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Impact of Sleep and Brain Science of Lucid Dreaming: Insights into Therapeutic Applications

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Abstract

Lucid dreaming is being conscious within one's own dream. In recent years, dream lucidity has started to attract more attention not only from the broad neuroscience field but also from applied neurology, psychiatry, sports performance science, or art therapy areas. The aim of this research is to investigate and evaluate some of the therapeutic potentials of dream lucidity. The findings propose that the emergence of self-awareness during sleep could have various health and wellness benefits and applications. Analysis and evaluation of existing neuroscientific data on lucid dreaming was performed and combined with own investigations and methodological insights. In addition, virtual reality training and transcranial direct current stimulation areas of research were also investigated in the context of potential applications for inducing dream lucidity. Results show that various clinical and non-clinical applications of lucid dreaming techniques might be effectively employed in reducing nightmares, increasing mindfulness, or as an experimental treatment for individuals suffering from certain mental health disorders like narcolepsy or post-traumatic stress disorder. It's further suggested that dream lucidity training might help with sleep quality while reducing daytime stress and anxiety. Nevertheless, further research and caution in this area are required to fully understand both the therapeutic benefits and potentially negative long term consequences of cultivating lucid dreaming.

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Keywords

Neuroscience of Consciousness; Lucid Dreaming; Dream Lucidity; Disorders of Consciousness; Cognition; Coma; Anesthesia Awareness; Brain Injury; Locked in Syndrome

Introduction

Researchers from The Center for Neuroscience, West Virginia University highlighted how sleep disturbances negatively impact a significant number of traumatic brain injury patients and proposed how various treatments may aid in sleep disruptions for both acutely and chronically affected patients [1]. Their research pointed out how sleep deprivation or fragmented, poor quality sleep can act as a cellular stressor and may alter neuropsychiatric, physical, cognitive and behavioral health or recovery for those patients. In the context of the importance and impact of sleep on health and general wellbeing, this article proposes that dream lucidity cognitive sleep techniques might turn out to be therapeutically beneficial in various clinical and non-clinical applications. This includes employing conscious dreams as a potential solution for continuous, traumatizing and debilitating nightmares, including those of children. Employing lucid dreams effectively to alleviate nightmares is currently studied and tested. Patients gaining self-awareness during nightmares might provide them the needed help to realize the nightmare is not real, and possibly to even take control of the narrative of the dream itself after sufficient training at dream agency, which may lead to easing the tension and fear. Narcolepsy patients are known to have a higher frequency of nightmares than healthy dreamers. Furthermore, narcoleptic patients seem to have a higher frequency of spontaneous lucid dreams for reasons that are not yet identified. Thus, utilizing specialized training to learn how to reclaim self-awareness and sense of agency during traumatic, recurring nightmares could be further investigated for its therapeutic aid in easing the suffering of narcoleptic patients.

Lucid dreaming is when an individual becomes aware of dreaming while being in a dream itself. Gaining control over the dream by changing characteristics, narrative, or the environment can occur and is often associated with lucidity phenomena. The term "lucid dreaming" was first coined in 1913 by Van Eeden, a psychiatrist who conducted extensive research on his personal experiences of self-awareness that he was inside his own dream while being physically asleep. Dreaming uses various parts of the sensory networks in the brain that are involved when perceiving the outside world in a waking state. Lucidity in dreams refers to a particular cognitive state where the individual is aware of dreaming while the dream continues. This conscious awareness is sometimes called "insight". Insight, control, and dissociation represent some of the criteria of lucid dreams. Insight is considered the core criterion, whereas control and dissociation might or might not be enhanced during lucidity [2]. Control enables an individual to alter the dream plot and use agency to manipulate the dream content itself and is a skill that can be mastered by experienced lucid dreamers.

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Most lucid dreams happen during the Rapid Eye Movement (REM) phase of sleep. The REM cycle is part of the sleep-wake cycle and is controlled by the reticular activating system in the brain. Individuals who lucid dream can communicate their state through predefined voluntary eye movement patterns to the sleep study researchers through the use of electrooculogram [3]. Lucid dreaming occurs when someone is consciously aware while dreaming. A false awakening occurs when an individual dreams but believes they are woken up. Sleep paralysis involves skeletal muscle atonia. REM sleep is believed to facilitate the brain's processing of information, memories, and emotions.

Dream lucidity induction techniques involve external stimulation during sleep through auditory or olfactory cues, cognitive pre-sleep training techniques, and even the intake of specific pharmacological substances [4]. None of these protocols alone has been proven to cultivate lucid dreaming reliably and constantly for every participant and on predictable demand. The lucid induction method based on forcing awakeness and wake periods during the night is called the wake-up-back-to-bed technique. It disrupts sleep, increases fragmentation, modifies the architecture of dreams, and can decrease sleep duration [5]. Sleep disruptions can consist of insufficiency or come from reduced total sleep time due to fragmentation of sleep by brief arousals in the mentioned technique. Dream re-entry is another method frequently used for dream lucidity induction.

