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Original Article

Dream Recall, Nightmares, and Aggression-Related Dream Content in Patients with REM Sleep Behavior Disorder (RBD)

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Sleep Sci

Abstract

Patients with REM sleep behavior disorder (RBD) enact their dreams, leading to enhanced dream recall. They report more negative emotions in their dreams, recall retrospective nightmares more frequently, and often experience more aggressive dreams. This study aims to understand dream characteristics in REM sleep behavior disorder using both retrospective and prospective measures in a controlled sleep laboratory setting to address possible recall biases in retrospective dream recall frequency. The sample comprises 102 iRBD-diagnosed patients (21 women, 81 men; M = 64.08, SD = 11.27) and 208 healthy controls (136 women, 72 men; M = 30.08, SD = 12.03), all undergoing identical procedures of two consecutive nights in the sleep laboratory, enabling a robust comparative examination of dream patterns. Retrospective assessments revealed a higher frequency of dream recall in patients with iRBD, while no significant difference was observed in prospective assessments. Nightmares were also reported more frequently in retrospective assessments in iRBD patients compared to healthy controls. Aggressive dream content was more frequent in patients with iRBD compared to controls, a future prospective diary study might clarify whether this heightened aggression in dreams is related to waking-life traits.

Keywords

- dream recall
- nightmares
- REM sleep behavior disorder
- dream content
- aggression

Introduction

REM sleep behavior disorder (RBD) is a parasomnia characterized by the loss of muscle atonia during REM sleep, leading to abnormal motor behaviors and dream enactment.[1] These behaviors can manifest as bodily and eye movements, emotional expressions, audible vocalizations, and facial gestures, often resulting in injuries or sleep disruptions for both the patients and their bed partners.[1–3] These nocturnal motor episodes are closely associated with vivid and sometimes violent dream content, often directly corresponding to the enacted movements.[3–6] The diagnostic gold standard, according to the ICSD-3-TR, requires polysomnographic evidence of loss of muscle atonia during REM sleep and a history of dream-enacting behavior.[1] In individuals with RBD, the condition stems from an impairment in the REM sleep atonia system located in the pontomedullary brainstem, which is responsible for controlling muscle tone during REM sleep.[7,8] RBD often precedes neurodegenerative diseases, particularly α-synucleinopathies such as Parkinson's disease, dementia with Lewy bodies, and multiple system atrophy.[9] On average, neurodegenerative diseases develop within 6–7 years of an RBD diagnosis.[10] Approximately 75% of patients with RBD will develop a fully

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manifested synucleinopathy within 12 years.[11] The estimated prevalence of RBD is approximately 1% (0.38–1.34%). Symptoms typically begin between the ages of 45 and 63, with an average age at diagnosis of 52 to 68 years.[11]

The general trend across retrospective studies indicates that patients with RBD are characterized by a higher proportion of individuals who recall their dreams compared to different control samples.[12–17] Increased dream recall frequency has also been observed in these patients.[18] In contrast, prospective studies suggest no significant difference in dream recall frequency between patients with RBD and healthy control groups.[6,19–21] The discrepancies between retrospective and prospective methods point to a potential methodological artifact. This indicates that patients with RBD are more likely to recall dreams associated with dream enactment, awakening events, or nocturnal injuries, which retrospective measures tend to amplify. One explanation is that acting out dreams, along with the awakenings from REM sleep, enhances dream recall.[22,23] Retrospective methods primarily capture acted-out dreams, which are better remembered in hindsight, while prospective methods, by including non-acted-out dreams, capture a broader range of dreams. However, systematic laboratory investigations comparing patients with RBD to control groups remain limited.

The overall tendency across studies is that patients with RBD report more intense negative emotions in their dreams,[5,24,25] along with elevated RBDQ-Factor 1 scores.[24,26–29] The RBDQ-Factor 1 captures both the frequency of dream and nightmare recall, as well as dream content features such as violence, aggression, fighting, fear, and terror, in a single score. The literature reports an increased incidence of nightmares[13,30–32] and higher nightmare recall frequency in patients with RBD.[18] However, the influence of stress on nightmare recall frequency in this patient group has not been systematically examined.

