

Effects of lucid dream induction on external-rated lucidity, dream emotions, and dream bizarreness

Sophie Dyck^{1,2}, Nina Kummer¹, Nina König¹, Michael Schredl¹, Anja Kühnel²

¹Central Institute of Mental Health, Medical Faculty Mannheim/Heidelberg University, Germany

²Department of Education and Psychology, Freie Universität Berlin, Germany

Summary. Lucidity is a rare phenomenon, thus different induction techniques are used to increase the frequency of lucid dreaming. The aim of the present study was to investigate the effect of lucid dream induction (three different cognitive methods: Dream diary, Wake-up-back-to-Bed, and reality testing/reflection) on external rated lucidity, dream length, overall emotional tone, and bizarreness. Overall, 110 participants completed the three-week study protocol. Results showed only few external-rated lucid dreams compared to the high percentage dreams including some form of self-rated lucidity. The small effect of increasing positive dream emotions during the course of the study fit in with the framework of the Imagery Rehearsal Therapy. No effects on dream length and dream bizarreness were found.

Keywords: Lucid dreaming, lucid dream induction, dream emotions, dream bizarreness

1. Introduction

Dreams which include awareness of the fact that the current experiences belong to a dream are known as lucid dreams (LaBerge, 1985). This awareness gives the dreamer the possibility to influence and change their own dream content (LaBerge & Rheingold, 1990). As spontaneous lucid dreams appear quite rarely (Saunders, Roe, Smith, & Clegg, 2016; Schredl & Erlacher, 2011), researchers have investigated possibilities for increasing the frequency of lucid dreaming by using different induction techniques (Stumbrys, Erlacher, Schädlich, & Schredl, 2012). These induction methods can be divided into different techniques (Stumbrys & Erlacher, 2014): Cognitive techniques, external stimulation, and the application of drugs. For example, a commonly used cognitive technique is reality testing/reflection: the participants ask themselves regularly during the day whether they are currently dreaming or not, (Tholey, 1983). As shown in earlier studies (Levitan, 1989; Purcell, Mullington, Moffit, Hoffmann, & Pigeau, 1986), this technique can be effective. However, a more recent study (Aspy, Delfabbro, Proeve, & Mohr, 2017) indicated that a combination of methods (reality checks, wake-up-back-to-bed technique, and mnemonic inductions of lucid dreams [MILD]) is most effective.

So far, most induction studies focused on the effect of the induction technique on lucid dream frequency (Stumbrys et al., 2012) but changes in other dream variables like dream length, overall emotional tone, and bizarreness were rarely studied. The basic idea is that focusing on dreams during the course of the induction study and/or carrying out specific instructions during the day, e.g., reality checks, which

focus on bizarreness, might not only increase lucid dreaming frequency but also affect dream content.

The present study is a re-analysis of data published in Dyck, Schredl, and Kühnel (2017). We investigated the effect of lucid dream induction on several dream characteristics like dream length, overall emotional tone, and bizarreness. In addition, lucidity rated by external judges was correlated with the subjective ratings of the participants.

2. Method

2.1. Participants

Overall, 110 persons (57 women and 53 men) with a mean age of 22.75 ± 4.68 years (range: 18 to 56 years) successfully participated in the present study; 84 were psychology students and 26 were from the personal environment of the first author. The students were recruited as they took part in an experimental university course – including the present study. They received course credit for participating. There were three experimental groups (dream diary $N = 28$; Wake-up-back-to-Bed $N = 25$; Reality testing/reflection $N = 30$) and one control group ($N = 27$). Age means did vary significantly between the four groups ($F = 4.3$; $p = .007$). Participants of the control group were on average about 3 years older than the participants of the experimental groups. Both genders were distributed almost equally over the groups ($\chi^2 = 3.5$; $p = .316$).

2.2. Measurement instruments

Participants had to report their dreams on prepared diary sheets as completely as possible. The intensity of positive and negative emotions was measured on two, four-point self-rating scales ranging from 0 = no emotion, 1 = mild, 2 = moderate, to 3 = strong. Overall emotional tone was computed as the difference of self-rated positive emotions and self-rated negative emotions. In addition, they had to fill in the two-paged Dream Lucidity Questionnaire (DLQ: Stumbrys, Erlacher, & Schredl, 2013). The categories of the 13 DLQ items ranged from 0 = not at all, 1 = somewhat,

Corresponding address:

