Measuring lucid dreaming skills: A new questionnaire (LUSK)

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Summary. Lucid dreaming is the phenomenon of dreaming while knowing that one is dreaming but the skills within the lucid dream, e.g., carrying out successfully pre-arranged tasks, vary considerably from dreamer to dreamer – even in frequent lucid dreamers. In order to measure inter-individual differences in lucid dreaming skills, a ten-item questionnaire was developed. The internal consistency was high. Substantial correlations with the skills score, age, and lucid dream frequency were found whereas gender did not affect lucid dreaming skills in the present sample (N = 675). The next steps would be to validate the questionnaire, i.e., demonstrating that high lucid dreaming skills (LUSK) scores are predicting better performance in sleep laboratory experiments, e.g., performing pre-arranged eye movements or specific tasks.

Keywords: Lucid dreaming, lucid dreaming skills

1. Introduction

Lucid dreaming is the phenomenon of dreaming while knowing that one is dreaming (Gackenbach & LaBerge, 1986). Using this knowledge lucid dreamers can decide to control the course of the events, e.g., flying through the air, or observing the dream to unfold (Gackenbach & Bosveld, 1989; LaBerge, 1985). In addition to be useful for the training of complex activities (Erlacher & Schredl, 2010; Stumbrys, Erlacher, & Schredl, 2015) and for coping with nightmares (Brylowski, 1990; Zadra & Pihl, 1997), lucid dreaming offers fascinating options to study consciousness, especially if studied in the sleep laboratory (Hobson, 2009). The pioneering work of Keith Hearne (1978) and Stephen LaBerge (1979) showed that pre-arranged eye movement patterns can be carried out in lucid dreams and measured via electrooculogram externally because dreaming of moving the eyes physically moved the eyes – as eye muscles are not subject to REM atonia. However, most findings in this field are based on small samples, e.g., five to eight participants (Erlacher, Schädlich, Stumbrys, & Schredl, 2014) because not all invited participants are able to remember the instruction. For example, tossing a coin (Erlacher & Schredl, 2010), or carrying out the pre-arranged task successfully (Schädlich, Erlacher, & Schredl, 2017). In an online survey, (Stumbrys, Erlacher, Johnson, & Schredl, 2014), about 60% of the participants reported that they used intentions formulated in the waking state to carry out specific actions in the lucid dream. However, only 50% of the dreamers recalled this intention when becoming lucid and – if remembered – only 44% of the participants could perform the action successfully. Thus, the success rate is relatively small. In a home setting, only 7 of 20 experienced lucid dreamers were able to become lucid on a given night (Erlacher & Schredl, 2010). Lucid dream studies in the sleep laboratory are labor-intensive as demonstrated by the fMRI-EEG study of Dresler et al. (2011), where the researcher managed only to measure two REM periods with lucid dreams of one participant – even though they spent several nights in the lab with this participant and many unsuccessful nights with other participants. In order to reduce the financial cost of these type of studies, two approaches are promising. The first approach is to combine the specific study with an effective lucid dream induction technique like the wake-up-back-to-bed technique (Stumbrys & Erlacher, 2014) and, indeed, in the study of Schädlich et al. (2017) nine out of fifteen participants were able to perform the pre-arranged task of throwing darts. The second approach would be to select participants with frequent lucid dreams and with high lucid dreaming skills, e.g. being able to change the dream. Whereas reliable scales for measuring lucid dream frequency are available (Stumbrys, Erlacher, & Schredl, 2013a), questionnaires measuring inter-individual differences in lucid dreaming skills have not been developed. The only exception is a five item scale including two items measuring dream recall, one item measuring lucid dream frequency, and two items measuring dream control, (Neider, Pace-Schott, Forselius, Pittman, & Morgan, 2011). Interestingly, the baseline assessment of lucid dreaming skills correlated with the lucid dream score of a 7-day diary period, coding each remembered dream along those five items (Neider et al., 2011). Other questionnaires in this area like the LuCiD (Voss, Schemelleh-Engel, Windt, Frenzel, & Hobson, 2013) and the DLQ (Stumbrys, Erlacher, & Schredl, 2013b) have been developed to measure the extend or degree of lucidity within a single dream.

