Colors in dreams and the introduction of color TV in Germany: An online study

Nina König[1], Luisa M. Heizmann[1], Anja S. Göritz[2], & Michael Schredl[1]

[1]Central Institute of Mental Health, Medical Faculty Mannheim/Heidelberg University, Germany

[2]University of Freiburg, Freiburg, Germany

Summary. Visual elements are important ingredients of dreams, so dream objects should be – based on the continuity hypothesis of dreaming – as colorful as the waking world. However, the percentages of recalled colored versus black and white dreams as estimated by the participants varied considerably across studies. In the present online study, 2701 persons completed a question about recalling colors in their dreams with three options: percentage of black and white dreams, percentage of colored dreams, and percentage of dreams with no memory of colors. The older participants who most likely had watched black and white TV reported higher recall of black and white dreams than younger persons while the younger group with access to colored TV estimated that their dreams include more often colors compared to the older group. Since the attitude towards dreams and dream recall frequency were positively associated with the reporting of colored dreams, one might hypothesize that dreamers may attribute colors to a dream even if they are do not remember the colors of their actual dreams. In order to validate the present findings, future studies should include the amount of media consumption (TV, cinema etc.) over the life span of the individual and elicit possible confounding factors like age-related memory changes, attention to colors in waking life, and emotional valence of colored dream elements.

Keywords: Dream content, color, black and white, TV exposition, continuity hypothesis, memory, aging

1. Introduction

Visual elements are mentioned as occurring in almost every dream report (McCarley & Hoffman, 1981; Snyder, Karacan, Tharp, & Scott, 1968; Zadra, Nielsen, & Donderi, 1998), so questions have arisen as to whether there is color perception in dreams and whether this color perception might be similar to waking life.

In anecdotal reports, Aristoteles (1966), Descartes (1989) and Freud (1987) mentioned colors in dreams. Research in the early 20th century found that a considerable number of persons reported that their dreams did not include colors (Bentley, 1915; Husband, 1936; Middleton, 1933); Middleton (1942), for example, reported that 40% of the persons interviewed recalled having only black and white dreams. Some dream researchers then were convinced that people only dream in greyscales because of the analogy to black and white mass media such as television and cinema (Schwitzgebel, 2002). Schwitzgebel (2003) repeated the Middleton (1942) study 61 years later and found a prevalence of only 4.4% of the participants who reported dreams without colors, a finding which he explained by the growing popularity of colored mass media. A survey by Murzyn (2008) corroborated these findings: The age group confronted with black and white media for a longer period of time estimated that they dream more in greyscale than the younger age group, who were reported that they were less exposed to black and white media. In addition, persons within the over 55 year age group with black and white media experience reported significantly more greyscale and mixed dreams and less color dreams than the equally old group with no such experience (Murzyn, 2008). In a small follow-up study with N = 39 participants who had access to black and white media (Murzyn, 2012), medium-sized correlation coefficients between length of black and white media access and the frequency of colored or the frequency of greyscale dreams in the expected direction were found but due to the small sample size not significant.

Schwitzgebel, Huang, and Zhou (2006) replicated the Middleton (1942) study in a Chinese sample revealing that groups with more exposure to black and white media reported recalling dream with colors less often. Further support was provided by Okada, Matsuoka, and Hatakeyama (2011) analyzing the life span differences in color dreaming by comparing two cross-sectional surveys from 1993 and 2009. In both surveys, 80% of subjects younger than 30 years of age estimated recalling color in their dreams, but the percentage of recalling colors in dreams decreased with age and fell to 20% by the age of 60. The frequency of reporting colored dreaming increased from 1993 to 2009 (Okada et al., 2011); it would be interesting to carry out a longitudinal study in order to investigate within-subject changes with time.

