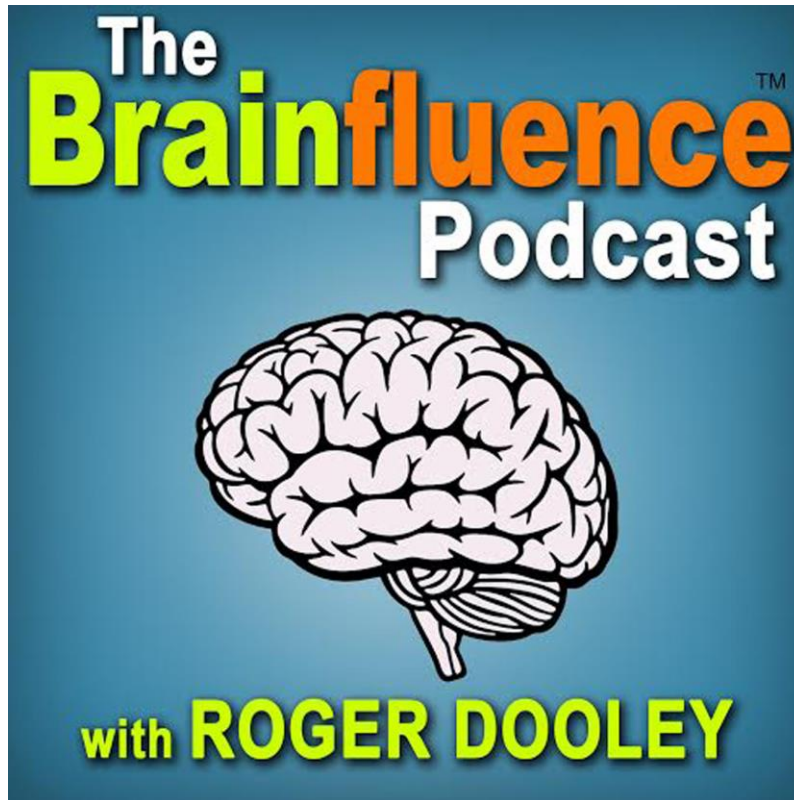


Ep #141: Your Distracted Mind with Dr. Adam
Gazzaley



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Roger Dooley

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Welcome to the Brainfluence Podcast with Roger Dooley, author, speaker and educator on neuromarketing and the psychology of persuasion. Every week, we talk with thought leaders that will help you improve your influence with factual evidence and concrete research. Introducing your host, Roger Dooley.

Roger: Welcome to The Brainfluence Podcast, I'm Roger Dooley. This is the second podcast I'm recording today on the fifth anniversary of ... Brainfluence. One thing I really enjoy is getting feedback from readers who are applying one or more of the hundred simple strategies I describe in the book. If you've read Brainfluence and have found a particular technique that worked for you feel free to ping me on Twitter and let me know or visit RogerDooley.com and let me know via that channel. If by some chance you haven't read the book or if you didn't know that the name of this podcast came from by book title I encourage you to check it out at Amazon, Barnes & Noble, or the bookstore of your choice.

We're well into the third year of The Brainfluence Podcast now. One of the most enjoyable things about it is connecting with smart people. In particular, it's fun to finally get to speak firsthand with people whose work you've written about, but know only via their name, on scientific papers, or books. Our guest this week, Adam Gazzaley, falls into that category. It's hard not to follow the practical aspects of neuroscience research without encountering his work. Dr. Gazzaley is the Founding Director of the Neuroscience Imaging Center at the University of California, San Francisco and Associate Professor in Neurology, Physiology, and Psychiatry and Director of the eponymous Gazzaley Lab, I really wanted to use the word eponymous in a podcast, a cognitive neuroscience lab that

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studies neuromechanisms of perception, attention, and memory.

Not just that, but he's co-founded a therapeutic videogame company and a venture capital firm focused on the scientific approach to improving human performance. He's authored more than 100 scientific papers. Now he's co-authored a book for the rest of us about a really important topic. The book is *The Distracted Mind: Ancient Brains In a High-Tech World*. Among other things you learn why you open the refrigerator door, stare inside, and can't remember for the life of you what you were looking for in the first place. Adam, welcome to the show.

Adam: Thank you, it's great to be here.

