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Using hypnotic enhancement with auditory suggestion for lucid dream induction

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Abstract

This study aimed to investigate the efficacy of using hypnotic enhancement of auditory suggestion to induce lucid dreams in inexperienced individuals. Lucid dreaming, a state in which the dreamer becomes aware of their dream state, provides opportunities for personal exploration, sports, and clinical applications. However, the rarity of lucid dreams poses a challenge to scientific exploration, making reliable induction methods essential. The study tested the efficacy of acoustic suggestion, hypnotic enhancement, and acoustic stimulation without suggestion as a control condition. Based on strict criteria, in which a lucid dream is verified by the dreamer, the external raters, and eye movements, 3%, 6%, and 6% of total dream reports were scored as lucid in the control, acoustic suggestion, and hypnosis conditions, respectively. Of the 10 participants, one reported lucidity in the control condition, whereas two participants reported lucidity in both experimental conditions. The study concludes that acoustic suggestion evokes more lucid dreams than nonsuggestive stimulation but is not further enhanced by hypnosis. Moreover, the induction methods employed in the study enabled inexperienced participants to learn lucid dreaming within a few days.

Keywords
Suggestion · Hypnosis · Sleep, REM · Polysomnography · Electrooculography

Lucid dreaming is a state in which an individual becomes aware of their dream state while still in the dream, leading to increased control and exploration of the dream world [7]. In contrast, nonlucid dreams are characterized by a lack of critical thinking, causing unawareness of the dream state. Here, dream scenarios are often perceived as reality without reflection. In addition, the experience of lucid dreaming is associated with sustained wake-like consciousness, resulting in an increased understanding of the unreal nature of the dream state. Lucid dreaming can occur in various degrees of awareness, ranging from partial metacognitive consciousness to fully immersive virtual reality-like experiences that enable the dreamer to experience complete control over the dream environment and characters. Research on lucid dreaming uses various methods, including self-reports, physiological measures, and neuroimaging techniques. One method that has been particularly useful for studying lucid dreaming is eye signal verification [14]. This involves instructing participants to make specific eye movements during the lucid dream, which are detected by electrooculography (EOG). This method has been used to reliably identify lucid dreaming and has been instrumental in advancing our understanding of the neural correlates of this phenomenon [12].

Research has consistently shown that lucid dreaming is a rare occurrence, which, in turn, is one of the main challenges to research [22]. This rarity makes it dif-

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ficult for researchers to study the phenomenon and creates a need for reliable induction techniques [28]. While several techniques have been developed to facilitate lucid dreaming, including reality testing, mnemonic induction of lucid dreams (MILD), and wake back to bed (WBTB), they are not always effective for everyone [26]. In recent decades, many studies have contributed to finding reliable lucid dream induction strategies [28]. Aside from the established techniques mentioned above, researchers are trying to find ways to access dreamers while they are already dreaming. One of the main prerequisites for lucid dream induction is some form of reality checking in a dream. Reality checking involves critically questioning the reality of the experience during wakefulness. For example, this can be done by checking whether your hands look normal, as in a dream, they will not. Another example is double-checking the time, as time does not work normally when you are dreaming. The dreamer must somehow be triggered to perform a reality check during dreaming in order to recognize that their experience is not real. Many researchers aim to reach the dreamer, trigger a reality check, and induce lucidity. Others try to improve the reality check quality during wakefulness using, for instance, virtual reality training [11]. Reaching dreamers inside a dream has been done using different cues targeting different modalities, such as light, odor, and acoustics [27]. Various types of audio cues, such as verbal prompts, tones, and music, have been tested for their effect on dream content, dream recall, and lucidity levels. For example, Kueny and LaBerge & Owens [16, 17] found that playing a tape recording of the phrase "You are dreaming" during the night increased the frequency of lucid dreams in participants. Another study used alternating audio and visual cues during REM sleep. The participants were instructed before sleep to practice a mental state of self-awareness while being presented with the cues. Presenting them again during REM sleep aims to activate self-awareness and lucidity. A control group received the same presleep instructions but was not cued during subsequent REM sleep. Based on eye-signal verification, lucid dreams were qualified and, after data analysis, 50% of the experimental group experienced signal-verified lucid dreams as opposed to 17% of participants in the control condition [5].

