



WIDE AWAKE WHILE DREAMING ON LUCID DREAMING AND ITS APPLICATIONS IN THE CLINIC

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Insight

What is something you have always dreamt of doing but never did? Maybe your opportunities lie within your dreams, in your lucid dreams, to be more specific. Lucid dreams are dreams where a person is aware that they are dreaming and, in some cases, is able to influence their dream. A famous lucid dreamer is movie director James Cameron. In an interview, he said that he tried to create a lucid dream in the movie *Avatar* (2009), where the main character is conscious and accesses a different body during his sleep [1]. Even if you do not aspire to be a famous movie director, lucid dreaming might be of interest to you. So, what are lucid dreams, can you learn to become a lucid dreamer, and can lucid dreams be of use for therapeutic purposes?

“Have you ever had a dream, Neo, that you were so sure was real?” This is the question Neo, the protagonist of *The Matrix* (1999), is asked in the first movie [2]. The Matrix is a dream world, and during the movie Neo learns to control this world and beat his enemies. Have you ever had such a dream? A dream where you were aware that you were dreaming or where you were able to influence the course of your dream? If yes, then you might have experienced a lucid dream. Lucid dreaming is a phenomenon where the dreamer is aware of the fact that they are dreaming and might, therefore, be capable of manipulating their dream [3]. About 55% of the population has ever experienced a lucid dream, and about 23% experiences lucid dreams regularly, meaning once a month or more [4]. It sounds exciting to be able to control your dreams, and you might be wondering if you too can learn this. The short answer is yes. At first glance, lucid dreaming seems all fun and games; however, it also has useful applications in the clinic. These clinical applications will be discussed after a concise overview of ways to induce lucid dreaming.

What is lucid dreaming?

Although research about lucid dreaming is a fairly young field in neuroscience, descriptions of the phenomenon have been around for ages, both in Eastern and Western literature. A very early description in Western literature was written by the Greek philosopher Aristotle, who is often seen as the first true scientist. In his text *On Dreams*, he writes: “Often, when one is asleep, there is something in consciousness which declares that what then presents itself is only a dream” [5]. In Eastern cultures, lucid dreaming has a role in various religions, e.g. Buddhism [6]. The term lucid dreaming, however, was not coined until 1913 by the Dutch psychiatrist Frederik van Eeden, who performed research on dreaming [3].

Describing the phenomenon of lucid dreaming is one thing, but proving its existence was a beautiful challenge for neuroscience. The first findings leading to proof of its existence were that lucid dreaming was most likely to occur during rapid eye movement (REM) sleep [7]. During REM sleep, all muscles are paralysed, except for the muscles that control eye movement [8]. Eye movements can be measured using electrooculography [8]. Combining these concepts, researchers came up with the idea that lucid dreamers could, in their sleep, send messages to the researchers using the pre-discussed

eye movements. The first scientist who succeeded in this method was Keith Hearne in 1975 [9,10]. However, Stephen LaBerge is often given credit for these findings because he published his findings, while Hearne did not [9,10]. Hearne's participant experienced lucid dreams frequently, and Hearne was able to demonstrate this in the laboratory by using the previously mentioned eye signals [9]. Later research focussed on electrophysiological correlates of lucid dreaming and ways to induce lucid dreaming [10].

Some people talk in their sleep, but what if you could have a conversation with someone experiencing a lucid dream? An intriguing development in the field of lucid dreaming research involved establishing two-way communication between the researcher and the dreamer. In an astounding study by Konkoly *et al.* (2021), four research groups in four different countries managed to establish two-way communication between the researcher and lucid dreamers using several methods [11]. The methods used were solving math problems in morse code (both acoustic and visual), tactile stimulation, spoken math problems, and spoken yes/no questions [12]. Participants in the trial answered with eye movements and gave the correct response in 18% of the experiments, meaning that when two-way communication was established, the answer was correct [11]. In unsuccessful trials, the stimulation was not incorporated in the dreams [12]. Another important finding is that dream reports matched the electrophysiological data. Two-way communication during dreaming can have great potential in enhancing the clinical applications discussed later.

If you were (or maybe are) able to have lucid dreams, what would you do in your dream? Maybe you would do everything the current corona measures forbid, such as meeting with a group of friends or eating out. Maybe you would practice your dance routine one more time because you have a performance tomorrow. Maybe you would try to reorganise your room to make room for a new couch. Research has found that there are several reasons why people engage in lucid dreaming. Using a questionnaire, Stumbrys and Erlacher found that the most common application of lucid dreaming was wish fulfilment (defined as, e.g. flying, dancing, or having sex), followed by solving problems, overcoming fears, spiritual experiences, healing (e.g. for physical pain or handling grief), and training motor skills [13]. They also found that wish fulfilment in particular induced a positive

mood upon awakening, possibly clarifying why it is such a popular application [13]. If these applications have intrigued you, you might be wondering how you can learn to engage in lucid dreaming.

How can I learn it?

In *Inception* (2010), a movie exploring the idea that you can enter someone else's dream without them noticing and implant ideas, one of the main characters explains, "Well, dreams, they feel real while we're in them, right? It's only when we wake up that we realize how things are actually strange" [14]. In order to learn to have lucid dreams, one needs to learn to recognise that they are dreaming, which can be done by learning to recognise the strangeness of a dream. There are several methods to learn to have lucid dreams. We will discuss keeping a dream diary, a reality check with virtual reality, sensory cues, and wake-back-to-bed (WBTB), as these are often used in research. More techniques, that will not be further elaborated, are summarised in the article of Stumbrys *et al.* [15].

