

# Frequency of lucid dreams in a long dream series of an infrequent lucid dreamer

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**Summary.** As actual lucid dreaming frequency is quite low, research has focused on a large variety of induction methods but has never studied the long-term effects of these methods. The present study is based on a series of 8,420 dreams of a young male over a span of twenty-three years. Overall, 94 lucid dreams were recorded (1.12%) by this dreamer. As expected, lucid dreaming frequency increased after the dreamer attended a lucid dreaming workshop and regular reality-check training. But two years after discontinuing the training, the young man's lucid dreaming frequency returned to his baseline levels. It is suggested that the long-term effects of different lucid dream induction techniques be studied more systematically.

**Keywords:** Dream series, lucid dreaming

## 1. Introduction

The term lucid dream designates a dream in which the dreamer, while dreaming, is aware he is dreaming (LaBerge & Rheingold, 1990; Tholey, 1983). Although representative surveys have indicated that 26% to 51% of the general population have experienced a lucid dream at least once in their lives according to their own accounts (Schredl & Erlacher, 2011; Stepansky et al., 1998). The actual frequency of lucid dreams, when compared to all the remembered dreams recorded in dream diaries, is relatively low: 0.3% to 0.7% in unselected student samples (Barrett, 1991; Zadra, Donderi, & Pihl, 1992) and up to 6.5% in gifted lucid dreamers (Reed, 1978). Interestingly, the figures are much higher if frequency scales measuring dream recall frequency and lucid dream frequency separately are used. In the general population, the estimated rate of lucid dreams in relation to all remembered dreams is 7.5% (Schredl & Erlacher, 2011), and is even higher in selected samples like German athletes (14.5%, Erlacher, Stumbrys, & Schredl, 2011-2012).

A large variety of techniques designed to increase lucid dream frequency have been published over the years and most of them have been effective (overview: Stumbrys, Erlacher, Schädlich, & Schredl, 2012). LaBerge (1980) was the first lucid dreamer who published his lucid dreaming frequency over a period of three years and demonstrated that it is a learnable skill. LaBerge used techniques like auto-suggestion and mnemonic induction of lucid dreams (MILD), a technique he developed. In his paper (LaBerge, 1980), he reported a decrease in lucid dream frequency after he discontinued the lucid dream induction, but the fre-

quency remained high, or about 15 lucid dreams per month. Other authors (Clerc, 1983; Garfield, 1975; Saint-Denys, 1982) also reported that lucid dreaming frequency remained at a high level after the authors had increased lucid dream frequency by using different induction methods, even when the authors discontinued using the induction methods. Research on the long-term effects of lucid dream induction methods, however, has yet to be done.

The present study aims to fill that gap by analyzing the frequency of lucid dreams within a series of 8,420 dreams recorded by a dreamer over a period of twenty-three years. The dreamer attended a course on lucid dreaming and practiced reality-checks during the day for several months using one of the popular and easily applicable induction methods. It was expected, as has been shown by empirical studies (Stumbrys et al., 2012), that the dreamer's lucid dream frequency would increase. No hypothesis was formulated with regard to the time course following the dreamer's lucid dream training.

## 2. Method

### 2.1. Dream diary

The participant kept an unstructured dream diary from the age of 22, beginning in September, 1984 through December 2007. For the present analysis, 8,420 dreams from that period were included (see Figure 1). The mean dream length was  $128.8 \pm 82.6$  words.

### 2.2. Participant and procedure

The male participant attended a workshop on lucid dreaming given by Paul Tholey and Brigitte Holzinger on February 22, 1996 and started performing reality-checks more or less regularly during the day to increase the number of his lucid dreams (Tholey, 1983). His goal was to ask himself five to ten times the question "Am I dreaming or am I awake?" Then, he would scan the environment for incongruences. On average, he managed to do this three to four days per week. After several months, he discontinued this lucid dream induction technique.

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The participant's dream reports were typed and entered into a database (Alchera 3.72, created by Harry Bosma, www.mythwell.com). The Alchera database allows the assignment of key words to dreams, a task carried out by the dreamer himself. The participant rated each dream for lucidity according to the definition of "being aware that one is dreaming while dreaming." Dreams with no clear awareness of lucidity (being aware that one is dreaming), but with references only to the current state of consciousness, were classified as pre-lucid dreams.