Based on the continuity hypothesis of dreaming (Schredl, 2003), stating that daily waking-life activities are incorporated into dreams, one would expect that dreams contain colors since the daily world is colored. A study by Roffwarg, Herman, Bowe-Anders, and Tauber (1978) supported the continuity hypothesis for dreams obtained from awakenings of the early REM periods: participants wearing goggles with red filters for five days reported more dreams colored in red,

Corresponding address:
Michael Schredl, Sleep laboratory, Central Institute of Mental Health, PO Box 12 21 20, 68072 Mannheim, Germany.
Email: Michael.Schredl@zi-mannheim.de

Submitted for publication: December 2016
Accepted for publication: April 2017

orange and yellow. Moreover, EEG-studies have shown increased activities in the visual cortex that is involved in color perception during REM-sleep (Braun et al., 1998; Wehrle et al., 2005).

Methodological procedures might also contribute to differences between studies: spontaneously reported colors were relatively scarce. In about 20% of the dream reports (Schredl, 2008) colors were explicitly mentioned, whereas when probing for color in dreams, colors were reported by 80% of the participants (Kahn, Dement, Fisher, & Barmack, 1962; Rechtschaffen & Buchignani, 1983, 1992; Schredl, Fuchedzhieva, Hämig, & Schindele, 2008). In addition, memory processes played an important role as the percentage of black and white dreams was related to dream recall frequency: High dream recallers estimated their dreams as being black and white less often (Schredl et al., 2008). When the option that dream colors might not be remembered was presented as a third category, the frequency of explicit black and white dreams became relatively small and the percentage of dreams where colors were not remembered was about 35% (Schredl et al., 2008). In addition, Hoss (2010) found not differences in percentage of spontaneously mentioned colors in students' dreams collected in the late 1940ties (Hall & Van de Castle, 1966) and students' dreams from the 1980ties; a finding that indicate that memory for color content might be a confounder if this type of memory is decreasing with age.

To summarize, based on the continuity hypothesis (Schredl, 2003) one would expect all dreams to be colored since our daily world is colored; a hypothesis that is supported by laboratory and diary study results reporting that actual dream reports very often include colors – if the participants are questioned explicitly directly after reporting the dream (Rechtschaffen & Buchignani, 1992; Schredl et al., 2008). So there is a question as to why some persons report that their dreams are mainly black and white. The explanation offered by Schwitzgebel (2003) was based on his view that dreams are neither colored nor black and white; this seems not very plausible according to the above mentioned findings. An alternative viewpoint would be that it is difficult to remember the color of dream objects (if not being asked directly after awakening) as the actions and emotions are more prominent in dreams (Schredl, 2014). Schwitzgebel (2002) suggested that the popular opinion about the presence of colors in dreams based on the parallelism between film images and dream images affects the recall of dreamed colors, i.e., participants living in time periods in which media were mostly in black and white would report more black and white dreams due to the analogy between media and dreams – even if the dreams themselves have not changed. On the other hand, based on the continuity hypothesis persons watching a lot of black and white media should also report more black and dreams than persons not exposed to black and white media even if most of their non-media waking life contains colors and, thus, the majority of the dreams of both groups should include colors. An open question is to whether persons that are only exposed to colored media and colors in their daily world would still report black and white dreams.

The present study investigated whether having lived in a time period with very likely exposition to black and white TV might correlate with the reporting of color perception in dreams. The first hypothesis is that older participants, being more exposed to black and white TV in the past, report that their dreams are colored less often than younger participants and that they recall more often black and white dreams than younger participants growing up with colored TV. The second hypothesis is that participants with high dream recall frequency were expected to report more colored dreams because they remember dream colors more easily – based on the idea that our dream world is as colorful as the waking world and recalling colors is the key factor.

2. Method

2.1. Participants

Overall, 2929 (1742 women and 1187 men) completed the online survey between April 18, 2014 and April 29, 2014. Due to item-nonresponse and incorrect answers the final sample included 2701 persons (1620 women and 1081 men) with a mean age of 45.50 ± 14.17 years ranging from 16 to 90 years (women 43.10 ± 13.40 years; men 49.11 ± 14.53 years).