The aim of the present study was to develop a brief instrument for measuring inter-individual differences in lucid dreaming skills reliably with the idea that this skills score can be used as a selection criterion for laboratory studies

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of lucid dreaming in addition to using the criterion of having frequent lucid dreams.

2. Method

2.1. Participants

Overall, 1380 persons (777 women, 603 men) completed the online survey. The mean age of the sample was 51.63 ± 14.13 years (range: 17 to 93 years). The questions regarding lucid dreaming skills were answered by 716 participants. However, we excluded 41 participants because they never experienced a lucid dream (lucid dreaming frequency scale). Thus, the total sample for the present analyses consisted of 675 persons (399 women, 276 men) with a mean age of 49.98 ± 14.42 years (range: 20 to 88 years).

2.2. Research Instruments

For eliciting lucid dream frequency, an eight-point rating scale was presented ("How often do you experience so-called lucid dreams (see definition below)?" 0 = never, 1 = less than once a year, 2 = about once a year, 3 = about two to four times a year, 4 = about once a month, 5 = two to three times a month, 6 = about once a week, 7 = several times a week). A short definition was given: "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." The retest reliability of the lucid dream frequency scale was r = .717 (Schredl, Berres, Klingauf, Schellhaas, & Göritz, 2014), in a sample of students r = .89 (Stumbrys et al., 2013a).

Based on previous questionnaires (Girzig, 2009; Stumbrys et al., 2013b; Voss et al., 2013), 22 items were selected (see Table 1). The items are stemming from three different domains: awareness/perception (Items 1, 2, 3, 4, 5, 6, 8, 9, 11), dream control (Items 7, 10, 13, 14, 15, 16, 17, 18, 19, 20), and problems associated with being lucid (Items 12, 21, 22). The five answering categories were coded as depicted in Table 1.

For the item selection process, the sum score of all 22 items were computed – with items 12, 21, and 22 reversed.

2.3. Procedure

The participants completed the online survey between January 25, 2017 and January 31, 2017. The link of the study that was posted on the online panel www.wisopanel.net and the registered persons were informed via email about the new study. Within this panel, 9864 persons with an interest in online studies and with heterogenic demographic backgrounds were registered at that time. The participation was voluntary and unpaid.

Statistical procedures were carried out with the SAS 9.4 software package for Windows. For the item selection process, the correlations between sum score (22 items) and each item was computed. The aim was to select 10 items with high correlations to the sum score and a large range of mean values. Spearman Rank correlations were computed

Table 1. Item pool for measuring lucid dreaming skills

No.	In how many of your lucid dreams …
1	…were you aware of differences to the waking state (e.g., bizarre incidents or settings)?
2	…did you perceive your surroundings more intense than in non-lucid dreams (e.g., more intense colors, sounds or bodily sensations)?
3	…were you aware that your physical body was asleep?
4	…were you sure that the dream actions do not affect your waking life?
5	…were you aware that all dream objects were not real?
6	…did you perceive your emotions more intense than in non-lucid dreams?
7	…did you think about different options of what you can do in a dream?
8	…were you aware that all your dream characters were not real people?
9	…were you able to keep your awareness for a satisfying period of time?
10	…were you able to realize your intentions for the dream successfully?
11	…did you decide deliberately to observe the dream as a dream?
12	…were you not able to realize your intentions for the dream satisfactorily?
13	…were you able to deliberately shape your environment (e.g., change landscapes/surroundings, let persons/characters appear or disappear)?
14	…did you decide deliberately not to wake up?
15	…did you decide deliberately to wake up?
16	…were you able to end an unpleasant situation?
17	…did you have full control of your dream body (movements, actions)?
18	…did you recall some facts or episodes from your waking life?
19	…did you choose deliberately for a specific action?
20	…were you able to perform specific actions (e.g., flying, floating, talking with dream characters, perform magic, sexuality)?
21	…did you transit against your will from a lucid state to a non-lucid state?
22	…did you wake up prematurely against your will?

