

# Spontaneously Reported Colors in Dreams: Correlations with Attitude Towards Creativity, Personality and Memory

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The continuity hypothesis of dreaming states that dream content reflects waking-life. Given that our daily world is colored, one would expect that all dreams contain some kind of color. The percentage of colored dreams, however, varies greatly between studies. Influencing factors might be the understanding of dreams (comparing them with films which have been mostly black and white in the first half of the twentieth century) and creativity. The present study included 444 participants who kept a dream diary over two weeks and completed several questionnaires. The findings indicated that report style has a small but significant relationship with spontaneously reported colors in dreams. Future studies should focus on the question as to whether dream objects are colored in the same way as in waking-life. (**Sleep and Hypnosis 2008;10(2):54-60**)

**Key words:** Creativity, colors, dream content, personality, memory, dream recall

## INTRODUCTION

The continuity hypothesis of dreaming states that dream content reflects waking-life (1). Given that our daily world is colored, one would expect that all dreams contain some kind of color. In a representative survey of 1000 Austrians in the nineties, only 37% of the sample gave a positive response to the question "Do you dream in colors?" (2). Studies carried out in the first half of the

twentieth century yielded extremely low amounts of persons reporting that they dream in color: 25.6% (3), 40.8% (4), 25% (5), 29% (frequently or occasionally colors; [6]). Today, the number of persons who state that they dream completely in black and white is rather small: 0% (7), 4% (N = 40.000 American online poll, cited in [8]), 6.6% (9), 10% to 22% (Chinese students; [10]). Analyses of dream reports, however, yielded relatively small percentage of dreams with explicitly mentioned colors: 20.3% (N = 54; [11]), 29% (N > 3000; [12]), 11% to 46% (650 REM awakening dreams; [13]). If dreamers were asked explicitly for colors in their reports, the percentage of dreams with colors increased to about 80% (13,14).

The most extensive study on color

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Acknowledgements: The data collection was supported by a grant (SCHR 637/2-1) from the Deutsche Forschungsgemeinschaft (DFG) given to the author.

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Accepted June 7, 2008

perception in dreams was carried out by Rechtschaffen and Buchignani (15, 16). After awakening, 129 variations which included different combinations of color saturation, illumination, clarity (sharp vs. diffuse, fogged, out of focus), figure vs. background differences, and overall color balance of a single photo (young woman sitting on a couch) were presented to the participants immediately upon awakening. Participants generally had little difficulties in matching one to the photos to the last dream scene.  $N = 312$  matches were made by the 24 participants. Most dreams were comparable to waking life color perception but 20.2% of the chosen photos were achromatic. Taken altogether, the problem as to whether all dreams are colored is not yet solved and thus the question arises as to what factors affect the reporting of colors in dreams.

Schwitzgebel (7) pointed out that the media (cinema, TV in black and white) might have contributed to the low number of colored dreams in the middle of the last century. In Chinese students, Schwitzgebel, Huang and Zhou (10) found that frequency of colored dreams is related to the age when the person had first access to colored media but not with the amount of time currently watching colored or black-and-white media. This can be interpreted as an effect of how people understand dreams ("They are like films and therefore black and white/or colored) rather than real differences in the amount of colors in the dreams. This idea is supported by the study of Roffwarg et al. (17) who reported that red, orange, and yellow colors were very prominent in the dreams of subjects wearing goggles with red filters for five days. I.e., the colors seen during the day affected dream color in that study, so the lack of this effect on the person's general estimate of dream colors might be a prejudice. Schechter, Schmeidler and Staal (18) reported that art students reported colors spontaneously in their dreams more often than science students or engineering students

(50% vs. 16% and 0%, respectively). The difference was also found but smaller after explicitly asking for colors (72% vs. 55% and 55%). The question thus arises as to whether art students' dreams include colors more often or are they more aware of colors and therefore remember them more easily upon awakening. It might be a sort of report style. Up to now, systematic research on the correlates of reporting colors in dreams has not been carried out.

The purpose of this study was to determine the frequency of dreams including spontaneously reported colors and to investigate whether report style, personality, memory or creativity measures are associated with the reporting of colors. It was predicted that creative persons report colors in their dreams more often and that persons who included colors in waking reports also report colors in their dreams more often. The other variables were analyzed in an exploratory way.