2.2. Measurement Instruments

Two questions of the Mannheim Dream Questionnaire (MADRE; Schredl, Berres, Klingauf, Schellhaas, & Göritz, 2014) that is available in German and English in its full length were used in the present study. The dream recall frequency was measured by a 7-point-scale (0 = never, 1 = less than once a month, 2 = about once a month, 3 = two to three times a month, 4 = once a week, 5 = several times a week, 6 = almost every morning). The retest reliability of the dream recall frequency scale is high with r = .756 (Schredl et al., 2014). Second, the attitude towards dreams was measured by six items coded on a 5-point-scale (0 = not at all, 1 = rather not, 2 = partly, 3 = rather yes, 4 = completely), e.g. "how much meaning do you attribute to your dreams?", "I think that dreams are meaningful". This scale has a high internal consistency (α = .910) and the retest reliability is high with r = .842 (Schredl et al., 2014).

In addition, the participants were asked to estimate the percentages for their recall of color perception for three possible color modalities. This was explained by the following text: Dreams can be colored (comparable to waking-life), or they can be in black and white, or it might be that the person does not recall as to whether the dream was colored or black and white. Please estimate the percentage of your dreams belonging to each category. If one option does not apply to you, please fill in Zero. Keep in mind that all three estimated percentages must add up to 100%.

Table 1. Frequency of recalling color modalities in dreams (N = 2701)

Color modalities	**Mean Percentage**
Colored	48.57% ± 41.79%
Black and white	10.67% ± 21.95%
No recall of color perception in dreams	40.76% ± 43.13%
	Σ 100%

Table 2. Percentage of recalled color modalities (N = 2701)

Category	Colored	Black and white	No recall of color perception
0%	32.14%	68.09%	38.95%
1-10%	3.89%	9.66%	6.33%
11-20%	3.48%	6.18%	6.96%
21-30%	3.52%	4.07%	3.89%
31-40%	2.37%	2.55%	2.81%
41-50%	9.22%	3.96%	5.74%
51-60%	3.18%	1.07%	1.30%
61-70%	3.74%	0.44%	1.59%
71-80%	6.89%	1.18%	1.74%
81-90%	4.33%	0.78%	1.18%
91-99%	1.74%	0.19%	0.41%
100%	25.51%	1.81%	29.10%

2.3. Procedure

The study link was posted on the online panel www.wisopanel.net where persons with an interest in online studies are registered with heterogenic demographic backgrounds. For some surveys, prizes or money are given for participation, but this study was voluntary and unpaid.

The participants were divided into three groups depending on historical data as to when color TV was introduced in Germany: time period with black and white TV, time period with colored TV and a transitional group. Colored TV was introduced in Germany in 1967 and, due to the Olympic Games in 1972 and the football world championship in 1974, most households had a colored TV by 1975 (Teuteberg & Neutsch, 1998). Since kids of 6 years of age regularly watch TV (Götz, 2007), participants who were born before 1961 were in the "black and white TV" group. Moreover, persons born after 1969 were in the "colored TV" group and people born between 1961 and 1968 were in the transitional "between black and white and colored TV" group.

Statistical procedures were carried out using SAS for Windows 9.4. Since the percentage data were not normally distributed they were categorized into 12 groups. Multiple ordinal regression analyses were done to test the relation between categorized estimations of color perception in dreams and the independent variables of age, dream recall frequency, and attitude towards dreams.