Lucid dream induction often relies on convincing yourself that you will become lucid once entering a dream state. This technique, also known as autosuggestion, has been vital for lucid dream induction methods such as MILD [8]. When suggestion or instruction is not provided by the self but by an external person, we move toward the concept of hypnosis. Hypnosis is a state of consciousness characterized by focused attention, heightened suggestibility, and reduced peripheral awareness [2]. In hypnosis, a suggestion aims to elicit specific behavior [18]. Suggestions can affect behavior during or after hypnosis. A suggestion intended to take effect after hypnosis is called a posthypnotic suggestion [15]. In order to use hypnosis for lucid dream induction, the dreamer should be activated during the dream to perform a reality check. In the present study, posthypnotic suggestion is used to make a person perform a specific task, a reality check, after the hypnotic trance has ended, in this case, during the dream. The suggested task can be performed in response to a prearranged cue, such as an audio cue: "You are dreaming." Execution of the task might occur consciously or unconsciously and is, therefore, suitable to be used in a dream context.

Stumbrys et al. [27] described the effectiveness of posthypnotic suggestion in their review of the induction of lucid dreams. Two laboratory experiments have been performed using this technique: Dane [6] previously attempted to use hypnosis for lucid dream induction. Of the 15 women undergoing posthypnotic suggestion, 14 reported lucid dreams during a single night in the sleep laboratory [6]. These findings seemed extremely promising. However, the second laboratory study failed to replicate these findings [10]. Additionally, field studies offer conflicting results. While one study reports that posthypnotic suggestion gives rise to at least one lucid dream in 9 weeks [10], others report no effects [21].

The current study aims to replicate the original results from Dane in a stricter laboratory setting [6]. The authors combine hypnotic enhancement with acoustic suggestion to further enhance the induction potential. Hypnotic enhancement of the cue "You are dreaming" is tested against the sole use of the acoustic suggestion "You are dreaming." A third and final control condition is included, using the mention of the participant's name only, i.e., using acoustic stimulation without suggesting lucidity. We predict that hypnotic enhancement of acoustic suggestion will result in more lucidity, as opposed to acoustic suggestion alone. Additionally, acoustic suggestion is predicted to result in more lucidity than acoustic stimulation without suggestion.

Methods

Participants

Ten female students with mean (M) age = 21.6 years (standard deviation, SD = 2.5) were selected to test three different conditions on three consecutive nights, counterbalanced in order. Inclusion criteria included good dream recall, no previous lucid dream experience, and a positive attitude toward hypnosis. Together with a questionnaire on inclusion criteria, applicants were sent information about the study, explaining its aim, important theoretical constructs, and a short walkthrough of the study. In addition, they were instructed to train in the performance of specific eye movements at home. At the time of data collection (2009–2010), ethical review and approval was not required for the study on human participants in accordance with local legislation and institutional requirements (Institute of Sports and Sports Sciences, Heidelberg University, Germany). Participants provided written informed consent before the beginning of the study and the experiment was conducted in accordance with the Declaration of Helsinki. Participation was compensated by 90 €.

Polysomnography

Polysomnography (PSG) was applied using silver cup electrodes attached according to the American Academy of Sleep Medicine's (AASM) guidelines for PSG using the 10–20 system. Sixteen electrodes were used in total, with six electroencephalography (EEG) electrodes, two each for frontal (F3/F4), central (C3/C4), and occipital (O1/O2) regions. Two electrooculogram (EOG) channels, two electromyogram (EMG) channels on the chin, and one electrocardiogram (ECG) channel were used. Reference electrodes (M1/M2) for EEG and EOG were placed on the mastoids. The EMG reference was placed on the chin, and the ECG electrode was in the middle of the lower right rib. An electrode above the nasion served as the primary reference. The visualization of PSG used sampling rates of 500 Hz and the lower and upper filter cut-off frequencies were set in accordance with AASM guidelines. The EEG channels had an indicated sensitivity of 7 µV, the EOG had a sensitivity of 30 µV, and the EMG and ECG had a sensitivity of 20 µV. For lucid dream verification, the participant executes a specific sequence of predetermined eye movements upon lucidity, which the EOG electrodes then pick up. In this study, a left–right–left–right (LRLR) sequence was used.