Roger: Before we get to your book which is really great, I'm sure listeners would enjoy hearing about your business ventures which are really unconventional and fascinating. I've always felt that videogames could be an amazing tool if harnessed for some productive purpose. A game like *Call of Duty* requires a lot of learning even for a very average player, but players don't think of it as learning. It's fun, it's a flow state and I'm guessing that AK47s and RPGs really don't figure much in your Akili games, but can you explain what they might be like and what you hope to accomplish.

Adam: Yeah, sure. Akili Interactive is a company that essentially spun out of technology from my lab, Gazzaley Lab at UCSF, which has now expanded into a center called Neuroscape. The idea behind it which drove the birth of Akili and as well as most of the research and technical development that we do here at Neuroscape is the idea that you can create an experience, a targeted experience, to engage someone's brain in a very selective way through network activation.

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Then through a closed-loop system, and I'll describe that in a little bit more detail, you can put pressure on that network and that operation and that system in someone's brain to improve it over time. The closed-loop system that really forms the basis of all of our development is to challenge someone in a very targeted way, as I mentioned, and record the data of what their experience has generated like, for example, how fast they are, how accurate they are. Then use that data essentially in real time to update the challenge that they're experiencing as well as the feedback on how they're doing.

This closed-loop videogame design formed the basis of the first videogame that we built here at UCSF called NeuroRacer which went on to become a Nature paper ... on the cover of Nature in 2013. Then the technology that led to the launching and the founding of Akili where they've taken the methodology which is in the form of a patent behind NeuroRacer and have now developed a way better game from a game point of view, but even better closed-loop dynamics, more usability, better art, music, and story, all of which we think are critical features.

That game is now called EVO, Project: EVO, is now in multiple, clinical trials to see if it can reach the regulatory levels and approval that's necessary to have it as a prescribable, therapeutic device, with the first target at the FDA level being the treatment of ADHD. That's a little bit about how our research at Neuroscape relates with a company that really grew out of our technology, Akili.

Roger: Have you thought about doing it as a consumer-facing thing? There are all these brain-training companies out there now that may or may not be based on really solid science. Rather than going the FDA route do you think there's an inexpensive, consumer-facing solution for various things, maybe not even

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just ADHD, but other types of ways that people could improve their thought processes without necessarily it being a prescription thing?

Adam: Sure, I think that every type of population that might benefit from this type of experiential treatment should. I think there's the pathway of educational tools either in class or out of class for young people, I think for adults that are healthy as wellness tools to either maintain or improve abilities that might need optimization. Then there is the goals of helping people that are suffering debilitating deficits where you could think of it as a medicine. I expect that in the future we'll have well-validated solutions using videogames across all of these different verticals, but Akili, every company has its own focus as all startups need to.

The real necessity to get physicians onboard with other types of treatments aside from pharmaceuticals, which have dominated the world of neurology and psychiatry, we think is really critical. To have a future where a physician would reach into their pocket and pull out a prescription pad and write iPad for one month and have that reimbursed to ... and have a parallel whether it's complimentary or independent of our current incumbent situation where we rely on drugs is an incredible opportunity. Akili at least decided to be focused on that route, but I don't think it's the only route possible.

Roger: Great, let's move onto your book. I think its title Distracted will resonate with our listeners. All of us have to deal with constant visual and audible notifications. I just heard one on your end there that are constantly telling our brain, boy, this might be important, pay attention or it might be fun. Then we have app designers that are really good at creating addictive feedback

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loops. Your basic thesis is that our brains aren't designed to cope with this, correct?

Adam: Essentially it comes down to understanding the strengths and weaknesses of our brain and then figuring out and understanding where technology has inserted itself. As I describe in the book we have this amazing ability as humans to create high-level goals, goals that are delayed in time that are interwoven with multiple people and multiple other goals. In many ways I think our goal-setting abilities are the pinnacle of human brain evolution.

We then realized and lots of neuroscience researchers contributed to this including from our own lab, that we have fundamental limitations on the abilities that we need in order to enact our goals, what we call cognitive control, attention and working memory and ability to multitask. These limitations collide and basically present barriers to our goals. I would say that we have this very basic conflict between what we want to do, how we set our goals, and what we're actually capable of doing, how we enact them.

That's where I would say technology has inserted itself. It's not that this conflict hasn't always existed, but I would say technology has exasperated it by just an unprecedented exposure to information. Not just exposure to information and accessibility to information, but the fact that our devices can ping us when they want to share and not just the other way around.

That has really, really challenged us and created this concept that I described as

the distracted mind which then propagates a negative influence across pretty much every domain of our lives. It impacts

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education, it impacts us in the workplace, it impacts sleep and health, safety on the road, as well as relationships of how we engage with other people. That's one of the main theses of the book, that technology has aggravated this conflict between our goal-setting abilities and our very limited goal-enactment abilities.