3. Results

Overall, the mean dream recall frequency was 3.64 ± 1.73 (according to the coding of the scale this mean is somewhat below the category "once per week"); about 11% of the participants remembered their dreams every morning, while 5% never recalled a dream. Women claimed they remembered more dreams than men (standardized estimate = .0861, $\chi^2 = 20.1$, $p < .0001$) and age was negatively correlated with dream recall frequency (standardized estimate = -.0978, $\chi^2 = 25.8$, $p < .0001$). The mean attitude towards dreams in the sample was 2.54 ± 0.90. Women had a more positive attitude compared to men (standardized estimate = .1646, $t = 8.6$, $p > .0001$) and there was a negative association between attitude towards dreams and age (standardized estimate = -.1261, $t = -6.6$ $p < .0001$). Lastly, a positive correlation between attitude towards dreams and dream recall frequency was found ($r = .348$, $p < .0001$).

Table 1 shows the means and standard deviations of frequencies of color modalities in dreams. The total sample estimated on average that about 50% of their dreams were estimated to include colors, while 10% of the dreams were estimated to be in black and white. Since the data were not normally distributed, 12 categories for the dream recall frequency were built and are shown in Table 2. The distributions are U-shaped.

Moreover, means, standard deviations, and percentages for the three categories related to the periods of black and white vs colored TV introduction are depicted in Table 3. A logistic regression for the categorized variables of the three color modalities yielded significant results for the factors of TV category (colored, transitional, black and white), dream recall frequency and attitude towards dreams while gender was only significant for the black and white modality (see Ta-

Table 3. Analysis for the three birth categories regarding black and white and colored TV access

Factors	Born before 1961"black and white TV" (N = 835)	Born between 1961-1968 "transitional" (N = 550)	Born after 1968 "colored TV" (N = 1316)
Age	62.22 ± 6.57 yrs.	49.44 ± 2.27 yrs.	33.25 ± 6.97 yrs.
Age range	54 to 90 yrs.	46 to 53 yrs.	16 to 45 yrs.
Colored dreams	39.18% ± 40.50%	42.60% ± 42.06%	57.03% ± 40.81%
Black and white dreams	15.75% ± 27.33%	11.13% ± 22.48%	7.25% ± 16.62%
No recall of color perception	45.06% ± 44.31%	46.27% ± 45.24%	35.72% ± 40.88%
Persons with 100% Colored dreams	18.92%	22.91%	30.78%
Persons with 100% Black and white dreams	3.95%	1.64%	0.53%
Persons with 100% No recall of color perception	33.89%	36.18%	23.10%

Table 4. Logistic regression for the three recalled color modalities (categorized variables see Table 2)

Color modality	Factor	SE	χ^2	p
Percentage of colored dreams (categorized variable)	Birth year (categorized into three groups)	.1549	62.3	<.0001
	Gender	-.0035	0.0	.8610
	Dream recall frequency	.1703	66.6	.0001
	Attitude towards dreams	.1325	39.3	<.0001
Percentage of black and white dreams (categorized variable)	Birth year (categorized into three groups)	-.1538	45.1	<.0001
	Gender	-.0732	10.2	.0014
	Dream recall frequency	.0858	12.0	.0005
	Attitude towards dreams	.1259	24.7	<.0001
Percentage of no recall of color perception (categorized variable)	Birth year (categorized into three groups)	-.0534	7.3	.0070
	Gender	.0072	0.1	.7202
	Dream recall frequency	-.1723	67.1	<.0001
	Attitude towards dreams	-.1345	39.6	<.0001

SE = Standardized estimate

ble 4). The estimates given for the number of colored dreams increased from the group born before 1961 to the younger group born after 1968 while the number of black and white dreams decreased. Interestingly, attitude towards dreams and dream recall frequency were both positively associated with more colored and more black and white dreams. The percentage of participants with 100% of dreams estimated to be in color increased while the proportion of participants with 100% of dreams to be in black and white decreased.

Even in a subsample of high recallers (estimating their recall higher than at least one dream recalled per week), some participants reported to have 100% black and white dreams: 3.72% of the participants born before 1961 rated their dreams to be 100% black and white and this was true for only 1.64% born between 1961 and 1968. Only 0.35% of the participants who were born after 1968 and only used to colored TV still reported their dreams to be 100% black and white.

