This is a transcript of The Conversation Weekly podcast ‘Creative flow: what's going on inside our brains when everything just clicks,’ published on June 6 2024.

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Gemma Ware: Have you ever experienced creative flow?

John Kounios: Yes sometimes while writing, there are times when I sit down to write something, and it's a struggle. You know, I put a sentence down, I put another sentence down, I don't like it, what's the next sentence, I don't know. And other times, if I'm just in the right, frame of mind, I can just sit down and write something that is virtually a final product without hardly stopping at all.

But yes I do occasionally experience flow. I'd like to experience a lot more of it. I think most people would.

Gemma: This is John Kounios. He's a professor of psychological and brain sciences at Drexel University in Philadelphia, in the US and he researches the neuroscience of creativity. Recently, he's been studying creative flow.

What's it feel like? How would you describe the feeling?

John: Flow has been described as effortless attention. It is effortless. Total focus and absorption on a task. It's pleasurable. There's no distraction. It's just the ideas just flow. You might experience it while gardening, while cooking, while conversing, while playing music, while writing, you may have had problems that you're trying to resolve, and then one time you just sit down and all the answers just come out.

Gemma: John is fascinated about what's actually going on in our brains when we experience creative flow. And he's been analysing the brains of jazz musicians to find out. So this week, we’re delving into the brain with him to reveal the secrets to creative flow.

I'm Gemma Ware and this is The Conversation Weekly, the world explained by experts.

Gemma: Hi Kate. Hi Kate

Kate: Hi Gemma
Gemma: Great to have you on the show. So Kate Kilpatrick, you’re the Philadelphia editor at The Conversation in the US, and you recently worked with John Kounios, who we’ve just been hearing from about some new research he’s just been doing on the way creative flow works in our brain. What about creative flow got you interested?

Kate: I think a lot of creative people have been fascinated by this idea of creative flow and how do we sort of maximise productivity and get out our most creative material and yeah, so I think just seeing something and I was like yeah, here’s this science-based look at how this works, or how we might achieve flow.

Gemma: And what led you to John?

Kate: Well as the Philadelphia editor I’m constantly looking for Philadelphia scholars, people who are doing research involving Philadelphians. So I found his piece because his research was working with 32 Philly-based jazz musicians.

Gemma: And Philadelphia, known for it’s jazz?

Kate: Philadelphia has always been known for its music, back since the days of the Philadelphia sound. I am not a jazz aficionado, but I do know Philly has always produced great music.

Gemma: Yeah, and for flow itself, have you ever experienced creative flow, I know you’re interested in it, but have you ever experienced it yourself?

Kate: Before working with John I would have said yes, absolutely. After understanding a little bit more about what’s required and sort of the level of expertise, I’m not sure. When I think about times I’ve been in creative flow, it’s typically either two things. So I think either when I’m like really deep in an edit, and two hours flies by and I’m just kind of running through and everything seems to be fitting in place. And then I dance a lot, I started dancing two years ago, like salsa partner dancing. And in class is when I’m focused on ok, is my wrist down, is my frame in place, are my hips moving in the right way, and then you get to the dance, you know like night-time, outdoor dance under the stars and you just let all that go. But then after reading his piece I’m like wow, I’m very new at dance so maybe what felt like flow is not actually flow because I definitely have not reached that level of expertise.

Gemma: Yeah but if it felt fun, that’s great.
Kate: Yeah I felt it. Whether it was happening in my brain or not, who knows. I felt it in my body.

Gemma: Well thanks very much Kate.

Kate: Absolutely, thank you.

Gemma: There are a lot of theories about how creative flow is generated in the brain. So I asked John, what the research actually tell us.

John: So there's been behavioral psychological research, about flow for 50 years or more than 50 years pioneered by the psychologist Mihály Csikszentmihályi, who popularized the term flow, but because that research focused almost entirely on overt behavior and people's introspections and their self reports, it didn't give a really clear understanding of what the mechanisms of flow are, the internal mechanisms. It gave a good description of what it feels like, gave a good description of when it tends to occur or for whom it tends to occur, but not a lot of insight into what's actually happening in the brain.

Gemma: The development of new brain imaging techniques in recent decades has allowed researchers to study how creative flow works in the brain.

John: But a lot of those studies have had methodological problems. They haven't really isolated the flow state.

Gemma: So John and his team designed a new experiment.

John: What we did is to actually have people report. Are you in a state of flow or not? And we use that to identify brain processes that are associated with flow.

Gemma: And to do this, they used jazz musicians.

Why jazz?

John: In recent years, jazz improvisation has become a favorite tool of researchers who are focused on creativity. And the reason is that in jazz improvisation, your production of ideas occurs in real time. You have to come up with new ideas constantly. You can record the musicians. You can quantify what they're doing moment by moment. And you can have experts rate the creativity of different improvisations. If you're a musician improvising jazz, you
can't go back and change what you just did. So you can study, literally, the flow of ideas in real time. One could do the same thing with, for example Indian classical music, which is again, improvisatory and it can be recorded, it can be analyzed. If we were in India, probably would have used Indian classical musicians.