During the study, participants slept in a soundproof room located in the sleep laboratory while experimenters sat in a separate control room. The participants were able to communicate with the experimenter through an intercom system. Sleep recordings were done using an Xltek amplifier (model: TrexTM Ambulatory EEG and PSG System), and data were transferred to the recording computer using the Xltek NeuroWorks program (Natus, Middleton, WI, USA). The auditory stimulus was recorded and edited with the Audacity® program (Audacity Team; https://audacityteam.org/) and transmitted via loudspeakers. An additional amplifier channel was used for PSG to mark stimulation times in the recording.

Assessment of susceptibility

In the present study, the term hypnotic enhancement is used as opposed to posthypnotic suggestion, as an acoustic suggestion was used as a cue, with additional hypnosis to potentially strengthen its efficacy. The suggestibility of participants was assessed using the German version of the Stanford Hypnotic Susceptibility Scale [4]. First, the session induces a suggestible state in the participant, followed by 12 test suggestions (e.g., lower the outstretched right arm). The duration of the assessment was about 1 h. If the participant was susceptible to one of the 12 test suggestions, a point was awarded, resulting in a final score of 0–12. The participants in this study had an average susceptibility score of $M = 6.2$ ($SD = 2.6$). One participant scored 2, three participants scored 4, and the rest scored 6 or higher.

Assessment of hearing and wake-up threshold

Sensory stimulation during sleep requires a particular intensity and is controlled by a delicate balance. If the stimulation is too low in intensity, the cue might not reach the dreamer during sleep. On the other hand, if the stimulation is too high in intensity, the participant might experience arousal or even awakening. In the case of acoustic stimulation, the intensity levels apply to the volume of the presented stimulus [5].

Because of this, it is essential to find the perfect volume thresholds. Thus, a hearing and a wake-up volume threshold were established before sleep. The hearing threshold test was performed in a lying, supine position in bed. For this test, the volume of the acoustic stimulation was altered, and the participant had to indicate whether they were able to hear the stimulus. The hearing threshold was set at the lowest volume value at which the sentence was perceived during wakefulness but not necessarily understood.

Once a participant entered the first or second REM stage, the wake-up threshold was established. The auditory stimulation for inducing a lucid dream, i.e., the phrase "You are dreaming," was presented through two speakers attached about 2 m above the head of the bed. The wake-up threshold was determined by starting stimulation with a volume of 20 steps above the hearing threshold. Then, every 30 s, the volume was increased by two steps until the participant woke up. On the first night, the mean of two test wake-up thresholds was used as the final wake-up threshold of the first night. The wake-up threshold of the second night was the mean of the first night's final wake-up threshold and the second night's test wake-up threshold.

Conditions and procedure

Conditions

In this experiment, three different conditions were tested for their potential to induce lucid dreams on three consecutive nights that were counterbalanced in order.

Acoustic suggestion. The acoustic suggestion included presentation of the phrase "You are dreaming" from the third REM phase onward. This condition tests acoustic suggestion during sleep and simultaneously acts as a control for the hypnotic enhancement condition in this study. This first condition tests the potential of the acoustic suggestion on its own.

Acoustic stimulation. As a control condition for the acoustic suggestion, acoustic stimulation was included in the procedure, controlling for acoustic suggestion by presenting solely the participant's name, avoiding any literal suggestion of becoming lucid.

Hypnotic enhancement of acoustic suggestion. Finally, a condition that enhances the acoustic suggestion using a hypnosis protocol was used. In this condition, the hypnotic enhancement was first performed after the hearing threshold had been established. It started with fractionation to bring the participant into a relaxed state [15]. Afterward, the lucid dream experience was suggested, followed by practicing the reaction to becoming lucid while presenting the acoustic suggestion "You are dreaming." The simulated lucid dream was signaled by LRLR eye movement. After the hypnosis session was finished, the participant was instructed to sleep. This procedure was repeated from the third REM phase onward.

Experimental procedure

Lucid dream induction was performed after the wake-up threshold had been successfully established, usually starting from the third REM phase. Stimulation began 5 min after the occurrence of the first rapid eye movement. The volume was increased continuously, starting at 10 volume steps below the wake-up threshold. The stimulation intervals were increased