4. Discussion

The main finding of the study indicates that older persons who had access to black and white media when they were younger reported more black and white dreams than younger persons, while more colored dreams were reported by the younger group that presumable started with colored TV. As the study did not elicit current and past media consumption of the participants, the inference that former access to black and white media is the key factor in explaining the percentage of black and white dreams is probable but has to be supported by a more detailed study eliciting actual media consumption over the participant's live span.

In the present study 50% of all recalled dreams were estimated to be colored compared to only 10% in black and white (40% dreams without color memory). It is worth noticing that even in the group born before 1961 and only exposed to black and white TV, colored dreams were already more frequent with 40%. In this group the average percentage of black and white dreams experienced with 15% was considerably smaller compared to the percentages typically reported in former studies (e.g. Middleton, 1942).

Some methodological issues have to be taken into account. In the present study, the participants rated the color modality of their dreams on a questionnaire with three options: percentage of colored dreams, percentage of black and white dreams, and percentage of dreams without color memory. They estimated a considerably large percentage of their dreams with no recall of colors (40%) – similar to 35% found by Schredl et al. (2008). This finding supports the idea that memory processes, i.e., difficulties in remembering dream colors, play an important role. Due to the third option persons are not forced to decide between colored or black and white so that there might be less black and white dreams than in the Middleton (1942) study: "Do you see colors in your dreams?" could be answered with "very frequently", "frequently", "occasionally", "rarely" and "never". The last category "never" was chosen in about 40%, so participants who were not sure about colors in their dreams might have chosen this option. In line with this finding, a significant negative correlation between dream recall frequency as well as attitude towards dreams and "no recall of color perception in dreams" was found in the present study. Therefore, persons that are not interested in their dreams or that are low recallers might have chosen this third option.

There are number of possible explanations for the result that the introduction of colored TV correlated with reporting more colored dreams. First, based on the continuity hypothesis of dreaming (Schredl, 2003), watching colored TV during the day might result in more colored dreams – this is in line with surveys showing that media consumption affects dreaming (Stephan, Schredl, Henley-Einion, & Blagrove, 2012; Van den Bulck, 2004) even though these studies have to be followed-up by content analytic stud-

ies of actual dream reports. In addition, the percentage of participants estimating that 100% of their recalled dreams were in color increased with being born later while the proportion of participants reporting that 100% of their dream were in black and white dreams decreased with – parallel to the increase of the availability of colored TV (Murzyn, 2008; Schwitzgebel et al., 2006).

Second, this effect might be explained by participants applying the analogy between dream and film (Schwitzgebel, 2002). Persons exposed to black and white media in their childhood and/or young adulthood would think that their dreams are black and white, even if they do not recall whether the dream was in black and white or in color. The finding that for a large percentage of dreams the dreamer was not able to recall the colors support this line of thinking. In the present study, attitude towards dreams was significant and positively associated with more colored dreams. One would expect people with a positive attitude towards dreams to have more knowledge about dreams (including the continuity between color perception in waking and while dreaming), so there would be more color reports. Interestingly, attitude towards dreams was also correlated positively with the percentage of black and white dreams; this maybe based on a different knowledge about dreaming. To clarify this issue, future studies should elicit the type of knowledge of the participants regarding colors in dreams whether they think dreams are mainly in black and white or in color. Other factors that have not been included in the present study might also – at least partly – explain the present findings: paying attention to colors in waking, e.g. one might expect difference between art students and psychology students (cf. Schechter, Schmeidler, & Staal, 1965), memory of colors in the waking state might change with age (the estimated percentages of black and white dreams are related negatively to color memory; Schredl et al., 2008), and colors might be associated with emotions in the individual (cf. Hoss, 2010) which might affect the incorporation of colors into the dream and/or recalling the color after waking up as emotional salient daytime experiences are more likely to be incorporated into dreams (Schredl & Reinhard, 2009-2010), and salient dreams are more easily recalled (Schredl, 2007).