At least one or two studies have looked at rap musicians who are improvising. You can do this with any, anything in which people improvise. And jazz was just a very good tool or vehicle for that.

Gemma: And you're in Philadelphia, so you asked a bunch of jazz guitarists from Philadelphia to come into your lab. What did you ask them to do?

John: The pitch of course, was to get them into the lab so that we could reveal to them and to ourselves what's going on in their brains when they actually improvise. And so we used musicians that had a range of experience. Some were highly experienced, real experts, people who'd been performing hundreds of performances over many decades. And we also had some musicians who were very good and had given some performances, but very few, they were relative novices.

What we asked them to do is to improvise two lead sheets that had chord sequences and a rhythm that we provided that was playing in the background. And they improvised to several of these, each musician, and we asked them to rate the degree of flow they experienced during each of these improvisations.

Gemma: The music you're hearing here is some of the recordings made during the experiments.

John: We recorded all of these improvisations, and then we had three expert judges, people who are teaching jazz at musical conservatories, expert teachers rate these recorded performances along various dimensions, but also including for creativity. And while the musicians were performing, we recorded their EEGs, their electroencephalograms, which give a record of the electrical activity of the brain moment by moment. And then we could isolate the performances during which there was high flow compared to performances during which there was low flow.

Gemma: After John's team of experts rated the musicians' performances, they found significant differences between the abilities of professional musicians and hobbyists. And there were also differences in how often they experienced creative flow.
John: The most experienced musicians, their creativity ratings of their performances were higher than the less experienced musicians, but also they reported being in a flow state more often than the less experienced musicians. So right there, that suggests that there's something about experience, something about expertise that allows one to get into a flow state. You can't just tackle some new task or a task that you're not very familiar with or not very expert in and immediately go into a flow state. It has to be something that you've already learned and practiced for quite some time to the point where, with the expert musicians, they just felt like they're just turning a faucet on and letting it all come out. Whereas the the more inexperienced musicians, they tend to think through it in a very deliberate way. Oh, now I'll try this. Oh, that didn't work very well. Now. I'll try that, ah that worked. I'll do more of that now. I have to switch to something else. Whereas the jazz musicians they're not thinking about it. It's just coming out.

Gemma: As a kind of amateur jazz saxophonist myself elapsed one, I should say. I totally get what you're saying that you really have to think about, Oh, there's this chord it's coming up. What am I going to do? Oh, that bit worked. What did you then learn when you went back and analyzed the brain scans of the musicians?

John: So one thing that jumped out was that the most experienced musicians had a network of brain areas in the left hemisphere that was associated with a high state of flow. And we did not see that in the less experienced musicians. So that suggested right there, that experience allowed the these high performing musicians, it led to the development of a specialized brain network for jazz improvisation. Specialized area that built up over many years of performing and practicing

Gemma: Scientists have identified specific functions performed by both the left and right sides of the brain, but it's not been very clear where creativity fits in. So the fact that this expert network John found was in the left side of the brain is important.

John: There is a a theory goes back to the 1990s. Elkhonon Goldberg, a neuropsychologist proposed this theory that the two hemispheres of the brain play different roles in cognition and in creativity. So when you're learning something new, the right hemisphere is primarily involved. When you become very practiced at it, then that skill shifts over to the left hemisphere.

These left hemisphere areas are areas that are known to be involved in hearing in motor control, things like that. So there are things that are at face value makes sense for someone who's playing the guitar. And listening to the rhythms,
listening to themselves, et cetera. So this is consistent with that theory, that kind of baked in creativity becomes automatic with a lot of practice. That's a left hemisphere capability.

The most experienced musicians. They have built up this network. They can produce high quality improvisations on demand.

**Gemma:** Neuroscientists have also distinguished a second type of creativity

**John:** Some researchers who study intelligence call this fluid intelligence, it's the ability to deal with novelty, with unfamiliarity. And according to Goldberg's idea. Yeah, that the right hemisphere seems to be more involved in fluid intelligence. So these less experienced musicians they're thinking it through. This is all new to them. They're not familiar with as many types of rhythms and chord sequences, they’re less practiced so they have to engage the right hemisphere.

**Gemma:** What was exciting about John's study was what his brain scans revealed about the level of control the musicians seemed to exerting when they experienced creative flow. Now, our ability to control our cognitive functions is mostly associated with a part of the brain called the prefrontal cortex, or the frontal lobes – it crosses over both hemispheres of the brain and it helps with things like planning and organizing of tasks, decision making, or identifying problems and figuring out solutions.

**John:** Our data supported another theory or hypothesis about flow, and that involves what's called transient hypofrontality. So there's a theory that was proposed about 20 years ago by a cognitive neuroscientist named Arne Dietrich, and he argued that flow involves a release of control, a release of cognitive control. And so our results fit this idea perfectly.