## METHOD

### Participants

The sample included 444 persons whose mean age was 23.5 years ( $SD = 5.7$ ). These 376 women and 68 men were mainly psychology students. The participants were recruited at the Universities of Mannheim, Heidelberg, and Landau for a study entitled "Sleep, dreams, and personality". Participants were paid for participation.

### Materials

#### Dream recall frequency

Overall dream recall frequency was measured by a seven-point rating scale (0 = never, 1 = less than once a month, 2 = about once a month, 3 = twice or three times a month, 4 = about once a week, 5 = several times a week and 6 = almost every morning). The retest reliability of this scale for an

average interval of 70 days is high ( $r = .83$ ,  $N = 39$ ; [19]).

### Personality measures

The German version of the NEO-PI-R (Ostendorf & Angleitner, 1994) comprises 240 five-point items (coded: 0 to 4) measuring the Big Five personality measures (neuroticism, extraversion, openness to experience, agreeableness and conscientiousness). Scale scores (with 48 items on each of 5 scales) can range from 0 to 192. The internal consistencies of the scales are high ( $r = .89$  to  $.92$ ), and confirmatory Multitrait-Multimethod analyses replicated the findings of the English version (20).

### Creativity Questionnaire

The scale assessing attitude towards creativity was developed by Schredl (21) and contains 12 five-point Likert items, e.g., "Are you interested in modeling with clay, gypsum etc." (1 = not interested to 5 = strongly interested) or "Do you like creative, abstract activities more than clear, regular tasks?" (1 = strongly dislike to 5 = strongly like). The mean of these items (which all ranged from 1 to 5) was used in the analyses. The internal consistency was  $\alpha = .67$  (21). In addition, the participants were asked whether they were engaged in creative activities, such as painting, playing an instrument, doing needlework/handicraft in their leisure time. Lastly, a five-point Likert scale (1 to 5) for the subjective estimate of one's creativity was presented.

### Visual memory

The first two memory tasks were taken from the LGT-3 of Bäumlér (22). Firstly, 20 pictures of objects were presented simultaneously for 60 seconds. The subjects were asked shortly afterwards to recall as many objects as possible. Secondly, a city

map with a specific route was shown for 60 seconds. Immediately after the presentation the subjects were asked to reproduce the route on the now empty city map. The test score is the sum of correctly reproduced segments of the route (0 to 31). Finally, a 5-min sequence of the film "Four rooms" of Allison Anders, Alexandre Rockwell, Robert Rodriguez and Quentin Tarantino was presented without sound. In the following 15-min. period the subjects wrote down the details they could recall. To measure the performance of one subject, the sequence was divided into 62 scenes and 33 details. An independent rater coded the film reports for presence of the scenes and details. The interrater reliability for 50 film reports ranged from  $r = .958$  (scenes) to  $r = .980$  (details). The written reports were scored for the presence of colors by an external judge. All colors mentioned in the report were grouped into black, white, red, blue, green, yellow, mixed colors (brown, orange, beige, violet, gray, earth-colored, pastel colors), colored (no further specification).

### Dream diary

The participants kept a standardized dream diary over a 2-wk. period. If able to recall at least one dream, they were asked to record their dream(s) as completely as possible (on a maximum of five mornings per person). The dream reports were typed, randomized and scored for the presence of colors within the dream report by an external judge. All colors mentioned in the report were grouped into black, white, red, blue, green, yellow, mixed colors (brown, orange, beige, violet, gray, earth-colored, pastel colors), colored (no further specification). One hundred dream reports were coded by a second judge. The interrater reliability was high (Cohen's  $\kappa = 0.90$ ; exact agreement: 95%). The number of mornings with explicit dream recall was included as a second measure for dream recall frequency.

## Design and Procedure

The participants of the first sample completed the questionnaires over a two-week period and returned them with the dream diary to one of the experimenters. Of 457 participants, 444 persons returned their materials.

The mentioned color words were divided by the total word count in order to obtain a measure which is independent from report length. Sum scores were computed for black and white, all colors including black and white, and all colors without black and white.

