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Real-Time Dialogue with Dreamers: An Exploration of Communication During REM Sleep

Dr. Wilner:

You're listening to *NeuroFrontiers* on ReachMD. I'm Dr. Andrew Wilner. And if you want to hear about a literal dream job, then you've come to the right place. With me today is Dr. Ken Paller, Professor of Psychology and James Padilla Chair in Arts and Sciences at Northwestern University. He's also Northwestern University's Director of the Cognitive Neuroscience program, and the training program in the Neuroscience of Human Cognition, who recently led a team of researchers communicate with people during their lucid dreams. Well, Dr. Paller, I'm really excited to have the chance to talk to you about this research. So thanks so much for being here today.

Dr. Paller:

I'm glad to talk with you too.

Dr. Wilner:

Now, before we dive into your research Dr. Paller, let's do some level setting for our audience. Can you tell us what lucid dreaming is? And if someone could be trained to lucid dream?

Dr. Paller:

A lucid dream is when you have a dream, and at the time of the dream, you realize that it is a dream. You realize that you're not awake. And that's something that happens to people sometimes spontaneously, perhaps when they have a nightmare, and then they realize it's just a nightmare. And they perhaps wake up right away. But if you have a lucid dream, you might also remain in the dream for a while, and then explore that, unique experience. In fact, sometimes even decide how you want it to go, rather than just have it follow its own course. And you asked, can you, increase the likelihood of having a lucid dream? And the answer is, yes, there are a lot of people that have been looking for methods to help people have lucid dreams, because many people that experience these dreams, enjoy them, and they want to have more of them. But none of the methods are perfect. They all take some effort. And it can take some patience to actually have a lucid dream. So in my lab, we've been working on methods to make them happen more often, because in order to study them, we need to have them happen more often.

Dr. Wilner:

Now, I can definitely think of some dreams that I've had that I was ready for them to end. But there are others that I wish had lasted a little longer. So, hypothetically, if I wanted to get trained, what are the kinds of things you do in your lab?

Dr. Paller:

Well, one of the standard methods is what's called a reality check. And that simply means to observe your present experience and decide whether it's a dream, or a waking experience. And if you get into the habit of doing that, you can perhaps have it happen while you're in a dream. So the standard dream is one where you don't ask yourself that question, you don't even entertain the possibility that you're dreaming. Most dreams, you just think it's a normal experience, and you go with whatever happens. So this habit of checking to see if it's actually a dream is one of the key methods. We do more than that in my lab, though. We also have people practice making that check with a particular sound cue that we play to them, at the moment they're doing that check. And then that sound cue becomes associated with or conditioned with doing the check. And then when they are in REM sleep, we can play that same sound to them quite softly, so it doesn't wake them up, but it can enter into their dream experience and then propel them into a lucid dream.

Dr. Wilner:

For those just tuning in, you're listening to *NeuroFrontiers* on ReachMD. I'm Dr. Andrew Wilner. And I'm speaking with Dr. Ken Paller about his research in two-way communication with lucid dreamers.

Okay, well, Dr. Paller, so tell me about the trial that you reported. How did you set it up? What did you ask, and what did you learn?

Dr. Paller:

Well, as we've been discussing, we've been using methods where we present sounds to people while they're asleep to try to study and understand the memory processing that's a normal aspect of sleep. In these new studies, we switch to studying people while they're in REM sleep and trying to learn more about the processing of the brain that's happening at that point in time. And one of the shortcomings of studying dream reports that people give when they wake up is that they're happening sometime after the dream actually happened. In fact, we don't necessarily know how many moments later, or minutes later, the dream happened. And we also suspect that people aren't remembering everything, that we forget a lot of what happens in our dreams. And we maybe don't recall it all correctly when we do recall some. So we wanted to add to the methods of understanding this interesting processing that humans have been doing.

And the new method we explored in this study was to try to find out about, is there a way to find out about people's dreams at the time they're dreaming, rather than only waiting for them to wake up? And so to do this, we explored this idea of two-way communication, where we can ask a question to someone who's in a dream, and they can give an answer. And this is work that we did together with three other laboratories, in Europe: one in the Netherlands, one in France, and one in Germany. And all of us did similar types of studies, where we interrogated people to find out if they could understand our questions and give us answers. And to verify that this was working, we wanted to ask them questions where we knew what the correct answer was. And then we could evaluate, did they understand the question and give us an answer that made sense? Now, in the future, we want to ask them questions about their dreams, find out, you know, what's happening in their dream at that moment.

But for now, we started, with simpler questions, such as asking them to do a simple math computation of addition or subtraction. And so we asked these math problems and had them answer. And so there's two parts of that, asking the question; we can do that by speaking very softly, or actually having a recorded voice from the computer present the question very softly, or we can do it with lights, or tactile stimulation. So various methods to get the information in.

To get an answer out, people can't just speak back, because in REM sleep, most of your body is essentially paralyzed, there's muscle atonia. So you can't just use your mouth to speak in the normal way. So instead of that, what we used is a number of other methods, in particular eye movements. Because that's one of the exceptions, is when you move your eyes in your

sleep, your actual eyes move as well. So you might be dreaming, and walking around and looking at things. And if you look to the right and look to the left, we can actually record your eyes as you're sleeping, move to the right and the left. You can even see them if you're looking with a camera, for example, but what we do is put electrodes on the face and we can record the electrical activity that's produced whenever your eyes move. And in this way, people can answer our questions with a series of eyes movements. And they were told in advance, listen, if you have a lucid dream, and you understand that it's a dream, move your eyes left, right, left, right, all the way to the left all the way to the right, twice. And that was a signal where they were expressing that they were in a lucid dream at the time, and then they were ready for the questions, we're going to ask, for example, simple math questions like, what's eight minus six? And they could answer that with the signal for two, which was doing the left right movement twice. So they would, you know, one would be moving left, right, once two would be doing a twice, three, three times they knew the code they were going to use to express the numbers to answer these math problems. And we found that, although often we got no response at all, sometimes, and repeatedly in our lab and in the European labs, we would get the correct answer to the question. Enough to convince us that people were hearing the question, doing the mental computation, and then expressing the answer to the math problem, so we could show that it happened repeatedly in our different laboratories with this similar sorts of procedures.