**Gemma:** So could you actually see in your brain scans that the more experienced musicians were letting go of control? Was there an area of the brain that kind of deactivated?

**John:** Yes. The frontal lobes of the brain or part of the frontal lobes of the brain the superior frontal gyri were deactivated when the expert musicians were in a high flow state. That was coupled with greater activity in this left hemisphere expert network. So with years of practice these experienced musicians have built up the specialized network of brain areas in the left hemisphere that allow them to just generate these musical ideas and perform them, but they have to release control in order to let that, brain network take over.
So you might think of this as analogous to say a world class tennis player who all of a sudden has a dry streak and is losing some games, making some mistakes. And there are two ways to go about this, right? So if that tennis player has a coach that says, OK, you're doing this wrong, you're making mistakes because maybe you have to lift your elbow a little more and maybe you've got to pay attention more to where your body's pointed and all that. That can lead to more problems because the person is exerting cognitive control. They're paying too much attention to what they're doing and they're choking because they're not letting their expertise take over. They're not letting this expert brain network take over.

What they should really be doing is just ignoring that. Don't pay too much attention to what they're doing and just, let the dry streak just run out. And it could just be random chance anyway and let their expertise take over and choking by paying too much attention to yourself and exerting too much control, micromanaging yourself. That is what blocks this flow network from taking over and generating ideas on demand.

**Gemma:** If we want to release control over our frontal lobes, and it’s not as easy as consciously flicking a switch to deactivate that region of our brain and get more creative.

**John:** If you simply tell people, Ok, now that was good, but now be more creative. They are for a little while and that you find this in many domains in music, in writing, in design, invention, in all kinds of things. However, expertise experience is really important to creativity.

**Gemma:** John did another study a few years ago, again with experienced and non-experienced musicians, to see what would happen if they were told to 'be more creative'.

**John:** And what we found was that for the least experienced musicians, when you tell them to be more creative, they produce musical improvisations that are rated to be of higher creativity. But if you tell that to the most experienced musicians, they get irritable. What do you mean be more creative? I'm always creative. What do you mean? They don't get any better. And in fact, some of them get even a little bit worse in their performances because they've been doing it for so long that the creativity it's baked in, it's automatic. Whereas the less experienced musicians who haven't been doing it for that long, they're still using cognitive control to perform.
So if you ask them to adjust what they're doing it's not a problem because they're controlling consciously what they're doing anyway. They just decide, okay, I'll do this a little bit different.

So it helps to tell people to be more creative, but that is for situations in which the person's not already an expert because you don't want them to micromanage themselves and choke.

**Gemma:** What purpose does creative flow then have? Are there any evolutionary kind of markers about why we might be able to achieve this state in something that we're an expert in?

**John:** So a former student of mine, who's now a professor at the Stanford graduate school of business, David Melnickoff has proposed that flow does have an evolutionary basis. And the idea is that flow is pleasurable. People love to be in a state of flow. They'll seek it out. And he argues flow is provides neural rewards.

It activates the reward system of the brain in order to encourage people or reward people for doing things in a that they're successful at. That are working well. So instead of, so called beating a dead horse by trying constantly to do things that one is not good at, you get rewarded for doing things that you are good at, that you've practiced and that is why people seek out flow.

And it makes sense. It doesn't explain necessarily why people will work hard to practice at something and become an expert at it in the beginning, because in the beginning, it's very tedious to acquire that expertise. Learning to play a musical instrument at a high level takes years and lots of practice. But once you're good at something, you want to do it more and more because it just feels good.

**Gemma:** And other than those years and years of practice, are there any other ways people try successfully to reach a state of creative flow?

**John:** If our results are pointing us in the right direction, and if you need both the expertise and the release of conscious control, then flow is not something you can just turn on. You have to have that expertise. You have to put in the work initially, but then once you put in the work, you have to do things to release cognitive control. Some musicians may use alcohol. They may use drugs in order to release cognitive control. I'm not recommending that for anyone and it shouldn't be necessary to do that.
There are plenty of informal techniques. I'm not aware of any scientifically validated techniques for doing this, although I don't see why they couldn't be developed. But sure anything that will get you to, once you've achieved expertise, to not focus so much on what you're doing and to just let your expertise take over, that should work. Don't overthink it. Just do it. Just let go.

**Gemma:** Great. Thank you so much, John. It's been fascinating talking with you. It makes me want to go practice my saxophone. So maybe I'll get it out this evening.

**John:** Good idea. Thank you very much.

**Gemma Ware:** That’s it for this week's episode. We'll put a link in our shows to a story John wrote for us on The Conversation about his new study.

This episode was written and produced by by Mend Mariwany with assistance from Katie Flood. Sound design was by Eloise Stevens, and our theme music is by Neeta Sarl. Stephen Khan is our global executive editor and Soraya Nandy does our transcripts. I'm Gemma Ware the executive producer.

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