Categories: 0 = In none, 1 = In a quarter, 2 = In half, 3 = In three quarters, 4 = In all

Table 2. Lucid dreaming frequency (N = 675)

Category	Frequency	Percent
Several times a week	37	5.48%
About once a week	57	8.44%
two or three times a month	90	13.33%
About once a month	97	14.37%
About two or four times a year	178	26.37%
About once a year	80	11.85%
Less than once a year	136	20.15%
Never	0	0.00%

for the lucid dream frequency scale because of its ordinal scaling.

3. Results

The distribution of the lucid dream recall frequency scale is depicted in Table 2. As reported in the method section, participants stating that they never remembered lucid dreams were excluded – even if they answered the lucid dreaming skills items.

In addition to the means and standard deviations of the lucid dreaming skills items (see Table 4), the distribution across the five categories are presented in Table 3. Item 13 "…were you able to deliberately shape your environment (e.g., change landscapes/surroundings, let persons/characters appear or disappear)?" showed the lowest mean value whereas Item 1 "…were you aware of differences to the waking state (e.g., bizarre incidents or settings)?" yielded the highest mean value. Interestingly, the three items eliciting problems with lucid dreaming also correlated positively with the total score and with lucid dream frequency, although the coefficients were considerably smaller. The selected 10 items are depicted in the Appendix – a German and an English version. The mean value of the Lucid dreaming Skills Scale (LUSK) was 1.51 ± 0.88; the distribution is depicted in Figure 1. Cronbach's alpha for the 10 item scale was r = .849. Most participants showed small to medium scores and the group with very high scores (above 3.00) is relatively small – about 5%.

The LUSK score correlated significantly with lucid dream frequency: $r = .226$, $p < .0001$). The regression analysis for the LUSK score showed a non-significant gender effect (standardized regression coefficient = .056, $t = 1.5$, $p = .1401$), a negative age effect (standardized regression coefficient = -.172, $t = -4.6$, $p < .0001$), and a positive effect of lucid dream frequency (standardized regression coefficient = .232, $t = 6.3$, $p < .0001$).

4. Discussion

The item selection procedure clearly indicates that it is possible to construct a comprehensive ten-item scale with high internal consistency (Cronbach's alpha). So, the first step measuring inter-individual differences in lucid dreaming skills has been successful.

From a methodological viewpoint, it has to be mentioned that the sample did not consist primarily of persons with high interest in lucid dreaming as it would be expected if

Table 3. Distribution of the items measuring lucid dreaming skills (N = 675)

No.	Item (abbreviated)	In none	Quarter	Half	Three-quarters	In all
1	Aware of differences to waking life	20.59%	24.59%	23.11%	14.37%	17.33%
2	Perception more intense	49.33%	18.81%	13.78%	8.89%	9.19%
3	Physical body was asleep	29.19%	21.48%	17.33%	13.04%	18.96%
4	Dream actions not affecting waking life	28.74%	20.15%	16.00%	16.00%	19.11%
5	Dream objects were not real	23.41%	24.00%	18.67%	16.44%	17.48%
6	Emotions more intense	31.70%	18.07%	19.41%	12.44%	18.37%
7	Thinking about different options	39.11%	18.22%	19.11%	12.74%	10.81%
8	Dream characters not real	34.96%	21.48%	19.11%	10.22%	14.22%
9	Keeping awareness	32.30%	24.59%	24.15%	11.56%	7.41%
10	Realizing intentions	47.56%	23.56%	18.07%	6.37%	4.44%
11	Observing the dream	39.41%	19.56%	17.63%	10.96%	12.44%
12	Not realizing your intentions	38.52%	19.41%	17.19%	13.63%	11.26%
13	Shape your environment	50.52%	21.63%	17.33%	5.19%	5.33%
14	Not waking up	42.52%	21.48%	18.81%	8.44%	8.74%
15	Waking up	42.67%	22.22%	19.85%	9.04%	6.22%
16	Ending end an unpleasant situation	31.26%	27.37%	20.00%	14.37%	12.00%
17	Control of your dream body	31.70%	22.96%	23.56%	9.19%	12.59%
18	Recalling waking life	26.37%	26.67%	24.44%	12.30%	10.22%
19	Choosing an action	31.26%	22.07%	23.26%	13.93%	9.48%
20	Performing specific actions	26.52%	20.44%	23.26%	15.56%	14.22%
21	Becoming non-lucid	52.30%	21.53%	15.56%	5.63%	4.59%
22	Waking up against will	27.41%	27.26%	24.59%	11.85%	8.89%