Table 1 Sleep data per night with the F and *P*-values resulting from ANOVA

	Nights									ANOVA	
	1st Night			2st Night			3st Night			F	*P*-values
Total bedtime (min)	491.9	±	44.9	503.6	±	35.5	503.3	±	68.3	0.16	0.85
Total sleep time (min)	366.1	±	69.3	414.8	±	56.1	417.5	±	55.5	3.43	0.05
Sleep efficiency (%)	74.2	±	11.4	82.2	±	7.7	83.1	±	3.7	5.06	0.02
Sleep latency (min)	36.5	±	29.4	23.3	±	25.7	16.2	±	13.0	3.59	0.05
REM latency (min)	182.9	±	33.7	155.4	±	71.1	102.6	±	46.2	8.49	0.00
REM period count	4.0	±	0.9	5.2	±	1.1	6.2	±	1.1	10.71	0.00
REM total time (min)	32.7	±	14.6	55.1	±	23.9	72.9	±	17.2	14.89	0.00
REM% SPT	6.6	±	2.9	10.8	±	4.3	14.4	±	2.8	18.89	0.00
Wake% SPT	25.8	±	11.4	17.8	±	7.7	16.9	±	3.7	5.06	0.18
Stage 1% SPT	13.0	±	11.3	7.7	±	4.2	6.5	±	3.8	4.68	0.02
Stage 2% SPT	34.6	±	10.7	40.4	±	6.7	38.6	±	6.0	3.37	0.06
Stage 3% SPT	18.2	±	8.6	22.2	±	4.9	21.6	±	6.2	1.64	0.22

REM rapid eye movement, *ANOVA* analysis of variance, *SPT* sleep period time

to 60 s compared to the 30-second intervals during the wake-up threshold condition to avoid overstimulation and give participants enough time to incorporate the stimulus into the dream. Stimulation was stopped if the participant switched from REM to another sleep stage.

In some cases, REM sleep reappeared within a few minutes, allowing stimulation to continue. If the participant became lucid during stimulation, they were instructed to perform three LRLR eye movements, each separated by a 5-second break. After a maximum of 10 stimulations and an additional final waiting period of 60 s, the participants were awakened for a dream report. After each REM awakening, any thoughts before awakening were collected, together with the potential perception of a stimulus and whether this stimulus had led to waking up.

Dream content analysis

Before dream content analysis, the original dream transcripts were processed [23]. Thereafter, based on the dream reports, the research team (DE and FM) established whether the participant had realized that they were dreaming in the dream.

Criterion for successful lucid dream induction

The lucid dream induction counts as successful if three different types of proof hold [8]: (1) the participant's subjective self-rating of lucidity; (2) the dream report rated by external judgement as having either possible or clear signs of lucidity; (3) the participant reports LRLR eye signaling, which can be unambiguously identified on the PSG recording by external rating by the research team. All three proofs must hold true for the "strict" criterion of successful lucid dream induction. For the "loose" criterion, (1) and (2) were considered sufficient.

Data analysis

Using the Neuroworks program, each PSG recording was scored following the AASM manual for sleep scoring [13]. The hypnogram data were exported and further analyzed. Sleep parameters such as sleep onset latency, sleep duration, REM sleep duration, and others were compared between the three nights and conditions to control for any confounders affecting sleep quality other than the three different conditions. An ANOVA test was performed for each sleep parameter. The percentage of lucid dreams was calculated following the liberal and conservative approaches.

Results

Sleep data

Table 1 shows the sleep data over the three nights. A REM rebound effect was observed. Regardless of the condition, participants had M = 4.0 (SD = 0.9) REM phases on the first night, M = 5.2 (SD = 1.1) on the second night, and M = 6.2 (SD = 1.1) on the third night. Participants slept longer overall, and the proportion of REM sleep to total sleep increased throughout the three nights from M = 6.6% (SD = 2.9) on the first night, M = 10.8% (SD = 4.3) on the second night, to M = 14.4% (SD = 2.8) on the third night. Sleep efficiency increased over the nights as sleep latency decreased throughout the three nights. Over the three nights, participants had an increase in the total amount of REM sleep.

Table 2 displays the sleep data for the three conditions, and the total bedtime between the conditions differed significantly. This is because the hypnosis condition required spending 20–30 min longer in bed during the posthypnotic suggestion session. Sleep efficiency was highest during the control condition and lowest in the hypnotic enhancement condition.

Dream reports

A dream was reported in 93% of the REM phases used for lucid dream induction. In the hypnotic enhancement condition, the average dream report was M = 337 words, compared to M = 232 words in the acoustic suggestion condition and M = 178 words in the control condition. The analysis was performed on 104 dream reports, resulting in the following data.