Roger: Right, and you call that goal interference and there's two kinds, internal and external. Now can you explain that dichotomy .

Adam: Sure, so we can have distractions and the act of multitasking both of which degrade performance, well-described, either in our external world which we're very familiar with, sitting in a restaurant trying to deal with all the chatter or having a text vibrate in your pocket when you're driving along the road, we get that. We also have this entire phenomena playing out within our own minds, internal interference, internal distractions, just urges and feelings and thoughts that without our intentions rise into our minds and create distractions with what we're trying to do.

Then we also make the decision to internally multitask, think about something else while engaging in another goal. Understanding the full landscape of interference is really critical when it comes to managing it. For example, studies have shown that both young people studying as well as office workers in the workplace will interrupt activities, be interrupted by a task every three to five minutes at the most before engaging in something else and maybe not returning to it even for quite a while. It seems that those interruptions occur just as frequently from internal sources as being externally pinged by a device.

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Roger: Right, so that fruitless trip to the refrigerator, that would probably be an internal interruption of some kind where you knew you had to go there to get the mustard or something, but in the meantime you were thinking about the email that you had to send. You get to the door and you stare inside and you're scratching your head, yeah, I knew I needed something. You're looking around the kitchen, what was I working on? Although sometimes I've found that I stare into the refrigerator because I think that if I stare long enough something actually really good to eat will materialize. It really is effective though. That would be an internal interference where just your mind is going in various directions and you lose track of one task because you're thinking about another one.

Adam: I'd say it's most likely to be internal. It doesn't have to ... You described what I would describe as internal interruption which is you're multitasking. You're like I'm going to go do this, but I'm also going to ... I'm thinking about something else purposefully. Sometimes it's just an internal distraction, something just pops into your mind even though you didn't have the intentions of it or it could be external. You could have felt a text come in on your way over there or there could be something laying on the table that just happened to catch your eye on the way there.

These are very interwoven, how interference across both our external and internal world degrade our performance and create goal interference, so it's complex. I'd say once you start noticing and really break down and show in a categorical framework how all these different types of interference come together and play off of each other and once you wrap your head around it you start seeing them everywhere. It just becomes a little bit easier to understand how you might be pulled and pushed in ways that you didn't actually want to be.

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Roger: You talk about multitasking, Adam. Is it always bad? I know I find I tend to multitask when say I'm watching a not very demanding TV show. I really don't feel I need 100% of my attention to keep up with what's going on and it's not particularly life and death anyway if I miss something, so I'll read a magazine or check my email or play a game on my iPad. It seems to work in that situation without any negative consequences, but am I training my brain to behave badly when I do that?

Adam: I would say that I agree with you and I describe it very much the same way. We don't know the long-term consequences of engaging in multitasking behavior even when you're not doing things that are critical. It's possible that it puts you into a type of cognitive style that makes you more distractible in general and certainly data that ... correlational data, not causal data, that suggests that might be true.

Putting that aside for now I would say in general multitasking is a choice that you make based on an informed decision about how you interact with the world either in an optimal and suboptimal way and what your goals are. If your goals are to produce something that's very high-quality, that really represents you, that has a timestamp on it that it needs to be accomplished by then I would suggest that the data would indicate that the way you accomplish that is to do one thing at a time. That high levels of multitasking will degrade your performance and possibly make you miss your deadline.

Then other times when they are very low level activities most people find multitasking more fun because of its higher novelty load. It has a greater drive of the reward system and so it might be the only way you can get through a set of boring tasks is to multitask them. I don't see anything necessarily wrong with that,

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so I agree with you, I think it comes down to making the decision, but that's the part that many people are challenged by is this act of taking control over how they use technology based on this information.

You might understand it and wrap your head around that texting and driving or

doing email when you're on a conference call is going to degrade the performance that you really want to bring to the table, but you do it anyway. That's where you really need to bring a set of rules and behaviors and strategies onboard, so that you can actually enact that plan of interacting with your technology in a healthier way.

Roger: It makes a huge amount of sense. I know that ... Perhaps you haven't had a morning like that, but your goal that you set for the morning is to write a certain amount or write about a particular topic and complete that task. You get to the end of the morning and you've made little progress because of everything else that was happening whether your own mind fired off and said, boy, I ought to check this thing or you had external interruptions and so on.