Dr. Wilner:

So I think that demonstrates that there is this gradation between being awake and engaging with your environment, and being asleep, where you're not engaging. But it seems like there is a gray area here where you can be asleep, because you documented that right, while they were moving their eyes back and forth? You know, based on their brainwaves, that they were technically asleep. And yet they were able to interact with you is that correct?

Dr. Paller:

Yes, that's certainly an important part. Because if they weren't quite asleep, that would be a different thing altogether. So we verify that people are in this stage of sleep called REM sleep, where there's a certain type of brain activity that's a lot like waking activity. And there's also this muscle atonia. So we can see the electromyogram showing a very small signal, as the muscles are mostly inhibited. So we see these signs of REM sleep. And we can see, of course, the course of all the different sleep stages that they progress from before entering REM sleep. So yes, we verify that people are in REM sleep when we ask them these questions and when they produce the answer. And then sometime after that, they will wake up, or we will wake them up, and then we'll ask them for a report about the dreams. So, an interesting phenomenon is, we often get them to report, "Oh, yes, I remember you asked me what eight minus six was, and I

answered with my eye signals the answer to," but not always. So sometimes they don't remember all the questions they answered. They, in fact, forget part of the dream by the time they wake up if enough time has passed.

Dr. Wilner:

Now, did everybody pretty much respond similarly? Or were there some people who never got it right? And then if there was somebody who got it right, did they always get it right? Or were they inconsistent as well? Was it, because this is pretty new research, you didn't really know how your subjects were going to do?

Dr. Paller:

Yes, when we started it, we didn't know whether we would be able to have communication because we thought perhaps the sounds would get in and usually wake people up. Or if they didn't wake people up, maybe they would misunderstand the question and then not be able to answer or have difficulty as various reasons. So yes, this was a tricky kind of phenomenon. So, it often did not work. For example, someone could come to the laboratory, and not be able to fall asleep. So that's the first step. If they fall asleep, they have to stay asleep long enough to actually enter the REM stage of sleep. That didn't always happen either. And then, when we present the sounds, we have to be sure we don't wake them up. So we're pretty good at that, because we know how to monitor the brain activity and be sure that we're not playing the sounds too loudly so that we can avoid waking people up. But often, even if we succeeded in presenting the sounds without waking people up, we might not get a response. And we're still trying to understand that it could be that sometimes they're preoccupied by whatever they're dreaming about, and not attending to the sensory channel sufficiently to get the information in.

But interestingly, if we did get an answer, we very seldom got the wrong answer. You know, they didn't hear a different math problem or miscompute the answer and give us the wrong answer. So that really suggests that well, when the information gets in, it's part of their dream and they can respond to it. And it's quite interesting that it was a different part of their dream. For example, some people heard the sound just coming like from the ceiling, entering whatever dream environment they were in. Whereas other people, kind of the sound would get incorporated into something in their environment. For example, one person was in a car, and they heard the voice as if it was coming out of the car radio.

So there are different ways that the information we're presenting can get incorporated into the dream. And that seems to be sort of a critical feature for them to actually then be able to answer. The information does have to enter their dream experience. And that's not a sure thing. That's only happening sometimes. And so it will require more work on our part to understand well, what are the circumstances when that information is more likely to get in.

Dr. Wilner:

Well, before we close, Dr. Paller, you know, given that you've gotten this far, and you have been able to establish communication with lucid dreamers, at least sometimes, what's next?

Dr. Paller:

Well, there are lots of questions that are easier to ask now. Even the lucid dreaming phenomenon was difficult to study because it happened too infrequently to make studies in the laboratory feasible. There were studies, but without very many subjects, without very many examples. So I think in the future, there'll be much more research on lucid dreaming, and we can try to understand it better, and understand how it's different from non-lucid dreaming, the normal types of dreams that we have.

And there's a lot of questions about dreaming that still need to be answered about how the dream experience influences your brain activity at the time of the dream. And also how any aspects of dreaming influence what happens when you wake up the next day. So there are ideas that dreaming might give us, some benefits later on. It might help us with our creativity, with our ability to solve problems, and with our memory. And so these are important questions to ask because if we understand more about dreaming and these memory phenomena, we can then be better equipped to try to improve things and also apply that information to clinical applications. Are there circumstances in which your brain during the night is not doing the optimal type of processing. And that's reasonable to think that there's not optimal sleep in circumstances such as in PTSD or depression, or other disorders. Perhaps, the problems with sleep, you know, or first, you might think about them as another symptom of the disorder which might be true. But it's also possible that poor sleep is contributing to the disorder, in which case, there might be some way we can think of some new interventions that will try to change what's happening during sleep, and perhaps have some positive impact on the symptoms that people experience when they're awake.

Dr. Wilner:

Well, I hope to have the chance to speak with you again when those new research avenues and findings become available. And I want to thank you, Dr. Paller, for joining me to discuss, this very exciting research. It was great having you on the program.

Dr. Paller:

Thank you very much, Andrew.

Dr. Wilner:

I'm Dr. Andrew Wilner. To access this and other episodes in our series, visit ReachMD.com/NeuroFrontiers, where you can Be Part of the Knowledge. Thanks for listening.