Aggressive dream content without daytime aggressiveness in REM sleep behavior disorder

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Abstract—*Background:* REM sleep behavior disorder (RBD) is characterized by vigorous sleep motor activity associated with dream mentation. Patients with RBD frequently report action-filled and violent dreams. *Objective:* To systematically assess dream characteristics and daytime aggressiveness in patients with RBD and controls. *Methods:* Forty-nine patients with polysomnographic-confirmed RBD diagnosis and 71 age- and sex-matched controls were asked to recall the most recent dreams and to complete the Aggression Questionnaire (AQ). Forty-one patients with RBD (81.6%; 36 men, 5 women; mean age: 67.5 ± 7.5 years) and 35 controls (49.3%; 30 men, 5 women; mean age: 69.1 ± 5.9 years) were able to remember their dreams and a total of 98 (RBD) and 69 (controls) dreams were collected in the two groups. Verbatim dream descriptions were scored and analyzed according to the Hall and Van De Castle method. *Results:* Patients with RBD showed a higher percentage of dream with at least one aggressive episode (DWA) than controls (66% vs 15%; $p < 0.00001$), a higher aggression/friendliness interaction ratio (86% vs 44%; $p < 0.0001$), and a greater frequency of animal characters (19% vs 4%; $p = 0.0001$). In contrast to controls, no patient with RBD had dreams with elements of sexuality (0% vs 9%; $p < 0.0001$). The two groups did not differ in total AQ scores, except for a lower score on the physical aggressiveness subscale in patients with RBD compared to control subjects (16.5 ± 6.4 vs 20.4 ± 8.3; $p = 0.034$). No correlation was observed between dream aggressiveness and age, duration, or frequency of RBD symptoms. *Conclusions:* Dreams in patients with REM sleep behavior disorder were characterized by an elevated proportion of aggressive contents, despite normal levels of daytime aggressiveness. Dreams with aggressiveness and the known excessive phasic muscle activity during REM sleep may be related to the hyperactivity of a common neuronal generator.

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REM sleep behavior disorder (RBD) is characterized by vigorous motor activity during sleep usually associated with dream mentation.[1] Typical behaviors include talking, laughing, yelling, jerking, gesturing, grabbing, punching, kicking, and sometimes jumping out of bed, which may result in injuries for the patient or the bed partner.[1,2] Arousal from episodes is usually rapid and accompanied by a congruent dream recall, although the concordance between dreams and motor enactments has not been systematically assessed. Polysomnographic (PSG) features of RBD include a loss of the physiologic muscle atonia and an excessive muscle phasic activity during REM sleep.[1] RBD occurs acutely during intoxication or withdrawal from several substances, while the chronic form may be either idiopathic or secondary to neurologic disorder, mostly of the degenerative type.

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An intriguing feature of the RBD is the elevated occurrence of specific dream contents in front of a variety of individual psychological profiles. Patients with RBD commonly report dreams in which they are attacked by animals or unfamiliar people and they would either fight back in self defense or attempt to flee.[1,2] Fear and anger are the most common associated emotions. It has been observed that the aggressiveness displayed during nocturnal behaviors contrasts with the often placid and mild-mannered daytime temperament.[1] Therefore RBD appears to be a disorder involving both behavior and dream synthesis. The fact that treatment with clonazepam appears to be effective in both controlling RBD and disturbed dreams[3,4] also supports the hypothesis of a common neuronal generator for both motor and dream pattern. Although altered dream process appears strongly involved in the pathogenesis of RBD, dream content has been poorly investigated in these patients. Therefore, we systematically evaluated both dream characteristics and daytime aggressiveness in patients with RBD compared to those of healthy subjects.

