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Investigating Consciousness in Sleep Studies: Evaluation of Key Dream Lucidity Induction Techniques

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Abstract

Lucid dreaming is a rare phenomenon of consciousness emerging while asleep, most often during the rapid eye movement phase. It is estimated that over half of the world population have had at least one lucid dream in their lifetime and around one fourth report to have one episode of dreaming lucidity each month. Conscious dreaming happens when a dreamer becomes suddenly aware of being inside their own dream. This realization leads to immediate waking up in some people, while more experienced lucid dreamers report the ability to stay lucid within one's dream and gain agency over its narrative, characters, and own actions and feelings. Scientists in sleep laboratories have invented numerous techniques and procedures intended to increase the frequency of conscious dreams. As researchers propose new protocols to induce lucidity, this analysis aims to address a pressing challenge to continue the evaluation of such experiments to aim for establishing empirically validating standards for this young field of research. A lot of new reported protocols are based on anecdotal or personal accounts. As such, they may contain some form of bias and omission, rendering the data as inconclusive. Another challenge is the lack of methodological standardization in protocols used. A recommended classification is to group the methods into three broad categories for dream lucidity induction: external stimulation, cognitive techniques including mnemonic methods and reality check protocols, and miscellaneous techniques, including pharmacological ways to induce lucidity.

Keywords: Neuroscience of consciousness; Lucid dreaming; Dream lucidity, Sleep studies

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Introduction

Dream lucidity refers to a state where an individual becomes self-conscious of dreaming while dreaming. In Western literature, lucid dreaming goes back as far as the fourth century before the common era, when Aristotle stated that "often when one is asleep, there is something in consciousness which declares that what then presents itself is but a dream".[1] Likewise, Eastern culture is not short of reports about people who cultivated awareness in dream states.[2] Although in the early days, conscious dream practices may have involved mainly spontaneous, meditative or intention-based practices, contemporary researchers have introduced several key techniques for inducing lucidity in sleep research.

In the past, some researchers expressed skepticism about lucid dreaming as a phenomenon due to the lack of supporting empirical evidence offered.[3] The doubt changed in the 1980s when sleep scientists demonstrated that the dream eye movements can be made volitional and observed through electrooculogram (EOG). When entering lucidity, the dreamers would signal their awareness to the sleep researchers through the pre-agreed eye movement patterns, which has proven beyond the doubt the verifiable nature of dream lucidity.

Studies of this neuroscientific paradox of emergence of consciousness during sleep remain important. There are numerous therapeutic, as well as non-clinical applications for dream lucidity. Commonly investigated ones include treatments for phobias and nightmares, including those associated with trauma and post-traumatic stress disorder (PTSD). Increasing our understanding of the phenomenon of awareness states may have implications for anesthesia awareness syndrome, for improving current neuroimaging techniques for more accurate detection of consciousness in the locked-in syndrome in vegetative patients, as well as in various other disorders of consciousness. Worldwide studies point to the prevalence of many sleep disorders in around 10–30% of the population, some suggest they might be even as high as 50–60%. This reflects the importance of conducting research in this area.

The aim of this analysis is to take a step forward towards achieving a greater consensus on the effectiveness or superiority of different lucid dreaming induction protocols. As such, this study investigates some of the methodologies that can be used in bringing about dream

lucidity. A hypothesis and proposition of this research is that it might be possible to classify and group the methods into three broad categories: external stimulation, cognitive techniques, and other miscellaneous techniques, which would also include usage of pharmacology or certain drugs and natural substances to induce lucidity.

Materials and Methods

This research employed a qualitative methodology for a literature review design of data collection. To review existing reports, credible electronic databases such as ProQuest, Google Scholar, PubMed, PsycINFO, and MEDLINE were reviewed to gather relevant information in relation to the subject. It was challenging to set inclusion criteria for sources published between 10 to 20 years because nearly all evaluated articles trace the beginning of contemporary lucid dreaming-inducing techniques to Dutch psychiatrist Fredrik Van Eeden.[4] For quality assessment, the exclusion criteria were chosen as follows: studies on dream lucidity that did not address the induction methodologies, non-English studies, and studies done more than ten years ago. For further quality assessment, all gathered data were reviewed on the basis of their completeness, accuracy and lack of inconsistencies. The selection process involved screening with the use of keywords including: reality testing, reality check techniques, lucid dreaming induction, dream lucidity mnemonic methods, and conscious dreaming frequency protocols. The analysis included empirical research focusing on lucid dream induction or those that discussed techniques for improving frequency of lucid dreams. The other method involved creating a search alert on some databases to retrieve recent studies on the subject matter. After analysis, all the data extracted from the materials was presented in the narrative form.

