

# Reliability and stability of lucid dream and nightmare frequency scales

Tadas Stumbrys<sup>1</sup>, Daniel Erlacher<sup>2</sup>, & Michael Schredl<sup>3</sup>

<sup>1</sup>Institute of Sports and Sports Sciences, Heidelberg University, Germany

<sup>2</sup>Institute of Sport Science, University of Bern, Switzerland

<sup>3</sup>Central Institute of Mental Health, Medical Faculty Mannheim, Heidelberg University, Germany

**Summary.** Lucid dream and nightmare frequencies vary greatly between individuals and reliable instruments are needed to assess these differences. The present study aimed to examine the reliability of eight-point scales for measuring lucid dream and nightmare frequencies. The scales were administered twice (with a four-week interval) to 93 sport students. A re-test reliability  $r = .89$  ( $p < .001$ ) for the lucid dream frequency was found and for the nightmare frequency  $r = .75$  ( $p < .001$ ). Both eight-point scales appear to be reliable measures for assessing individual differences in lucid dream and nightmare frequencies.

**Keywords:** Lucid dreams; nightmares; frequency; scale; reliability

## 1. Introduction

Dream recall varies greatly between individuals. To assess the individual differences in dream recall frequency three methods are commonly applied: rating scales, dream diaries and sleep laboratory awakenings (Schredl, 1999). While dream diaries and sleep laboratory awakenings can be considered as more precise measurement techniques, their application can increase dream recall markedly (Schredl, 2002a). Rating scales, such as a seven-point Dream Recall Frequency (DRF) scale (0 – never; 1 – less than once a month; 2 – about once a month; 3 – two or three times a month; 4 – about once a week; 5 – several times a week; 6 – almost every morning) developed by Schredl (2002b), are easy to administer and they do not affect dream recall substantially. A re-test reliability for the DRF scale was found to be high ( $r = .85$ ;  $p < .0001$ ;  $N=198$ ; Schredl, 2004). Similar eight-point scales (see Table 1) were devised to measure the frequency of two special types of dreams: lucid dreams (Schredl & Erlacher, 2004) and nightmares (Schredl, 2003).

Lucid dreams are dreams in which the dreamer is aware that he or she is dreaming and can often consciously influence dream content (LaBerge, 1985). About half the people in a general population report at least one incidence of lucid dreaming over their lifetime. About 20% have lucid dreams regularly (once a month or more frequently) and can therefore be considered as frequent lucid dreamers (Schredl & Erlacher, 2011; Snyder & Gackenbach, 1988). For some specific samples, for example, university students, the prevalence and the frequency of lucid dreaming can be markedly higher (cf. Palmer, 1979; Schredl & Erlacher, 2004; Yu, 2012).

Since the onset of lucid dream research, the “gold standard” for measuring lucid dreaming in a sleep laboratory was volitional eye-signaling during REM sleep (and also perhaps during NREM sleep, cf. Stumbrys & Erlacher, 2012) and a confirmatory dream report following a subsequent awakening (LaBerge, Nagel, Dement, & Zarcone, 1981). Yet in lucid dreams the dreamers are not always able to remember their intentions or to successfully execute them (Stumbrys, Erlacher, Johnson, & Schredl, in press). Thus a whole range of ambiguous situations can occur (e.g., the dreamer was lucid but forgot to signal; a signal is visible on the sleep recording but the dreamer does not recall the signaling; the sleep stage is equivocal). When lucid dreams are counted in the dream diaries of university students, their frequency in relation to all recalled and recorded dreams seem to be about 0.3-0.7% (Barrett, 1991; Zadra, Donderi, & Pihl, 1992), but might be as high as 13% if the dreams are collected once weekly (Gackenbach & Curren, 1983).

Nightmares are extremely frightening dreams from which the person is directly awakened (Spoomaker, Schredl, & van den Bout, 2006). Most people have at least one nightmare experience and about 2-6% of the general population report weekly nightmares (Levin & Nielsen, 2007). Women tend to report nightmares more often than men, especially during adolescence and young adulthood (Schredl & Reinhard, 2011). Nightmares rarely occur in the sleep laboratory (Woodward, Arsenault, Murray, & Bliwise, 2000). When dream diaries are used, nightmare frequency can be several times higher in comparison to retrospective estimates (Levin & Nielsen, 2007), but it is not clear whether the frequency of nightmares is retrospectively underestimated or increases by focusing on nightmares and keeping a dream diary (together with an increase in overall dream recall frequency).

The aim of the present study was to examine the reliability of two eight-point scales for measuring lucid dream and nightmare frequencies (Table 1). While these scales were adapted from the DRF scale with a high re-test reliability, the respective categories have been shifted to accommodate

Corresponding address: Tadas Stumbrys, Heidelberg University, Institute of Sports and Sports Sciences, Im Neuenheimer Feld 700, 69120 Heidelberg, Germany

Email: tadas.stumbrys@issw.uni-heidelberg.de

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Table 1. Eight-point scale for measuring nightmare or lucid dream frequency with original and recoded scores.