Michael Schredl, Sleep laboratory, Central Institute of Mental Health, PO Box 12 21 20, 68072 Mannheim, Germany.
Email: Michael.Schredl@zi-mannheim.de

Submitted for publication: December 2017

Accepted for publication: March 2018

Table 1. Number of pre-lucid and lucid dreams of all remembered dreams in all four groups for each measurement

Experimental Group	Baseline	Week 1	Week 2	Week 3
Dream Diary (N = 28)	N = 0/17	N = 0/18	N = 0/16	N = 0/20
Wake-up-Back-to-Bed (N = 25)	N = 0/12	N = 1/14	N = 1/12	N = 1/12
Critical Reflection (N = 30)	N = 2/20	N = 1/21	N = 1/16	N = 1/12
Control Group (N=27)	N = 1/17	N = 2/20	N = 3/19	N = 0/18
Total Sample (N = 110)	N = 3/66	N = 4/73	N = 5/63	N = 2/62

2 = moderately, 3 = pretty much, 4 = very much and encompassed participants' awareness of dreaming, control of changing dream content and remembrance of waking life and intention. Item 1 of the DLQ was formulated as follows: "I was aware that I was dreaming.". In addition to the 12 original items devised by Stumbrys et al. (2013) an extra question was added: "I was sure that events in my dream would not affect reality". The total score consisted of the means of the 13 items. Internal consistency of the DLQ was $r = .893$ (Dyck et al., 2017).

2.3. Dream content analysis

Several dream content analytic scales were adopted from Schredl (1999): Positive and negative dream emotions (coded as 0 = none, 1 = mild, 2 = moderate, to 3 = strong) and bizarreness (1 = possible in wake life and resemble normal daily experience; 2 = possible in real life, but unusual course of events and elements; 3 = one to two fantasy objects, bizarre elements and actions that are impossible in real life; 4 = frequent fantasy objects, bizarre elements or actions that are impossible in real life). Interrater reliabilities for these scales were high: bizarreness: $r = .765$; positive emotions: $r = .642$; negative emotions: $r = .825$ (Schredl, Burchert, & Grabatin, 2004). The lucidity scale was presented to the rater in the following way: "Does the dream-self think about whether the current experiences could be a dream? Does s/he come to the explicit conclusion that it is a dream?" (Schredl & Noveski, 2017). The format was a three-point scale: 0 = no evidence of lucidity in the dream, 1 = pre-lucid: dream-self thinks about whether this is a dream, but

does not become lucid and 2 = lucid: dream-self knows s/he is dreaming. The interrater reliability of this scale was also high: Cohen's kappa = .92 (Schredl & Noveski, 2017). A scale measuring study references within the dream was newly developed: "Are there references in the dream related to the study protocol, e.g. keeping a diary, instructions regarding the Wake-up-back-to-Bed technique (getting up at several times, extracting dream content (reading a dream and writing it down), recognizing dream content, autosuggestion) and reality testing/reflection (Asking whether one is currently awake or dreaming; noticing allusions of dreaming) or occurrence of the experimenter (Sophie Dyck)." This variable was coded with 1 if at least one study reference was present in the dream report.

2.4. Procedure

Participants were randomized into the three experimental groups (dream diary, Wake-up-back-to-Bed, reality testing/reflection) and the control group. They received their questionnaire package with the instructions via e-mail. Altogether, 128 questionnaires were handed out. After the baseline measurement, participants completed the three-week protocol and filled in the dream diary sheet and the DLQ three additional times at intervals of one week. The detailed instructions for the three induction groups are presented in Dyck et al. (2017), e.g., recording all remembered dreams as completely as possible in the dream diary group or how to carry out reality checks about ten times per day in the reality testing/reflection group.

Table 2. Dream length (word count) in all four groups for each measurement

Experimental Group	Dream length Baseline	Dream length Week 1	Dream length Week 2	Dream length Week 3
Dream Diary (N = 28)	89.76 ± 70.91 (N=17)	64.44 ± 36.88 (N=18)	65.25 ± 44.93 (N=16)	76.75 ± 59.75 (N=20)
Wake-up-Back-to-Bed (N = 25)	62.00 ± 110.77 (N=12)	38.86 ± 35.02 (N=14)	24.67 ± 27.85 (N=12)	40.25 ± 46.03 (N=12)
Critical Reflection (N = 30)	53.40 ± 39.73 (N=20)	53.71 ± 54.83 (N=21)	44.94 ± 33.76 (N=16)	50.50 ± 28.05 (N=12)
Control Group (N=27)	66.82 ± 49.10 (N=17)	54.90 ± 45.91 (N=20)	58.37 ± 39.70 (N=19)	59.94 ± 53.93 (N=18)
Total Sample (N = 110)	67.79 ± 67.57 (N=66)	53.84 ± 44.79 (N=73)	50.29 ± 39.64 (N=63)	59.73 ± 51.31 (N=62)

