might just be a neural correlate to that ancient saying.

"both patients recounted a sense of "challenge" or "worry" (also known as *foreboding*) but remained motivated and aware that they would overcome the challenge. Patient 1 used an interesting analogy to explain his feeling. He reported that he felt as if he were driving a car into a storm. [...] Patient 2 recounted feeling worried and anxious about something negative that was going to happen, but simultaneously knowing that he had to fight to make it through and not give up."

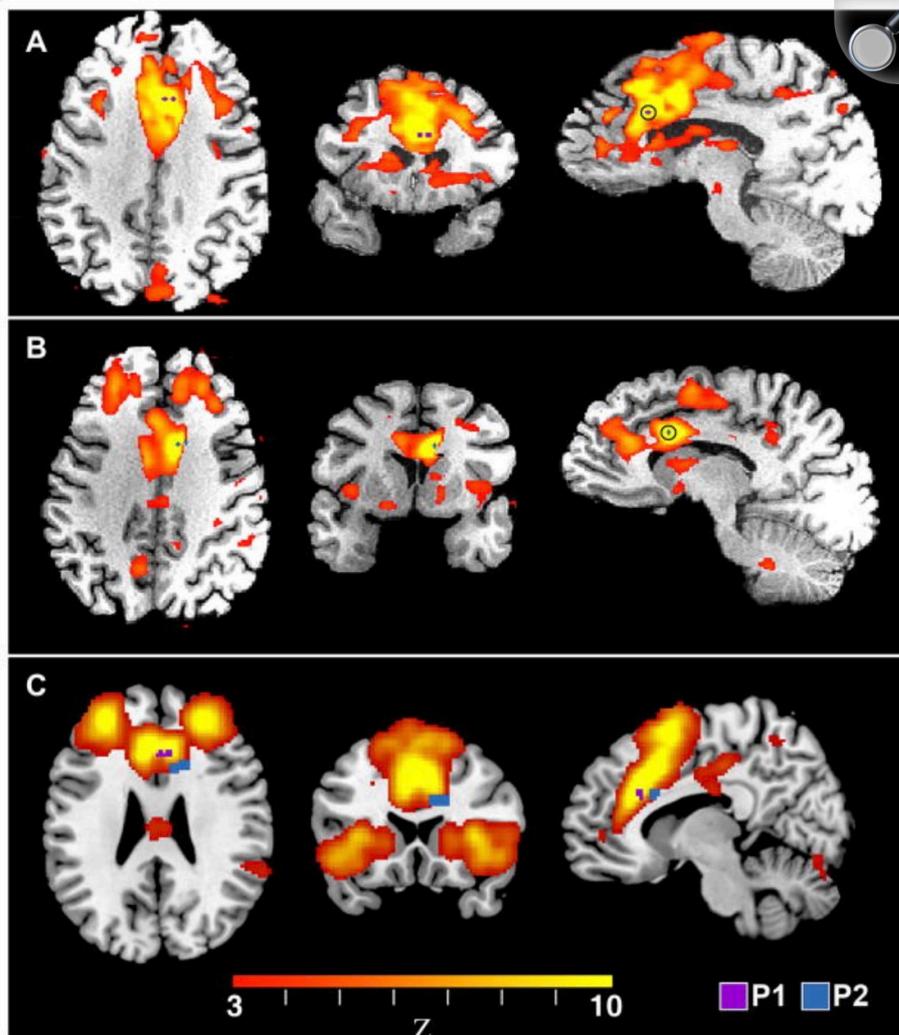
This reminds me of how I frame bodily sensations to clients. I ask them to tell me what's happening in their body when they feel anxious or scared. The usual suspects are named: restless, fidgety, heart racing, breathing quicker, etc. Then I ask them to name what's happening inside when they're excited. They pause ... and name virtually the same sensations. "The difference?" I say "In one, you're telling yourself it's bad; the other, the feelings are good."

It seems the brain craves a challenge ... and rises to the

occasion. It's us, based on our life experiences, that tell ourselves that something (feeling, thought, emotion) is bad or good.

Reminds me, too, of what neuroscientist Lisa Feldman Barret says about emotion: "A single interoceptive cue, such as a dull ache in your abdomen, could mean a stomachache, hunger, tension, an overly tight belt, or a hundred other causes. **Your brain must explain bodily sensations to make them meaningful, and its major tool for doing so is prediction.** So, your brain models the world from the perspective of someone with your body. Just as your brain predicts the sights, smells, sounds, touches, and tastes from the world in relation to the movements of your head and limbs, it also predicts the sensory consequences of movements inside your body."

Figure 2. Functional Connectivity Analyses of the Stimulation Sites Identify the EBS Target Sites as Part of the Emotional Salience Network.