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Methods. *Patient population.* Forty-nine consecutive patients with polysomnographic-confirmed RBD diagnosis and 71 age-matched healthy control subjects were initially enrolled in the study. Control subjects were recruited among members of recreational groups for elderly in the same geographic area. In these subjects, the presence of RBD symptoms was ruled out by a structured interview conducted by a sleep specialist. Except for symptomatic RBD (sRBD), none of the subjects had a chronic incapacitating illness or was affected by a neurologic condition, and none had a history suggestive of sleep disorders like obstructive sleep apnea syndrome (OSAS), narcolepsy, or restless legs syndrome (RLS). In both patients and control subjects the presence of psychiatric disorders was ruled out according to the corresponding Diagnostic and Statistical Manual of Mental Disorders-IV criteria. Furthermore, the Beck Depression Inventory was administered in order to assess the presence of depressive symptoms and it was scored according to published procedures. Forty-one of 49 patients with RBD (83.7%; 36 men, 5 women; mean age: 67.5 ± 7.5 years) and 35 of 71 control subjects (49.3%; 30 men, 5 women; mean age: 69.1 ± 5.9 years) were able to remember their dreams and were enrolled in the study. In 27 patients RBD was idiopathic (iRBD; 24 men, 3 women) while in 14 it was symptomatic (sRBD; 12 men, 2 women; Parkinson disease [PD] n = 10, multiple system atrophy n = 3, and dementia with Lewy bodies n = 1). Patients with RBD had a mean duration of clinical symptoms of 6.1 ± 6.9 years (7.9 ± 7.9 years for iRBD and 3.0 ± 2.3 years for sRBD; range 1 to 23 years) and the mean age at the onset of the parasomnia was 60.8 ± 9.3 years (59.3 ± 10.1 years for iRBD and 62.9 ± 7.4 years for sRBD; range 44 to 73 years.). Five patients (5 men; 1 iRBD and 4 sRBD) were receiving specific treatment for RBD at the time of the evaluation, which consisted of clonazepam in all cases (mean dose: 0.64 ± 0.23 mg, mean duration of treatment: 1.6 ± 1.9 years) plus melatonin in two cases (3 mg). Ten sRBD patients, including the four treated with clonazepam, were also taking dopaminergic drugs in mono or polytherapy (L-dopa: n = 6; pramipexole: n = 6; ropinirole: n = 2), while the rest of the patients with RBD and all controls were free of psychotropic medications.

Dream collection and analysis. Subjects were asked to recall one or more recent dreams during an ad hoc visit, according to the Hall and Van De Castle method,[5,6] using the following words: "We would like you to tell us the last dream(s) you remember having, whether it was last night, last month, or in the last year and the date this dream occurred." Dreams that occurred within 1 year from the interview were included. A trained interviewer collected verbatim description of dreams. Then a semi-structured interview was performed in order to more precisely assess specific elements of the dream such as characters, social interactions, activities, success and failures, emotions, setting, objects and descriptive elements, as described in the original method.[5,6] The Hall and Van De Castle is the most comprehensive and widely used empirical system for dream content analysis.[6,7] Dreams were coded according to several nominal categories by an independent scorer blind to the condition and percentage and ratios related to 28 indicators were obtained.[6] A detailed description of dream content variables appears in table E-1 (available on the *Neurology* Web site at www.neurology.org).

This method has been used by researchers in several different countries and has shown good reliability, intraindividual consistency over time, and correlation with individual, sex, and cultural differences.[8] The method also provides norms for college-age women and men, which have been replicated several times.[8] Studies have shown that dream reports do not change much after young adulthood, except perhaps for aggression scores,[8] allowing a potential use of norms to compare adults of all age. However, since the patient population of the present study was considerably older than the one used for norms, and since aggression elements represented the major focus of the investigation, we performed a comparison with an age- and sex-matched control group.

Daytime aggressiveness assessment. After dream content evaluation, subjects completed the Aggression Questionnaire (AQ). Several studies have demonstrated that aggression is a stable personality trait.[9,10] The AQ is a validated test developed to assess aggression that consists of 29 items[11] and a validated Italian version is available.[12] The subjects rate each item on a five-point scale to indicate the degree to which the item is characteristic of themselves. Four AQ subscales assess different aspects of aggressiveness, namely physical aggression, verbal aggression, anger, and hostility. Since the four AQ scales are thought to measure a common underlying construct of aggression, their scores can be summed to obtain a total score, which indicates the subject's overall level of aggressiveness.[11] A score higher than 96 is believed to indicate aggressiveness.