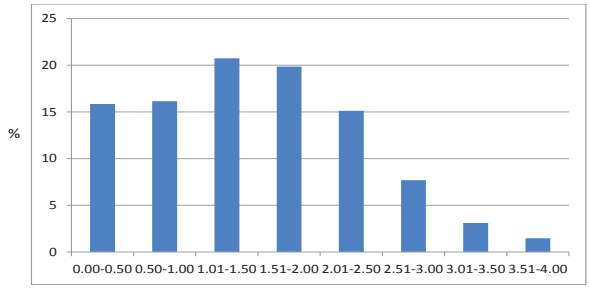
Table 4. Means and standard deviation of the items measuring lucid dreaming skills (N = 675) and the correlations to the sum score (22 Items) and lucid dreaming frequency

No.	Item (abbreviated)	M ± SD	Correlaton with Sum score (22 items)	Correlation with Lucid dreaming frequency1
1[a]	Aware of differences to waking life	1.83 ± 1.37	.583	.149***
2	Perception more intense	1.10 ± 1.34	.404	.112**
3[a]	Physical body was asleep	1.71 ± 1.48	.607	.149***
4	Dream actions not affecting waking life	1.77 ± 1.49	.590	.161***
5[a]	Dream objects were not real	1.81 ± 1.42	.628	.137***
6	Emotions more intense	1.68 ± 1.49	.465	.127***
7[a]	Thinking about different options	1.38 ± 1.39	.590	.214***
8	Dream characters not real	1.47 ± 1.42	.580	.115***
9[a]	Keeping awareness	1.37 ± 1.25	.664	.188***
10	Realizing intentions	0.97 ± 1.15	.591	.142***
11[a]	Observing the dream	1.37 ± 1.41	.630	.211***
12	Not realizing your intentions	1.40 ± 1.40	.124	.095*
13[a]	Shape your environment	0.93 ± 1.17	.542	.147***
14	Not waking up	1.19 ± 1.30	.505	.167***
15	Waking up	1.14 ±1.24	.397	.143***
16	Ending end an unpleasant situation	1.53 ± 1.37	.579	.102**
17[a]	Control of your dream body	1.48 ± 1.35	.610	.159***
18	Recalling waking life	1.53 ± 1.28	.542	.182***
19[a]	Choosing an action	1.48 ± 1.31	.677	.144***
20[a]	Performing specific actions	1.71 ± 1.38	.642	.181***
21	Becoming non-lucid	0.88 ± 1.14	.158	.130***
22	Waking up against will	1.48 ± 1.25	.147	.086*

[a] Selected items of the LUSK scale [1] Spearman Rank correlations, * p < .05, ** p < .01, *** p < .001

participants were recruiting via ads (Aspy, Delfabbro, Proeve, & Mohr, 2017) or lucid dreaming websites (Stumbrys et al., 2014). We think that this is an advantage of this study as persons who read a lot about lucid dreams might increase their "natural" lucid dreaming skills by this information input. To evaluate this idea, it would be interesting to test how strong specific information about lucid dreaming affects the skills within a lucid dream. In a nightmare content study (Schredl & Göritz, 2018), twenty participants reported being lucid within a nightmare but were unable to change the dream in order to reduce anxiety levels, i.e., being lucid was not enough, the dreamer has to know that s/he can change the dream or observe the dream in a relaxed manner

Figure 1. Distribution of the LUSK scores (N = 675)



– persons who read a lot about lucid dreams on the internet know that but not "naïve" lucid dreamers.

