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Will students pass a competitive exam that they failed in their dreams?

Isabelle Arnulf [a,b,c,*], Laure Grosliere [a,b], Thibault Le Corvec [a,b,c], Jean-Louis Golmard [a,d], Olivier Lascols [a], Alexandre Duguet [a]

[a] Sorbonne Universités, UPMC Univ Paris 06, Paris F-75005, France
[b] Sleep Disorder Unit, Pitié-Salpêtrière Hospital, APHP, Paris, France
[c] Centre de Recherche de l'Institut du Cerveau et de la Moelle, UPMC-Paris 6, Inserm UMR_S 975, CNRS UMR 7225, France
[d] Department of Biostatistics, Pitié-Salpêtrière Hospital, ER4, France

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ABSTRACT

We tested whether dreams can anticipate a stressful exam and how failure/success in dreams affect next-day performance. We collected information on students' dreams during the night preceding the medical school entrance exam. Demographic, academic, sleep and dream characteristics were compared to the students' grades on the exam. Of the 719 respondents to the questionnaire (of 2324 total students), 60.4% dreamt of the exam during the night preceding it. Problems with the exam appeared in 78% of dreams and primarily involved being late and forgetting answers. Reporting a dream about the exam on the pre-exam night was associated with better performance on the exam ($p = .01$). The frequency of dreams concerning the exam during the first term predicted proportionally higher performance on the exam ($R = 0.1$, $p = .01$). These results suggest that the negative anticipation of a stressful event in dreams is common and that this episodic simulation provides a cognitive gain.

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1. Introduction

The functions of dreaming have been a matter of debate for a century (review in Nir & Tononi, 2010). In addition to the psychoanalytic hypothesis (dreams preserve sleep and fulfill unconscious wishes) (Freud, 1900), the protoconsciousness theory (dreams might serve a creative function by providing a virtual reality model (Hobson, 2009) that allows brain changes after learning), and the neurocognitive theory (dreams have no function *per se* but coherence and meaning, which is often conflated with function (Domhoff, 2003), the Threat Simulation Theory has recently emerged. This novel evolutionary hypothesis suggests that one of the biological functions of dreaming is the simulation of threatening events and the repetitive rehearsal of threat perception and threat avoidance responses (Revonsuo, 2000). This simulation in an almost-real experiential world would train the brain to perceive dangers and rapidly face them within the safe condition of sleeping (Valli & Revonsuo, 2009). Evidence supports this view. In the first normative study of 1000 home dream reports from college students, approximately 80% of the emotions expressed in dreams were negative (and only 20% were positive). Misfortune in dreams was seven times more frequent than good fortune, and aggression was the most frequent type of social interaction (Hall & Van de Castle, 1966). Dreams contain more frequent and more severe threats than waking life does. Two-thirds of

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everyday home dream reports contain at least one threatening element (Revonsuo & Valli, 2000). In these dreams, threats are realistic and primarily threaten the Dream Self who tends to behave in a relevant defensive manner in response to them (Revonsuo & Valli, 2000). Similarly, 75% of the dreams and nightmares of post-partum mothers involve anxiety about an infant who is lost, injured, or in danger (Nielsen & Paquette, 2009). Dreams associated with parasomnias simulate different types of threats (and flight-or-fight responses), including natural disasters and misfortunes during sleepwalking and sleep terrors (Oudiette et al., 2009), and human and animal aggression during REM sleep behavior disorder (Uguccioni, Golmard, et al., 2013; Uguccioni, Pallanca, et al., 2013). The dream threats of patients with parasomnias reflect real problems that have previously occurred in the patient's life (or that have been observed in the media) or that are newly developed (Mwenge, Brion, Uguccioni, & Arnulf, 2013; Uguccioni, Golmard, et al., 2013; Uguccioni, Pallanca, et al., 2013). The issue of whether threats in dreams reflect some anticipated stressful event has rarely been examined. Interestingly, 34% of pregnant women dream of their future infant, who is in peril in 58% of these dreams (Nielsen & Paquette, 2009). These negative dreams may simply reflect waking concerns about the future (e.g., "Will I be able to protect my future child?"), but they may also train the future mother to better protect her baby when she experiences danger. In this study, we aimed to clarify whether people tend to dream of an expected stressful event in the future and whether dreams that simulate an event in advance (mostly as a threat) are linked to the increased possibility of better performance when the event is realized. For this purpose, we tested whether students dreamt about an entrance exam to medical school and whether dreaming about the entrance exam led to a higher success rate on the exam. We chose to analyze dream content with the Dream Threat Scale (Revonsuo & Valli, 2000), which identifies and describes all types of threatening events in dreams, and to correlate the dreams' characteristics with the grade later obtained on the exam.

2. Methods

2.1. Subjects

During 2012–2013, 2324 students were registered at Pierre and Marie Curie University (Paris, France) in the first-year section common to the medical school, dental school, pharmacy school and midwifery school. To enter the first year, the students had passed the exit examination from high school (which is passed by 37% of a generation). The students began the course on October 1, 2012. The general characteristics of the students were provided by the university administration and coded with the university's student number. The characteristics included age, sex, country of citizenship (France, European Union outside of France, non-European Union), type of general high school section (scientific, economics, literature), honors obtained in the exit examination, first-year vs. repeater status, students with grants, and professions of the parents. Because a survey was used, responses to the questionnaire were considered consent for the study with regard to French research law, which was sufficient to waive the requirement for written consent from the participants and agreement from the ethics committee. The students sat for an exam twice during the first year of university (December 17, 2012 and May 2013). The responses were short written reports and multiple-choice answers reported on a form with boxes.

2.2. Results of the entrance exam

The individual results were obtained from the university via anonymous student numbers 3 months after the entrance exam. The individual grade, from 0 (worst) to 20 (best), was defined as the main study outcome. The exam was competitive, with a *numerus clausus*. Passing the entrance exam has a major career effect. After the two exam sessions, students ranked 1–313 can enter the medical school, students ranked up to 430 can enter the pharmacy school, students ranked up to 460 can enter the midwifery school, and students ranked up to 499 can enter the dental school.

2.3. Questionnaire

On December 17, 2012 at 6 PM, the students received an e-mail containing a request from the university to complete a short (2–8 min long) Google survey regarding the entrance exam. This message was repeated on the following two days, and the survey was closed on December 19, 2012 at midnight. The questionnaire contained 16 questions (Table 1), including 3 questions regarding the general sleep and dream habits and anxiety levels of the participants, 7 questions on sleep time and quality and the content of dreams during the night preceding the test (the night between December 16 and 17), and 3 questions on the dream content of nights other than the one preceding the exam. There was a free, unlimited written answer for questions 9 and 12 on dream reports.

2.4. Analysis of dream reports

The written dream reports were corrected for spelling mistakes and analyzed by two independent scorers trained by a psychologist on how to use the dream scales. Discordant scores were adjudicated by consensus after discussion. The general description of the dream materials included coding for length as total word count (Antrobus, 1983), complexity (Orlinsky, 1962) and bizarreness (Revonsuo & Salmivalli, 1995) (to determine whether the dreams obtained with this method would