Testing the effectiveness of two lucid dream induction methods: A four-week diary study

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Summary. Lucid dreams (being aware that one is dreaming while still dreaming) can be a lot of fun. As lucid dreams occur relatively rare spontaneously, researchers investigated possible techniques to increase lucid dream frequency. In the present study, 81 persons (59 women, 22 men) were assigned to one of two induction techniques that should be practiced for four weeks. The findings indicate that neither the reality testing technique nor the autosuggestion technique showed a significant increase in lucid dream frequency. The direct comparison of the two induction techniques yielded a significant difference (medium effect size) at first, with the reality testing method superior to the autosuggestion method. However, this group difference was almost completely explained by differences in pre-study lucid dream frequency between the two groups. Overall, the main factor whether a person experienced lucid dreams during the study period was the frequency of lucid dreams the person had prior to participating in the study. The question of whether everyone can learn to have lucid dreams is still open to debate.

Keywords: Lucid dreaming, lucid dream induction, reality checks, autosuggestion

1. Introduction

Within lucid dreams, the dreamer is aware of the fact that they are dreaming while still being in the dream (LaBerge, 1985). Typically, lucid dreams are fun as skilled lucid dreamers can manipulate the dream action (Stumbrys et al., 2014). Lucid dreaming can also be helpful in coping with nightmares or training motor skills (Dresler et al., 2022). Although about 50% of the population experienced at least one lucid dream during their lifetime (Saunders et al., 2017). The percentage of persons who experience lucid dreams at least once per week is very small: 5% (Schredl & Erlacher, 2011). Thus, research focused from the beginning of lucid dream research in the late 1970s on methods to increase lucid dream frequency, the so-called induction methods (Stumbrys & Erlacher, 2014). Today, there is a large variety of different methods (Stumbrys et al., 2012; Tan & Fan, 2022), for example, the wake-up-back-to-bed technique (Schredl et al., 2020), virtual reality training (Gott et al., 2021), transcranial direct current stimulation (Stumbrys et al., 2013b), or auditory stimulation (Peters et al., 2024). Two methods, the autosuggestion and the reality testing techniques were used from early on as they can easily be practiced in the home setting (Stumbrys et al., 2012). Practicing the autosuggestion technique includes that the person suggests to themselves to have a lucid dream during the night before falling asleep; however, the empirical evidence for this technique is limited (Stumbrys et al., 2012): One study found no effect (Levitan, 1989), whereas another study using an eight-week training period (compared to only one week in the Levitan study) obtained a significant increase in lucid dream frequency (Schlag-Gies, 1992). In the review of Stumbrys et al. (2012), five out of six field studies indicated that reality testing (the reality testing technique involves asking oneself around 5 to 10 times during the day whether one is dreaming or not, and examining the environment for possible incongruences) can increase lucid dream frequency: However, three more recent studies (Aspy et al., 2017; Dyck et al., 2017; Taitz, 2011) with training periods of one to three weeks found no significant effect of reality testing training on lucid dream frequency. Levitan (1989) showed in her study using a cross-over design that one week of training reality testing was much more effective than training the autosuggestion method for one week. Overall, the findings on whether these two easy-to-use methods are effective in inducing lucid dreams are heterogeneous.

The aim of the present study was to study possible effect of training the autosuggestion method or the reality testing method over a 4-weeks period on lucid dream frequency. Based on the previous finding of Levitan (1989), we hypothesized that the reality testing technique would be more effective than the autosuggestion technique.

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Submitted for publication: April 2025
Accepted for publication: June 2025
DOI: 10.11588/ijodr.2025.2.110523

2. Method

2.1. Participants

Overall, 81 persons (59 women, 22 men) with a mean age of 24.44 ± 8.49 years (range: 19 to 56 years) participated in the study. The participants were mainly psychology students (N = 68); N = 7 were other students, and N = 6 participants were non-students. N = 40 (28 women, 12 men) were randomized into the reality check group and N = 41 (31 women, 10 men) into the autosuggestion group. The gender distribution between the two groups was not statistically different (Chi^2 = 0.3, p = .5704). Similarly, the mean ages did not differ (25.95 ± 10.17 yrs. (Reality check group) vs. 22.98 ± 6.22 yrs. (Autosuggestion group), t =-1.6, p = .1154).

