

Relationship between lucid dreaming, creativity and dream characteristics

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Summary. Lucid dreaming is the ability of a dreamer to become aware that he is dreaming and to possibly change some aspects of his current dream. This ability is associated with higher creativity and a proclivity for divergent thinking. Between subjects, dreams have different structural characteristics, such as the incorporation of daytime events, aversive dream content, or dream recall frequency (DRF). This study aimed to investigate the relationship between lucid dreaming, creativity and dream characteristics like aversive dream content, personal significance, dream recall, incorporation of daytime events and great dreams. A total of 334 participants took part in an online study. The results show that lucid dreamers scored higher on the creative personality scale of the Adjective Checklist and reported a higher DRF than non-lucid dreamers. As to the dream structure, lucid dreamers were more likely to incorporate daytime events into their dreams, and their dreams had a higher personal significance than those of non-lucid dreamers. Furthermore, substantial gender differences were found in DRF and other dream characteristics. The results confirm the relationship between lucid dreaming and creativity and indicate that lucid dreamers differ from non-lucid dreamers in their general dream structure.

Keywords: Lucid dreaming, dreams, creativity, dream recall frequency, dream characteristics, gender effects

1. Introduction

Lucid dreaming is defined as the fact that a dreamer is aware that he is dreaming while dreaming (e.g., LaBerge, 1987, Spormaker & van den Bout, 2006). Tholey and Utecht (1997) added more criteria to this phenomenon such as awareness of freedom of decision, memory of the waking state, and full intellectual abilities. However, only very few of all lucid dreams seem to fulfill all of Tholey and Utecht's criteria (Barret, 1992). An Austrian representative survey by Stepansky, Holzinger, Schmeiser-Rieder, Saletu, Kunze & Zeitlhofer (1998) showed that 26% of the sample had experienced the phenomenon of lucid dreaming. In another study, 82% of an unselected student sample reported having experience with becoming aware that they were in a dream (Schredl & Erlacher, 2004) and in a representative German sample 51% of the participants reported that they had experienced a lucid dream at least once (Schredl & Erlacher, 2011). Nevertheless, only 0.3% to 0.7% of all recalled dreams seem to be related to this specific state of mind (Barret, 1991; Zadra, Donderi & Phil, 1992). Applications of lucid dreaming are for example training of complex actions in lucid dreams (Tholey & Utecht, 1997) and its relevance in psychotherapy, especially as an effective nightmare treatment (Brylowski, 1990, Schriever, 1934, Zarda &

Pihl, 1997). Studies have found that lucid dreamers have a higher internal locus of control, need for cognition, and they are more creative than non-lucid dreamers (Blagrove & Hartnell, 1998; Blagrove & Tucker, 1994; Gackenbach, Heilman, Boyt & LaBerge, 1985; Galvin, 1990). We suggest that all these aspects of cognition could be related to lucid dreams as they represent cognitive complexity and flexibility

Creativity appears to be an important variable associated with lucid dreaming. In a field study, Stumbrys and Daniels (2010) provide some evidence that lucid dreaming may contribute to problem solving when dealing with more creative rather than logical tasks. Both, frequent and occasional lucid dreamers reported higher scores of creative personality (Blagrove & Hartnell, 1998). Also, individuals with thin boundaries were reported to be more creative (Hartmann, 1989; 1991). As to creative dreams, Schredl and Erlacher (2007) found that the main factors influencing frequency of creative dreams were DRF and the thin boundaries personality dimension. Creativity can be described as the ability to a 'new combination of information' (Holm-Hadulla, 2011). Measuring creativity or creative personality proves to be difficult because of the diversity of existing definitions (Baron & Harrington, 1981). According to Baron and Harrington (1981), a differentiation has to be made between creativity as a socially valuable product in order to call an act or a person creative and creativity as being intrinsically valuable, so nothing of demonstrable social value needs to be produced, such as creativity of dreams, thoughts, imaginative expression or the curiosity of a child. Another differentiation can be made with regard to the type of creative performance, such as the difficulty of the problem solved, the elegance or beauty of the product, or the impact of its consequences (Baron & Harrington, 1981). Furthermore, one must differentiate between creativity as an achievement, creativity as an ability, and creativity as a disposition or attitude (Baron & Harrington, 1981). Rhodes (1961) described four basic ele-

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ments of creativity: The creative person, the creative process, the creative product and the creative environment. As a measure of the creative personality the Adjective Checklist (ACL, Gough, 1983), which was used in this study, focuses on Rhode's first basic element, the creative person.