PSG evaluation. Subjects underwent one night of video-polysomnographic recording in the sleep laboratory. Sleep was recorded and scored according to the Rechtschaffen and Kales' method,[13] with allowance for loss of REM sleep atonia in scoring REM sleep. Recording of oral and nasal air-flow, thoracic and abdominal movements, and oximetry was performed to detect apneas or hypopneas. None of the patients had a respiratory event index (apneas and hypopneas per hour of sleep) greater than 15. Surface EMGs of the right and left anterior tibialis muscles were recorded and PLM were scored according to standard criteria.[14] EKG was recorded from a standard D2 lead.

Statistical procedure. An average dream report score was calculated in subjects who recalled more than one dream. Coded dreams were analyzed using dreamSAT software[15] and between-group differences in all dream categories were evaluated with Cohen's h statistic, except for the category of Social Interaction Ratios (such as A/C, F/C and S/C Indexes, table 1), which were not statistically assessable. Because multiple comparisons were performed, Bonferroni correction was applied to diminish the probability of committing a type I error. Between-group differences in both AQ and BDI scores were assessed by *t* test. The relationships between dream characteristics and AQ scores were evaluated by the Pearson product-moment correlation tests.

Results. A higher proportion of subjects in the original RBD group were able to recall at least one dream, compared to same-age healthy subjects (83.7% vs 49.4%, $\chi^2 = 14.75$; $p < 0.001$).

Ninety-eight (patients with RBD) and 69 (controls) dreams were collected. The two groups were comparable for prior education, present working status, mean duration of retirement, and prior occupation (see table 1). There was no difference in the average number of dreams reported per subject, while patients with RBD tended to recall dreams that were older than those of controls (see table 1).

No between-group differences were found in the Beck Depression Inventory score (11.0 ± 7.3 for RBD vs 7.8 ± 7.8 for control subject, $p = 0.10$). Dreams characteristics of patients with RBD and control subjects are shown in table 2. Patients with RBD reported a higher percentage of "Dreams with at least one aggression" than controls (66% vs 15%, $p < 0.00001$). Moreover, an increased Aggression/Friendliness interactions ratio (86% vs 44%; h = 0.93; $p < 0.0001$), an increased Aggressions/Characters (A/C) ratio (0.81 vs 0.12; no statistics applicable), and an increased frequency of animals (19% vs 4%; h = 0.53; $p = 0.0001$) characterized the dreams of patients with RBD compared to those of controls. Interestingly, none of the patients with RBD had a "dream with at least one element of sexuality," in contrast to what was observed in control subjects (0% in RBD vs 9% in controls; h = −0.62; $p < 0.0001$). Although no differences were found in other dream elements after applying Bonferroni correction, a trend for a higher percentage of "Dreamer as aggressor" (29% vs 0%; h = 1.14; $p = 0.002$), for a higher percentage of "Negative emotions" (82% vs 61%; h = 0.46; $p = 0.003$), and for a lower percentage of "Familiar characters" (52% vs 65%; h = −0.26; $p = 0.065$) was observed in dreams of patients with RBD compared to those of controls.