Astonishingly, some participants (born after 1968) who were exposed almost exclusively to colored media (in addition to the colors of the waking world) still reported having only black and white dreams. This is partly explained by dream recall frequency as the number decreases to three persons if only high recallers were considered. For future research, these persons should be invited to a sleep laboratory with REM sleep awakenings and dream collecting to test their memory for colors occurred in the dream immediately upon awakening under controlled condition, for example by presenting differently colored pictures (cf. Rechtschaffen & Buchignani, 1992). We would expect that those persons would also report colors.

To summarize, the present study has shown that estimates of having black and white dreams are related to the introduction of and presumable access to colored TV. As the attitude towards dreams and dream recall frequency were positive associated with reporting colored dreams, one might hypothesize that dreamers might attribute colors to their dreams even if they are not really remembering any. Future studies should also investigate actual media consumption over the live span, color memory, its relation to age (cf. Schredl et al., 2008), participants' knowledge about colors in dreams, emotions associated with colors – as these factors possibly affecting the percentage of reporting colored or black and white dreams. In addition, the studies using retrospective estimates regarding colors in dreams should be complemented by content analytic studies in large samples of dream report.

References

Aristoteles. (1966). Über Weissagung durch Träume. In H. Bender (Ed.), Parapsychologie: Entwicklung, Ergebnisse, Probleme (pp. 26-30). Darmstadt: Wissenschaftliche Buchgesellschaft.

Bentley, M. (1915). The study of dreams. American Journal of Psychology, 26, 196-210.

Braun, A. R., Balkin, T., Wesensten, N., Gwadry, F., Carsen, R., Varga, M., . . . Herscovitch, P. (1998). Dissociated pattern of activity in visual cortices and their projections during human rapid eye movement sleep. Science, 279, 91-95.

Descartes, R. (1989). The passions of the soul (1596-1650). Indianapolis: Hackett.

Freud, S. (1987). Die Traumdeutung (1900). Frankfurt: Fischer Taschenbuch.

Götz, M. (2007). televizion. Fernsehen von -0,5 bis 5. Eine Zusammenfassung des Forschungsstands. Retrieved from http://www.br-online.de/jugend/izi/deutsch/publikation/televizion/20_2007_1/goetz_solo.pdf

Hall, C. S., & Van de Castle, R. L. (1966). The content analysis of dreams. New York: Appleton-Century-Crofts.

Hoss, R. J. (2010). Content analysis of the potential significance of color in dreams: A preliminary investigation. International Journal of Dream Research, 3, 80-90.

Husband, R. W. (1936). Sex differences in dream contents. Journal of Abnormal and Social Psychology, 30, 513-521.

Kahn, E., Dement, W., Fisher, C., & Barmack, J. E. (1962). Incidence of color in immediately recalled dreams. Science, 137, 1054-1055.

McCarley, R. W., & Hoffman, E. (1981). REM sleep dreams and the activation-synthesis hypothesis. American Journal of Psychiatry, 138, 904-912.

Middleton, W. C. (1933). Nocturnal dreams. Scientific Monthly, 37, 460-464.

Middleton, W. C. (1942). The frequency with which a group of unselected college students experiences colored dreaming and colored hearing. Journal of General Psychology, 27, 221-229.

Murzyn, E. (2008). Do we only dream in color? A comparison of reported dream color in younger and older adults with different experiences of black and white media. Consciousness and Cognition, 17, 1228-1237.

Murzyn, E. (2012). Imagery and memory for color and the reported color of dreams. International Journal of Dream Research, 5, 108-113.

Okada, H., Matsuoka, K., & Hatakeyama, T. (2011). Life span differences in color dreaming. Dreaming, 21(3), 213-220. doi:10.1037/a0024084

Rechtschaffen, A., & Buchignani, C. (1983). Visual dimensions and correlates of dream images. Sleep Research, 12, 189.