2.2. Research Instruments

2.2.1 Baseline Questionnaire

A seven-point scale (coded as 0 = never, 1 = less than once a month, 2 = about once a month, 3 = about 2 to 3 times a month, 4 = about once a week, 5 = several times a week, 6 = almost every morning) was presented for measuring dream recall frequency (Schredl et al., 2014a); the retest reliability is high with an r of 0.85 (mean interval about 8 weeks) (Schredl, 2004).

The participants were asked whether they had ever experienced a lucid dream defined as a dream in which they knew they were dreaming and were able to control the dream. If so, the frequency of lucid dreams were measured with the similar seven-point scale that was used to measure dream recall (with not having any lucid dream so far codes as 0 = never). Moreover, the participants were asked to estimate the number of mornings with at least one lucid dream they had during the last 28 days.

2.2.2 Dream diary

The dream diary was designed for a four-week period. For each morning, the participants were asked to state whether they recalled a dream or not (including an in-between category of recalling that one has dreamed but is unable to recall the specific content of the dreams also called "white dreaming") and whether they recalled a lucid dream from the previous night. Only in case of having a lucid dream, a brief description including a possible reason why the dreamer became lucid should be given.

2.2.3 Email Questionnaire

After each week, the participants received a brief questionnaire via email. The four questions covered the number of mornings with successful dream recall, the number of days the participants had practiced their respective induction technique, and the number of mornings with lucid dreams. Only if they had lucid dreams, a brief description of those lucid dreams should be added (non-lucid dreams should not be recorded).

2.3. Procedure

The project was carried out by two student experimenters under the supervision of the author. The psychology students were approached by the experimenters after classes. They received course credit for returning the materials. The other participants were from the social network of the experimenters, they were not reimbursed for participation. The experimenters prepared two different booklets including the general instructions, the baseline questionnaire, the group-specific instructions (see below), and the four-week dream diary. Four participants did not complete the study. Five participants out of the total sample (N = 81) did not return the dream diary but completed the email questionnaires, and three participants did not respond to the last email questionnaire (after the last week). The included participants completed the study between November 9, 2005 and December 17, 2005.

The first part of the booklet consisted of two pages with general information about lucid dreaming, the knowledge of being in a dream while dreaming, the ability to control the dream action, to experiment within the dreams or to fly. In addition, the possible benefits of lucid dreaming for coping with fears, for example, were highlighted. This was used as background why studies testing lucid dream induction methods are useful. Next, the four tasks the participants should complete, were listed: Training their method daily (about 3 minutes per day), completing the baseline questionnaire (about 7 minutes), completing the checklist every morning for the next 28 days (one to two minutes per day), and respond to the email questionnaire that will be send weekly (about 4 minutes). The time estimates were included in order to increase the motivation to complete the study.

The Reality Check group received instructions on how to carry out the reality checks about 8 times per day, for example directly upon awakening in the morning, during breakfast, during lunch, two times during the afternoon, and hourly three hours before bedtime. They should concentrate on whether something bizarre is happening, or abrupt scene shifts, memory gaps and ask themselves whether they are dreaming or are awake. The participants received a flyer with this question, so that it can be posted on a prominent place to serve as a reminder.

The instructions of the Autosuggestion group were as follows: Please read the flyer (Text: "During this night I will have a lucid dream. I will be aware that I am dreaming.") directly prior to sleep onset. After reading the sentence, it should be mentally repeated eight times with eyes closed.