<b>How often do you experience nightmares?</b>		
<b>How often do you experience so-called lucid dreams (see definition)?</b>		
<i>Definition: In a lucid dream, one is aware that one is dreaming during the dream. Thus it is possible to wake up deliberately, or to influence the action of the dream actively, or to observe the course of the dream passively.</i>	<b>Original scores</b>	<b>Recoded scores</b>
Several times a week	7	18.000
About once a week	6	4.000
About 2-3 times a month	5	2.500
About once a month	4	1.000
About 2-4 times a year	3	0.250
About once a year	2	0.083
Less than once a year	1	0.042
Never	0	0.000

Note. For the nightmare frequency scale, future studies should consider including a brief definition of nightmares too (e.g., "Nightmares are dreams with strong negative emotions that result in awakening. The action of the dream can be remembered well upon awakening.").

for much lower frequencies of lucid dreams and nightmares in comparison to overall dream recall. It was hypothesized that the frequency of lucid dreams and nightmares should not differ between two measurements.

## 2. Methods

### 2.1. Participants and procedure

The overall sample included 119 sport students (67 male, 52 female) at Heidelberg University, whose ages ranged from 19 to 34 years, with the mean age of  $23.2 \pm 3.4$  years. The participants filled a paper and pencil questionnaire which included the lucid dream and nightmare frequency scales. The questionnaire was administered twice: first in November 2010 and then again in December 2010. The time difference between the two tests was four weeks (28 days). From the whole sample, 93 participants (51 male, 42 female; age range: 19 to 34 years, mean age:  $23.2 \pm 3.4$  years) filled the questionnaire on both occasions and their data was used for the present study.

### 2.2. Material

The questionnaire involved several questions about dreams and sleep. Eight-point scales were used to measure lucid dream and nightmare frequencies (Table 1). To ensure a clear understanding of lucid dreaming, a short definition was provided: "In a lucid dream, one is aware that one is dreaming during the dream. Thus it is possible to wake up deliberately, or to influence the action of the dream actively, or to observe the course of the dream passively" (for importance of a clear definition see Snyder & Gackenbach, 1988). In order to obtain units in frequency per month, the scales were recoded using the class means (see Table 1). For example, if the person checked "once a month", the value of the recoded variable was 1 (lucid dream or nightmare per month). If the participant checked "2-3 times a month", the recoded variable was set to the mean value of

2.5. The category "several times a week" was recoded as 18 (range from 8 [twice a week] to 28 [every morning]). Further, the participants were asked to estimate the number of their lucid dreams during the previous four weeks (zero values were assigned if they reported that they had never had a lucid dream).

### 2.3. Statistical analysis

SPSS Statistics 20 software was used for the statistical analysis. Two-tailed statistical tests were applied with  $\alpha = .05$ . Paired T-tests were used for the comparison between measurements. Effect sizes  $d$  were calculated by using *G\*Power 3.1.3* (Faul, Erdfelder, Buchner, & Lang, 2009).

## 3. Results

In the present sample, 64 (68.8%) participants reported at least one lucid dream experience on the first test and 63 (67.7%) on the second test. Twenty eight (31.1%) participants on the first test and 25 (26.9%) on the second test reported a lucid dream frequency of once a month or higher and could thus be considered frequent lucid dreamers in the terminology of Snyder and Gackenbach (1988). At least one nightmare was reported by 80 (86.0%) respondents on the first test and 73 (78.5%) on the second test. Six participants (6.5%) reported a nightmare frequency of once a week or higher on both measurements. Detailed lucid dream and nightmare frequencies in comparison with other studies are depicted in Tables 2 and 3. With recoded scales, on the first measurement the average frequencies were  $0.96 \pm 2.73$  lucid dreams and  $1.34 \pm 3.25$  nightmares per month, while on the second measurement the averages were  $1.37 \pm 4.09$  lucid dreams and  $1.07 \pm 2.16$  nightmares per month.

A re-test reliability of the lucid dream frequency scale was found to be high ( $r = .89$ ;  $p < .001$ ). Lucid dream frequency did not differ between the two measurements;  $t(92) = 0.954$ ;  $p = .343$ ,  $d = 0.09$ . The reported number of actual lucid dreams during the previous four weeks also did not differ between the two measurements across the whole sample

Table 2. Lucid dream frequencies across different samples (in percents).