After analysis of all data, the final selection through searching databases yielded 26 relevant studies. The process of citation search provided an initial 9 sources discussing the induction techniques. 117 articles were considered, with 65 articles excluded for not focusing on the induction methodologies, 8 rejected for shallow scope, and 18 rejected for lacking enough of empirical validation. The final 26 articles that passed the criteria were utilized to further investigate the topic at hand. Based on the review of the data, several takeaway lessons emerged.

Results

Based on the review, all researchers had a similar working definition of lucid dreams. There was a uniform and congruent understanding that a lucid dream revolves around the dreamer's awareness that they are dreaming, which in some cases could give them the ability to consciously influence the dream's content.[5] Notably, almost all researchers acknowledged the contribution of Frederick Van Eeden, a Dutch psychiatrist who described a lucid dream as involving "the reintegration of the psychic functions so complete that the sleeper remembers day-life and his own condition, reaches a state of perfect awareness and can direct his attention to attempt different acts of free volition".[4] Numerous scholars have empirically tested Van Eeden's description of lucid dreams, with compelling evidence that individuals experiencing lucid dreams are indeed verifiably aware that they are dreaming while still physiologically asleep. While in the dream condition, they can perform specific and deliberate actions like pre-programmed eye movement patterns, and sleep researchers are notified through the use of EOG that have just entered a state of lucidity.[6]

In more than a hundred years since the groundbreaking contributions of Van Eeden, several scholars have proposed different methods for inducing lucid dreaming.[7] The need in classifying these suggestions has become apparent in contemporary literature.[8] Gackenbach offered one of the earliest classifications of lucid-inducing techniques using two broad categories he referred to as sleep induction and pre-sleep induction techniques.[9] Price et al proposed another classification suggesting that all lucid dreaming techniques could be either cue REM-minding (rapid eye movement), sensory suggestion based, or awareness based.[10] The lucid awareness training entailed techniques such as waking fantasy training, alpha waves feedback, or heightened perceptual awareness. The cue REM-minding approaches in the proposed model included techniques such as auditory, tactile, and external stimuli triggering methods.

Newly designed techniques that do not fit into these major categories have been one of the challenges scientists have identified for the mentioned classification model. For example, several researchers explained that lucid dreaming-inducing methods such as the hypnagogic technique or Tholey's combined technique would not fit into any of those three broad categories.[10] Although the attempts to classify or group techniques effectively contributed to a more holistic understanding of the procedures, most scholars have failed to propose an all-encompassing classification model that groups similar styles coherently. However, such studies have undoubtedly expanded the pool of knowledge on the subject.[11]

Cognitive Techniques

Most of the sources evaluated in this review discussed cognitive techniques for inducing lucidity in one's dreams. The studies included sleep laboratory studies and field experiments. These sources discussed different cognitive processes, including alpha feedback, post-hypnotic suggestion, dream re-entry, pre-sleep autosuggestions, Tholey's combined approach, mnemonic intention, reality or reflection testing, and mnemonic induction of lucid dreams (MILD) process.

MILD Technique

The MILD technique demands that the dreamer rehearses an intention of lucidity before they fall asleep. When the individual pre-rehearses the dream they intend to have during the night, the MILD process requires them to prioritize remembering that they are dreaming. Multiple sources tested the MILD method, and the researchers established that the approach succeeds at increasing lucid dreaming frequency.[12] Based on several findings, the MILD process was found slightly more effective in inducing lucid dreaming than the light stimuli approach.[13] The combination of the two techniques, according to some records, yielded results that were more favorable than either of the methods practiced alone.[14]

Auto-suggestion or Intention

The internal intentions technique is an approach that requires that each time before falling asleep for a period of many weeks, an individual has to intensively imagine being in a dream situation and being aware that they are dreaming, to set a strong auto-suggestion expectation on the outcome.[8] Some researchers compare the intention and MILD technique based on their cognitive similarities and suggest those might be essentially interchangeable.[8]

