What are dreams and why do we have them?

Now that we know a little more about sleep and why we need so much of it, it's a good time to talk about what happens during sleep. No, I am not talking about cuddling up to your favourite teddy bear – I'm talking about dreams.

Dreams are where we play out an imaginary life where we can fly and visit strange places, or sometimes, encounter creepy Victorian little girls who sing nursery rhymes and giggle in doorways for apparently no reason – our nightmares!

We have all experienced dreams – thoughts and sensations that occur while we sleep – but why we dream has never been fully answered. Throughout the years, there have been many suggestions as to why we dream. Perhaps they are a window into our subconscious mind, or maybe they are a way for our mind to act out our secret desires without social consequences. This was actually demonstrated in one study that recruited people who recently quit nicotine:[9] almost everyone dreamt about smoking in the months after quitting, with dreams becoming more frequent as time went on, presumably as the brain continued to go through withdrawal.

The clearest idea about why we dream is that the brain needs time to process the memories and emotions that we experienced during the day and place them into long-term storage.[10] This makes a lot more sense when we look at the brains of people who are sleeping and see that the hippocampus, the part for memories, and the anterior

cingulate cortex, which is involved in assigning emotional context, are particularly active. In fact, on days where we have lots of new experiences, the brain can still be processing this information up to seven nights later. This also partly explains why stressful and emotional events in our lives can significantly affect the quality of our sleep.

One team of scientists demonstrated this by having people play video games for several hours before sleeping.[11] Over 60% of people reported having dreams about the game, suggesting that our short-term memory is particularly active during our dreams.

Furthermore, the dream's events are believed to be a combination of the short-term memories we recently experienced and the long-term memories that our brain thinks are relevant and need to be connected with each other. This supports the view that sleeping and dreaming help to transition our memories from being in short-term storage in the hippocampus to long-term storage all over the brain. This process happens mostly in NREM sleep, and the application of emotional context – how we feel about them – occurs in REM sleep, our deep sleep.

Because some areas of the brain are sleeping, while others are not, we experience this as a strange reality and call it a dream. Interestingly, if we go further into the meaning and symbolism of dreams, we find a more abstract explanation of dreams and a theory that I find particularly interesting.

World-renowned dream specialist Rubin Naiman thinks that we may be looking at dreams entirely the wrong way,[12] and that they are in fact a subset of the thoughts and processes that we experience during the day. They are not particularly special or different to what we

encounter during our waking life, and perhaps dreams should be spoken about the same way we talk about the stars at night – they are always there, but we only seem to notice them at night. So, if this is true and we never really stop dreaming, either during the day or night, then why am I not currently writing this book dressed in a pink tutu while sitting on the surface of the Sun? For starters, the pink tutu is currently in the laundry, but the surface of the Sun – well, that is all down to our prefrontal cortex. This is the PFC that we talked about earlier, the area just behind the forehead, which is responsible for logic, planning, attention and generally things that are called executive functions. It's basically the really smart part of the brain. Couple this to the fact that neurotransmitters, the chemicals sent between neurons, are lower than normal and need to be replenished, and you have a recipe for a brain that isn't working entirely as it would be during our waking day.

Try thinking about dreams as if the brain is analysing our daily experiences without much logic. While you sleep, the visual cortex is very much awake. This part of our brain is busy processing the images from the day. Unrestrained, the brain can now think more abstractly and creatively, using imagery and metaphors to express ideas.[13] This is perhaps why scenes and events are often exaggerated during our dreams, yet we don't notice the dream's strangeness (as the prefrontal cortex is sleeping). It is at the point of waking when we recognise how unusual things actually were.