Table 2 Sleep data for each experimental condition

	"Name"			"You are dreaming"			"You are dreaming + hypnosis"			F	*P*-value
Total bedtime (min)	474.8	±	42.6	493.0	±	31.7	531.0	±	58.2	4.27	0.03
Total sleep time (min)	396.3	±	48.0	385.9	±	43.3	416.2	±	90.4	0.76	0.48
Sleep efficiency (%)	83.3	±	4.3	78.5	±	9.7	77.6	±	11.1	1.47	0.26
Sleep latency (min)	20.8	±	13.3	30.1	±	28.9	25.2	±	29.4	0.55	0.58
REM latency (min)	140.1	±	63.6	154.7	±	76.5	146.2	±	44.7	0.15	0.86
REM period count	5.3	±	1.3	4.9	±	1.4	5.2	±	1.5	0.18	0.84
REM total time (min)	55.5	±	22.1	47.9	±	21.9	57.4	±	31.0	0.37	0.70
REM% SPT	11.6	±	4.2	9.8	±	4.7	10.5	±	5.2	0.32	0.73
Wake% SPT	16.7	±	4.3	21.5	±	9.7	22.4	±	11.1	1.47	0.26
Stage 1% SPT	6.9	±	4.1	11.6	±	11.2	8.7	±	5.6	1.69	0.21
Stage 2% SPT	39.0	±	6.6	36.2	±	9.7	38.4	±	8.7	0.64	0.54
Stage 3% SPT	24.8	±	7.2	19.2	±	6.3	18.0	±	5.0	6.78	0.01

REM rapid eye movement, *SPT* sleep period time

Table 3 Number of lucid dreams in different conditions separated for REM stimulations and number of participants

	"Name"		"You are dreaming"		"You are dreaming + hypnosis"	
	Dream reports	Partici-pants	Dream reports	Partici-pants	Dream reports	Partici-pants
–	36	10	34	10	34	10
Self-ratings	4 (11%)	3	6 (18%)	6	7 (21%)	6
Loose	2 (6%)	2	4 (12%)	4	5 (15%)	4
Strict	1 (3%)	1	2 (6%)	2	2 (6%)	2

REM rapid eye movement

Lucid dream ratings

Table 3 summarizes the results of self-ratings as well as those for the loose and strict lucid dream criteria. In the self-ratings, 21% of the dream reports in the hypnosis condition were scored as lucid, whereas 18% of the acoustic suggestion dreams were lucid and 11% were lucid in the control condition. Following the loose criterion, the percentages were 15% using hypnosis, 12% using acoustic suggestion, and 6% using acoustic stimulation. Finally, the strict conditions resulted in 6% of dream reports being scored as lucid in the hypnosis, 6% in the acoustic suggestion, and 3% in the acoustic stimulation conditions.

When looking at the number of dreamers becoming lucid, there is no difference between the acoustic suggestion and the hypnotic enhancement group. In both conditions, six participants became lucid according to the self-ratings, four according to the loose criterion and two according to the strict criterion. In the acoustic stimulation condition, these numbers were three, two, and one respectively.

Discussion

This study examined hypnotic enhancement of acoustic suggestion during REM sleep for its efficacy in lucid dream induction. Three conditions were tested: firstly, acoustic suggestion with hypnotic enhancement using a posthypnotic suggestion session before sleep onset and after each REM awakening; secondly, acoustic suggestion was tested independently; and, finally, a control condition using acoustic stimulation without any suggestion was presented.

Efficacy of hypnotic enhancement

In the hypnotic enhancement condition, 21% of dreams were reported to be lucid based on self-reports, 15% based on loose criteria, and 6% based on strict criteria. In the acoustic suggestion condition, 18% of dreams were reported to be lucid based on self-reports, 12% based on loose criteria, and 6% based on strict criteria. Thus, when regarding lucid dreams that were confirmed by the dreamer, the rater, and eye movements, there was no difference between the two experimental conditions. In the control condition, i.e., acoustic stimulation without suggestion, less lucidity was reported: 11% of dreams were reported to be lucid based on self-reports, 6% based on loose criteria, and 3% on strict criteria.

When looking at the number of dreamers having a lucid dream, there are no differences between the hypnosis and the acoustic suggestion conditions. Both conditions resulted in self-reported lucid dreams in six participants. The loose criteria scored four participants and the strict criteria scored two out of 10 participants as having had a lucid dream. In the control condition, these numbers were three, two, and one, respectively. This could be explained by the fact that dreamers did not receive any suggestion to become lucid in this condition.