Just as dream contents can be described and classified (e.g. Hall & van de Castle, 1966), other dream characteristics like dream recall frequency (DRF), personal significance of dreams, incorporation of daytime events, the sensory quality of the dream, aversive dreams, and great dreams can be classified as well. These dream characteristics, which are assessed in part with different dream inventories, constitute what is termed as dream structure in the following. An outstanding dream characteristic is the DRF. Several factors are associated with DRF. In a comparison of four representative German samples, a substantial gender difference in DRF could be demonstrated, with higher DRF in women than men (Schredl & Piel, 2002). Likewise, individuals with thin boundaries (Hartmann, 1989; 1991) have a higher DRF (Aumann, Lahl & Pietrowsky, 2012; Pietrowsky & Köthe, 2003; Schredl & Piel, 2002). A higher DRF was also associated with a greater impact of dreams on waking behavior the next day.

There are also gender differences for different variables of dream structure. Studies have shown that females exhibit a higher DRF and a stronger impact of dreams on the waking state on the next day (Brand, Beck, Kalak, Gerber, Kirov, Pühse, Hatzinger & Holsboer-Trachslar, 2011). A multiple regression analysis in that study indicated that female gender, sleep quality and creativity are predictors of a higher DRF. Hartmann (1991) found that females have thinner boundaries than males, which may account for more frequent incorporation of daily events into their dreams.

Several instruments have been developed to measure the structure and characteristics of dreams. These questionnaires assess variables such as dream importance, DRF (Schredl, 2002a, 2002b, 2004), dream vividness (Kallmeyer & Chang, 1997), attitude towards dreams (Schredl, Nürnberg, & Weiler, 1996), the emotional and narrative content of significant dreams (Kuiken, Lee, Eng & Singh, 2006) or dream intensity (Yu, 2008). Data obtained with the above-mentioned questionnaires revealed that dreams of individuals can be differentiated by those variables, such as DRF and attitude towards dreams (Schredl, Ciric, Götz & Wittmann, 2003), emotional and narrative content of impactful dreams (Eng, Kuiken, Temme & Sharma, 2005), or dream intensity (Yu, 2008, 2010).

The Düsseldorf Dream Inventory (DDI), which was developed by the authors based on an item and factor analysis procedure (Aumann et al., 2012; Pietrowsky, Zink & Schmitz, unpublished) is another questionnaire for assessing dream structure. It includes a sleep quality scale (sleep duration, time to sleep onset, nocturnal awakenings, intake of tranquilizer or sleeping pills, alcohol consumption, subjective sleep restfulness and light sleep) and the five dream structure scales "aversive dream contents", "personal significance" (of the dream), "dream recall", "incorporation" (of daytime events into the dream) and "great dreams" (dreams with elements of wishful thinking, fulfilling desires and gaining happiness). Using a preceding version of the DDI, Aumann et al. (2012) found that DRF is associated with a higher dream intensity and greater personal significance of dreams.

The aim of the present study was to examine the relation-

ship between lucid dreaming and creativity and their association with structural aspects of dreaming. As discussed earlier, lucid dreamers were expected to report more creativity than non-lucid dreamers. With regard to the high association between lucid dreaming and DRF (e.g., Schredl & Erlacher, 2004, 2011), it was proposed that lucid dreamers have a higher personal significance of dreams, because their dream characteristics and dream recognition may lead to an intensive occupation with dreams. Since some lucid dreamers can change elements in their dreams, fewer aversive dreams and more great dreams were expected in lucid dreamers compared to non-lucid dreamers. Gender differences were expected in a higher DRF and a higher personal significance of dreams with more impact on the next day. Considering the possibility that not only the ability to have lucid dreams but also their frequency has an impact on the results, a differentiation between frequent and occasional lucid dreaming was made, because differences between frequent and non-lucid dreamers are assumed to be more significant than between occasional lucid dreamers and non-lucid dreamers.