Patients with RBD more frequently report dreams involving violence and aggression.[12,13,18,21,30] In contrast, prospective studies have found no significant differences in dream content.[21,33,34] These contrasting findings suggest a potential methodological artifact, indicating that aggressive dream content is especially likely to be acted out. Dreams involving intense, complex movements are more likely to break through impaired muscle tone suppression, leading to awakenings during REM sleep. This, in turn, increases the recall of dream content compared to dreams with minimal movement. In contrast, prospective methods capture both acted-out and non-acted-out dreams without specific emphasis on either. It is assumed that while aggressive dreams make up the majority of those acted out, they represent only a minority of total dreams.[2] Furthermore, prospective studies have also reported that most motor events during REM sleep in RBD are minor, with violent episodes constituting only a small fraction of overall RBD episodes.[5,24] As a result, these studies found no significant difference in dream content between patients with RBD and the healthy control group.

In the present study, patients with isolated REM sleep behavior disorder (iRBD) were compared to healthy participants in a sleep laboratory. We hypothesized that the occurrence of dream enactment in patients with iRBD is linked to a higher dream recall frequency in the home setting than in healthy participants, whereas dream recall frequency in a controlled laboratory setting without enactment should be similar. Secondly, we hypothesized that patients with iRBD would report a higher retrospective nightmare recall frequency compared to the healthy control group. In an exploratory fashion, we looked at emotional and aggressive dream content in patients with iRBD.

Materials and Methods

Participants

This study included 102 patients diagnosed with isolated RBD (21 women, 81 men) and 208 healthy participants (136 women, 72 men) who underwent two consecutive nights in the sleep laboratory. There was a significant difference in gender distribution between the two groups ($\chi^2 = 54.9$, $p < .0001$). The patients had an average age of 64.08 ± 11.27 years (range: 26–84), while the healthy participants had an average age of 30.08 ± 12.03 years (range: 18–76). There was also a significant difference in age between the two groups ($t = 23.9$, $p < .0001$). Dream reports were provided by 28 patients (7 women, 21 men) with an average age of 61.79 ± 13.71 years (range: 26–83), resulting in a total of 36 reports. In comparison, 99 healthy participants (62 women, 37 men), with an average age of 30.71 ± 11.42 years (range: 18–76), contributed 124 dream reports.

Instruments

Dream Questions

Dream recall frequency over the past few months was measured using a seven-point scale: 0 = never, 1 = less than once a month, 2 = about once a month, 3 = two to three times a month, 4 = about once a week, 5 = several times a week, 6 = nearly every day.[35] The scale demonstrated a retest-reliability of $r = .85$ after 54 days.[36] Nightmare frequency was assessed using an eight-point scale: 0 = never, 1 = less than once a year, 2 = about once a year, 3 = about two to four times a year, 4 = about once a month, 5 = two to three times a month, 6 = about once per week, 7 = several times a week. This scale also showed a high retest reliability of $r = .75$.[37]

Morning Dream Questionnaire

In the dream questionnaire, participants rated whether they remembered a dream (0–no, 1–I dreamed but I cannot remember the content, 2–yes, I remember one or several dreams with following content). They were then asked to write down the dream content and rate the intensity of positive and negative emotions on two four-point scales (0 = none, 1 = somewhat, 2 = moderate, 3 = strong). The emotional tone was calculated as the difference between the two values. The dream recall frequency results from the retrospective and laboratory dream questionnaires showed high correlations, with $r = .683$ and $r = .710$, respectively.[38,39] For one patient, dream recall in the laboratory was assessed using the Sleep Questionnaire A, which contains categories similar to those in the dream collection questionnaire.[40]