Adam, you talk about internal distractions. There are a lot of people who say meditation increases your focus and helps you screen out distracting thoughts. I know my fellow podcaster, Tim Ferriss, is a big advocate of meditation and he uses the term 'monkey brain'. He says that meditation helps quiet his 'monkey brain'. Do you agree with the value of meditation and is there any science on this?

Adam: Yeah, there's great science and Tim is a buddy of mine, we've talked about this a lot. There is a lot of relatively recent evidence considering it is an ancient practice of mindfulness,

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speaking very broadly about that whole category. There's lots of different types of meditation practices. The data would suggest that it can have a benefit on our attention abilities themselves, but also mood and stress.

A lot of those studies are difficult to interpret either because they're done on expert meditators where there might be a lot of factors that could result in this type of finding aside from just the meditation itself. Then it's often difficult to do very well-controlled, placebo-controlled studies when the intervention is something as complex as a meditation retreat let's say. I would say that there's certainly a strong signal out there from the convergence of a lot of findings that seem to show similar type of effects. I'm very intrigued by it.

We actually have a video game or more of an app that we created that uses our closed-loop system to challenge internal focus and the regulation of internal distraction called Meditrain. We just completed a study of 20-year-olds using that app on a six-week training program and now we're beginning a study of older adults. Because of a videogame format of delivery of the meditative-type of practices we can do a very nicely, placebo-controlled design. We're waiting to still finish analyzing that data, but we're already getting some encouraging results. I do think that the practice as we advance in terms of our empirical evidence related to it it's going to really show that it is essentially an attention exercise and it can be used to build these skills that can help the distracted mind.

Roger: Excellent. That's something to look forward to. I'm really excited to see those results when they come out. Somebody who I think you would probably agree with, Adam, is Martin Lindstrom, the branding expert. His last book was Small Data and its thesis was that brands could achieve great insights for

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new products and new strategies by focusing on what seemed to be really insignificant details in the environment or in their customers' homes. He says that we really need to be keen observers and always be engaged with the environment.

The reason I think you'd agree with him is because he basically observes people and find if they have even 20 seconds of downtime they don't engage with the environment. They pull out their smartphone to check Facebook or Instagram or something and he ended up ... or so he claims, at least, getting rid of his smartphone just so that he wouldn't have that distraction. I suppose that would probably be a good thing for all of us, but the odds of it happening are slim to none.

Adam: Yeah, I would respond to that in two ways. First of all, it's not just I would say being a keen observer of our environment although I appreciate that comment. I think it's certainly true. I think that that's not the only thing that we suffer when every time there's a moment of freedom we resort to our devices. I also think that we need to be more keen observers of our minds, of our internal environment. The act of just having that quiet moment data would suggest is also an area where creativity lives.

We don't only rob ourselves the potential to see things around us that are important and can change our perspective, but also just to think and to explore our inner worlds. That phenomena of always needing to be in our information technology sources does present a great challenge to us in lots of ways. That's a ton of what we talk about in the book. The forces that drive us to that are complex and we also break that down in The Distracted Mind.

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I think that most people if they think about and do a little introspection would find that some of it is just driven by a complete intolerance to boredom, the act of just not being stimulated every moment, I think, is a real powerful driving force. It doesn't allow us to just wait on that line at the grocery store and just be quiet. Then there's also the source of influence from anxiety, that fear of missing out. What is going on that I'm not aware of? Who's doing what? I think social media also plays a role in exacerbating that. These are very powerful, primal forces that really could drive our behavior without our awareness, but prevent us from these moments that I agree are evaporating.

Roger: Yeah, probably some social forces, too, because I think there's a feeling that if you're simply standing there that that's awkward, that if people see you they'll think that you're a loser. I'm sure that you've been to networking events and they have conferences where a third of the people rather than talking to other people are hunched over their smartphones. I'm sure that a few of them really are transacting important business, but probably the vast majority don't just want to stand there looking awkward. This way they can appear to be socially connected with somebody at least.

Adam: Yeah, I think that that is probably also related to anxiety, maybe not the fear of missing out, but another aspect of social anxiety. I would say that that problem's not likely to go away especially as young people are maybe even losing or impairing their skills of face-to-face communication which makes that even a more likely scenario that people will be more comfortable texting across the room rather than walking up and having a conversation with someone face-to-face. Yeah, these are incredibly complex issues that we face and they're multilayered.

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That's what I'm really interested in, trying to dissect it, so that we can remedy it.