Results and Discussion

Lucid dreaming has been found to have a likelihood of having a positive influence on cognitive health and wellness for its practitioners. Heightened state of self-awareness within a dream enables dreamers to meta-observe their actions with conscious awareness and allow the more trained individuals to actively influence the content of the dream. This gives them an agency to use the dream plot and the experience itself for therapeutic purposes. As such, lucid dreaming may have the potential to reduce nightmares, anxiety, or even improve motor skills for sports performance. It is also hypothesized that dream lucidity techniques may have an influence on daytime creativity [4]. Some studies have also indicated that lucid dreaming might be able to play a role as a supporting treatment for various mental health disorders to improve the well-being of affected patients [6]. Other research has showcased a positive influence of practiced dream lucidity on increased self-confidence and a waking life general sense of well-being [7]. Lucid dreamers were found to be more socially bold, dominant, open to experiment, enthusiastic, and warm after regular practice of dream agency [8]. Association between lucid dreaming and personality is not yet well explored and remains to be a potential area of investigation. Other survey studies have shown that the typical motivations behind influencing dream actions by their practitioners are to experience self-indulgent activities in dreams [9]. Much more rarely, the intention was reported to come from the intention to overcome fears, solve problems in waking life, or boost one's creativity for work or passion projects. The intention of having more fun was common, with flying or having sex being some of the most frequent mentions. Solving life problems was another intention of lucid dreamers. Finally,

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physical and mental healing was yet another aim for practice. Despite anecdotal reports, it is scarce to find empirical research that covers the long-term effects of lucid dreaming on mental and physical healing.

One notable survey aimed to answer the question of whether or not lucid dreaming is helpful for the cognitive and physical health of those who claim to practice it regularly [10]. The study's overall sample included 528 participants, while the final and qualifying sub-sample included 386 participants. A questionnaire was given to all participants to measure different aspects of their lucid dreaming, including its regularity, content, and aim. The findings revealed that many individuals reported the benefits of lucid dreaming on their mental health and well-being. These self-perceived benefits were, however, also correlated to such elements as the other practices of daily mindfulness and the overall spirituality of the participants.

Practicing dream lucidity is also believed to be able to alleviate continuous or debilitating nightmares. Nightmares can be disturbing and can both come from daily stress, as well as cause additional stress and decrease overall well-being. Lucid dreaming is proposed to be used as a mindfulness technique to help reduce stress, improve sleep quality, and promote cognitive relaxation. In this context, it could be seen as a coping resource that a trained individual can use to improve their quality of life. Becoming aware of one's own dreaming state while asleep eases the stress by indicating to the dreamer that the nightmare is not real. Next, agency over the plot, characters, and disturbances within the dream can change the dream content itself, so the nightmare stops being one. In this context, dream lucidity techniques can be seen as one type of mindfulness-based intervention that could be implemented into existing clinical practices to target nightmare disorders.

A linkage of mindfulness and dream lucidity was attempted in two notable studies [11]. The first one had 338 participants, and the second had 187 participants. The first study had 201 females, and the second study had 120 females and 60 males. The age median for study one was 24 years, and the age range for study two was 25-34 years. Both studies were based on self-administered surveys. The 14-item Freiburg Mindfulness Inventory (FMI) scale was used to measure concepts of mindfulness. The results indicated that nightmare frequency had a negative correlation with mindfulness and the frequency of lucid dreaming episodes [12]. This suggests that dream lucidity practice can reduce distress and promote psychological well-being.

Posttraumatic Stress Disorder (PTSD) is another potential clinical application for lucid dreaming as a supportive management technique. PTSD is a mental health disorder that affects individuals who have previously experienced traumatic events. Nightmares can become more prevalent during periods of stress and can emerge as associated with traumatic experiences for patients with PTSD. It's being estimated that about 80% of individuals experience at least one significant traumatic event during their lifetime, and the prevalence of PTSD is estimated at 7.4% [12]. Affected individuals often avoid interacting with people, places, trigger objects, and other stimuli related to the traumatic event to withdraw from recurrent, distressing recollections that cause alterations in their stress and anxiety levels. PTSD patients often suffer from nightmares that tend to be emotionally related to the original trauma. Various treatment options

have been discussed due to the chronic and persistent symptoms of PTSD causing significant distress to daily life activities. The American Academy of Sleep Medicine recommends a few Cognitive Behavioral Therapy (CBT) methods for treating nightmares, including systematic desensitization, Imagery Rehearsal Therapy (IRT), Exposure therapy, Relaxation, Rescripting Therapy (ERRT), sleep dynamic treatment, or self-exposure therapy [14]. These approaches differ, but they all conceptualize nightmares as a learned response that specific cognitive and behavioral strategies may modify. Lucid dreaming holds the promise of becoming one of the therapeutic applications for this disorder and is currently under active research [15].