Dream Content Analysis

Dream reports were evaluated using a dream manual by Schredl et al.[41] When multiple dreams occurred in a single night, they were collectively coded as one unit of analysis. The rater assessed the level of aggression using a binary format: 0 = no, 1 = yes. The overall aggression score incorporates all dream reports containing at least one of the four facets of aggression. The interrater reliability for aggression scoring is 88%. Positive and negative emotions were coded on a four-point scale (0 = none, 1 = somewhat, 2 = moderate, 3 = strong). The emotional tone was calculated as the difference between the two values. The correlation between external emotion ratings and self-assessments by the dreamer was $r = .67$ for negative dreams and $r = .557$ for positive dreams.[41]

Stress Questionnaire

The recreation-distress questionnaire (EBF) consists of 72 items, divided into 12 subtests, each containing 6 items. All items were rated on a seven-point scale (0 = never, 1 = rarely, 2 = sometimes, 3 = several times, 4 = often, 5 = very often, 6 = always).[42] Participants responded to items such as "In the last 3 days and nights, I have been aggressive." An average score was calculated for each subtest and then combined with the averages from other subtests. Seven subtests were used to compute the distress index, while five subtests measured recreation aspects. Internal consistency was found to be strong across all subtests, with values ranging from r = .80–.97. A 24-hour retest of a similar questionnaire showed correlations ranging from r = .79–.91.[43]

Procedure

All patients underwent a diagnostic interview followed by two nights of video-polysomnography, which provided the data for the diagnosis of iRBD by a sleep specialist and helped rule out other sleep disorders. Healthy participants followed a similar procedure, and those found to have an undiagnosed sleep disorder were excluded. Additionally, no psychotropic medications were administered to iRBD patients, as their use would compromise the integrity of the diagnostic process. Prior to the first polysomnographic recording, participants completed questionnaires on sleep, dreams, and stress. After each of the two consecutive nights in the sleep laboratory, which included standard sleep measurements (EEG, eye movements, electrocardiogram, submental electromyogram, leg movements, and respiration), participants completed a dream questionnaire to document any recalled dreams. Additionally, they rated the positive and negative emotions in their dreams. All dream reports were transcribed and rated in randomized order, following the dream manual by Schredl et al.[36]

Statistical analyses were performed using SPSS 27 and SAS 9.4 for Windows. Ordinal regressions were applied to examine group differences between patients with iRBD and healthy control groups in terms of retrospective dream and nightmare recall frequency. Parametric regressions were additionally employed to analyze variables related to stress and sleep. Mixed model analyses using the Glimmix method were applied to calculate differences in all dream content themes, dream recall in the laboratory, and the relationship between dream recall at home and in the laboratory for patients with iRBD. Given the significant differences in age and gender between the two groups, these variables were included as control variables. In the analysis of dream content, word count was controlled for, as longer dreams tend to contain more content.[44]

Results

Non-confidential data is available from the senior author on reasonable request.

As shown in ►**Table 1**, the majority of patients (86.17%) and most healthy controls (95.15%) reported remembering their dreams.

Ordinal regression analysis was used to compare the retrospective dream recall frequencies between patients with REM sleep behavior disorder and the healthy control group (N = 300). The results indicate that patients with iRBD recall their dreams significantly more often than the control group (Standardized estimate = .3012, $\chi^2 = 9.5$, $p = .0021$), after controlling for age and gender. The effect size in this comparison was small $d = 0.362$. A significant association was found between dream recall frequency and age, with younger age linked to higher dream recall (Standardized estimate = -.4309,

Table 1 Retrospective dream recall frequency of patients with REM-Sleep-behavior disorder (RBD) and healthy controls

Frequencies	RBD		Healthy controls	
	N = 94	Percentage (%)	N = 206	Percentage (%)
Nearly every day	9	9.57	15	7.28
Several times a week	18	19.15	56	27.18
About once a week	24	25.53	51	24.76
Two to three times a month	9	9.57	33	16.02
About once a month	10	10.64	23	11.17
Less than once a month	11	11.70	18	8.74
Never	13	13.83	10	4.85