2. Method

2.1. Participants

All 334 participants were recruited for the pseudonymous online study via social networks and the mailing list of the University of Düsseldorf E-mail system. Participants who reported depression, other mental disorders or the intake of benzodiazepines in the online questionnaire were excluded since they may have alterations in their sleep quantity and quality which may affect dreaming and dream structure. Thus, 36 participants were excluded. Data from the remaining 298 participants (240 female, 58 male; mean age 23.66 years, SD \pm 5.71 years), who were mostly students, were included in the analysis. Psychology students received credit for participating in the study and three randomly chosen participants received book tokens as gratification.

2.2. Instruments

Several demographic items (gender, age, education, occupation, mental disorders) and sleep quality (by the respective DDI scales) were assessed for the description of the sample and the exclusion of participants not fulfilling the inclusion criteria (mental disorders, intake of tranquilizers or sleeping pills) by self-report. In order to assess lucid dreaming, we first formulated a definition of lucid dreams: 'Lucid dreams are dreams, in which the dreaming person becomes aware of being in a dream and intentionally changes certain elements.' This definition comprises the common criteria for lucid dreaming, as well as two of Tholey and Utecht's (1997) criteria. This definition is more strict than in most other studies. An additional item was used to measure the frequency of lucid dreams. The answer options were 'at least once a month' (frequent), 'once in a lifetime, but less than once in a month' (occasional), and 'never'.

DRF in general was assessed by the item 'How many dreams do you remember over the last four weeks?' A cut-off was set at 30 dreams to prevent outliers from biasing DRF mean scores.

Creativity was measured using the creativity scale (Smith & Schaefer, 1969) of the Adjective Checklist (ACL; Gough & Heilbrun, 1965). The ACL is a list of 300 adjectives contain-

ing 37 scales for a systematic, comprehensive and summarizing method to measure self-description by adjectives. The creativity scale does not assess creativity per se but is an implicit self-description of a creative personality by adjectives. The creativity scale of the ACL was empirically developed and cross-validated to gain adjectives that indicate different aspects of creative thinking and behavior (Domino, 1970). It contains 30 items with 18 positive and 12 negative items (Gough, 1979). As no German translation of the ACL was available, the adjectives were translated into German by the first author (N.Z.). After retranslation by a native English speaker, synonyms were checked and corrected. Participants were instructed to read all 300 adjectives and check the ones that describe their personality (not how they wish to be); they were also advised not to spend too much time checking individual ACL items.

Dream structure was assessed using a revised 43-item version of the DDI (Pietrowsky, Zink & Schmitz, unpublished). The actual version of the DDI consists of 36 items to assess dream structure and seven items to assess sleep quality. The sleep quality items include sleep duration, time to sleep onset, nocturnal awakenings, intake of tranquilizer or sleeping pills, alcohol consumption, subjective sleep restfulness and light sleep. The 36 dream structure items have factor loadings on five scales (in descending order of variance explained by the factor: Aversive dream content, personal significance, dream recall, incorporation and great dreams). In addition to the scores on each of the five factors a total DDI score can be calculated which indicates a general strong occupation with the dreams and a high subjective significance of dreaming. The scale aversive dream content consists out of 8 items (e.g. 'I have nightmares', 'I dream about personal failure', 'I dream about threats'), the scale personal significance consists out of 10 items (e.g. positive items like 'my dream are messages from subconsciousness', 'my dreams are a gate to a spiritual world' or negative items like 'interpretation of dreams is waste of time', 'my dreams have no special significance for my life.'). the scale dream recall consists out of 7 items (e.g. positive items like 'I can remember my dreams after waking', 'I can recall many details of my dreams' or negative items like 'I usually awake from a deep and dreamless sleep' 'I usually quickly forget what I dreamed'), the scale incorporation con-

sists out of 8 items (e.g. 'I dream about things I experienced the day before'; 'stress has an influence on my dreams'; 'if I was anxious in a situation, I dream about it') and the scale great dreams consists out of 3 items (e.g. 'in my dreams my personal wishes come true; I have dreams that are so beautiful that I wish they become reality').