Table 3. Overall emotional tone (self-ratings) in all groups during all four measurement points

Experimental Group	Emotional tone Baseline	Emotional tone Week 1	Emotional tone Week 2	Emotional tone Week 3
Dream Diary (N = 28)	-0.42 ± 2.23 (N=17)	0.11 ± 2.27 (N=18)	-0.56 ± 1.79 (N=16)	0.40 ± 1.43 (N=20)
Wake-up-Back-to-Bed (N = 25)	0.50 ± 1.88 (N=12)	0.36 ± 1.55 (N=14)	0.17 ± 1.99 (N=12)	0.42 ± 1.51 (N=12)
Critical Reflection (N = 30)	-0.20 ± 1.77 (N=20)	-0.24 ± 1.81 (N=21)	-0.60 ± 2.20 (N=15)	0.92 ± 1.88 (N=12)
Control Group (N=27)	-0.69 ± 1.62 (N=16)	-0.42 ± 2.06 (N=19)	-0.44 ± 2.04 (N=18)	0.18 ± 2.43 (N=17)
Total Sample (N = 110)	-0.25 ± 1.83 (N=65)	-0.83 ± 1.94 (N=72)	-0.39 ± 1.98 (N=61)	0.44 ± 1.83 (N=61)

The 110 completed dream diary sheets and DLQ questionnaires were returned to the author at the end of the study period. The dream reports in dream diary sheets were type-written, randomized and serially numbered. Dream length was determined as word count. An external rater coded the dreams along the scales presented in the dream content analysis section. Statistical analysis was performed using SPSS for macOS Sierra 10.12.4.

Mixed models were used to check on effects of means in dream length in the interaction of the group belonging and the study period. Mixed models were also used to study the effects on overall emotional tone and bizarreness. Spearman rank correlations between lucidity and DLQ total score, self-rated positive and negative emotions and judge rated positive and negative emotions were computed.

3. Results

Overall, 264 dream reports were collected during the four measurement points of the study. Fourteen dreams were rated by the external judge to be either pre-lucid (N = 6) or lucid (N = 8). The descriptive statistics of pre-lucid or lucid dreams for all groups during all four measurement points are shown in Table 1. Due to very small sample size, statistical tests could not be performed; however, the figures indicate

that there is no systematic effect of the lucid dream induction technique on the occurrence of lucid dreams. External rated lucidity (dream being pre-lucid or lucid) correlated significantly with the DLQ total score ($r = .128$; $p = .043$; $N = 249$).

Dream length for all groups for all four measurement points can be seen in Table 2. Results of mixed models showed a significant group effect ($F = 4.5$; $p = .004$) but no significant time effect ($F = 1.7$; $p = .169$) nor a significant interaction ($F = 0.3$; $p = 0.980$). The group keeping a dream diary had a higher total score in dream length (74.15 ± 54.63 words; $N = 71$) than the other groups. The figures for the overall emotional tone of dreams are shown in Table 3. Results of this mixed model showed no significant group effect ($F = 1.3$; $p = .264$) but a marginally significant time effect ($F = 2.1$; $p = .099$): the overall emotional tone evolved to be more positive during the course of the study. The interaction of group and measurement was not significant ($F = 0.3$; $p = 0.966$). Dream bizarreness for all groups over the course of the study is depicted in Table 4. Results of this mixed model showed neither a significant group effect ($F = 2.0$; $p = .109$) nor were there a significant time effects ($F = 0.4$; $p = .732$) or interaction ($F = 0.5$; $p = .892$).