For carrying out the statistical procedures, we used the SAS 9.4 software package for Windows (Cary, North Carolina, USA). Ordinal regression analyses were computed to analyze the effect of the induction technique on lucid dream frequency, controlling for age, sex, dream recall frequency,

Table 1. Dream recall frequency and lucid dream frequency distributions (N = 81).

	Dream recall frequency		Lucid dream frequency	
Category	Frequency	Percentage	Frequency	Percentage
Almost every morning	6	7.41%	0	0.00%
Several times a week	31	38.27%	1	1.23%
About once a week	23	28.40%	3	3.70%
About two to three times per month	11	13.58%	9	11.11%
About once a month	5	6.17%	4	4.94%
Less than once a month	4	4.94%	30	37.04%
Never	1	1.23%	34	41.98%

Table 2. Lucid dreams during the four-week study period.

	Retrospective data (N = 81)		Diary data (N = 76)		Email questionnaire data (N = 81)	
Category	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Three or more lucid dreams	10	12.35%	7	9.21%	7	8.64%
Two lucid dreams	5	6.17%	6	7.89%	8	9.88%
One lucid dream	4	4.94%	8	10.53%	9	11.11%
No lucid dreams	62	76.54%	55	72.37%	57	70.37%

and pre-study lucid dream frequency. The variables were entered simultaneously. Effect sizes were computed using the webpage of Lenhard and Lenhard (2016). Their algorithms are based on Cohen (1988).

3. Results

The distributions of dream recall frequency and lucid dream frequency are depicted in Table 1. Most of the participants recalled dreams once a week or more often. On the other hand, most participants rarely or never experienced lucid dreams (see Table 1). The Spearman rank correlation between the two scales was r = .277 (p = .0123; N = 81).

During the four-week period, about 30% of the participants experienced at least one lucid dream (see Table 2). The number of lucid dreams recorded in the diary correlated with r = .988 with the data reported in the email questionnaire. The data were categorized because the distributions were not normal but positively skewed. Of the persons with three or more lucid dreams (diary data), two reported four lucid dreams, two five lucid dreams, and one reported six, eight, or fourteen lucid dreams each. The distribution for the email questionnaire based data was almost similar: four lucid dream (N = 2), five lucid dreams (N = 1), six lucid dreams (N = 1), seven lucid dreams (N = 2), and twelve lucid dreams (N = 1). The pre-study number of lucid dreaming during the last 28 days is also depicted in Table 2. Four persons reported having three lucid dreams, two four lucid dreams, three five lucid dreams and one eight lucid dreams in the four weeks prior to the study. The difference between the retrospective measuring lucid dream number and the number of lucid dreams based on the email questionnaire was not significant (total group: z = 0.3, p = .3854, one-tailed, N = 81, d = 0.067; Reality Check group: z = 0.2, p = .4168, one-tailed, N = 40, d = 0.063; Autosuggestion group: z = 0.1, p = .4708, one-tailed, N = 41, d = 0.031). The Spearman rank correlation between the lucid dream frequency measure (retrospective data) and the lucid dream frequency measure (email data) was r = .465 (p < .0001, N = 81).

The categorized number of lucid dreams based on the email questionnaire data for the two induction groups are presented in Table 3. More participants in the Reality Check group reported a lucid dream compared to the Autosuggestion group; the ordinal regression yielded a significant group effect (standardized estimate: .3385, Chi^2 = 5.6, p = .0089, effect size = 0.545). However, the analyses of the baseline questionnaire data revealed that the Reality Check group had a higher pre-study dream recall frequency (4.38 ± 1.00 (Realty Check) vs. 3.78 ± 1.51 (Autosuggestion), z = 1.7, p = .0413) and a higher pre-study lucid dream frequency (1.30 ± 1.29 (Reality Check) vs. 0.73 ± 1.07 (Autosuggestion), z = 2.3, p = .0113). The number of days per week with practicing the induction method did not differ between the two groups (5.83 ± 0.89 (Reality Check) vs. 6.04 ± 0.84 (Autosuggestion), t = -1.3, p = .2600). Including age, gender, dream recall frequency (pre-study), lucid dream frequency (pre-study), and averaged practice days over the four-week period, the group effect is no longer significant (see Table 4). The only significant factor was the pre-study lucid dream frequency with a large effect size. Table 5 demonstrates the effect of prior experience with lucid dreams on the number of lucid dreams during the four-week study. Whereas only 4 out of 34 persons with no previous lucid dream experience experienced their first lucid dream practicing one of the induction techniques, a large number of persons with lucid dreams once per month or more often also experienced a lucid dream during the study.