No correlation was observed between each of the dream characteristics and age, duration, or frequency of RBD symptoms. Moreover, indicators of aggressiveness in dreams did not correlate with years of education, years of

Table 1 *Demographic data of patients with REM sleep behavior disorder (RBD) and controls*

	RBD patients, n = 41	Controls, n = 35	*p* Value
Age, y, mean ± SD	67.5 ± 7.5	69.1 ± 5.9	0.31
Men/women	36/5	30/5	0.79
Mean duration of RBD, y, mean ± SD	6.1 ± 6.9	—	
Total no. of dreams	98	65	
Average ± SD no. of dreams per person	2.4 ± 1.5	2.0 ± 1.1	0.68
Range of dream recall per person	1–7	1–6	
Average delay dream-to-interview, d, mean ± SD	105.9 ± 130.6	65.2 ± 100.1	0.06
Education, y, mean ± SD	8.8 ± 4.5	10.1 ± 4.8	0.39
Working/retired	4/37	5/30	0.54
Previous or present work activity			
Factory workers	15	13	
Farmers	1	1	
Employees	5	7	
Liberal professionals	12	15	
Years ± SD from retirement	11.7 ± 6.8	11.5 ± 5.4	0.93

retirement, or prior work. Twenty-seven out of 41 patients with RBD (63%) showed a PLMS index > 5 and the mean PLMS index in the RBD group was 26.3 ± 39.3. A positive correlation was found between the PLMS index and either the Aggressions/Characters (A/C) ratio ($r = 0.401$; $p = 0.017$) and the % of dream with at least one aggression ($r = 0.407$; $p = 0.014$) in patients with RBD. Furthermore a negative correlation was found between PLMS index and the % of familiar characters ($r = -0.446$; $p = 0.008$).

Two patients with RBD and four control subjects had an AQ score greater than 96, which is considered suggestive of daytime aggressiveness. There were no between-group differences in daytime aggressiveness as measured by the total AQ scores (69.9 ± 16.1 in RBD patients vs 73.8 ± 20.31 in control subjects; $p = 0.98$). However, when looking at the subtypes of aggressiveness, patients with RBD showed lesser Physical aggressiveness than control subjects (16.5 ± 6.4 vs 20.4 ± 8.3; $p = 0.034$), while no between-group difference was observed in the other categories such Verbal aggressiveness, Anger, and Hostility. Moreover, in RBD patients, Pearson product-moment correlation tests showed negative correlations between the % of Dreams with at least one aggression and the score in the Hostility AQ subscale ($r = -0.55$; $p < 0.0005$), between the % of Dreams with at least one misfortune and the score in the Anger AQ subscale ($r = -0.51$; $p = 0.001$), and between the % of Negative emotions and the score in the Physical aggression AQ subscale ($r = -0.52$; $p = 0.001$). No correlations were found between any dream characteristics and AQ scores in control subjects.

No significant differences were observed in dream content between iRBD and sRBD, except for the percentage of male/female characters ratio in dreams, which was lower in the sRBD than in iRBD (26% vs 78%; $h = 1.11$; $p < 0.00001$) and the percentage of dreams with at least one element of striving (expressed by the ratio of the sum of dreamer-involved successes and failures, over the total number of dreams), which was also lower in sRBD than in iRBD (15% vs 0%, $h = 0.79$; $p = 0.00024$).

Discussion. Dreams in patients with RBD were characterized by a striking prevalence of aggression themes. Analysis revealed a higher percentage of Dreams with at least one aggression, an increased percentage of both Aggression/Friendliness and Aggressions/Characters ratios, and a trend for higher percentage of Dreamer as aggressor and for higher frequency of Negative emotions. Furthermore, animals were much more represented in dreams of patients with RBD than in those of controls, whereas familiar characters were less common than in controls.

Interestingly, sexual elements in dreams were never reported by patients with RBD. The latter is concordant with the observation that appetitive behaviors, such as feeding or sexual, have never been observed as a manifestation of RBD, either in humans or in the animal model. This may be of particular relevance in medico-legal proceedings dealing with "sleepsex" and invoking RBD. Indeed, sexual behaviors during sleep may be the manifestation of a NREM disorder of arousal, but is likely never due to RBD.