The Alchera software also provides a word count for each dream report. The unit of analysis was a single dream report. The data were exported into a Microsoft Excel spreadsheet and data analysis was carried out using the SAS 9.2 for Windows software package. To analyze the single binary time series with time gaps (as the time lags between the dreams are not equidistant, ranging from several dream per night to nights without any dream recall), we fitted an AutoRegressive Generalized Linear Mixed Model (AR-GLMM) with a logit link and serial correlation according to Klingenberg (2008). The statistical test analyzed the binary "being lucid" variable (yes/no) of the two time intervals. No aggregated indices (sum or mean scores) were used. The GLIMMIX procedure with a power covariance structure was used.

### 3. Results

Overall, 94 lucid dreams were recorded (1.12%). The percentage of lucid dreams before the dreamer's attendance at the workshop in 1996 was 0.26% of the total 5668 recalled dreams. The percentage of lucid dreams increased to 2.87% after the workshop (N = 2752 recalled dreams). The frequency of lucid dreams per year is depicted in Figure 2, whereas the absolute number of lucid dreams per year are presented in Figure 3. During the years before the workshop, the number of lucid dreams varied between 0 and 4 per year, even though the participant was a high dream recaller (see Figure 1). The maximum frequency in 1996 was 2.3 lucid dreams per month. The number of lucid dreams dropped to about 1 lucid dream per month in 1997 and 1998, and returned to pre-workshop levels after 1999 to about 2 to 5 lucid dreams per year. 2004 was the exception year with a frequency of one lucid dream per month.

Table 1. Comparing lucid dreaming frequency with baseline values using the algorithm developed by Klingenberg (2008)

Comparison	t value	p value
1996 vs. 1995	3.9	< .0001
1997 vs. 1995	2.8	.0056
1998 vs. 1994 <sup>1</sup>	3.2	.0016
1999 vs. 1995	1.4	.1659
2000 vs. 1995	1.5	.1465
2001 vs. 1995	1.0	.3349
2002 vs. 1995	0.4	.7283
2003 vs. 1995	0.9	.3845
2004 vs. 1995	2.5	.0130
2005 vs. 1995	1.5	.1456
2006 vs. 1995	0.5	.6003
2007 vs. 1994 <sup>1</sup>	0.2	.9076

<sup>1</sup>The year 1994 was used as reference (baseline) as the algorithm did not converge using the 1995 period.

Using the algorithm of Klingenberg (2008), the course of the time series was analyzed by comparing the percentage of each year after the workshop with the percentage of the year before the workshop (1995). In two cases, the year 1994 was used as the baseline since the algorithm did not converge for the 1995 baseline due to the data structure (see Table 1). As expected, the year of the workshop (1996) showed a marked increase in lucid dreaming, an effect which persisted for two additional years (1997 and 1998). Since 1999, statistically the percentage of lucid dreaming did not differ significantly from the baseline, except for the year 2004.

