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Original Article

The sensory construction of dreams and nightmare frequency in congenitally blind and late blind individuals

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ABSTRACT

Objectives: We aimed to assess dream content in groups of congenitally blind (CB), late blind (LB), and age- and sex-matched sighted control (SC) participants.
Methods: We conducted an observational study of 11 CB, 14 LB, and 25 SC participants and collected dream reports over a 4-week period. Every morning participants filled in a questionnaire related to the sensory construction of the dream, its emotional and thematic content, and the possible occurrence of nightmares. We also assessed participants' ability of visual imagery during waking cognition, sleep quality, and depression and anxiety levels.
Results: All blind participants had fewer visual dream impressions compared to SC participants. In LB participants, duration of blindness was negatively correlated with duration, clarity, and color content of visual dream impressions. CB participants reported more auditory, tactile, gustatory, and olfactory dream components compared to SC participants. In contrast, LB participants only reported more tactile dream impressions. Blind and SC participants did not differ with respect to emotional and thematic dream content. However, CB participants reported more aggressive interactions and more nightmares compared to the other two groups.
Conclusions: Our data show that blindness considerably alters the sensory composition of dreams and that onset and duration of blindness plays an important role. The increased occurrence of nightmares in CB participants may be related to a higher number of threatening experiences in daily life in this group.

1. Introduction

Analyses of dream reports collected from sighted individuals show that dreams contain the experience of different sensory modalities. Whereas vision is present in nearly all dreams, auditory and tactile sensations are experienced in 40–60 % and 15–30% of dreams, respectively. In sharp contrast olfactory and gustatory sensations are rare, occurring in less than 1% of dreams [1,2]. The predominance of visual content in dreams raises the question to which extent the absence or loss of vision will affect the sensory construction of dreams. In line with the continuity hypothesis of Hall and Van de Castle [3] which contends that dream content is continuous with waking cognition and behavior [4], visual deprivation should lead to a reorganization of the sensory composition and the emotional and thematic content of dreams. Therefore, the aim of our study was to investigate how the congenital and acquired absence of vision affects the sensory, emotional, and thematic content of dreams.

Results from previous studies seem to suggest that individuals who become blind after the age of 7 years retain visual imagery in their dreams, though congenitally blind (CB) or early blind (onset of blindness before the ages of 5–7 years) individuals do not [5]. These findings are based on analyses of dream reports collected after awakenings during rapid eye movement (REM) sleep periods in sleep laboratories [6–8], home dream reports [9], and analyses of questionnaires and interviews regarding the dreams of blind individuals [10]. In addition, these studies showed that the prevalence of nonvisual sensory impressions was much higher in the dreams of blind than of sighted individuals. Results involving the emotional and thematic content of dreams in blind individuals are less consistent. Whereas some studies show that dream reports of blind individuals contain a higher amount of fear, anxiety, and apprehension [10,11], others studies have not confirmed these

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findings [12]. On the other hand, most studies concur that the overall level of emotions in the dreams of blind individuals is similar or lower than that in sighted individuals [11–14]. The thematic content of the dreams of blind individuals has received little attention. One study [9] showed that blind individuals tended to dream less about failures and successes and experienced less social interactions in their dreams. However, these findings have not yet been replicated in other studies.

A problem with the above-mentioned studies is that they all included small and heterogeneous study populations, lacked a matched sighted control (SC) group, and observed data that were analyzed in a qualitative manner without statistical analysis. Therefore, the purpose of our study was to do a quantitative analysis of dream content in a large and homogeneous group of CB, late blind (LB), and matched SC participants. In addition, we controlled for a number of possible confounding factors that are known to influence dream content, such as sleep quality, depression, and anxiety. We hypothesized that blind participants would have fewer visual but an increased number of nonvisual sensory components in their dreams. We further expected that these changes would be more pronounced in CB participants. Finally, we hypothesized that LB participants would experience more nightmares than the other groups, due to the traumatic event of becoming blind.

