Bizarreness in fever dreams: A questionnaire study

Michael Schredl, Olivia Küster, Angelika Spohn, & Anne Victor

Central Institute of Mental Health, Medical Faculty Mannheim, Heidelberg University, Germany

Summary. Fever is accompanied by distressing symptoms and also affects sleep. In a retrospective study, 62 participants were asked about their experiences with fever dreams. The fever dreams were more bizarre, more emotionally intense, and often negatively toned than diary dream from an age- and gender matched sample. This study is the first that takes a closer look on fever dreams and the results indicate that fever has an effect on the cognitive processing of the sleeping brain. Due to the retrospective nature of the study, it would be very interesting to follow-up this line of research by conducting diary studies during naturally occurring febrile illnesses and sleep laboratory studies in which fever is experimentally induced. This research helps to shed light on the interaction between the physiological level (brain activation) and the psychological level of subjective experiences.

Keywords: Fever, dreaming

1. Introduction

Fever is an elevation of body temperature above the normal circadian range resulting from a change in the thermoregulatory center of the hypothalamus (Gelfand & Dinarello, 1998). Typical patient-reported symptoms are runny or dripping nose, sore throat, trouble with breathing, weakness, feeling hot and/or cold, sweating, and chills (Ames et al., 2013). Systemic symptoms such as headache, malaise, lack of appetite and other sickness-related behaviors may also accompany fever(Ogoina, 2011). In addition, cognitive impairments can occur (Hall & Smith, 1996) as well as disturbed sleep (Powers et al., 2015). In children, fever can trigger parasomnias like sleepwalking and night terrors (Kales, Kales, Soldatos, Chamberlin, & Martin, 1979). Experimentally induced fever via pyrogens is reaching temperatures of about 39°C during sleep and significantly increases wake time and reduced slow wave sleep and REM sleep (Karacan, Wolff, Williams, Hursch, & Webb, 1968). In a single subject with fever ranging from 40.5°C at the beginning of the night to 39.2°C in the morning, frequent awakenings and no REM sleep occurred during the roughly 7 hours long sleep (Maron, Rechtschaffen, & Wolpert, 1964). Participants who developed moderate symptoms of a common cold induced experimentally with a rhinovirus showed reduced sleep efficiency (Drake et al., 2000). Interestingly, a field study (Smith, 2012) monitored 15 participants undergoing a common cold with actigraphy. Their results showed only small or no significant sleep disturbances; only those persons who reported nasal obstruction as a major symptom of the cold had reduced sleep efficiency.

Whereas there is some evidence that fever affects sleep patterns, research as to whether fever also affects dreaming (defined as subjective experience during sleep) has not yet been carried out. Karacan et al. (1968) reported that dream recall after fever nights (free recall in the morning) was much lower (17%) than recall after baseline and recovery nights (about 80%) but they did not analyze the remembered dreams. Ames et al. (2013) found that 3 of the 28 (11%) participants reported unusual, strange dreams accompanying their fever, e.g., “back and forth between a very difficult circumstance and a very comfortable circumstance.” Since many empirical studies are in accordance with the continuity hypothesis, which states that activities from waking-life are reflected in subsequent dreams (Domhoff, 2003; Schredl, 2003a) one would expect that having fever with all the accompanying symptoms should effect dreams. Even the strong effect of high fever on sleep (Karacan et al., 1968), would suggest that dreaming might also be altered.

This pilot study elicited retrospectively remembered fever dreams and subjective experiences related to these fever dreams like emotional intensity, body perception, and lucidity. Based on the personal experience of the first author, we expected fever dreams to be more bizarre than ordinary dreams – similar to cognitive processes that might be altered by high fever in waking (Piraino, Vollmer-Conna, & Lloyd, 2012).

Corresponding address:
Prof. Dr. Michael Schredl, Sleep laboratory, Central Institute of Mental Health, PO Box 122120, 68072 Mannheim, Germany.
Email: Michael.Schredl@zi-mannheim.de

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2. Method

2.1. Participants

The sample included 62 participants (43 women and 19 men) with a mean age of 26.5 ± 11.9 years, ranging from 19 to 72 years, and was divided into two groups: psychology students (N=56) and patients of general practitioners (N=6).The participation was voluntary and without monetary compensation.