Roger: In another part of the book, Adam, you talk about Alvin Toffler's waves and right now we're in the fourth wave, the information age. Even more specifically we're in a fifth sub-wave which is the smartphone wave. Do you think that we might be on the cusp of a whole new wave rather than just another mini-wave? Why is that and what do you think is going to happen?

Adam: I think that we are now connecting with our biology in a way that we haven't before. We think of our current wave as really in many ways an IT wave, it's about information. We're in the information age and each of these advances from computers to the Internet to the mobile phones to social media have really been layering on ways that we get to communicate which is just another form of exchanging information. It's not only communication that's used, it's also other forms of information.

Now we're entering an age of biology and modifying biology whether it be at the genetic level or implantables, electronic, electrical types of stimulation that, I think, will change us and merge in a very complex way with all of our information technologies that continue to evolve. Things like virtual reality and augmented reality I would say are yet another wavelet in that information age. As we bring our biology in and learn more from the basic sciences on how we could change ourselves I would say that that would essentially be yet another wave.

Roger: Folks like Ray Kurzweil have suggested that we'll at some point have digital interfaces for our brains that may be able to download information or somehow add additional processing power. It seems like complete science fiction now, but you're pretty close to this. What do you think of the prospects for that kind of thing?

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Adam: It's going to be a challenge. Our brains are still in many ways almost infinitely complex to those of us that study it. It's humbling every single day and to have interfaces that really offload memory like that I don't think is going to happen in the immediate future, I really don't. Not to say that it won't happen because we've seen how much has been accomplished already with our devices. I think it will eventually be part of our future. I'm more interested less on the far distant predictions, but more on what can be done now in a noninvasive way to use technology to improve the human condition itself.

That's much more interesting to me. How do we take all of these tools that are emerging in the consumer space like virtual reality, augmented reality, artificial intelligence, wearable physiological devices, motion capture to not offload things that humans do, but just make us better to improve our function, to improve our happiness, to improve our mindfulness. I think there's so much potential there that has not yet been realized to take technology and leverage it for that goal. That's going to, I think, have a bigger impact in the shorter term on us.

Roger: Is there any chance that technology has the power to save us? What I mean by that is we're seeing really rampant advances in artificial intelligence. If we could get Alexa or Siri or the assistant of your choice to turn into a really good filter and showing us what we need, screening out the distractions, keeping us on task, do you think that's a potential or is that a pipedream, too?

Adam: No, I think it's potential. I think that we'd get to that sooner than we do to implantable memory devices, but it's been a thorny problem. Most executives that I know still are the first passive filtering through their emails, myself included, and it's a chore and it's not getting any easier. I have Alexa/Echo at home and

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Siri and I love all the new technologies of AI and especially voice interface, but they're not very smart now as we all know. It would be great to have that type of technical assistance. It's not my area of expertise. I don't know how soon out that we're going to start seeing tools that are really useable that help us manage in a game-changing way, but I sure hope it happens.

Roger: Yeah, me, too. A couple of days ago I spoke to Tim Harford. He's an economist whose latest book is *Messy* and the core message of that book is I wouldn't say diametrically opposed to yours. I think that you and Tim would probably agree on most things. He makes a point that neat and tidy, either physically or digitally, isn't always good. That distractions can sometimes be productive. I think you'd probably allow for that, but he also talks about multitasking and he is a big proponent of sequential multitasking. When you're stuck on one task you switch to another task and let background, if you will, to use the computer term, work on the first problem.

I'm curious as to what your take on that strategy is because obviously very rampant multitasking, you make the point in your book, is a bad thing and that you can't really focus if you're switching constantly. He's advocating more a slower process of multitasking sequentially where you switch from one task to another and focus on that for a while. Is there any science behind the fact that our brains can actually work on problems, invent things and so on, unconsciously or in background while we're thinking about other stuff?

Adam: There's a lot in that. Let me try to unpack it a little bit. I always put distraction and multitasking in two separate categories of interference. Distraction is what we try to ignore and it might get through anyway and multitasking is when we make the decision to engage on more than one thing. In terms of distractions they

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often degrade performance, they create interference with our goals and it's well-described, but it doesn't mean that good things can't happen from them.

I've had these debates with others and I think that it's completely appropriate that if your filter is too good and on all the time you might miss opportunities to be inspired by things that were not within your goals, that are unexpected. Like everything in life, of yin yang, this is one of them. You don't want to walk through life just with goal-directed blinders on and not being able to see in the periphery at all. Yes, I agree that other unexpected influences can have a benefit.