The elevated aggressiveness displayed during dreams in these patients is not paralleled by increased levels of aggressiveness during the daytime, as no difference was found in the total AQ score. In the present study, patients with RBD were even found to have a reduced Physical aggressiveness compared to controls and a negative correlation between the % of Dreams with al least one aggression and the measure of daytime Hostility was observed. These results are somewhat in agreement with the anecdotal report of a frequently placid and mild-mannered daytime temperament in these patients.[1] Although the small size of the sample is not suitable for statistical comparison, no sex difference was ob-

Table 2 *Dream characteristics of patients with REM sleep behavior disorder (RBD) and control subjects*

	RBD	Controls	h	*p* Value	N RBD	N controls
Characteristics, %						
Male/female	63	57	+0.11	0.492	83	67
Familiarity	52	65	−0.26	0.065	108	93
Friends	17	19	−0.04	0.779	108	93
Family	35	45	−0.21	0.132	108	93
Dead & imaginary	01	01	−0.04	0.767	129	95
Animal	19	04	+0.52	0.00013*	129	95
Social interactions, %						
Aggression/friendliness	86	44	+0.93	0.00007*	97	23
Befriender	63	71	−0.19	0.722	7	7
Aggressor	29	00	+1.14	0.002	61	8
Physical aggression	73	55	+0.40	0.196	94	12
Social interaction ratios						
A/C index	0.81	0.12	+1.63	− †	129	95
F/C index	0.08	0.18	−0.22	− †	129	95
S/C index	0.00	0.11	−0.26	− †	129	95
Settings, %						
Indoor	45	49	−0.09	0.614	73	57
Familiar	60	67	−0.16	0.399	62	50
Self-concept, %						
Self-negativity	91	77	+0.40	0.064	70	31
Bodily misfortunes	08	20	−0.37	0.317	20	12
Negative emotions	82	61	+0.46	0.003	98	68
Dreamer-involved success	50	44	+0.11	0.819	8	9
Torso/anatomy	17	25	−0.20	0.664	23	6
Dreams with at least one, %						
Aggression	66	15	+1.08	0.00000*	101	69
Friendliness	12	22	−0.27	0.088	101	69
Sexuality	00	09	−0.62	0.00007*	101	69
Misfortune	15	17	−0.06	0.717	101	69
Good fortune	00	01	−0.20	0.211	101	69
Success	03	10	−0.28	0.077	101	69
Failure	07	09	−0.08	0.592	101	69
Striving	10	19	−0.25	0.105	101	69

Bonferroni correction was applied for multiple testing. Level of significance was set at = 0.002.

* Significant.
† Not statistically assessed.

N RBD = total number of elements occurring in the category, for the RBD group; N controls = total number of elements occurring in the category, for the control group.

served in any dream aggressiveness indicators or in AQ score.

It has been proposed that the biologic function of dreaming is to simulate threatening events and to rehearse threat perception and threat avoidance.[16]

Aggressions, negative emotions, misfortune, and threatening events are over-represented in dreams in the general population, compared to positive emotions and peaceful and nonthreatening activities.[5,6,16] Typical threats of an ancestral human environment, as physical aggression by wild animals, appear to be more frequent than current daytime threats.[16] The observation of an even higher rate of aggression (expressed by an increase in the A/C ratio) and animal characters in children's dream reports compared to the adult ones[7,16,17] and their decrease with age have been related to the development of threat-avoidance skills.[16]

Interestingly, in the present study, dreams in RBD were characterized by similar percentages of aggression and animal characters to those reported in children. It has been suggested that RBD may originate from an inappropriate activation of the threat-simulation system, leading to an intensive threat simulation during dreams and to a behavioral response (mostly adequate) to these threats.[16] Increasing evidence indicates that chronic idiopathic RBD is an early manifestation of a more pervasive degenerative process: impaired cortical activity, subtle neuropsychological deficits, autonomic and olfactory dysfunctions, and reduced dopamine innervation have all been observed in these patients[18] and the eventual emergence of an alpha-synucleinopathy is not infrequent. Therefore, it may be hypothesized that chronic RBD, as a part of a widespread neurodegenerative process, would lead to a release of ontogenetically early dream patterns.