"Our findings provide a striking subjective account of the feelings associated with the stimulation of the aMCC. Both subjects reported a stereotyped set of changes i.e., increased heart rate, induced physical sensation in the chest or the neck, **anticipation of challenge coupled with strong motivation to overcome it** [...] we refer to this stereotyped set of complex autonomic, emotional, and cognitive experience as the "**will to persevere**"

"neuroimaging studies in human subjects have shown aMCC activation, accompanied by autonomic changes, during the subjective experience of

intense affective states such as the anticipation and/or perception of aversive stimuli”

Clinical implications are vast: visualising a challenge and overcoming thus springs immediately to mind. Visualisation approaches are coming more front of mind for me over the past few years, springing from approaches like EMDR (in particular the Safe Place Exercise and Flash Technique) Somatic Experiencing, Clinical EFT, Accelerated Resolution Therapy, mindfulness-based approaches and, more dominantly, IFS.

What follows is a lengthy quote from my book *Tapping For Trauma*. It helps conceptualise this clinical utility: “Dual awareness therapies aim to bring this system back into equilibrium. ‘Renegotiating’—a Somatic Experiencing term that describes the process of exposing oneself through various means to a bodily reaction, slowing the reaction down, and pairing it with other bodily actions to help ‘complete’ what the reflex set out to do in the first place—helps a person turn reflexes into mindful appreciation and an overcoming of what is going on in order to give one more control over their nervous system. The process of ‘renegotiation’ is inherent in any successful therapy [and] creates a sense of mastery over once uncontrollable sensations. Importantly, mastery is tantamount to skill, and skill builds courage and confidence. What is neurobiologically fascinating is that the process of *pushing through* despite discomfort while remaining present and mindful activates a part of the limbic system called the **anterior midcingulate cortex (amCC)**. The amCC is associated with dopamine and noradrenaline release, motivational drive, and reward-oriented behaviour. Pushing through despite your feelings about it increases your motivational drive and, incidentally, the associated reward. The neuroscientist Andrew Huberman, PhD, calls this push in spite of adversity *limbic friction*. One part of your brain—your limbic region—is telling you to *Get the hell out of there!* while others—namely, the prefrontal regions of your cortex—are coaching you through it. It is often in the pushing through of this ‘limbic friction’ that one grows.”

“it is reasonable to assume that the perceptual and autonomic changes caused by EBS are due to changes of activity not only in the amCC but also in the network of brain regions connected with it – including cortical and subcortical nodes of the network.”

"If, indeed, "the will to persevere" is mediated by a specific brain region and its neuroanatomical network, it follows that differences in structure and function of this network are associated with innate differences in our abilities to cope with physical or psychological distress. This raises a number of critical questions relating to individual differences in the aMCC function and its associated network: how early can these differences be identified? Are they genetically determined? And to what degree can they be modified by behavioral therapy, medication, or, as suggested here, electrical stimulation?"

**Final thoughts:** Not many outside of what I've already stated, but a few. Namely, in his book *Trauma and Memory*, Peter Levine quotes this study and states: "In [a] provocative case study handed to me by my German friend, a group of Stanford researchers published an article with the intriguing title **"The Will to Persevere Induced by Electrical Stimulation of the Human Cingulate Gyrus."** It reported on an unexpected experience provoked by the delivery of **deep brain stimulation** to a completely different part of the brain than had been previously explored by Penfield and other earlier neurosurgeons. This brain region is known as the **anterior midcingulate cortex (aMCC)**. The patients in this study experienced something quite remarkable. The exact words of patient number two, as his aMCC was stimulated, were: "I'd say it's a question ... not a worry like a negative ... it was more of a positive thing like ... **to push harder, push harder, push harder to try and get through this ... if I don't fight, I give up. I can't give up ... I (will) go on.** [...] From a physiological point of view, there is at the level of the aMCC a functional convergence of the (dopamine-mediated) systems for motivation and the (noradrenergic) one for action. To keep things in perspective, let us not forget that for thousands of years, well before the advent of neuroscience, **such triumphant convergence of motivation and action, of focus and the will to persevere, has been described in numerous myths from around the world and in our everyday lives."**

**Dopamine. Adrenaline. Both** linked for motivation and action. And both through this tiny place in the brain. Now ... the applicability: **one must build a sense of drive in the client not just through talk but through movement and feeling and, yes, action.** Once this is achieved, there's greater buy-in.

*These Notes were taken by psychotherapist and author Emil Barna in January*

*2026 in his efforts to assist with professional development and further education for himself and those who read them. But remember, they are but a glimpse of what the text is actually about—for more context, read the article and make up your own mind. You can find out more about Emil by visiting [www.barnacc.com](http://www.barnacc.com)*

***“A text without a context is a pretext to a proof text.”***

**—Dr. Don Carson**