If you would ask yourself the question "Is this real?" while you are here reading this article, the answer is probably "Yes". Have you ever asked yourself the same question while dreaming? One of the simplest methods to increase your chances of having a lucid dream is by keeping a dream diary [16]. This will, in the first place, make you more aware of your dreams, and in the second place, allow you to look for recurrent themes in your dreams [16]. If you dream a lot about being on a train, for example, you might ask yourself "Is this real?" while you are actually on the train. You might start to do the same when a train appears in your dream and your dream becomes lucid. If you do not have any recurrent themes in your dreams, you can also do the reality check at random moments during the day, especially in dream-like situations, hoping that you will do the same during dreaming [16]. Researchers have thought of a way to enhance this, as dream-like situations in real life are rather scarce. One of the options they explored is the use of virtual reality to create more dream-like situations [17]. This did increase the tendency of lucid dreaming slightly, but it remained a rare phenomenon [17].

Another technique that is used to increase the rate of lucid dreaming is perceptual cueing. Using this technique, awake participants learn to associate cues with dreaming, the cues being odour, sound, lights, or tactile stimulation [18-20]. These cues are presented while the participant is awake to familiarise the participants with them and associate them with the question: "Am I dreaming?" During REM sleep, the cues are presented again, hoping that they are incorporated into the dream, and the participant becomes lucid [18-20]. Despite the clever idea, success rates remain rather low [18-20].

More promising techniques to increase lucid dreaming are sleep fragmentation and WBTB, often in combination with mnemonic induction of lucid dreaming. With the WBTB technique, participants are woken up during their REM sleep, stay awake for a certain amount of time, and go back to sleep after [21]. During the time awake, mnemonic induction of lucid dreaming is used. This is a technique where participants practice recalling their dreams, recognising dream-like features, and telling themselves that they will notice that they are dreaming the next time [21]. This increases the chances of lucid dreaming [21]. Sleep fragmentation refers to the phenomenon of alternated sleep-wake cycles [22]. Both of these methods reported increased lucid dreaming frequency in participants [21,22]. Concluding, there are several methods to induce or increase lucid dreaming, with different success rates. However, no magic bullet has been found yet.

Dream your fears away

While we mentioned earlier that wish fulfilment is the most used application of lucid dreaming, there has been growing interest in using lucid dreaming as a treatment approach for several psychiatric disorders. Perhaps the most obvious clinical application of lucid dreaming would be to overcome recurrent nightmares. Recurrent nightmares often occur in the context of post-traumatic stress disorder but can also present themselves without trauma, as well as in other psychiatric disorders, such as depression and anxiety [23]. Nightmares decrease sleep quality, may cause fear to fall asleep, and decrease daily functioning and quality of life during daytime [23]. Lucid dreaming as a therapy aims to make the patient aware of the fact that they are dreaming, enabling the patient to change the course of their nightmare. For example, if a nightmare is about being chased, a common nightmare theme, the dreamer can change or stop the chasing if the dream becomes lucid chasing [24]. They could, for instance, decide to stop running, turn around, and change their chaser into Elsa from *Frozen* singing *Let It Go* [25]. In this case, lucid dreaming helps against your fear by making it preposterous, similar to the Riddikulus spell in *Harry Potter*. This spell turns a Boggart, embodying your greatest fear, into something ridiculous, just like in the *Frozen* example [26]. However, the exact efficacy is not known yet [27]. A recent review by De Macêdo *et al.* concludes that lucid dreaming therapy has the potential to help people suffering from nightmares, but these results are still inconsistent [27]. One of the main limitations is that, so far, not all participants become able to have lucid dreams [27].

Similar to defeating nightmares, people with anxiety or phobias could use the lucid dreaming environment to tackle their fears. Simulation is often mentioned as one of the functions of dreaming, as dreams would be a safe environment to practice new behaviour [28]. In this way, lucid dreaming could be used as an add-on or enhancement to current exposure therapies. However, no such studies have been performed yet.

One study investigated the relationship between depression and lucid dreaming [29]. The hypothesis was that a higher lucid dreaming frequency would be associated with lower depression scores, mediated by the locus of control (LOC) [28]. The LOC is a concept that refers to whether you are in control of your life (internal LOC) or that external forces control your life (external LOC) [30]. A strong external LOC is associated with depression, while lucid dreaming is associated with a higher internal LOC [31,32]. Moreover, lucid dreaming is associated with a better mood [13]. Disappointingly, lucid dreaming frequency correlated positively with depression scores [29]. The author discusses that it is not yet clear in which direction causation goes, and more research is needed to investigate the relation between lucid dreaming and depression [29]. Concluding, lucid dreaming as a therapy has mostly been explored for recurrent nightmares, both idiopathic and in several psychiatric disorders. We are just at the dawn of lucid dreaming research, so more clinical applications might be around the corner.

Conclusion

James Cameron uses his dreams as inspiration for movies, but we now know that lucid dreaming can also offer us other purposes. Lucid dreaming is a phenomenon where the dreamer is aware that they are dreaming. Lucid dreaming can be induced via several methods, such as keeping a dream diary, virtual reality, sensory cueing, and using the WBTB method. Not all methods have similar success rates, and there is no method yet that can teach everyone to become lucid, nor a method to make people have lucid dreams every night. Lucid dreaming can be used to treat recurrent nightmares by

allowing people to have control over the storyline of their nightmare. For now, the biggest issue in lucid dreaming therapy research is that not yet everyone is able to learn to have lucid dreams. In addition, lucid dreaming research shows very mixed results. Maybe in the future, lucid dreaming might offer us possibilities where researchers now only dream about.

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