According to the activation-synthesis model of dream generation, phasic discharges from brainstem generators may activate motor, perceptual, affective and cognitive pathways and these impulses are subsequently synthesized into dreams by the forebrain.[19] Thus, in RBD, the known increase of phasic EMG activity may be responsible for both motor behaviors and action-filled dreams. Dreams with aggression and vigorous motor behaviors may be two manifestations of hyperactivity of a common neuronal generator. Interestingly, developmental changes in phasic REM sleep parameters have been described, as a reflection of maturation of the brainstem inhibitory systems.[20-22] From birth to late childhood, both a shortening of REM sleep phasic muscle activity and a decrease of simultaneous occurrence of REMs with phasic muscle activity have been observed.[21,22] These observations, together with the observed correlation between PLMS index and three of the main indicators of aggressiveness in dreams, support the notion of a link between excessive phasic muscle activity and dream content. However, it should be noted that in our study, recorded PLMS were not concomitant with the analyzed dreams, since dream recall was retrospective and covered a large temporal interval. Future studies assessing both level of aggressiveness in dream collected upon awakening from REM sleep and phasic EMG activity prior to awakening would be of interest in order to support this hypothesis.

It has been reported that clonazepam therapy is effective in both reducing RBD and disturbed dreams,[1,3,4] but no study has objectively assessed the dream improvement after therapy. Although the very small sample does not allow statistical comparison, patients taking clonazepam showed higher percentages of familiar and family characters when compared to drug-free RBD patients and a trend toward both reduced percentages of physical aggression and a lower ratio of male/female characters. Clonazepam is a benzodiazepine with serotoninergic properties that is highly effective in controlling motor disorder during sleep.[3,23] The observed effect on dream content in RBD might be exerted through a generic anxiolytic effect, although clonazepam was found to be ineffective in treating nightmares in dream disorders like post-traumatic disorder.[24] Interestingly, clonazepam was also found to significantly reduce the percentage of REM sleep muscle phasic activity in RBD.[4] Therefore, changes in dream content may be mediated by its effect on sleep motor patterns generator and this would further support the notion of the link between dreams synthesis and exaggerated motor activity.

No differences were found in aggressive dream contents between iRBD and sRBD, except for a lower prevalence of male characters in sRBD dreams compared to iRBD. The percentage of male characters in dreams is usually correlated to threatening and aggressive dream content.[6,16] Percentage of dreams with at least one element of striving was also lower in sRBD compared to iRBD. However, since the majority of the sRBD group was receiving dopaminergic treatment and a proportion of them were also treated with clonazepam, the possible impact of these drugs in dream contents must be taken into account.

Vivid dreams are often reported in patients with α-synucleinopathies, especially PD,[25] but quantitative assessment of the dream characteristics in these patients are lacking, particularly in relationship to the presence of RBD. Future studies comparing dream characteristics of patients with α-synucleinopathies, with and without concomitant RBD, would help to better elucidate the pathogenesis of the altered dream synthesis.

The increased ability of patients with RBD to recall dreams may be related to the peculiar dream characteristics, since vivid and action-filled dreams may lead to physical injuries and awakening during REM sleep, although most patients did not spontaneously awake during behavioral episodes and sleep architecture is usually well preserved.[1] The increased ability to recall dreams might alternatively reflect differences in memory processes.

This is a preliminary investigation conducted in a large sample of unselected patients with RBD, including RBD with different etiology and a small subset of patients treated with clonazepam. Future studies longitudinally assessing dream content in patients with RBD, particularly in those patients receiving clonazepam therapy, would be of interest. Also, it may be argued that a proportion of symptomatic patients were taking dopaminergic drugs, which may cause dream alterations, including nightmares. However, since no difference was observed in the main dream aggressiveness indicators between iRBD and sRBD, a drug-related effect seems unlikely.

Dream content appears severely altered in RBD. Despite the fact that altered dream pattern appears to be strongly involved in the pathogenesis of the disorder, its underlying mechanism needs further study.

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