Within this context the discussion whether skill (defined as once learned remains stable) or ability (can be increased by training but decreases when the training is stopped) is more appropriate for lucid dreaming (Stumbrys & Erlacher, 2014). This paper used the terminology of the paper "Lucid dreaming as a learnable skill: A case study" published by Stephen LaBerge (1980). Stumbrys and Erlacher (2014) argued that in his case study the frequency of lucid dreams dropped if the dreamer stopped training; a similar effect was reported by Schredl (2013). As mentioned above, the LUSK scale primarily aimed at measuring inter-individual differences in "natural" lucid dreaming skills and not the effect of lucid dream inductions methods. Based on this discussion, it would be very interesting to study long-term effects of lucid dream induction techniques – whether the lucid dreaming skills or abilities are stable over time or decrease rapidly after stopping the training (so far the above mentioned data are based on two participants).

The sample had a large age range and consisted not only of young students who are keen to learn more about lucid dreaming. The finding that lucid dreaming skills are lower for elderly persons – even if lucid dreaming frequency is statistically controlled – also supports the notion that access to information about lucid dreaming (this is presumably easier for young persons to surf the internet regularly) might be a crucial factor regarding lucid dreaming skills. On the other

hand, gender did not affect lucid dreaming skills; a findings that is comparable to lucid dreaming frequency findings in large samples (Hess, Schredl, & Goritz, 2016; Schredl & Erlacher, 2011) – if dream recall frequency is statistically controlled.

The moderate correlation between lucid dream frequency and the lucid dreaming skills (LUSK) score is very plausible; the more often the person experiences lucid dreams the more s/he has a chance to train his or her skills. As the correlation is not very high (r = .226), it is also clear, on the other hand, that lucid dream skills are a different concept to just having lucid dreams, i.e., it seems promising to select participants for laboratory studies based on both variables. Interestingly, the two items measuring problems within lucid dreams ("Becoming non-lucid" and "Waking up against will") were positively correlated (small coefficients) with the overall skills score (22 items of the total item pool). The simplest explanation would be that if the participant is try to practice his or her skills problems do also occur; on the other hand, these two items might represent an independent factor (see discussion below).

As this is the first study, to develop a questionnaire measuring lucid dreaming skills a lot of work still lies ahead. The primary goal of this study was to develop a comprehensive scale for measuring the general lucid dreaming skills (hence the criterion of selecting 10 items). As the items were selected from different areas (awareness/perception and control) one might speculate that the general dimension could be subdivided into at least two sub-facets – comparable to the development of the very general Big Five Personality factors (Ostendorf & Angleitner, 2004) because each of these five factors can be subdivided into six facets. Future studies could use different item pools to study whether the different dimensions of lucid dreaming skills (using factor analysis) differ between experienced and less experiences lucid dreamers.

In addition, it would be necessary to establish external validity of the LUSK score, i.e., persons with a high score should be more likely able to perform pre-arranged tasks in a laboratory setting, like carrying out specific eye movements that can be verified with the electrooculogram recording. A diary study with a baseline LUSK measurement and lucidity scores based on ratings of all lucid dreams reported during the study period (see the study of Neider et al., 2011) would be helpful in establishing the validity of the retrospective LUSK questionnaire. It would also be interesting to study whether there is a correlation between lucid dreaming skills and personality, for instance; lucid dream frequency related to the Big Five personality factors openness to experience and agreeableness (Hess et al., 2016).

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Fragebogen zum luziden Träumen (LUSK)

Alter: ____ Jahre

Geschlecht: ◯ männlich ◯ weiblich

Wie oft erleben Sie luzide Träume (siehe Definition)?

Definition: Beim luziden Träumen ist man sich während des Traumes bewusst, dass man träumt. So kann es sein, dass man bewusst aufwachen oder die Handlungen aktiv beeinflussen kann, oder das Geschehen mit diesem Bewusstsein passiv beobachtet.

◯ mehrmals die Woche
◯ etwa einmal die Woche
◯ 2-3mal im Monat
◯ etwa einmal im Monat
◯ etwa 2-4mal im Jahr
◯ etwa einmal im Jahr
◯ weniger als einmal im Jahr
◯ nie

Wenn Sie schon luzide Träume oder Klarträume hatten, auch wenn diese länger zurückliegen, füllen Sie bitte die folgenden Fragen aus. Sie beziehen sich auf ihr Erleben und Ihre Fähigkeiten innerhalb Ihrer luziden Träume.
(Falls dies nicht der Fall sein sollte, ist die Umfrage für Sie beendet und wir danken Ihnen für Ihre Teilnahme.)