2.3. Data Analysis

Analysis of variance (ANOVA) was used to compare creativity, DRF and the DDI scores between the three groups of participants (frequent lucid dreamers, occasional lucid dreamers, non-lucid dreamers). Subsequent t-Tests served to identify significant differences between each two groups of participants. In addition, the lucid dreamers (frequent and occasional) were collapsed to the group of lucid dreamers and contrasted with non-lucid dreamers by t-Tests. Gender differences for all measures were tested by t-Tests for independent samples. All analyses were performed with IBM SPSS Statistics.Version 21.

3. Results

Of the total of 298 participants, 85 (28.5%) reported no lucid dreams, 142 (47.7%) reported occasional lucid dreams, and 71 (23.8%) had frequent lucid dreams (at least once in a month).

Creativity did not differ significantly between the three groups of participants; $F(2,295) = 2.33, p = .099$. In the subsequent comparison, lucid dreamers (frequent and occasional) had significantly higher creativity scores when contrasted to non-lucid dreamers; $t(295) = 2.08, p = .038$ (see Table 1).

Comparing the mean frequencies of dream recall during the last four weeks (Table 1), the three groups of participants differed in DRF, $F(2,290) = 5.08, p = .007$. Subsequent t-Tests between each two groups revealed that both, frequent and occasional lucid dreamers had a higher DRF compared to non-lucid dreamers; $t(150) = 2.70, p = .008$; $t(222) = 3.02, p = .003$, respectively. The pattern was slightly different for the DDI scale "dream recall" (Table 1). The ANOVA also revealed a significant group effect, $F(2,295) = 3.18, p = .043$. But subsequent contrasts showed that frequent

Table 1. Means (± SD) of personal creativity scores, dream recall frequency (DRF) and measures of dream structure in lucid and non-lucid dreamers

Variable	Frequent Lucid Dreamers (N = 71)	Occasional Lucid Dreamers (N = 142)	All Lucid Dreamers (N = 213)	Non-Lucid Dreamers (N = 85)
Creativity	55.76 ± 9.94	55.02 ± 8.59	55.27 ± 9.05	52.90 ± 8.15
DRF	7.07 ± 6.52	6.88 ± 5.90	6.94 ± 6.09	4.54 ± 5.05
Dream Structure				
Aversive Dream Content	20.07 ± 8.05	19.97 ± 7.36	20.00 ± 7.58	20.20 ± 7.15
Personal Significance	24.59 ± 7.36	23.02 ± 6.40	23.54 ± 6.76	22.66 ± 6.26
Dream Recall	22.07 ± 5.92	20.14 ± 5.97	20.78 ± 6.01	19.73 ± 6.75
Incorporation	24.62 ± 6.26	24.77 ± 6.11	24.72 ± 6.15	23.14 ± 6.34
Great Dreams	8.66 ± 3.20	7.62 ± 2.86	7.96 ± 3.01	7.36 ± 3.15
Total DDI Score	100.01 ± 21.53	95.52 ± 19.82	97.02 ± 20.47	93.09 ± 18.83

Table 2. Frequency of lucid dreams (%) and means (\pm SD) of personal creativity scores, dream recall frequency and measures of dream structure in male and female participants

Variable	Males	Females
Lucid Dream Frequency		
Frequent lucid dreams	29.3%	28.3%
Occasional lucid dreams	41.4%	49.2%
No lucid dreams	29.3%	22.5%
Creativity	54.44 \pm 8.13	54.64 \pm 9.03
DRF	5.07 \pm 5.96	6.55 \pm 5.87
Dream Structure		
Aversive Dream Content	17.22 \pm 6.20	20.75 \pm 7.57
Personal Significance	22.45 \pm 7.38	23.50 \pm 6.43
Dream Recall	18.29 \pm 6.01	21.01 \pm 6.19
Incorporation	19.31 \pm 5.15	25.47 \pm 5.88
Great Dreams	8.95 \pm 3.46	7.51 \pm 2.89
Total DDI Score	86.22 \pm 19.64	98.24 \pm 19.46

lucid dreamers scored significantly higher than non-lucid dreamers and occasional lucid dreamers; ; $t(154) = 2.28$, $p = .024$; $t(211) = 2.23$, $p = .027$, respectively.

