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The Neuroscience Lessons of Freestyle Rap

What brain scans of rap artists reveal about creativity—and what they do not

By Arne Dietrich

Even for the wilderness of human thinking, creative ideas seem to be deliberately designed to defy empirical enquiry. There is something elusive and mystical, perhaps even sacred, about them. So what is a neuroscientist to do if she wants to study inspiration in the lab, under tightly controlled conditions? Clearly, she cannot simply take volunteers, shove them into the nearest brain scanner and tell them: now, please be creative! That's why most paying members of the Society for Neuroscience find the prospect of studying creativity akin to trying to nail jelly to the wall. But don't forget: big, intractable problems in science have always been more of a calling.



Flow state

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 in *flagrante*: the infamous Alternative Uses Test. In hindsight, it is easy to see that having a test subject list as many alternative uses of a non object was never going to have a real-world validity. Think you should we really expect a testing that to imagine an alternative a safety pin to tell an Einstein from a certified public accountant? After a few decades of this kind of myopic research, the cul-de-sac we stumbled into is plain for everyone to see. While much ink has been spilled over creativity from social, psychological, and historical perspectives, filling shelves of books and articles, we know next to nothing about the mechanisms, cognitive or neural, that give rise to creativity.

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It is high time, then, that neuroscientists become more creative about creativity. A new paper by [Liu and his colleagues](#) is a welcome example of just that. It joins what is still a slow trickle of studies taking a fresh stab at creativity. In this case, the scientists picked freestyle rap as their “task,” a choice both cunning and clever. The entanglement of rap and neuroscience – however irrelevant to the study’s interesting results – strikes all the right chords for coverage in the tweet-sized attention span of modern news reporting. The next thing in tow, given the drift of things, is surely an MRI scan showing the brain activity of experts playing Fruit Ninja! One only hopes that in all the brouhaha about the hip-hop brain some relevant characteristics of this behavioral measure are not lost. Like free jazz improvisation, freestyle rap lends itself nicely to creative expression in the lab because it can be prompted – in this case by asking rappers to improvise rhymes and lyrical cadences to an 8-bar beat. What’s more, it can easily be contrasted with an appropriate control condition – a set of lyrics already committed to memory and performed to the same beat. The spontaneous generation of freestyle performance, a common genre of artistic expression, taps into a [flow state](#) and for this special state of consciousness we do seem to understand some of the underlying neurocognitive mechanism.

So what did we learn in this experiment? Quite a bit, as it happens. The key finding is the dissociation of two prefrontal areas during spontaneous composition of artistic content. The medial prefrontal cortex showed increased activity, and the dorsolateral prefrontal cortex – DLPFC for short – showed decreased activity. While the former has been in the news lately for its association with various aspects of social cognition – self-perception, self-knowledge, moral decisions, etc. – the DLPFC has long been known to mediate the so-called higher mental functions: executive attention, working memory, willed action and cognitive control.

Given that creativity is among the most extraordinary capacities of the human mind, one would think that our most highly prized piece of cortical real estate, the DLPFC, would need to run on all cylinders here. But this does not seem to be the case. Turns out, there is already a term for this phenomenon: [Transient hypofrontality](#). It refers to the temporary downregulation of hyper-analytical and metacognitive processes which – oftentimes needlessly – limit the solutions space in a creative endeavor. With these toned down, more remote associations can occur. Importantly, this new experiment confirms this hypothesis. In addition, it shows that the heightened activation in the medial prefrontal cortex is accompanied by similar increases in activation in language areas (around the lateral fissure), the amygdala and the cingulate motor cortex, all of which form a network in which freestyle artistic expression may unfold.

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