Table 2 Frequencies of prospective dream recall in the laboratory setting

Frequencies	REM-Sleep behavior disorder N = 168 nights		Healthy controls N = 409 nights	
	N	Percentage (%)	N	Percentage (%)
Yes, I remember one or several dreams with following content	35	20.83	105	25.87
I dreamed but I cannot remember the content	29	17.26	146	35.70
No	104	61.90	158	38.63

$\chi^2 = 19.9$, $p < .0001$). The effect size was moderate $d = 0.593$. However, gender showed a non-significant trend, with women tending to report higher dream recall frequency (Standardized estimate = .1046, $\chi^2 = 2.8$, $p = .0942$). The effect size was small $d = 0.194$. In total, 80% of the variance was explained by this analysis ($R^2 = .802$).

As shown in ►**Table 2**, on more than half of all nights, no dream recall was reported by patients with isolated REM sleep behavior disorder. Moreover, in the iRBD group, the number of nights in which patients reported having dreamed but could not remember the content was approximately 50% lower compared to the control group. Finally, the healthy control group recalled specific dream content in about 5% more nights than the iRBD group.

Prospective dream recall in the laboratory setting was analyzed using a mixed model analysis. No significant difference was observed in dream recall frequency between patients with iRBD (N = 168 nights) and the control group (N = 409 nights) in the laboratory (Standardized estimate = -.5853, Standard Error = 0.435, t = -1.4, p = .1771). Additionally, the analysis revealed that men (1 = female, 0 = male) had a significantly higher frequency of dream recall (Standardized estimate = -.4796, Standard Error = 0.3428, t = 2, p = .0492). Age had no effect on the frequency of dream recall in the laboratory (Standardized estimate = .0056, Standard Error = 0.0096, t = -0.6, p = .5605).

The dream recall in the laboratory setting of patients with iRBD was analyzed using a mixed model analysis using data from N = 162 nights. The analysis examined the influence of dream recall frequency at home, age, and gender as independent variables on dream recall in the laboratory as the dependent variable. The analysis revealed that, among patients with iRBD, the frequency of dream recall at home had a significant impact on dream recall in the laboratory (t = 3.3, p = .0017). Neither age (t = 0.6, p = .5704) nor gender (1 = female, 0 = male) (t = 0.2, p = .8829) had a significant impact on dream recall in the laboratory.

As shown in ►**Table 3**, many patients with iRBD (87.91%) and healthy controls (72.73%) reported experiencing nightmares. Almost one-third of patients with iRBD and nearly 7% of the control group experienced nightmares at least once a week.

The mean values and the standard deviations of the stress questionnaire for the patient group were 1.78 ± 0.91 (N = 92) and for the healthy control group 1.24 ± 0.67 (N = 179). This difference was statistically significant (standardized regression coefficient = .7341, t = 7.8, p < .0001; regression analysis was controlled for age and gender). ►**Table 4** presents the results of two regression analyses. The first analysis shows that patients with REM sleep behavior disorder report a significantly higher retrospective frequency of nightmares compared to the control group, with a strong effect size. Additionally, younger age is correlated with increased nightmares, showing a moderate effect. Women also report significantly higher nightmare recall frequencies compared to men, with a small effect. The first analysis explains approximately 29% of the variance. In the second regression analysis, even after accounting for distress (EBF), the significantly higher frequency of nightmares in patients compared to the control group persists. The same significant age and gender effects observed in the first analysis are also present in the second. The distress factor is also significantly

Table 3 Frequencies of retrospective nightmare recall in patients with RBD and Healthy controls