3.8% of the dreams included study references. The following examples illustrate the incorporation: "I had a dream

Table 4. Bizarreness of all remembered dreams in the four groups for each measurement

Experimental Group	Bizarreness Baseline	Bizarreness Week 1	Bizarreness Week 2	Bizarreness Week 3
Dream Diary (N = 28)	2.06 ± 0.97 (N=17)	1.94 ± 1.00 (N=18)	1.88 ± 1.31 (N=16)	2.05 ± 1.10 (N=20)
Wake-up-Back-to-Bed (N = 25)	1.50 ± 1.00 (N=12)	1.64 ± 0.93 (N=14)	1.67 ± 1.07 (N=12)	1.58 ± 0.90 (N=12)
Critical Reflection (N = 30)	1.75 ± 1.07 (N=20)	1.52 ± 0.68 (N=21)	2.06 ± 1.00 (N=16)	1.33 ± 0.49 (N=12)
Control Group (N=27)	1.76 ± 1.03 (N=17)	1.95 ± 1.28 (N=20)	2.05 ± 1.08 (N=19)	1.89 ± 1.08 (N=18)
Total Sample (N = 110)	1.79 ± 1.02 (N=66)	1.77 ± 1.00 (N=73)	1.94 ± 1.11 (N=63)	1.77 ± 0.98 (N=62)

about the study and what's going to happen and that everyone I know was asking me about it.”; “Due to performing reality checks, I was afraid of not being able to wake up or not able to differentiate between sleep and reality.”

4. Discussion

The findings in the present study indicated that there no systematic effects of lucid dream induction techniques on dream characteristics like dream length and dream bizarreness and there was also no clear-cut effect on increasing the frequency of pre-lucid and lucid dreams. Solely, a small effect on dream emotions (more positive dream emotions after three weeks) was found.

As discussed in Dyck et al. (2017) the lucid dream induction effect was quite small compared to similar studies in the field (Stumbrys et al., 2012); an effect that might be explained by relatively low motivation in this sample (received course credits but did not have a specific interest in lucid dreaming, e.g., compared to Aspy et al. (2017) who included participants responding to an advertisement regarding their induction study). The motivation might be increased by sending out reminders regarding the reality checks and an internet-based protocol to ensure the adherence to the wake-up-back-to-bed technique.

Overall, the percentage of externally rated pre-lucid and lucid dreams was relatively small (5.3%), especially when compared with the percentage of dreams including some form of lucidity measured via the five-point self-rating scale “I was aware that I was dreaming.”; about 50% of the dreams were rated to include lucidity “somewhat”, “moderately”, “pretty much”, or “very much” (Dyck et al., 2017). In view of the small correlation between the DLQ total score and the external rated lucidity, the question arises as to whether some form of lucidity (“I was somewhat aware that I was dreaming.”) is different from the typical definition of lucid dreaming as having the clear realization within the dream that one is dreaming (LaBerge, 1985). One explanation might be that brief and transient thoughts about being in a dream might not be recorded, i.e., might be missing from the dream report – this lack of reporting every detail of the dream has been shown for emotions (Schredl & Doll, 1998) and bizarreness (Schredl & Erlacher, 2003). In order to validate lucid dream questionnaires like the DLQ (Stumbrys et al., 2013) or the LuCid (Voss, Schemelleh-Engel, Windt, Frenzel, & Hobson, 2013), it would be very interesting to carry out in-depth qualitative studies into the specific dream experiences associated with dreams that are not fully lucid (“I am fully aware that I am dreaming”) but contain some form of lucidity measured on the self-rating scales of the respective questionnaire.

The marginally significant increase of emotional tone over the course of the study might be explained by the participants' expectations that lucid dreaming allows some form of control, also in negatively toned dreams. This would fit in the framework of the Imagery Rehearsal Therapy (Krakow & Zadra, 2010) – a very effective method for coping with nightmares which is based on confrontation and mastery. We did not find significant effects on dream length and dream bizarreness; nevertheless it seems interesting to study the effect of lucid dream induction techniques on dream content more closely. As participants were asked only at four mornings during the study period to report dreams (if recalled) and not every morning during the three weeks, the statistical power of the study was not very high (as the

number of dream reports are quite small) and thus might be a factor accounting for the non-significant findings. More dreams per participant would have improved this issue. As formulated in the introduction section, the specific form of focusing on dreams, their closeness to reality (reality check technique) might affect dream content in some way, not only increase lucidity.

The diary group reported longer dreams compared to the other groups; this is plausible given the instructions this group received, i.e., recording their dreams as completely as possible, etc. (Dyck et al., 2017). The dream-enhancing effect of keeping a dream diary has been reported previously (Schredl, 2007).

Interestingly, 3.8% of participants' dreams were affected by participating in the study. This findings supports the continuity hypothesis of dreaming (Schredl, 2003) stating that waking life experiences are reflected in dreams. This figure is higher compared to studies that only include a dream diary without induction instructions (0.8%) but considerably lower compared to laboratory studies (19.4%) (Schredl, 2008). It would be very interesting to investigate the effect of lucid dream studies carried out in the laboratory on the incorporation rate of study-related topics.