Scores on the DDI scale "aversive dream contents" (Table 1) were not affected by lucid dreaming), as was the "personal significance" scale of the DDI; $F(2,295) = 0.25$, $p = .98$; $F(2,295) = 1.89$, $p = .15$, respectively (see Table 1).

No significant differences were also observed for the DDI scale "incorporation" between the three groups of participants, $F(2,295) = 1.98$, $p = .14$. However, comparing the collapsed group of lucid dreamers with non-lucid dreamers revealed significantly higher scores for lucid dreamers; $t(296) = 1.99$, $p = .048$ (see Table 1).

For the DDI scale "great dreams" a significant group effect was observed; $F(2,295) = 4.03$, $p = .019$. Subsequent t-Tests revealed that frequent lucid dreamers scored higher on this scale than either occasional lucid dreamers or non-lucid dreamers; $t(211) = 2.43$, $p = .016$; $t(154) = 2.54$, $p = .012$ (see Table 1).

The total DDI scores (Table 1) were not affected by lucid dreaming; $F(2,295) = 2.37$, $p = .095$.

Regarding gender differences (Table 2) no significant differences were observed for lucid dream frequency. No gender difference was found for creativity; $t(295) = 0.15$, n.s.; while DRF was higher in females compared to males as was "dream recall" scale; $t(291) = 1.70$, $p < .05$; $t(296) = 3.02$, $p < .01$, respectively. A highly significant gender difference was observed for the total DDI score, females scoring higher than males, $t(296) = 4.21$, $p < .001$. Females also scored higher on the aversive dreams scale; $t(296) = 3.28$, $p < .001$; and incorporation; $t(296) = 7.33$, $p < .001$; but there was no difference on the personal significance scale; $t(296) = 1.08$, n.s.. Finally, males scored higher than females on the great dream scale.

4. Discussion

The present study showed that lucid dreamers have a higher degree of creativity than non-lucid dreamers. In addition, the number of dreams recalled within the last four weeks was higher in frequent and occasional lucid dreamers than non-lucid dreamers. Dream recall frequency assessed by the DDI, in addition, revealed that frequent lucid dreamers recalled more dreams than occasional lucid dreamers. Note, however, the dream recall scale of the DDI covers a wider range of aspects than just the DRF. Lucid dreamers scored higher than non-lucid dreamers on the incorporation scale of the DDI. Moreover, frequent lucid dreamers scored higher than non-lucid dreamers and occasional lucid dreamers on the DDI subscale great dreams. . Females have a higher DRF, more aversive dream content and incorporations in dreams and fewer great dreams than males. The fact that females also had a higher total DDI score suggests that their dreams are experienced more intensely than is the case for male participants.

Roughly 24% of the participants reported having a lucid dream at least once a month and about 48% having at least one lucid dream in their lifetime. These data corroborate the findings of Schredl and Erlacher (2004), in which also a student sample displayed 82% of lucid dreamers. In a more recent study by Schredl and Erlacher (2011), in a representative German survey, 51 % of the participants reported lucid dreams as least once in lifetime, which is close to the 48 % of participants in the present study, reporting at least one lucid dream in their life. With regard to creativity, DRF and incorporation, both frequent and occasional lucid dreamers differ significantly from those individuals who reported no lucid dreams. This leads to the conclusion that the fundamental capacity to have lucid dreams (irrespective of the actual occurrence of lucid dreams) has an impact on dream structure, dream recall and creativity.

Furthermore, individuals who had frequent lucid dreams had higher scores in the DDI scales dream recall and great dreams than occasional lucid dreamers, so it can be supposed that these measures of dream structure are affected not only by the ability to have lucid dreams, but also by their frequency. The results thus indicate that creativity, DRF and incorporation of daily events into dreams are associated with the ability to have lucid dreams, while their frequency has less impact, except of the DDI subscales "dream recall" and "great dreams". There was no significant gender difference between lucid and non-lucid dreamers.