The small difference found in the number of lucid dreams in total might be explained by the fact that the participants had never experienced a lucid dream before and likely had little prior engagement with the phenomenon. The novel intensive engagement with lucid dreaming, in addition to auditory suggestion and an additional hypnosis session, is a likely reason for the lucid dreams experienced in the study [20]. However, when looking at individual lucid dreamers, the lack of hypnotic enhancement of acoustic suggestion should be acknowledged, albeit regarded with a pinch of salt, as the number of participants was rather low, which may render the results inconclusive. In a future study, the imbalance in the time spent engaging with the subject of lucid dreaming between the three conditions could be leveled out by having participants in the other two conditions read or talk about lucid dreaming for the same amount of time. Suggestibility, with a mean of 6.2, was in the mid-range and slightly above average [4]. Dane [6] obtained promising results in their study on lucid dream induction with highly suggestible participants. It would be interesting to conduct future studies with a similar experimental design as the present study, but solely with highly suggestible participants. One of the aims of the present study was to replicate Dane's study (1984) [6]. The results show that the lucid dream rates are not comparable. In addition, Dane achieved a relatively high lucid dream rate through hypnotic suggestion alone, without additional external stimuli.

Limitations of the induction methods

This study has some methodological limitations. The efficacy of these conditions was tested in lucid dreamers without prior lucid dreaming experience. Due to their lack of experience, the participants found it challenging to recognize and report the lucid state [25]. Additionally, the participants reported experiencing difficulty with giving eye signals, or the act of signaling was so activating that they woke up. This has an influence on the strict criteria and might have suppressed the outcomes, as the lack of eye signal verification, in some cases, might not have been the result of a lack of lucidity. This points to a preference for using the loose criteria. Unfortunately, the arousals were not systematically recorded and this thus remains speculation. The hearing threshold was measured on the first day of the study, with participants asked to lie on their backs. However, there is a possibility that due to changes in sleeping position, one ear may have been obscured by a pillow or the mattress. Headphones would create more problems than they would solve: participants may find wearing headphones uncomfortable, hindering falling or staying asleep.

After determining the threshold for awakening, stimulation was carried out during REM sleep without distinguishing between tonic and phasic REM sleep. A recent study has shown that the thresholds for awakening differ between tonic and phasic REM sleep [9]. The threshold for awakening also depends on how often the stimulation was presented before sleep. The participants heard the stimulation before sleep, during hypnosis, and during dreaming, thus likely increasing the awakening threshold [29, 30]. In future studies, this effect could be counteracted by increasing the stimulation every consecutive night.

Sleep efficiency was the lowest in the hypnotic enhancement condition. This could be explained by the fact that the hypnotic session was performed while the participants were already in bed, thus increasing their bedtime and consequently decreasing sleep efficiency. This is not an effect of the increased lucid dreaming frequency, but a result of the methodology.

Furthermore, the hypnotic enhancement was conducted by one of the researchers, who independently learned how to perform hypnosis in a multiday hypnosis seminar. This researcher worked together with an experienced sports hypnotist to develop the suggestion texts. However, the researcher may have lacked practical experience. Additionally, it is questionable whether conducting only one hypnosis session on the evening of the experimental night is sufficient. Increased lucid dream frequency may be associated with the number of hypnosis sessions.

Additionally, Dane's study [6] results suggest that a hypnosis text tailored to the participant's individual suggestibility may positively affect lucid dream frequency. For the external rating of lucidity, two of the authors (DE and FM) performed the analysis and consensus. The advantage of analysis by the research team was that the experimenters were present during data acquisition and could better understand or interpret the sometimes ambiguous statements in the dream reports. However, it also creates a bias towards a particular interpretation.

Finally, the most critical limitation is not only a problem in the present study, but in dream incorporation studies in general. In some cases, the stimulus was heard, but the participant was unsure whether they were awake or still in REM sleep. If they had recognized during stimulus presentation that they were dreaming, the dream would have been considered lucid. The timing of awakening after a stimulus poses a big challenge for dream incorporation studies. A stimulus is often repeated several times, followed by a certain waiting period to verify that the stimulus was presented during sleep. However, using this paradigm, it is often the case that the stimuli cause arousal, subsequently waking up the participant before the protocol has ended. In these cases, the problem of timing arises. Reporting a stimulus as being incorporated into a dream when it was actually presented during wakefulness could result in false assumptions, leading to inaccurate accounts of dream incorporation.