In most of the dreams (75.4%) no colors (including black and white) were spontaneously reported. Colors (excluding black and white) were mentioned in 19.7% of the dreams. The distribution was as follows: black (107), white (94), red (93), blue (77), green (56), yellow (54), mixed colors (181), and colored without further specification (43).

## Colors in dreams and film reports

The mean length of the film reports was 343.7 words (SD = 87.1). In Table 1, the

**Table 1. Colors in dreams and film reports**

| Color              | Dreams | Film  | Difference<br>(Effect size: Cohen's d) | Correlation (Dream/Film) |
|--------------------|--------|-------|--|--------------------------|
| Black              | 0.04%  | 0.46% | 0.735***                               | .063                     |
| White              | 0.04%  | 0.13% | 0.314***                               | -.011                    |
| Red                | 0.03%  | 0.30% | 0.769***                               | .094                     |
| Blue               | 0.03%  | 0.03% | 0.013                                  | .053                     |
| Green              | 0.02%  | 0.01% | -0.111*                                | .063                     |
| Yellow             | 0.03%  | 0.04% | 0.018                                  | .104*                    |
| Mixed color        | 0.07%  | 0.03% | -0.212***                              | .040                     |
| Colored            | 0.02%  | 0.00% | -0.137**                               | .073                     |
| Black/White        | 0.08%  | 0.59% | 0.668***                               | .027                     |
| All colors         | 0.29%  | 1.00% | 0.646***                               | .126**                   |
| Colors without B/W | 0.21%  | 0.41% | 0.333***                               | .148**                   |

Note. Values are percentages standardized to report length.

\* $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .0001$ .

If a participant reported more than one dream, the scores were averaged over all of his/her dreams.

Statistical analyses were carried out with the SAS 9.1 software package for Windows. Because the self-developed dream recall frequency scale was ordinal and the distribution of the percentage of color words was not normal, the more robust Spearman-Rank correlations were computed.

## RESULTS

### Frequency of colors in dreams

Overall, 1612 dreams were reported. Their mean length was 155.3 words (SD = 130.1).

averaged percentage of color words standardized in regard to total word count are presented for the dreams and the film reports. In general, the film reports included more references to color than the dream reports. For the colors blue and yellow, no difference was found, whereas green, mixed colors, and mentionings of 'colored' were found more often in dream reports. Small but significant correlation coefficients were found for the percentage of all mentioned color words (with and without black and white) and yellow.

### Correlations between colors in dreams and film reports with creativity, personality and memory

In Table 2, 72 correlation coefficients are

**Table 2. Correlations between colors in dreams and film reports, creativity, personality, and memory**

| Variables                             | Film report |                            | Dreams     |                            |
|---------------------------------------|-------------|----------------------------|------------|----------------------------|
|                                       | All Colors  | Colors without black/white | All Colors | Colors without black/white |
| Gender (1 = female)                   | .079        | .068                       | -.051      | -.052                      |
| Age                                   | -.104*      | -.075                      | .057       | .049                       |
| Creativity (attitude) <sup>1</sup>    | .120**      | .129**                     | .112*      | .086*                      |
| Painting <sup>1</sup>                 | .069        | .065                       | .045       | .039                       |
| Playing music                         | .012        | .006                       | .009       | .003                       |
| Handicraft/Needlework                 | .064        | .007                       | .055       | .051                       |
| Creativity (self-rating) <sup>1</sup> | .066        | .074                       | .075       | .051                       |
| Neuroticism                           | .054        | .033                       | .066       | .054                       |
| Extraversion                          | -.027       | .021                       | -.033      | -.018                      |
| Openness to experiences               | .011        | .052                       | .071       | .034                       |
| Agreeableness                         | -.019       | -.107*                     | -.056      | -.062                      |
| Conscientiousness                     | -.005       | .035                       | -.062      | -.046                      |
| Dream recall (Quest.)                 | .058        | .044                       | .070       | .022                       |
| Dream recall (Diary)                  | .059        | .011                       | .021       | -.008                      |
| Visual memory (pictures)              | .050        | .072                       | .035       | .049                       |
| Visual memory (map)                   | -.029       | .021                       | .020       | .015                       |
| Film test (Number of scenes)          | .171***     | .110*                      | .046       | .056                       |
| Film test (Number of details)         | .624***     | .504***                    | .130**     | .135**                     |