Figure 1. Number of dreams per year

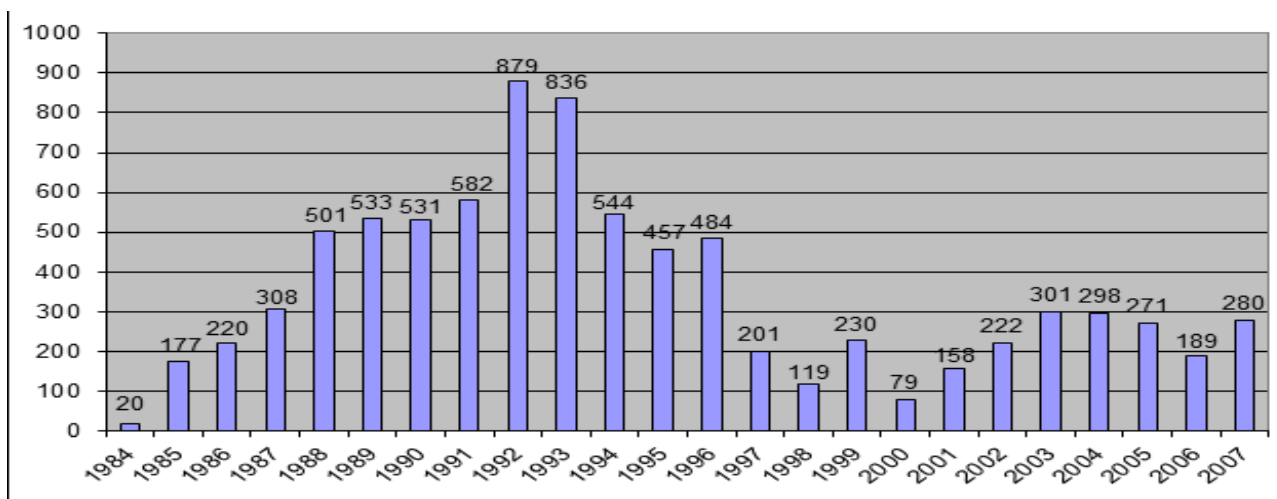
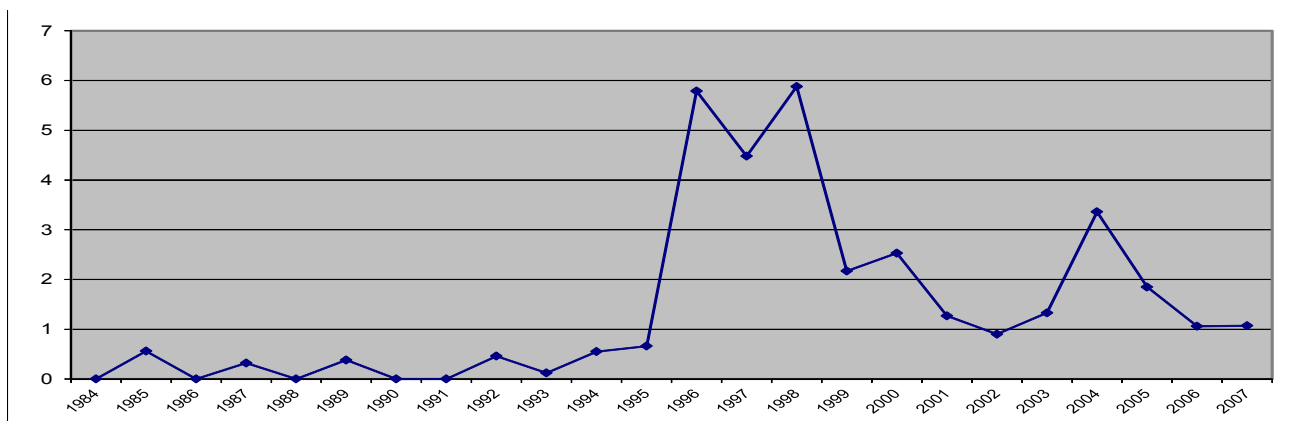


Figure 2. Percentages of lucid dreams



#### 4. Discussion

Overall, the dreamer’s lucid dreaming frequency did increase after he applied a well-known induction method. However, the dreamer’s lucid dreaming frequency returned to baseline levels after three years. The year 2004 was an exception because the dreamer prepared and published an article on lucid dreaming (Schredl & Erlacher, 2004), even though he did not apply any induction technique. It is believed that the dreamer’s intense theoretical preoccupation with lucid dreaming had an effect on his lucid dream frequency. By contrast, gifted lucid dreamers like Harvey de Saint-Denys, Patricia Garfield, Stephen LaBerge, and Olivier Clerc more consistently maintained their high lucid dreaming frequency after discontinuing formal lucid dream training (Clerc, 1983; Garfield, 1975; LaBerge, 1980; Saint-Denys, 1982).

This is the first study on the long-term effects of a lucid dream induction method on the frequency of lucid dreams. LaBerge (1980) demonstrated that lucid dreaming is a learnable skill, but the present data showed that it can also be unlearned. So, some dreamers need constant practice in order to have frequent lucid dreams once a month or more often. From an empirical viewpoint, it would be very interesting to carry out lucid dream induction studies with long follow-up intervals. Up to now, no such studies have been published (see overview: Stumbrys et al., 2012). Further, it would be very productive to study the differences between persons who maintain high lucid dream frequency and per-