Frequencies	Rem-Sleep behavior disorder		Healthy controls	
	N = 91	Percentage (%)	N = 187	Percentage (%)
Several times a week	15	16.48	6	3.21
About once a week	13	14.29	7	3.74
2-3 times a month	25	27.47	6	3.21
About once a month	18	19.78	26	13.90
About 2-4 times a year	3	3.30	56	29.95
About once a year	3	3.30	22	11.76
Less than once a year	3	3.30	13	6.95
Never	11	12.09	51	27.27

Table 4 Ordinal regression analysis of retrospective nightmare recall frequency

	Variable	SE	χ^2	p	d
N = 278 R^2 = .2898	RBD-HC	.9801	72.0	<.0001	1.182
	Age	-.4476	18.8	<.0001	0.539
	Gender	.1690	6.7	.0095	0.314
N = 268 R^2 = .3230	RBD-HC	.8387	45.5	<.0001	0.904
	Age	-.3406	9.7	.0018	0.388
	Gender	.1407	4.2	.0354	0.252
	Distress	.2289	11.4	.0007	0.422

Note. HC, Healthy controls; RBD, REM-Sleep behavior disorder; SE, Standardized estimates, Gender (1= f, 0 = m).

associated with nightmare recall frequency. This model explains approximately 33% of the variance.

►**Table 5** shows that the word count of dream reports from patients with iRBD was lower than that of healthy controls, with a trend toward significance, while neither age nor gender was associated with word count. Regarding emotional content in their dreams, patients with iRBD experienced fewer positive emotions compared to healthy controls, with no significant influence from age, gender, or word count. Additionally, they reported more negative emotions, with no significant effect of gender, whereas younger age and higher word count were associated with more negative emotions in dreams. Patients with iRBD also displayed an overall more negative emotional tone compared to the control group, with no influence from age, gender, or word count. In the dreams of iRBD patients, fewer references to the laboratory environment were identified than in the control group.

As shown in ►**Table 5**, the dream theme of aggression was analyzed using a mixed model analysis, with group (RBD and HC), age, gender, and word count as independent variables, and overall aggression as the dependent variable. The results show that, after two nights in the laboratory, dream reports from patients with iRBD exhibit significantly more themes of aggression compared to the control group. Word count was controlled for in the analysis, as longer dreams may tend to exhibit more aggression content. This association between longer dreams and increased aggression was also significant (►**Table 5**).

Discussion

In this study, patients with iRBD showed a higher retrospective dream and nightmare recall frequency compared to the healthy control group, although no prospective dream recall frequency difference was observed between the groups in the laboratory setting. Unexpectedly, a significant difference in aggressive dream themes was observed in the prospective laboratory dream reports between patients with iRBD and the control group.

A key strength of this study is that both patients and the healthy control group underwent the same diagnostic procedure, including two nights of polysomnography. Additionally, both retrospective and prospective measurements were used to assess dream recall frequency within the same sample.

Table 5 Means and standard deviations and mixed model analyses of subjective dream content valences

Dream reports	RBD	Healthy controls	Analysis							
			RBD-HC		Age		Gender (1= f, 0= m)		Word count	
	M ± SD	M ± SD	F/t	p	F/t	p	F/t	p	t	p
Word count	32.81 ± 23.86 (N = 36)	76.76 ± 74.76 (N = 124)	3.2^1	.074	0.5^1	.497	0.2^1	.654		
Positive emotions	0.85 ± 1.08 (N = 34)	1.25 ± 0.98(N= 103)	2.2^2	.0367	1.6^2	.1215	0.8^2	.4303	0.7^2	.5053
Negative emotions	1.38 ± 1.23 (N = 34)	0.98 ± 0.95(N = 103)	3.1^2	.0046	-2.5^2	.0206	-1.0^2	.3313	2.9^2	.0076
Emotionale tone	0.53 ± 2.03 (N = 34)	0.26 ± 1.49(N = 102)	-3.3^2	.0033	2.5^2	.1087	1.1^2	.3014	-1.1^2	.2833
Aggression total	19.44% (N = 36)	5.58% (N = 124)	2.9^2	.0062	-1.5^2	.1459	-1.3^2	.2153	4.2^2	.0002

Note. Gender (1= f, 0 = m), HC, Healthy controls; RBD, REM-sleep behavior disorder, ^{1}F Value linear mixed model, ^{2} t value mixed model for ordinal data.