Rechtschaffen, A., & Buchignani, C. (1992). The visual appearence of dreams. In J. S. Antrobus & M. Bertini (Eds.), The neuropsychology of sleep and dreaming (pp. 143-155). Hillsdale: Lawrence Erlbaum.

Roffwarg, H. P., Herman, J. H., Bowe-Anders, C., & Tauber, E. S. (1978). The effects of sustained alterations of waking visual input on dream content. In A. M. Arkin, J. S.

Antrobus, & S. J. Ellman (Eds.), The mind in sleep: Psychology and Psychophysiology (pp. 295-349). Hillsdale, New Jersey: Lawrence Erlbaum.
Schechter, N., Schmeidler, G. R., & Staal, M. (1965). Dream reports and creative tendencies in students of the arts, sciences and engineering. Journal of Consulting Psychology, 29, 415-421.
Schredl, M. (2003). Continuity between waking and dreaming: a proposal for a mathematical model. Sleep and Hypnosis, 5, 38-52.
Schredl, M. (2007). Dream recall: models and empirical data. In D. Barrett & P. McNamara (Eds.), The new science of dreaming - Volume 2: Content, recall, and personality correlates (pp. 79-114). Westport: Praeger.
Schredl, M. (2008). Spontaneously reported colors in dreams: correlations with attitude towards creativity, personality and memory. Sleep and Hypnosis, 10, 54-60.
Schredl, M. (2014). Sleep and dreaming. In C. L. Bassetti, Z. Dogas, & P. Peigneux (Eds.), ESRS European Sleep Medicine Textbook (pp. 63-71). Regensburg: European Sleep Resarch Society.
Schredl, M., Berres, S., Klingauf, A., Schellhaas, S., & Göritz, A. S. (2014). The Mannheim Dream questionnaire (MADRE): Retest reliability, age and gender effects. International Journal of Dream Research, 7, 141-147.
Schredl, M., Fuchedzhieva, A., Hämig, H., & Schindele, V. (2008). Do we think dreams are in black and white due to memory problems? Dreaming, 18, 175-180.
Schredl, M., & Reinhard, I. (2009-2010). The continuity between waking mood and dream emotions: Direct and second-order effects. Imagination, Cognition and Personality, 29, 271-282.
Schwitzgebel, E. (2002). Why did we think we dreamed in black and white? Studies in History and Philosophy of Science, 33, 649-660.
Schwitzgebel, E. (2003). Do people still report dreaming in black and white? An attempt to replicate a questionnnaire from 1942. Perceptual and Motor Skills, 96, 25-29.
Schwitzgebel, E., Huang, C., & Zhou, Y. (2006). Do we dream in color? Cultural variations and skepticism. Dreaming, 16, 36-42.
Snyder, F., Karacan, I., Tharp, V. K., & Scott, J. (1968). Phenomenolgy of REMs dreaming. Psychophysiology, 4, 375.
Stephan, J., Schredl, M., Henley-Einion, J., & Blagrove, M. (2012). TV viewing and dreaming in children: The UK library study. International Journal of Dream Research, 5, 130-133.
Teuteberg, H. J., & Neutsch, C. (1998). Vom Flügeltelegraphen zum Internet: Geschichte der modernen Telekommunikation (No. 147). Stuttgart: Franz Steiner Verlag.
Van den Bulck, J. (2004). Media use and dreaming: the relationship among television viewing, computer game play, and nightmares or pleasant dreams. Dreaming, 14, 43-49.
Wehrle, R., Czisch, M., Kaufmann, C., Wetter, T. C., Holsboer, F., Auer, D. P., & Pollmächer, T. (2005). Rapid eye movement-related brain activation in human sleep: a functional magnetic resonance imaging study. Neuroreport, 16, 853-857.
Zadra, A. L., Nielsen, T. A., & Donderi, D. C. (1998). Prevalence of auditory, olfactory and gustatory experiences in home dreams. Perceptual and Motor Skills, 87, 819-826.