2. Methods

2.1. Study population

Our study population consisted of 50 participants, among whom 25 were blind (12 men; mean age, 44 ± 13 years) and 25 were age- and sex-matched SC participants (12 men; mean age, 44 ± 12 years). The group of blind participants consisted of 11 CB (5 men; mean age, 42 ± 15 years) and 14 LB participants (7 men; mean age, 45 ± 11 years). Table 1 summarizes the demographics of the blind participants. For the blind participants, we calculated a blindness duration index (BDI) according to the formula (age–age onset blindness)/age. The BDI score varies from 0 to 1, expressing the relative amount of time an individual has been blind, with low scores indicating recent onset of blindness and high scores long duration of blindness.

All blind participants were recruited through the Danish Institute for the Blind and the Partially Sighted and the gender- and age-matched controls were found through advertisement in local newspapers and websites. All participants were without known neurologic and psychiatric diseases. The local Ethics Research Committee of the Capital region of Denmark (H-3-2012-FSP49) approved the experimental protocol and all participants gave their written informed consent before participation.

2.2. Study procedures

2.2.1. The initial interview

Before study inclusion, participants completed an interview during which we acquired information about their general health status, including psychologic state, sleeping habits, and possible sleep issues. For the blind population, we collected additional information related to onset, duration, etiology, and severity of blindness. During the interview, we also tested the participants' ability of visual imagery in waking cognition (see below). Furthermore, we asked the participants about their amount of social interactions and ambitions. We measured anxiety and depression using the State-Trait Anxiety Inventory by Spielberger et al. [15] and the Major Depression Inventory [16], respectively. The trait anxiety score ranges from 20 to 80, with higher scores indicating higher levels of anxiety. The total sum score for the Major Depression Inventory ranges from 0 to 50, with 26 being the most appropriate cutoff point for the presence of depression.

We measured sleep quality using the Pittsburgh Sleep Quality Index (PSQI) [17], a self-rating questionnaire that assesses sleep quality and sleep disturbances over the past month. PSQI scores range from 0 to 21, with higher scores indicating poorer quality of sleep. Because it has been suggested that sleep disturbances such as REM sleep behavior disorder (RBD), sleep apnea, and restless legs syndrome (RLS) may affect dream content [18], participants were asked to fill in a single-question screen for RBD

Table 1
Demographic characteristics blind participants.

ID	Sex	Age	Characteristics of the blindness				
			Etiology	Onset	Residual vision	Prior visual quality	BDI
CB1	M	60	ROP	Birth	–	–	–
CB2	W	38	ROP	Birth	–	–	–
CB3	M	60	ROP	Birth	–	–	–
CB4	M	38	ROP	Birth	–	–	–
CB5	W	26	ROP	Birth	–	–	–
CB6	W	59	ROP	Birth	–	–	–
CB7	M	28	ROP	Birth	–	–	–
CB8	M	60	ROP	Birth	–	–	–
CB9	W	29	ROP	Birth	LP, CP	–	–
CB10	W	22	ROP	Birth	LP, CP	–	–
CB11	W	44	ROP	Birth	LP, CP	–	–
LB1	M	44	Meningitis	1 y	–	Normal	0.98
LB2	W	60	Iridocyclitis	22 y	–	Normal	0.63
LB3	W	26	ROP	2 y	–	Normal	0.92
LB4	W	30	ROP	2 y	–	Normal	0.93
LB5	W	61	Juvenile diabetes mellitus	31 y	–	Normal	0.49
LB6	W	44	Retinitis pigmentosa	16 y	–	Normal	0.64
LB7	M	46	Cancer optic nerves	2.5 y	–	Normal	0.95
LB8	W	36	Underdeveloped eyes	21 y	–	Moderate/low	0.42
LB9	M	46	Unknown	39 y	–	Normal	0.15
LB10	W	49	Retinitis pigmentosa	35 y	–	Normal	0.29
LB11	M	60	Fundus flavimaculatus	32 y	–	Normal	0.47
LB12	M	47	Retinitis pigmentosa	9 y	–	Normal	0.81
LB13	M	36	Retinitis pigmentosa	18 y	–	Normal	0.5
LB14	M	49	Retinitis pigmentosa	34 y	–	Moderate/low	0.31

Abbreviations: M, man; W, woman; ROP, retinopathy of prematurity; y, years; LP, light perception; CP, color perception; BDI, blindness duration index.