Dream example 1 (no prior experience with lucid dreams; reported in week 1)

> *"I had a nightmare and was able to face the danger because I knew it was just a dream. I consciously turned towards the danger. I had never had anything like that before, or had never been able to!"*

Table 3. Categorized lucid dream frequency (email questionnaire data) for the two induction groups

	Reality check group (N = 40)		Autosuggestion group (N = 41)	
Category	Frequency	Percentage	Frequency	Percentage
Three or more lucid dreams	4	10.00%	3	7.32%
Two lucid dreams	7	17.50%	1	2.44%
One lucid dream	6	15.00%	3	7.32%
No lucid dreams	23	57.50%	34	82.93%

Table 4. Ordinal regression analyses for the categorized number of lucid dream number during the four-week period based on the email questionnaires (N = 81).

Item	SE	χ^2	p	d
Age	.2357	3.3	.0714	0.412
Gender	.0563	0.1	.7126	0.070
Dream recall frequency (pre-study)	-.0199	0.0	.9075	0.022
Lucid dream frequency (pre-study)	.5923	14.4	.0001	0.930
Practice days	-.0089	0.0	.9535	0.012
Group (RC vs. Auto)	.1321	0.7	.2048[1]	0.187

SE = Standardized estimates, d = Effect size, [1]one-tailed

Dream example 2 (no prior experience with lucid dreams, reported in week 3)

> *"I looked at the experiment's dream diary and thought to myself: "You're dreaming lucidly right now, now you can enter it in the questionnaire."*

4. Discussion

The findings indicate that neither for the reality testing technique nor the autosuggestion technique four weeks of training showed a significant increase in lucid dream frequency. Only four out of 34 novices (never had a lucid dream before) experienced their first lucid dream during the study period. The comparison of the two induction techniques yielded a significant difference (medium effect size) with the reality testing method superior to the autosuggestion method. However, this group difference was almost completely explained by differences in pre-study lucid dream frequency. Overall, the main factor whether a person experienced lucid dreams during the study was the frequency of lucid dreams the person had prior to participating in the study.

From a methodological viewpoint, the study used a four-week training interval which is longer compared to some studies (Aspy et al., 2017; Levitan, 1989; Taitz, 2011) with one or two weeks of training. Furthermore, we tried to increase motivation by sending out weekly emails. The high overlap between the data obtained via email and the data obtained via dream diary indicated that the participants were reliably filling in the diary and answering the email questionnaire. The participants also stated that they trained regularly (about 6 of 7 days per week on average), thus, it could be assumed that the training was carried out as instructed. However, data regarding the frequency of reality checks during the day or how long the autosuggestion was carried out prior to sleep onset, were not collected. Given modern communication means, one might be able to prompt the participants several times a day with text messages (and requiring a brief reply) to make sure that reality tests have been carried out during the day and the autosuggestion prior to sleep onset. This could test whether a possible lack of training might be responsible for not obtaining an effect regarding lucid dream induction.