Virtual Reality (VR) is a computerized, software generated environment where scenes and objects appear natural, enabling individuals to act within the scenes as one would do in real life. Conducted studies were set up to determine if virtual reality can enhance lucid dreaming. Virtual reality was proposed to make the traditional methods for lucid induction more amplified through the additional supply of virtual reality environments that include dream state properties. In one four-week study, participants underwent lucid dream training and virtual reality complimentary training sessions [14]. It was found that VR-assisted training supported the speculation of an increased occurrence of dream lucidity and also had an influence on dream content [14]. Another study focused on researchers wanting to induce flying dreams by utilizing custom-built virtual reality flying environments as a pre-dream training [16]. It employed 137 volunteers to participate in VR-flying sessions, after which they were asked to nap in the morning to measure dream lucidity content and occurrence rate. In addition, subjects were provided with dream journals for five days before and ten days after the virtual reality exposure. It was discovered that flying dreams changed qualitatively by showing higher levels of lucid control and more intense emotions after exposure to virtual reality sessions. Individuals trained using virtual reality reported experiencing more flying dreams and having more lucid control over those dreams. Virtual reality may train the brain to dream differently, but more research is necessary to uncover all the factors associated with these correlations [17].

A painless and non-invasive treatment called transcranial Direct Current Stimulation (tDCS) uses direct electrical currents to stimulate specific brain lesions. Various studies and meta-analyses have suggested that tDCS is safe to perform for the subjects involved. Transcranial direct (tDC) and transcranial Alternating (tAC) current stimulation during sleep has been postulated to increase dream self-awareness [15]. A study was conducted where 40 participants ages 18-29 were recruited by public advertisements. During the investigations, they slept twice in the lab, for one-morning nap with tAC stimulation and the other without simulation. Each participant was screened for self-reported sleep disorders, physiological and neurological disorders, other illnesses, and the use of medications. The results did not support the conclusion that frontal 40 Hz tAC stimulation heightens dream self-awareness. It casts doubt on whether 40 Hz frontal brain activity in REM sleep is a reliable index of lucid dreaming, as some scientists previously postulated [18]. This was not the only study that did not find specific 40 Hz activity as meaningful in the frontal regions of participants who were frequent lucid dreamers [19].

Conclusion

Controlled dreams can rarely occur spontaneously. However, some methods and training techniques can be practiced to induce self-awareness while asleep. The outcomes of the various data sets examined in this research show that increasing control of dream lucidity may hold the promise of easing various disorders and sleep disruptions. However, there are also reasons to stay cautious about the potential adverse effects on sleep and health of regular and frequent lucid dreaming practices. The main concern is that they could alter sleep integrity in ways not yet understood. There have not been many studies that have investigated the potential long term downsides of frequently practicing lucid dreaming. Future research in this area could include open-ended survey questions asking about specific lucid dream experiences and side effects that may have negatively affected subsequent waking life to draw some correlations in this regard.

It's been demonstrated that the occurrence of nightmares may be altered by the dreamer's realization that they are in a dream. Controlling variables within the dream gives this phenomenon the potential to reduce recurring and debilitating nightmares. Future self-healing therapies based on lucid dreaming protocols could include instructions for both inducing lucidity and confronting traumatizing situations within the content of a dream itself. As such, dream lucidity could become a complementary method to reduce nightmare frequency and distress in clinical and non-clinical settings. Nightmare sufferers may benefit from this type of supplemental aid for both therapeutic reasons and potentially as a preventive measure against continuous recurrence. It's sometimes suggested that nightmares might be one of the understudied symptoms of different psychological disorders, including linking them to eating disorders, post-traumatic stress disorder, depression, borderline personality disorders, or substance use disorders. In this context, lucid dreaming therapies could be well worth exploring.

After investigating multiple studies and data sets, it has been concluded that lucid dreaming may have a positive effect on an individual's health. VR-assistance protocols were shown to help prime and increase lucid dreaming agency. Future studies could investigate how different meditative practices affect lucid dreams' frequency and intensity levels. Becoming self-aware and gaining agency while dreaming enables individuals to shape their environments and control the outcomes. Common reasons for individuals to practice dream lucidity outside of clinical settings are to fulfill wishes, experience self-indulgence activities, overcome fears, and attempt physical and emotional healing. It would be interesting to also study if and how having an increased level of control during lucid dreaming could stay with individuals and help them feel more empowered and confident in their waking lives. More research on dream lucidity needs to be conducted to fully understand the limits, the benefits, and the long-term therapeutic outcomes.

Conflict of Interest

The authors report no conflict of interest. The authors alone are responsible for the content and writing of the manuscript.

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