To carry that discussion over to multitasking again it goes back to that idea that multitasking is not always a bad thing. If you are stuck on something I think there is evidence out there although I'd have to look through my literature to come up with the paper reference that there is some degree of subliminal type of problem-solving that can occur. Sometimes the tip of the tongue syndrome has been described from this perspective of it's best to just wait for it to appear without effort.

I would say that if you are constantly jumping between tasks, even if it was methodical and slow, you may be robbing yourself of the type of performance that can only be achieved with sustained attention on one area. I would push back and say yes, that is probably ... It seems to be an appropriate strategy sometimes, but sometimes I would say that being in one zone and if you are stuck it might be better to just take a break. Do a little light exercise, take a walk, expose yourself to nature, do something in the mindfulness practice domain and then come back to it as opposed to interrupting with another completely different information stream.

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I would argue and, I don't know, this is really where I push my boundaries of what I know from the literature in terms of a head-to-head comparison between those approaches, so maybe it's my own intuition there and I don't want to oversell it. I think it's an interesting discussion about when it makes sense to not switch, but just to take a good old-fashioned break, a non-tech information break and then return.

Roger: Great. Let me ask you one last question here. One of your projects that our

listeners may not have heard of is one that you worked on involving rhythm and the brain. What's that all about?

Adam: Yeah, we have eight new games at Neuroscape that we've been working on for the last several years that focus across a whole bunch of different domains that we want to optimize. I already mentioned NeuroRacer which became EVO, which is one big publication in that domain. We have the meditation game called Meditrain. We have a physical fitness meets cognitive fitness game called Body Brain Trainer and then we have a game called Rhythmicity. Rhythmicity is a game that we developed really inspired by my friendship with Mickey Hart who's the drummer from The Grateful Dead as well as another musician, Rob Garza, from the band Thievery Corporation who's contributed music and rhythms to the game that we created, Rhythmicity.

The hypothesis here is that the act of becoming more rhythmic will have benefits on your brain in the more general domains of cognitive control that we've been talking about like attention and working memory and task switching. The reason why is because our brains rely upon high-precision in terms of timing and this active anticipating an event that has not yet occurred.

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These are two critical features of what rhythm is all about. We think that a lot of the more anecdotal or less longitudinal studies in the music therapy domain may be showing some signs of improvement in cognition because of these very features of rhythm.

We've created a game that adaptively in our closed-loop system, as all our games are, pushes you to more and more challenging, rhythmic interactions both in the rudiments and the complexity of the rhythms themselves, the tempo, whether it's audiovisual or both sensory modalities integrated, how much time you have to anticipate. As you get better and more rhythmic the game is constantly pushing you.

Then as we do with all of our games we take it into a study that we're just launching now to see what does the act of becoming more rhythmic on a game mean in terms of how your brain functions. We'll look at MRI and EG to look at actual neural structure and neural function. We'll look at cognitive performance in various other domains that were not part of the rhythm-training game to see how the act of becoming more rhythmic transfers to other cognitive skills.

Roger: Great, I am definitely rhythm-challenged, so that sounds like one for me when it's released.

Adam: Yeah, ... makes you a better dancer that's still an open-ended question.

Roger: It would take a really powerful program for that to happen, but we can hope. Let me remind everyone that we're speaking with Adam Gazzaley, neuroscientist and co-author of the new book, *The Distracted Mind: Ancient Brains In a High-Tech World*. Adam, what's your preferred way for people to find you online?

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Adam: Sure, so I'm on social media. I'm on Facebook under my name. I'm on a Twitter under AdamGazz, A-d-a-m-G-a-z-z and we have a new website launched just now for our new center at UCSF called Neuroscape.UCSF.edu and that will be a way that you can keep informed on our latest research, our latest technologies. We have a mailing list and we post talks and papers and everything on that website.

Roger: Great, we'll link there, we'll link to Adam's new book and to any other resources we mentioned in the course of our conversation on the show notes page at RogerDooley.com/podcast. We'll have a text version of our conversation there in PDF format, too. It's a great way to refer back to something interesting you heard and a lot easier than trying to fast forward through the audio. Adam, thanks so much for being on this show. Your book really raises an important issue and offers at least a ray of hope for us humans.

Adam: Great, it's been fun talking with you.

Thank you for joining me for this episode of the Brainfluence Podcast. To continue the discussion and to find your own path to brainy success, please visit us at RogerDooley.com.