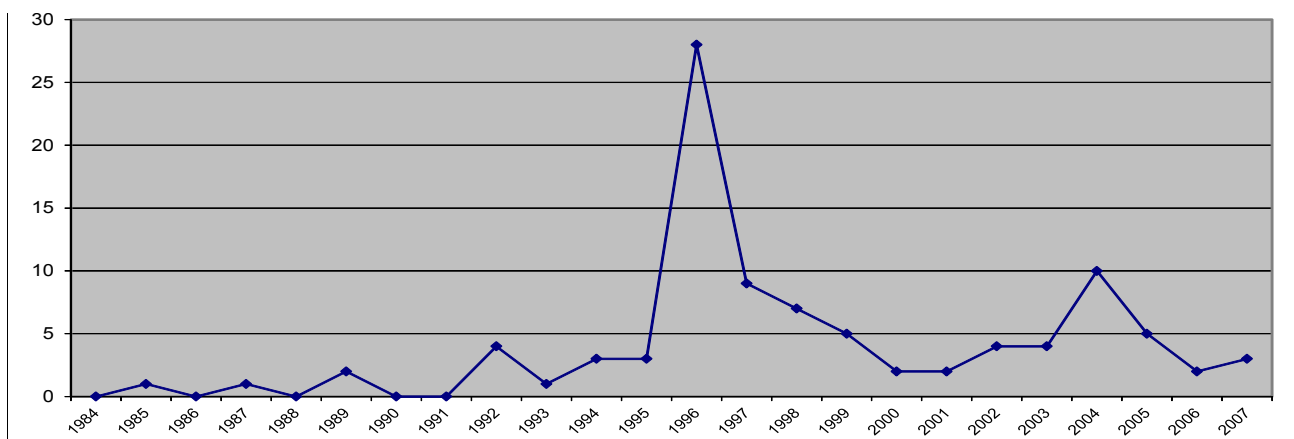
sons whose lucid dream frequency decreases after they discontinue the induction technique. It might be possible that the correlations are more pronounced when compared to the correlation between current “natural” lucid dream frequency and personality (Schredl & Erlacher, 2004).

In this context, a person (Conesa, 2002) who suffered from isolated sleep paralysis an average of two times per month reported 1.4% lucid dreams for a period of over ten years (N = 5.671 dreams). This percentage is considerably higher than the figure of 0.23% lucid dreams in the pre-workshop phase of the present dreamer. So, the chronic condition of sleep paralysis might be accompanied by increased lucid dreaming. Such a hypothesis is plausible because sleep paralysis, one of the key symptoms of narcolepsy in addition to daytime sleepiness and cataplexies (American Academy of Sleep Medicine, 2005), is also associated with heightened lucid dream frequency (Lequerica, 1999).

From a methodological viewpoint, time series analyses very rarely have been applied in dream research with one exception. Schredl (2000) analyzed variables like male/female percent and word count. The results indicate that dream-to-dream variability is very high. The autocorrelation functions and partial autocorrelation functions did not include any significant correlation coefficient for the first 24 lags, with one exception, which might be explained by chance.

In dream research, two problems arise in applying this method. First, the dream content variables are often binary. Widely used procedures like ARIMA can only be applied

Figure 3. Number of lucid dreams per year



to continuous variables (Werner, 2005). Second, a natural dream series has time gaps. The dreamer does not remember a dream every morning or, on the other hand, several dreams per night. Thus, using lags from dream to dream would not be accurate as the dreams are not equidistant. This author and his statistician, after doing an extensive literature search, found the algorithm published by Klingenberg (2008) is the only one tackling this problem. Yet, even this algorithm is limited in its features. One feature is the lack of convergence in two cases. Second, due to the need of extensive memory resources, the algorithm can only be applied to a series of about 2.000 observations at maximum. On the other hand, the present analysis and previous studies (Schredl & Reinhard, 2012) show that the algorithm yields very plausible results. The author emphasizes that this method should be more widely used in dream research as there are many publications on long dream series in the literature (Allen, 2005; Conesa, 2002; Domhoff, 2003; Johnston, 2004; Sausgruber, 1989; Smith & Hall, 1964).

In summary, the analysis of this long dream series indicates that lucid dreaming is a learnable skill, but that it also can be unlearned. Future studies should focus on long-term effects of different lucid dream induction techniques, and on a comparison of persons maintaining high lucid dream frequency to persons whose lucid dreaming frequency decreases following a discontinuance of an induction technique.

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