Reality or Reflection Testing

The reality/reflection testing technique is another approach that encourages the dreamer to assess possible incongruences in their daily environment and continuously contemplate and ask themselves if they are dreaming or not during the day. Scholars credit Dane's contribution to the topic as the founder of the mirror reflection testing approach.[15] Other subsequent researchers have tried the technique and proven it effective in inducing lucidity while dreaming.[7] Based on the review, several studies confirmed that reflection/reality testing successfully and predictably increases lucid dreaming frequency.[16]

Autosuggestion

When employing the autosuggestion technique to induce lucid dreaming, the dreamer self-guides oneself to have a lucid dream before drifting into sleep. Although Tholey explained the process of autosuggestion when trying to cause a lucid dream,[16] this review found incongruent data testifying for the effectiveness of this approach when practiced alone.[17] Analysis of various sources yielded ambiguous results. While some studies found that autosuggestion increased the occurrence of lucid dreams,[10] others did not find such related effects unless this method was combined with others.[11] For this reason, findings on autosuggestion as an approach to induce lucid dreams are nonuniform.

Tholey's Combined Technique

The technique is based on Tholey's work that combines autosuggestion, intention, and reflection to induce lucid dreaming.[8] Based on the previously developed other protocols, Tholey's approach emphasizes that the dream must develop with a reflective mind frame (reflection), the desire to become aware of it (intention), and self-suggestion that one is aware of his/her own dreaming (autosuggestion).[18] Some other researchers[19] found evidence that these integrated strategies increase the incidence of lucid dreams even for individuals with no previous experience with the practice.

Post-hypnotic Suggestion

This research also identified post-hypnotic suggestion as another approach for inducing lucid dreams. This procedure is used mainly in strictly controlled laboratory experiments where a hypnotherapist instructs a person in a hypnotic trance to have a lucid dream the following night.[20] Although scientists, including Galvin, found increased lucid dreams for participants who went through post-hypnotic suggestion,[20] others, including Purcell et al confirmed no similar results and provided evidence that the protocol was not duplicatable for their work.[21] For this reason, the effectiveness of this method remains controversial.

Alpha Feedback

In one unique study,[22] it was hypothesized that lucid dreaming is associated with increased electroencephalogram alpha frequency synchronization. The researchers, therefore, incorporated alpha training feedback to test if participants who go through the process would start having lucid dreams. However, their research findings indicated no positive correlation between alpha feedback training and REM alpha occurrences of lucidity.

Dream Re-entry

This approach entails re-entering a dream just after a short and purposeful awakening.[23] In other words, the method involves instructing a dreamer to first wake up, typically before their usual wake up time in the early morning, then to focus on some non-engaging activity for a brief period, remind oneself of an intention to become lucid and then to go back to sleep to re-enter or continue the interrupted dream.[24]

Combined Approaches

This category of lucid dream-inducing techniques involves using two strategies together, for example, re-entering methods with reality testing protocols, or with MILD techniques. The participants in one research[25] were children aged 10-12 years old. Since the researcher did not incorporate a laboratory sleep environment but used natural field settings where participants were practicing at home, it was more challenging to measure the efficacy of the combined technique. The findings were ambiguous,

for example, thirteen children said they experienced lucid dreams within the six-week field research training period. However, when tested at the sleep lab afterwards, only two of the four children tested had a verifiable lucid dream measured.[25]

External Stimulation

Apart from the cognitive approaches, the review identified other inducing techniques that use external stimuli to enable an individual to experience a lucid dream. Sources discussing these techniques involved both field and laboratory experiments. The most prevalent methods in such studies included using water stimulus, vestibular bodily stimulations, electro-tactile stimulus, vibrotactile stimulus, acoustic stimulus, and light stimulus.