Nightmares

So that may explain dreams, but what about nightmares? Scientists believe that nightmares have an evolutionary purpose and at some

point would have been useful for us. They likely evolved to keep us vigilant about dangers or concerns that we may have, so we don't simply brush them off and ignore them. This would have been extremely useful throughout our millions of years of evolution. For example, if our community was attacked there could be potential for it to happen again, or if a lion was seen to be frequently roaming nearby – we would need to keep our thoughts focused on it unless we wanted to be eaten. Dreaming about the stresses and concerns we have is our brain's way of working through the emotions and keeping our attention focused on the danger. As a result, we have nightmares.

Scientists have observed that when people are experiencing nightmares, there is increased brain activity in the amygdala, a key area involved in fear and making fearful events much more memorable. Together with the fact that the prefrontal cortex is generally sleeping too, there is a failure to control and reason with this scary reality, and causing a nightmare.[14]

Lucid dreaming

There may be potential to harness dreams for our benefit. Lucid dreaming is a fascinating phenomenon, where you are aware of being inside a dream as you are actually dreaming.

Think of it a little like the movie *Inception*, with Leonardo DiCaprio, whereby if you know you are dreaming, you have the potential to make the dream as you want it to be. This phenomenon was first recognised over 40 years ago, and although it has been studied in the decades since, we still can't fully explain why it happens or why some people seem to experience it more than others. Estimates suggest that

approximately 50% of people will experience lucid dreams at some point in their lives, 20% of us have them monthly and a small number of people experience them almost every night.[15]

In a dream, anything is possible. The logic areas of the brain are sleeping, while our visual and memory centres are experiencing this new world without being held back.

What we do know is that the PFC is a lot more active in lucid dreamers. The PFC affects other areas of the brain and starts to increase its signalling to the temporal lobe, which we know is vital in creating and storing our memories. A small study trying to reduce nightmares even found that those capable of lucid dreaming were able to prevent nightmares or limit the distress felt during them.[16]

Lucid dreams occur because of greater connectivity between certain regions of the brain involved in executive functions.[1] In other words, the clever parts of our brain are able to talk to the rest of it more freely during sleep than normal. Although this connectivity has been shown in brain scans, when we talk to people who experience lucid dreams often, they appear just the same as everyone else. Lucid dreamers or ordinary dreamers appear to have the same memory skills, and mindfulness, and demonstrate the same amount of daydreaming as anybody else.

Wouldn't it be interesting if we could take an ordinary dreamer and somehow convert them into a lucid dreamer? Well, because the neurotransmitter acetylcholine is heavily involved in regulating REM sleep and brain signalling in general, it is possible to create lucid dreams by tweaking the amount of acetylcholine in our brains at night. LaBerge and colleagues found that the drug galantamine, which increases acetylcholine, also increases the chance of lucid dreams by over 40%.[18] At this moment, it is unknown if they are identical to natural lucid dreams, but it could be a great way to study them in the future with greater predictability.

Making dreams work for you

What would be a lot of fun would be to try and actually participate in a lucid dream. Could we speak to people inside the dream? Could we ask

[1] Connectivity between the temporoparietal regions – specifically the anterior prefrontal cortex–angular gyrus–middle temporal gyrus. This is just a precise way of talking about areas involved in memories, attention, spatial awareness and processing information from our senses about what is around us.[17]

them what it is like, and use that information to help understand ourselves on a higher level? Is it possible that we could use this technique to talk to our subconscious somehow? Feel free to try this out if you ever experience them!

Would you believe it if you were told there is a device out there to allow to you share a lucid dream with another person? Back in 2012, an EEG device attempted to create social dreaming. The idea was that two people would each wear the device (connected to the internet) and when sleeper #1 started to dream, a coloured light bulb would turn on in the bedroom of sleeper #2. With enough practice, the sleeper could notice the light, even while sleeping, make a subtle movement with their eyes or fingers, and the brain activity would be detected and sent back to sleeper #1. They would have their own light bulb that would trigger them to become lucid in each of their dreams. The light would feel similar to hearing your alarm clock go off as you sleep. You would incorporate the noise (or in this case, the light) somehow into your own dream.