The autosuggestion method alone was ineffective to increase lucid dream frequency (cf. Levitan, 1989); only one study (Schlag-Gies, 1992) with an eight-week interval had obtained an effect. This raises the question of how long lucid dream induction studies should be, and how the experimenters can ensure continuous motivation in those participants who do not experience a lucid dream during the first weeks of the study. Even though, the review of Stumbrys et al. (2012) reported that five out of six field studies reported a significant effect on lucid dream induction for the reality testing method, our findings support the more recently published non-significant findings (Aspy et al., 2017; Dyck et al., 2017; Taitz, 2011) despite the longer training period of four weeks. We also were not able to reproduce the differential effect of the autosuggestion method and the reality testing method that was reported by (Levitan, 1989). After controlling for pre-study lucid dream frequency, the effect size for this difference was small in our data set. An a priori power analysis based on the this effect size indicated that large samples (N = 355 in each group) would be necessary for a robust statistical testing possible differences between the two induction methods.

The large effect of pre-study lucid dream frequency on the frequency of lucid dreams during the study period emphasizes how important it is to control for this variable. It is also reflected in the high stability of lucid dream frequency: $r = .89$, $p < .0001$ for a four-week period (Stumbrys et al., 2013a). Even for a 3-year interval, the retest reliability was high: $r = .567$, $p < .0001$, N = 1,281 (Schredl & Göritz, 2015). This raises the question of whether everyone can learn to have lucid dreams if the training interval is long enough. So far, a study aiming at inducing lucid dreams in all participants, also the novices who had never had a lucid dream, has not been carried out. In the current study, only a very small number of novices experienced their first lucid dreams. One might speculate whether more sophisticated methods like the wake-up-back-to-bed method carried out in a sleep laboratory with a success rate of 47.5% in 40 participants (Erlacher & Stumbrys, 2020) or reality testing combined with targeted memory reactivation with a success rate of 50% (Carr et al., 2023) are able to induce lucid dreams in every participant if applied more often during the study period.

Table 5. Having at least one lucid dream in the four-week study period for the two induction groups based on prior lucid dream experience.

	Reality check group (N = 40)		Autosuggestion group (N = 41)	
Lucid dreams prior to the study	Frequency	Percentage	Frequency	Percentage
One per month or more often	9/11	81.82%	3/6	50.00%
Less than once a month	6/17	35.29%	2/13	15.38%
No prior lucid dreams	2/12	16.67%	2/22	9.09%

The regression analysis indicated that practice frequency did not affect lucid dream frequency during the study; this might be simply explained by the fact that almost all participants kept to the instructions and practiced regularly. We also did not find an effect of dream recall frequency on the frequency of lucid dreams during the study – even though pre-study lucid dream frequency was correlated with pre-study dream recall frequency as it was reported by previous studies (Hess et al., 2017; Schredl & Erlacher, 2004). However, pre-study dream recall was very high in the sample with about three quarter reporting dream recall of once a week or more often – compared to representative samples with a figure of about 23% reporting such high dream recall (Schredl et al., 2014b). It seems obvious that very low dream recallers are not able to recall lucid dreams independent from any induction technique they practice. Therefore, increasing dream recall by keeping a dream diary is often recommended in lucid dream books as a basic technique (Erlacher, 2010; LaBerge, 1985). We didn't find gender differences in lucid dream frequency during the study period; however, there was a statistical trend for age. Older participants reported more lucid dreams during the study period. As pre-study lucid dream frequency was controlled in this regression analysis, we speculate that the older participants – not receiving course credits – were more motivated to participate compared to the young students. It would be very interesting to elicit motivational aspects related to lucid dreaming prior to the study, for example, the expectation to have a lot of fun with lucid dreams if the induction works.

To summarize, the simple techniques of autosuggestion or reality testing might not be as effective as previously assumed (Stumbrys et al., 2012) showing no effect in the present study with four-week training periods. This might be the reason why researchers combine different methods to increase success rates (Tan & Fan, 2022) and also develop novel techniques like the wake-up-back-to-bed technique (Erlacher & Stumbrys, 2020) or using hypnopompic hallucinations after micro-awakenings (Raduga, 2021). The question of whether everyone can learn to have lucid dreams is still open to debate.

Acknowledgements

The author would like to thank the two student experimenters, Sophia Becke and Milena Göckler, for their engagement in this study, especially regarding the data collection.

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