- Bitte geben Sie für jede Aussage an, in wie vielen Ihrer luziden Träume diese zugetroffen hat.
- Wenn Sie sich nicht mehr genau erinnern können, wählen Sie bitte die Antwortoption aus, die Ihrer Einschätzung nach am ehesten zutrifft.

In wie vielen Ihrer luziden Träume…	In keinem	In einem Viertel	In der Hälfte	In Dreiviertel	In allen
…nahmen Sie bewusst Unterschiede zum Wachzustand wahr (z.B. unrealistische Begebenheiten oder Umgebungen)?	◯	◯	◯	◯	◯
…waren Sie sich bewusst, dass Ihr Körper schlief?	◯	◯	◯	◯	◯
…waren Sie sich bewusst, dass alle geträumten Objekte nicht real sind?	◯	◯	◯	◯	◯
…dachten Sie über die verschiedenen Möglichkeiten nach, was Sie alles in einem Traum tun könnten?	◯	◯	◯	◯	◯
…konnten Sie Ihr Bewusstsein im luziden Traum für eine als befriedigend lang empfundene Zeit aufrechterhalten?	◯	◯	◯	◯	◯
…haben Sie sich bewusst entschieden den Traum als solchen zu beobachten?	◯	◯	◯	◯	◯
…konnten Sie Ihre Umwelt willentlich gestalten (z.B. Landschaften/Umgebungen verändern, Personen/Figuren erscheinen oder verschwinden lassen)?	◯	◯	◯	◯	◯
…hatten Sie vollständige Kontrolle über Ihren geträumten Körper (Bewegungsabläufe, Handlungen)?	◯	◯	◯	◯	◯
…entschieden Sie sich bewusst für eine bestimmte Handlung?	◯	◯	◯	◯	◯
…waren Sie in der Lage dazu, bestimmte Aktivitäten auszuführen (z.B. fliegen, schweben, mit Traumpersonen sprechen, zaubern, Sex)?	◯	◯	◯	◯	◯

Lucid dreaming Skills Questionnaire (LUSK)

Age: ____ years

Gender: ◯ male ◯ female

How often do you experience so-called lucid dreams (see definition below)?

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.

◯ several times a week
◯ about once a week
◯ two to three times a month
◯ about once a month
◯ about two to four times a year
◯ about once a year
◯ less than once a year
◯ never

If you had lucid dreams – even some time back – please complete the following questions. They relate to your experiences and skills within your lucid dreams.
(If you don't have lucid dreams, the survey is complete and we would like to thank you for participating.)

- Please report for each statement, in how many of your lucid dreams this statement was true.
- If you do not remember the facts exactly, please choose an option that matches your estimation most closely.

In how many of your lucid dreams …	In none	In a quarter	In half	In three quarters	In all
…were you aware of differences to the waking state (e.g., bizarre incidents or settings)?	◯	◯	◯	◯	◯
…were you aware that your physical body was asleep?	◯	◯	◯	◯	◯
…were you aware that all dream objects were not real?	◯	◯	◯	◯	◯
…did you think about different options of what you can do in a dream?	◯	◯	◯	◯	◯
…were you able to keep your awareness for a satisfying period of time?	◯	◯	◯	◯	◯
…did you decide deliberately to observe the dream as a dream?	◯	◯	◯	◯	◯
…were you able to deliberately shape your environment (e.g., change landscapes/surroundings, let persons/characters appear or disappear)?	◯	◯	◯	◯	◯
…did you have full control of your dream body (movements, actions)?	◯	◯	◯	◯	◯
…did you choose deliberately a specific action?	◯	◯	◯	◯	◯
…were you able to perform specific actions (e.g., flying, floating, talking with dream characters, perform magic, engaging in sex)?	◯	◯	◯	◯	◯