2.2. Questionnaire

Besides demographic data, the overall emotional intensity of the remembered dreams in general was measured on a five-point scale (0= Not at all intense, 1 = Not that intense, 2 = Somewhat intense, 3 = Quite intense, 4 = Very intense). The

retest reliability of this scale is fairly high (r = .704; Schredl, Berres, Klingauf, Schellhaas, & Göritz, 2014). Then the participants were asked to write down the last fever dream they remembered as completely as possible. Furthermore, questions were presented about how long ago the fever dream occurred, whether they were aware that they were dreaming, the emotional tone of the fever dream (predominantly positive, neutral/balanced, predominantly negative) and whether the perception of the own body within the dream was different from waking life. Lastly, the overall emotional intensity of all remembered fever dreams were to be rated on a five-point rating scale (see above).

2.3. Dream content analysis

The bizarreness/realism scale was adopted from Schredl, Sahin, and Schäfer (1998) and includes four categories: 1 = Possible in waking life and dream events are part of the normal everyday life, 2 = Many elements of the waking life, but the dream action is uncommon but not impossible, 3 = Occurrence of one fantasy object, a bizarre connection or action which is impossible in waking life, and 4 = Occurrence of two or more fantasy objects, bizarre connections or actions which are impossible in waking life. The interrater reliabilities of the scale were ranging from r = .689 to r = .779 (Schredl, Burchert, & Grabatin, 2004).

2.4. Procedure

The student participants were approached before statistic classes and returned the questionnaire to one of the authors. About 100 questionnaires were distributed in ten different general practitioners' waiting rooms with very low return rate (see above). Overall, 46 most recent fever dreams were reported, 12 participants did not report a dream and 4 participants described general dream characteristics but no explicit dream content. The dreams were typed and all elements not related to the dream experience were removed. Forty-five diary dreams of the study by Mathes and Schredl (2014) were selected, matched for word count. One questionnaire was returned after the judging was finished and, thus, could not be included. The 90 dreams were sorted in a random order to ensure that the raters did not know whether the dream was a fever dream or a control dream. Two raters applied the bizarreness/realism scale (see dream content analysis section). Statistical analysis was executed using SAS 9.4 for Windows. Since the bizarreness/realism scale is ordinal a Mann-Whitney-U-test was computed.

3. Results

The interrater reliability for the bizarreness/realism scale for the present sample of 90 dreams was r = .82 (Spearman Rank correlation). Length of fever dreams ranged from 12 to 191 words; the mean word count did not differ between the fever dreams and the control dreams (see Table 1). Fever dreams, however, were much more bizarre than the control dreams (see Table 1). Furthermore, about 63.0% (N = 54 valid answers) reported that they perceived their body as different from normal waking life. About 40.7% reported that during the fever dream they were aware that they were dreaming. Lastly, the majority (93.5%) of the participants stated that the fever dream was predominantly negative; only one participant rated the dream as positive (neutral/balanced: N = 2). The overall emotional intensity of the fever dreams (3.35 ± 1.12) was significantly higher than the mean emotional intensity of all remembered dreams (2.78 ± 0.95). About two thirds of the participants reported that their fever dream occurred at least a year ago.