Nightmare frequency was assessed using only retrospective measures. However, they show only a slight underestimation compared to prospective measures, suggesting a minimal impact of the measurement method on this outcome.[45]

On the other hand, obtaining balanced samples posed a challenge. Ensuring consistent diagnostic procedures limited the study to younger participants. Given the significant differences in age and gender between the healthy control and the patient group, statistical controls for age and gender were applied. Thus, we expected a minimal impact of these differences on our findings. Due to the small amount of aggression in the dream reports, usage of a binary overall aggression score was reasonable.

Unfortunately, the frequency of dream enactments in the home setting was not systematically assessed, therefore we were not able to correlate nightmare frequency with dream enactment frequency. One might expect more frequent dream enactment episodes could be associated with a higher nightmare frequency. However, this must be tested empirically.

The study also focused on a clinical sleep laboratory population with relevant RBD symptomatology, who sought professional help. This ensured that the patients in our study experienced significant distress due to RBD symptomatology. Importantly, all participants were free from other sleep or psychiatric disorders and were not on any psychotropic medication.

In line with previous findings,[12–18] this study also observed higher retrospective dream recall frequencies compared to prospective measures. Overall, the results of the present study reinforce the idea that retrospective measures are subject to recall bias.[43] This bias suggests that patients with RBD are more likely to remember dreams involving dream enactment, including self-injurious behaviors or injuries to bed partners, which lead to awakenings during REM sleep.[22,23,46] The findings indicate that patients with RBD do not generally exhibit higher dream recall frequency than the control group. Instead, the increased recall is attributable to the enactment of dreams.

Consistent with recent findings,[13,18,30–32] this study found that patients with iRBD exhibited more negative emotional content in their dreams compared to the healthy control group.[5,24,25] However, the general stress measured by the EBF does not fully account for the differences between patients with iRBD and the control group. Therefore, more specific RBD-related stress factors need to be further assessed. It would be interesting whether RBD patients with frequent nightmares – whether they are associated or not associated with dream-enacting episodes might not be of importance – might profit from interventions like Imagery Rehearsal Therapy and Lucid Dreaming Therapy.[47,48]

The study's exploratory finding of higher aggressive content in the dreams of patients with iRBD in the sleep laboratory is inconsistent with the literature, which generally reports no significant differences in aggressive dream content based on prospective measures.[21,33,34] Two possible conclusions can be drawn from this finding: Either patients with RBD genuinely report more aggressive dream content, or the small number of dream reports captured in the present study was not sufficient to accurately judge this matter. The present study captured only a few spontaneously recalled dreams (without enactment), therefore, studies with longer-kept dream diaries might be helpful in detecting more subtle differences between patients with RBD and healthy controls. Based on the findings of Bugalho et al.[49] it would be also interesting to correlate aggressive dream content with waking-life traits.

Overall, the findings of this study demonstrated a higher retrospective dream recall frequency, but not a heightened prospective dream recall frequency, supporting the idea that dream enactment in a home setting increases dream recall (due to awakenings caused by enacted dreams). Additionally, nightmares are linked to heightened general stress and might be related to other disease-related factors. The findings on aggressive dream content remain inconclusive. To clarify these, future research should involve long-term dream diary studies capturing more dreams per person and both enacted and non-enacted dream content, allowing for a more comprehensive understanding of aggressive dream content in patients with RBD.

Ethics Statement

The study (No. 2011-315N-MA) was approved by the Ethics Committee II of the Medical Faculty Mannheim, Heidelberg University, Mannheim, Germany. All participants provided written informed consent using the approved Informed Consent Form (ICF).

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Conflict of Interest

The authors report no conflict of interest.

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