The result that lucid dreamers are more creative than non-lucid dreamers confirms the earlier findings of Blagrove & Hartnell (1998), probably displaying underlying cognitive processes like cognitive complexity and flexibility, which could lead to more creativity and the capacity for lucid dreaming. Gruber, Steffen and Vonderhaar (1995) showed that the global factor "independence" of the 16-PF Questionnaire (Costa & McCrae, 1985) could reliably distinguish between frequent, occasional and non-lucid dreamers, those who score high on this factor exhibit initiative, while low scores are associated with passiveness and the need for external support. Gruber et al. (1995) assumed higher independence scores to be associated with the ability of self-reflection and more intentional control while dreaming, due to a better regulation of emotions in the wake state (Blagrove & Hartnell, 1998).

The higher DRF of lucid dreamers, which was previously found in another study by Schredl and Erlacher (2007), might be due to the fact that lucid dreams can more often be recalled. Furthermore the ability to recall more dreams can be part of the ability to have lucid dreams or vice versa. In addition, it may be possible that lucid dreams are regarded with more significance than non-lucid dreams. This assumption supports the finding that lucid dreamers score higher than non-lucid dreamers on the DDI scale incorporation.

The higher score on DDI scale "incorporation" in lucid dreamers compared to non-lucid dreamers may imply that the first experience more impact of the waking state on dreams. Together with the DDI scale "personal significance" these two subscales reflect the boundaries between dreaming and waking and how they affect each other. In terms of validity, the content of those scales corresponds to the concept of boundary structure (Hartmann, 1989, 1991). In line with this, Aumann et al. (2012) found that individuals with thin boundaries have a higher DRF than those with thick boundaries. They also described their dreams as being more personally significant, bizarre and aversive. The present study shows that incorporation scores were higher for those who reported lucid dreams regardless of their frequency. The results concerning great dreams correspond to the dream contents of frequent lucid dreamers, who developed greater control over dreams, so that aversive dream content was reduced and great dreams were increased (LaBerge, 1987).

Gender differences like the higher DRF for females confirm earlier findings (Brand et al., 2001; Schredl & Piel, 2002). Females also scored higher on the total DDI as well as on the subscales aversive dream contents, incorporation, and dream recall. Males only scored higher on the DDI subscale great dreams. Thus, the same pattern arises between the genders and between lucid and non-lucid dreamers: females and frequent lucid dreamer have a higher DRF and more incorporation in their dreams. Possible associations between these findings require further examination. Higher DRF may lead to more incorporation and vice versa, or else a third variable leads to higher scores in dream characteristics and is associated with lucid dreaming such as the boundary structure (Hartmann, 1989; 1991). In addition, the similarities between gender differences and differences in lucid dreaming lend support to the hypothesis of some underlying genetic predisposition. However, gender differences in cognitive flexibility and creativity have not been found in other gender studies (Baer & Kaufmann, 2008).

Although the present study was undertaken in a rather big sample of participants there are several limitations of the study which affect its generalizability. First, the study was undertaken online and thus this sample is self-selected probably due to interest in lucid dreaming. This bears an overestimation or bias of the number of lucid dreamers. Additionally, no control on the correctness of the data is given in an online survey. However, a large portion of participants have been undergraduate psychology students which received credits for participation. For those subjects a bias due to personal interest in lucid dreaming can be negligible. Second, there are a rather small number of male participants which may also weaken the representativeness of the study. Third, creativity was measured indirectly by self-description as a personality trait and not as a performance measure. This may weaken the generalizability of the results with other studies on creativity, which used the more com-

mon performance measures. Last, our definition of lucidity is more strict, than in most other studies since we included the criterion to intentionally take influence on the dream (in addition to being aware of dreaming).

In sum, the present study shows that individuals with lucid dreams differ in self-reported creativity and some dream characteristics from those who report no lucid dreams. Whether lucid dreaming is the cause or the consequence of these dream characteristics is not clear and needs further examination. As lucid dreamers especially differ from non-lucid dreamers in those dream characteristics associated with boundaries or the connectivity between dreaming and waking states, the interaction of these two states appears to be a trait of lucid dreaming. The results of this study suggest that – with the exception of experiencing great dreams – it is more the ability to have lucid dreams that is associated with creativity, DRF and other dream characteristics than the frequency of such dreams.

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