Potential and applications of lucid dreaming

This study aimed to contribute to the search for a reliable lucid dream induction method. If successful, lucid dreams would become more prevalent, opening up the many applications of this exceptional state of mind. The ability to control dream content creates a unique phenomenon that has the potential to counteract the negative aspects of dreaming, enable the practice of real-life skills, and create a space for personal exploration. Research has shown that lucid dreaming can help treat the nightmares that often occur in patients with posttraumatic stress disorder (PTSD) and phobias [31]. Outside of the clinical field, lucid dreaming can improve wakeful skill performance, ranging from motor skills to creative problem solving [3]. Further motor performances were practiced using lucid dreaming and showed promising results. Peters et al. provide an overview of the potential of lucid dreaming for motor performance enhancement [19]. Lucid dreaming has also been associated with personal benefits, including increased creativity. Increased creativity and problem-solving abilities were found in frequent lucid dreamers compared to nonlucid dreamers [1, 24]. In conclusion, lucid dreaming has been shown to have potential applications in various fields, including clinical psychology, sports performance, and personal development.

Conclusion

Hypnotic enhancement of acoustic suggestion resulted in a small increase in the number of lucid dreams; however, the number of dreamers experiencing lucidity remained the same between the two experimental conditions.

Participants in the control condition experienced fewer lucid dreams than both experimental conditions. The control condition uses acoustic stimulation only, without suggestion. Suggestion thus seems to be an important factor for lucidity. The present study shows that participants without prior experience of lucid dreaming could learn lucid dreaming within a few days using the acoustic suggestion method employed in the study. However, hypnotic enhancement does not seem to further improve this method. Thus, the study hypothesis was partially confirmed, as the control condition resulted in less lucidity. In a follow-up study, it would be interesting to investigate the change in lucid dream rates of the same participants after the study without continuing any induction methods. In Dane's study, participants who received posthypnotic suggestion reported more lucid dreams after the study had ended [6]. It would also be interesting to use hypnotic enhancement of other external stimuli, such as light flashes. Finally, it might be that hypnosis needs more than one session to be successful. Overall, this study provides evidence that acoustic suggestion is successful in eliciting lucidity but is not further strengthened by hypnosis.

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Declarations

Conflict of interest. E. Peters, D. Erlacher, F. Müller, and M. Schredl declare that they have no competing interests.

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

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Zusammenfassung

Verwendung von hypnotischer Verstärkung mit auditiver Suggestion zur Induktion luzider Träume

Ziel dieser Studie war es, die Wirksamkeit der hypnotischen Verstärkung auditiver Suggestion zur Auslösung luzider Träume bei unerfahrenen Personen zu untersuchen. Luzides Träumen, ein Zustand, in dem sich der Träumende seines Traumzustands bewusst wird, bietet Möglichkeiten für persönliche Erkundungen, Sport und klinische Anwendungen. Die Seltenheit des luziden Träumens stellt jedoch eine Herausforderung für die wissenschaftliche Erforschung dar, sodass zuverlässige Induktionsmethoden unerlässlich sind. In der Studie wurde die Wirksamkeit von akustischer Suggestion, hypnotischer Verstärkung und akustischer Stimulation ohne Suggestion als Kontrollbedingung getestet. Auf der Grundlage strenger Kriterien, bei denen ein luzider Traum durch den Träumer, externe Bewerter und Augenbewegungen verifiziert wird, wurden 3 % in der Kontroll-, 6 % in der akustischen Suggestions- und 6 % der gesamten Traumberichte in der Hypnosebedingung als luzide eingestuft. Von den 10 Teilnehmern berichtete ein Teilnehmer in der Kontrollbedingung von luziden Träumen, während in beiden Versuchsbedingungen 2 Teilnehmer von luziden Träumen berichteten. Die Studie kommt zu dem Schluss, dass akustische Suggestion mehr luzide Träume hervorruft als nichtsuggestive Stimulation, aber durch Hypnose nicht weiter verstärkt wird. Darüber hinaus ermöglichten die in der Studie verwendeten Induktionsmethoden unerfahrenen Teilnehmern, das luzide Träumen innerhalb weniger Tage zu erlernen.

Schlüsselwörter
Suggestion · Hypnose · REM-Schlaf · Polysomnographie · Elektrookulographie