	German representative sample <sup>1</sup> (N=919)	German athletes <sup>2</sup> (N=840)	German students <sup>3</sup> (N=439)	German sport students <sup>4</sup> (N=93)	
				1st test	2nd test
Never	49.0	43.5	18.0	31.2	32.3
Less than once a year	15.6	9.3	7.5	16.1	19.4
About once a year	6.0	8.2	10.9	9.7	8.6
About 2-4 times a year	9.4	15.4	26.7	12.9	12.9
About once a month	8.6	11.3	16.2	16.1	14.0
About 2-3 times a month	6.6	7.0	10.3	7.5	6.5
About once a week	3.7	2.4	8.0	4.3	1.1
Several times a week	1.2	3.0	2.5	2.2	5.4

Note. <sup>1</sup>Schredl and Erlacher (2011), <sup>2</sup>Erlacher, Stumbrys, and Schredl (2011-12), <sup>3</sup>Schredl and Erlacher (2004), <sup>4</sup>present study

( $0.90 \pm 2.41$  vs.  $0.71 \pm 1.96$ ;  $t(91) = 1.260$ ;  $p = .211$ ,  $d = 0.13$ ) and correlated strongly between the two time intervals ( $r = .79$ ,  $p < .001$ ). The re-test reliability of the nightmare frequency scale was found to be slightly lower ( $r = .75$ ,  $p < .001$ ). Nightmare frequency did not differ between the two measurements,  $t(92) = 1.056$ ,  $p = .294$ ,  $d = 0.12$ .

#### 4. Discussion

The present findings show that lucid dream and nightmare frequencies can be reliably measured with the eight-point scales (Table 1). The re-test reliability for the lucid dream frequency scale was  $r = .89$  ( $p < .001$ ) and for the nightmare frequency scale was  $r = .75$  ( $p < .001$ ). Neither lucid dream nor nightmare frequencies differed between the two measurements. Further, reported numbers of actual lucid dreams did not differ during two subsequent four-week pe-

riods, suggesting that lucid dream frequency seems to be relatively stable over the time.

Reported frequencies of lucid dreams and nightmares in the present sample (sport students) are in accordance with previous findings (Tables 2 and 3). Their reported frequencies fit in between the frequencies reported by a more general German student sample (cf. Schredl & Erlacher, 2004; Schredl, 2003) and the frequencies reported by German athletes (cf. Erlacher, Ehrlenspiel, & Schredl, 2011; Erlacher, Stumbrys, & Schredl, 2011-12). As expected, lucid dream and nightmare frequencies, as measured by the eight-point scales, did not differ between the two measurements. The re-test reliability of the lucid dream frequency scale was high and similar to the re-test reliability of the seven-point DRF scale (cf. Schredl, 2004). The re-test reliability of the nightmare frequency scale was slightly lower, which is likely

Table 3. Nightmare frequencies across different samples (in percents).

	German representative sample <sup>1</sup> (N = 919)	German athletes <sup>2</sup> (N = 840)	German students <sup>3</sup> (N = 439)	German sport students <sup>4</sup> (N = 93)	
				1st test	2nd test
Never	47.7	21.8	5.7	14.0	21.5
Less than once a year	19.2	12.6	7.7	10.8	9.7
About once a year	9.3	12.3	8.9	14.0	9.7
About 2-4 times a year	10.2	25.4	25.7	21.5	18.3
About once a month	6.5	14.5	21.8	21.5	20.4
About 2-3 times a month	5.5	8.0	18.2	8.6	10.8
About once a week	1.3	3.9	9.3	6.5	8.6
Several times a week	0.4	1.4	2.7	3.2	1.1

Note. <sup>1</sup>Schredl (2013b), <sup>2</sup>Erlacher, Ehrlenspiel, and Schredl (2011), <sup>3</sup>Schredl (2003), <sup>4</sup>present study

due to the fact that no definition for a nightmare was included within the scale. Thus nightmares might have been confused with bad dreams (cf. Zadra & Donderi, 2000). To distinguish nightmares from bad dreams, the awakening criterion is usually employed, however its validity has been questioned (Blagrove & Haywood, 2006). Yet, to increase the reliability of the nightmare frequency scale, future studies should consider including a brief definition for nightmares (e.g., “*Nightmares are dreams with strong negative emotions that result in awakening. The action of the dream can be remembered well upon awakening.*”, Schredl, 2013b).

Actual lucid dream frequency was found to be quite stable over the time period of the study – the reported numbers of lucid dreams did not differ between the two subsequent four-week periods. While lucid dream frequency can be increased by applying different induction techniques (cf. Stumbrys, Erlacher, Schädlich, & Schredl, 2012), the extent to which such techniques are used might be negligible in how they affect the overall lucid dream frequencies in larger samples. For example, in the sample of 840 German athletes, only 14 (1.7% of the total sample and 2.9% to those who reported at least one lucid dream) stated that they developed a lucid dreaming ability by applying specific techniques (Erlacher et al., 2011-12). Further, when such practice is discontinued, the lucid dream frequency seems to return to the baseline levels (Schredl, 2013a).

Finally, it is important to note that only frequencies of *recalled* lucid dreams and nightmares can be measured which may not precisely reflect the actual frequencies, as some lucid dreams and nightmares may not be recalled (which might be especially true for low dream recallers).

In conclusion, the eight-point frequency scales appear to be reliable measures for assessing individual differences in lucid dream and nightmare frequencies.

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