To conclude, although only small effects of the induction methods on dream characteristics were found, this pilot study clearly indicates that it might be fruitful for future lucid dream induction studies to investigate whether dream contents are affected in addition to the common measures of lucidity.

References

- Aspy, D. J., Delfabbro, P., Proeve, M., & Mohr, P. (2017). Reality testing and the mnemonic induction of lucid dreams: Findings from the national Australian lucid dream induction study. *Dreaming*, 27(3), 206-231.
- Dyck, S., Schredl, M., & Kühnel, A. (2017). Lucid dream induction using three different cognitive methods. *International Journal of Dream Research*, 10(2), 151-156.
- Krakow, B., & Zadra, A. L. (2010). Imagery Rehearsal Therapy: Principles and Practice. *Sleep Medicine Clinics*, 5, 289-298.
- LaBerge, S. P. (1985). *Lucid dreaming*. Los Angeles: Jeremy P. Tarcher.
- LaBerge, S. P., & Rheingold, H. (1990). *Exploring the world of lucid dreaming*. New York: Ballentine Books.
- Levitan, L. (1989). A comparison of three methods of lucid dream induction. *NightLight: Lucidity Institute Newsletter*, 1(3), 3, 9-12.
- Purcell, S., Mullington, J., Moffit, A., Hoffmann, R., & Pigeau, R. (1986). Dream self-reflectiveness as a learned cognitive skill. *Sleep*, 9(3), 423-437.
- Saunders, D. T., Roe, C. A., Smith, G., & Clegg, H. (2016). Lucid dreaming incidence: A quality effects meta-analysis of 50 years of research. *Consciousness and Cognition*, 43, 197-215.
- Schredl, M. (1999). *Die nächtliche Traumwelt: Eine Einführung in die psychologische Traumforschung*. Stuttgart: Kohlhammer.
- Schredl, M. (2003). Continuity between waking and dreaming: a proposal for a mathematical model. *Sleep and Hypnosis*, 5, 38-52.
- Schredl, M. (2007). Dream recall: models and empirical data. In D. Barrett & P. McNamara (Eds.), *The new science of dreaming - Volume 2: Content, recall, and personality correlates* (pp. 79-114). Westport: Praeger.

- Schredl, M. (2008). Laboratory references in dreams: Methodological problem and/or evidence for the continuity hypothesis of dreaming? *International Journal of Dream Research*, 1, 3-6.
- Schredl, M., Burchert, N., & Grabatin, Y. (2004). The effect of training on interrater reliability in dream content analysis. *Sleep and Hypnosis*, 6, 139-144.
- Schredl, M., & Doll, E. (1998). Emotions in diary dreams. *Consciousness and Cognition*, 7, 634-646.
- Schredl, M., & Erlacher, D. (2003). The problem of dream content analysis validity as shown by a bizarreness scale. *Sleep and Hypnosis*, 5, 129-135.
- Schredl, M., & Erlacher, D. (2011). Frequency of lucid dreaming in a representative German sample. *Perceptual and Motor Skills*, 111, 60-64.
- Schredl, M., & Noveski, A. (2017). *Lucid Dreaming: A Diary Study*. *Imagination, Cognition and Personality*, online first.
- Stumbrys, T., & Erlacher, D. (2014). The science of lucid dream induction. In R. Hurd & K. Bulkeley (Eds.), *Lucid dreaming: New perspectives on consciousness in sleep - Vol. 1: Science, psychology, and education* (pp. 77-102). Santa Barbara, California: Praeger.
- Stumbrys, T., Erlacher, D., Schädlich, M., & Schredl, M. (2012). Induction of lucid dreams: A systematic review of evidence. *Consciousness and Cognition*, 21(3), 1456-1475.
- Stumbrys, T., Erlacher, D., & Schredl, M. (2013). Testing the involvement of the prefrontal cortex in lucid dreaming: A tDCS study. *Consciousness and Cognition*, 22(4), 1214-1222.
- Tholey, P. (1983). Techniques for inducing and manipulating lucid dreams. *Perceptual and Motor Skills*, 57, 79-90.
- Voss, U., Schemelleh-Engel, K., Windt, J. M., Frenzel, C., & Hobson, A. (2013). Measuring consciousness in dreams: The lucidity and consciousness in dreams scale. *Consciousness and Cognition*, 22, 8-21.