Table 1. Fever dreams and control dreams

Variable	Fever dreams (N = 45)	Control dreams (N = 45)	Statistical Test
Word count	73.48 ± 47.20	73.00 ± 46.54	t = 0.1 p = .9607[1]
Bizarreness/realism	2.82 ± 0.94	1.78 ± 0.74	z = 5.1 p < .0001[2]

[1]t-test, [2]Mann-Whitney-U-test

Fever dream topics

The most common feature of the 46 fever dreams was some kind of spatial distortion; present in 24 dreams, e.g., the walls are moving, creatures with over-sized arms and legs, a growing mountain, metal spheres moving like an organism, balancing a hut on the fingertip (painful), black is slowly spreading all over, gigantic insets, the mother is a golden statue that is melting, burning clouds, bolts and cylinders changing sizes. The dreamer was threatened in 16 dreams; by big spheres, dogs, stones, insects, and terrorists. In 9 dreams the dreamer experienced some illness symptom: respiratory distress (N = 4), vertigo (N = 2), pain (N = 2), and distorted vision (N = 1). Lastly, two dreams included a repetition, one about hearing an annoying song over and over and the second dream illustrates this topic: "I am climbing up a mountain. Near the top there is a hut that I want to reach. The walk seems endless and I feel exhausted. I am looking at my feet. Every step is hard for me. Every time I look up the hut seems to be far away. When I reach to hut I am totally exhausted. I open the door of the hut and enter. As soon as I shut the door, I am standing again at the bottom of the hill and have to climb up again."

4. Discussion

The present pilot study indicates that fever not only affects sleep – as has been reported previously (Drake et al., 2000; Karacan et al., 1968) – but also dreaming, the subjective experiences during sleep. Fever dreams are more bizarre, more emotionally intense, often negatively toned and include altered body perceptions. I.e., the different physiology (brain on elevated temperature) affects cognitive processing.

From a methodological viewpoint it has to be noted that the retrospective design might have affected the results, as the time interval between filling out the questionnaire and the occurrence of the fever dreams was very long. Unfortunately, the exact time interval was not elicited and most participants checked the categories "one to two years ago" and "more than two years". Given the sample characteristics (many psychology students in their early twenties) one might expect that at least some fever dreams have occurred during childhood and/or adolescence. One might speculate that only extraordinary fever dreams will be remembered over this long period of time. To test this hypothesis, it would be interesting to have an approach similar to Smith (2012),

i.e., having a pool of interested participants on hold, and they start recording their dreams if they get a fever. It would also be very interesting to study the effect of experimentally increase body temperature by pyrogens on dream characteristics and content.

The effect regarding the bizarreness of fever dreams is pronounced compared to diary dreams of equal length. Even if most recent dreams were used as references – using the means of men and women of the study of Schredl, Paul, Lahl, and Göritz (2010-2011), the difference is very clear: The scale means for men were 1.97 ± 0.85 and for women 2.17 ± 0.82 in the most recent dream study were much lower than the mean of 2.82 ± 0.94 in the present study (large effect sizes) whereas mean word count was roughly comparable. The qualitative analysis indicates that the increased bizarreness is largely explained by spatial distortions. This would be an interesting topic to follow up in studies with experimentally induced fever, i.e., whether perceptions in dreams are changed if the brain is in a fever mode. As waking cognitive processes are affected also by fever (Piraino et al., 2012), we speculate that the bizarreness and distortions of fever dreams is a result of a brain that doesn't work properly at high temperatures.

Illness-related symptoms were present in about 20% of the dreams; much higher when compared to 0.56% of malaise symptoms in healthy students (Knoth & Schredl, 2011), supporting the continuity hypothesis of dreaming stating that the waking life is reflected in dreams (Schredl, 2003a). As stress is related to increased nightmare frequency (Schredl, 2003b), the high number of nightmarish dreams in the present sample (34.8%) also support the continuity hypothesis, i.e., the dreams also reflect the distress due to the febrile illness. Another topic that is very interesting for future research is the high percentage of lucid dreams (40%) which is much lower in healthy persons (about 7.5%; Schredl & Erlacher, 2011). This supports the notion that fever has an effect on the cognitive processes during sleep.

To summarize, this first study taking a closer look at fever dreams indicates that fever has an effect on the cognitive processing of the sleeping brain. Due to the retrospective nature of the study, it would be very interesting to follow up this line of research by conducting diary studies during naturally occurring febrile illnesses and sleep laboratory studies with experimentally induced fever. This research helps to shed light on the interaction between the physiological level (brain activation) and the psychological level of subjective experiences.

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