<sup>1</sup>one-tailed test of the correlation coefficient

\*p < .05, \*\* p < .01, \*\*\*p < .0001.

depicted. With respect to the predicted correlations with creativity and painting as leisure time activity, solely the general positive attitude towards creativity was significantly related to the percentage of color words in film reports and dreams. Persons with more positive attitudes towards creativity used more color words in their dreams and film reports. The exploratory analysis of personality variables, gender, age and memory showed no significant effects of these variables on spontaneously reported colors in dreams and film reports, except for the number of details remembered after viewing the five-minute film segment. Persons with good recall of details reported colors in the film report more often (often associated with details; e.g., cherries, red lipstick, red phone, black suit, white socks, golden sleeves, red flower) and also reported colors in their dreams more often.

**DISCUSSION**

The findings of the present study indicate

that there is a small but significant relationship between report style and frequency of spontaneously reported colors in dreams.

The percentage of about 20% dream reports with color words is in line with the previous findings in other samples of diary dreams (11,12). The comparison with the reports of the memory task (film segment) yielded the expected result that some colors that played a prominent role in the film like red, black, and white were also reported more often, but also showed that some colors are more often mentioned in dream reports: green, mixed colors and colored without specification. Whereas the explanation for the higher percentage of green might be simply the fact that the film setting was completely indoors and, thus, lacking salient green colors, it is interesting that mixed colors and color words without specification are more often mentioned in dreams. The increased color words without specification might be interpreted as a memory effect, i.e., the person did remember that colors where

present in the dream but was not able to name the specific colors. In a recent study [23], it was shown that performance in a color memory task carried out during the day is related to the amount of recalled colors in dreams. Thus, effects of color memory performance should be investigated within this context in future studies.

Of the three creativity measures, only the positive attitude towards creativity, but not creative activities like painting or self-rated creativity, was related to the number of spontaneously reported colors, partly confirming the findings of Schechter, Schmeidler and Staal (18). The result that the attitude measures were related to colors in dreams but not the actual preoccupation with creative activities might be interpreted as follows: It is not attributable to different amounts of colors in dreams but to something like report style. This line of thinking is compatible with the relationship between color reporting in the film test and in dreams and the correlation between color reporting in dreams and focusing on the film details (because most of them were colored). The exploratory analyses yielded no significant correlation between spontaneously reported colors in dreams and the big five personality factors and memory performance, including dream recall frequency. I.e., high dream recallers reported colors in their dreams as often as low dream recallers.

The major limitation of the study is that only spontaneously mentioned colors could be included in the analysis. Although self-report is obviously the only method to measure color in dreams, follow-up studies should probe the participants for colored dream objects because, they will find higher prevalence rates for colored dreams (23). One might assume, though, that the factors found in this study might still be related to the reporting of colors. One should also keep in mind that diary dreams reflect most often only the dreams in the second half of the

night prior to awakening (24), so it would be very helpful to carry out laboratory studies too (cf. [17]).

Although the study identified factors that explained a small part of the interindividual differences in reporting colors, the question as to whether all dreams/dream objects are colored (including black and white, like the real-life objects) and the major problem of adequate recall, is still unresolved. Maybe it will be interesting to conduct a study in which the participants will be shown colored paintings during the evening and study whether these colors reoccur in the dream and whether persons trained in that way to focus on colors are able to recall colors occurring in their dreams much better. Another approach to investigate colors in dreams was applied by Schredl et al. (25). They provided the participants with colored pencils and asked them to draw the major dream scenes. Out of 49 drawings, 77.6% were colored; comparable with the percentage color in drawings following free imagination in waking which were also elicited in the study. This finding indicates that specific memory issues around dream recall might play a subordinate role because the percentage of color in the pictures were similar for dreams and waking imagery recollections. Future research should use the drawing approach to capture the dream colors and include instructions about focusing on colors which were not given in the Schredl et al. (25) study.

To summarize, the present study demonstrated a small but significant relationship between report style and spontaneously reported colors in dreams. Future research should clarify whether memory processes are responsible for the low amounts of colored dreaming reported in some studies (cf. [8]) or whether there are dream elements that are achromatic despite being normally colored in the waking-life experience of the person.

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