If sending messages to the dreamer was the first step, then Konkoly and colleagues recently took the second one.[19] And it was a big step!

Training a group of people to experience lucid dreaming in their sleep labs, the team were able to have two-way communication with the dreamers. They asked the dreamers to answer simple arithmetic, such as 8 − 6, and the dreamer was able to respond back with eye movements (each movement represented a number). They remained dreaming but were able to hear the question as part of their dream. Some heard it as a voice-over, others through their dream-like radio playing in the background.

Although it was difficult for the team to get reproducible results (only around 25% of attempts were successful) some were even able to recall the question upon waking.

This study gives more credit to the idea that we could someday interact with our subconscious dreaming mind gain an insight from our dreams.

By becoming lucid in their own dreams, each sleeper would be aware of the signals. At this stage in the design of the headset you could not really interact with one another, but the idea that you can use your brain waves to send cues to another sleeper, influencing their dream, was a great concept and a notable first step into the area of social dreaming.

One last thought about dreams I would like to share with you is the possibility of using them to your own benefit. Some techniques attempt to utilise dreams as you would any other skill. Have you ever woken up from a dream but forgotten it quickly after? Well, a technique called dream recall may be a solution, whereby shortly after waking, you write down every creative idea you had so that any creativity you encountered can be remembered for when you need it. Famous horror writer Stephen King is well-known for using dreams as a source of creativity for his stories. His book *Dreamcatcher* was actually based on a dream he had about a cabin and hitchhikers.

If you have a particular problem that you need to find a solution to, well then dream incubation is your game! Before falling asleep, it is possible to focus on a problem that you may have. With enough attempts, studies have shown that it is possible to dream about topics of your choosing and use them to target a meaningful area of your life.

The mathematical genius Srinivasa Ramanujan is famous for mailing complex mathematical formulas to a University of Cambridge professor in the early 1900s. What makes his story even more incredible is that Ramanujan lived in a small village in India and had no real access to advanced books. From the age of 16 (he was 25 when he mailed his work to Cambridge) he said that formulas would appear before him in dreams, and he was able to develop them when he woke up.

Finally, an intriguing technique called dream prophecy sounds like it would have the most use in our waking life. Who wouldn't like to dream about events before they happen? Maybe you can avoid being late for work or spilling your drink over yourself, or maybe you could concentrate really hard and learn the lottery numbers to win millions. It sounds radical, but there are numerous reports of dreams that apparently play out scenes and interactions that you then experience in your life. Early suggestions tended to be explained as déjà vu, but it is much more likely that the experience is simply a coincidence, considering the thousands of dreams that are not prophetical. It may also be linked to the Baader–Meinhof phenomenon (see Chapter 2), whereby you are more likely to notice these coincidences after being made aware of them, with a strong desire to rely on anything to support your view – like when you think of a friend and they call moments later, yet you tend to forget the times when you think of them without the phone call. Feel free to try it out though!

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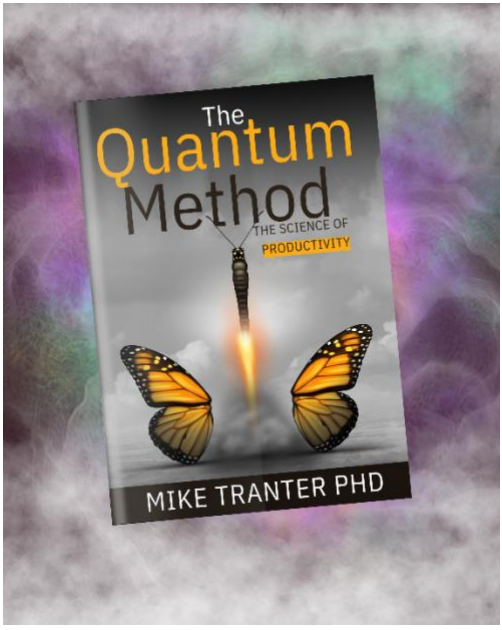

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