Researchers used light stimulation to induce a lucid dream during REM sleep using commercially available devices such as NovaDreamer, DreamLink, and DreamLight.[14] The tools used were specially constructed to produce a stimulating light signal during the REM sleep stage and, therefore, were dependent on an external eye mask to induce lucidity at the right time. In another approach, scientists used acoustic stimulation by using a buzzer noise, musical tone, or recorded voice to remind the individual that what they were experiencing was just a dream.[22] Multiple scholars provided empirical evidence supporting the claim that the acoustic approach yielded positive results.[26]

When using the vibrotactile stimulation approach, one study employed field research experimentation to determine the method's effectiveness. The researchers found that vibrotactile stimulation was the most effective if combined with other strategies, such as both light and acoustic stimuli.[26] On the other hand, one study investigated the electro-tactile stimulation technique. The author observed that the method had a higher success rate in inducing lucid dreaming when the number of stimulations during the REM period increased.

In another study, two brain scientists empirically tested the effectiveness of the vestibular technique. The researchers used a hammock for participants to sleep during the laboratory experiment to put respondents under a kinesthetic stimulation. The findings seemed inconclusive, but the researchers inferred that vestibular stimulation increased REM dream effectiveness.[26] Lastly, another study employed water stimulus in a laboratory experiment. The researcher splashed some water on the hands or faces of the participants. Based on the researcher's conclusion, the sensation of water did not subconsciously signal to individuals to induce lucidity successfully.

Application of Drugs

The application of drugs to enhance lucid dreams is yet another category in conscious sleep techniques. This review identified one significant study that used donepezil, an acetylcholinesterase inhibitor, for the participants, with a control group receiving a placebo.[26] Nine of the ten participants who received the donepezil dose reported experiencing a lucid dream. Only one participant claimed to have lucid dreams while on the placebo, which might have been an actual real result based on the strong mnemonic belief for the expected outcome. The researchers, therefore, concluded that donepezil induced lucid dreaming, with higher doses enhancing the lucidity frequency ratio more. However, participants reported experiencing strong side effects after receiving high doses of the substance. Some of the side effects included vomiting, nausea, and mild forms of insomnia.

Discussion

The findings of this study pointed to one of the critical issues that emerged based on the review results, namely the challenge and need to assess the methodological quality of the research presented that do not share unified methods of collecting the data. The results of investigating the effectiveness of different techniques and their abilities to arrive at conclusive and comparable outcomes revealed the pressing need to incorporate consolidation methodologies. Future research in this field is recommended to put as first focus the methodological unification and scrutiny to be applied to the protocols so more conclusive and parallel data reporting could result as an outcome. Evaluation of each technique for induction of dream awareness also leads to a conclusion that most amplified results might yet emerge from reliably tracking the effectiveness of some of the investigated protocols combined together.

Based on the sources discussed in this review, compelling evidence also resulted in the conclusion that all research conducted on techniques for inducing lucid dreaming can be grouped into three major categories. These approaches include drug application, external stimulation, and cognitive processes, where cognitive techniques focus on inducing lucid dreaming through cognitive training skills. These skills include intention, self-reflection, and the MILD strategy. On the other hand, other brain scientists have also focused on using external stimuli to induce dream lucidity. These included tactile, kinesthetic, auditory, visual or electric stimuli for the induction process. The presence of these stimuli in the dream was proven to remind the individual that they are in a dreaming state. Although researchers used the external stimuli methods mostly in laboratory experiments, the use of drug agents targeting to alter the brain's cholinergic levels to induce conscious dreams was self-administered outside of the sleep labs settings.[20] Similarly, experiments on different protocols involving children's were also done off-lab, which may be linked

to the discrepancy of the data results when compared to repeated laboratory tests on the same group of young participants. Despite the empirical evidence showing that some of the techniques positively influenced the occurrence and frequency of lucid dreams, the review did not find one best reliable approach able to generate a lucid dream consistently and every time it was applied. Nevertheless, many methods were found promising, especially when certain protocols were combined, where their effectiveness might be synergistically increased.

Conclusion

This review evaluated, summarized and analyzed the leading techniques and protocols that sleep and brain researchers have tested. It critically investigated the results of 26 field experiments and trials performed to induce lucidity in conscious dreams. For this reason, the study aimed to serve as a useful guide for future researchers in choosing the best approaches for continuing further lucidity induction research. Notably, the study suggested areas with incongruity or ambiguous findings to not be overlooked in determining the future directions and aims for the next research ahead.

Conflict of Interest Disclosures

None.

Ethical Statement

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