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# REM sleep, dream variables and suicidality in depressed patients☆

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**Abstract**

To examine the relationship between the emotional quality of dreams, REM sleep variables and suicidal tendency in depressed individuals, 26 depressed volunteers (10 males and 16 females) were assessed with the Beck Depression Inventory (BDI) and the Hamilton Depression Rating Scale (HDRS), and underwent 3 nights of polysomnography. There was a significant negative correlation between suicidality scores and REM latency and a positive correlation between suicidality and REM percent. Suicidal subjects had a significantly shorter mean REM latency and a higher mean REM percentage than the non-suicidal subjects. As expected in normal subjects, 20 subjects had an increase in dream-like quality (DLQ) of REM reports between the first and second halves of the night. The six subjects with a negative DLQ difference also scored as suicidal. A reduction in dream-like quality of the REM content reports between the first and second halves of the night was found to be associated with suicidal tendency. The findings may indicate that these subjects fail to self-regulate mood and integrate affect into long-term memory networks during sleep. Theoretical and clinical implications of these findings in depression are discussed.


*Keywords:* REM sleep; Dream content; Dreaming; Suicidal behavior; Depression

## 1. Introduction

There has been an increasing interest in the relationship between sleep variables, particularly those of rapid eye movement (REM) sleep, and the clinical characteristics of depression. Reduced REM sleep latency was identified as an objective indicator of depressive disorder and an inverse correlate of its severity 30 years ago (Kupfer and Foster, 1972). In subsequent years, reduced REM latency has proved to be one of the most robust and specific, if not exclusive, features of sleep in depressed patients (Benca, 2000). Other reported abnormalities in REM sleep include a prolonged duration of the first REM period, an increased density of eye movements and an increased REM percentage of total sleep time. Moreover, a short REM latency has been found to be associated with an increased risk of major depression beyond the familial risk associated with depressed proband (Giles et al., 1998). Among endogenous depressive symptoms, terminal insomnia, pervasive anhedonia, unreactive mood and appetite loss are reported

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to be related to short REM latency in depressed patients (Giles et al., 1986). Recently, poor treatment outcomes have also been observed among patients: who report poor sleep; who have increased amounts of REM sleep; who have increased numbers of eye movements during REM sleep; or who have an abnormal sleep 'profile' including poor sleep efficiency, short REM sleep latency and increased numbers of rapid eye movements (Buysse et al., 2001). These dysfunctions have suggested manipulations of REM may have therapeutic benefits for the depressed. Prolonged selective REM deprivation by awakenings has produced such beneficial effects (Vogel et al., 1980). That the majority of antidepressant drugs, across several different categories, exhibit robust suppression of REM sleep appeared to support this finding. However, others, such as bupropion and nefazodone, lack REM suppressant effects. Thus, it is still an unresolved issue whether REM sleep abnormalities are depressiogenic or whether early prolonged and more active REM sleep reflects an attempt to compensate for elevated levels of a waking depression (Cartwright and Lloyd, 1994).

Among the proposed psychological functions of dreaming, perhaps the one with the most research support is mood regulation. Dream characteristics appear to respond adaptively during life changes, but this is delayed when subjects are depressed (Cartwright et al., 1984). Indeed, increased REM density, a marker of depression, is correlated with more intensely negative cognitions and affects (Nofzinger et al., 1994). In general, those who are severely depressed are reported to have poorer dream recall and blunted dream affect (Armitage et al., 1995). In contrast, those who have less severe depression, particularly females, report higher rates of unpleasant dreams than other psychiatric patients or normal subjects (Cartwright, 1992). Recently, Cartwright et al. (1998) tested the mood-regulatory hypothesis of dreaming by comparing dream affect type and affect strength in a group of depressed subjects over a 1-year time period. These authors found that subjects reporting more negative dreams at the beginning of the night and fewer at the night's end were more likely to be in remission 1 year later than were those with few negative dreams at the beginning and more at the end of the night. Thus it may be speculated that early negative dreams reflects a within-sleep mood-regulation process taking place, while those that occur later may indicate a failure in the completion of this process.

Recently, a relationship between sleep and suicidal tendency has been described both in clinical and in electroencephalographic (EEG) sleep studies in depressed patients. Sleep disturbances may have prognostic significance in predicting suicide among patients with mood disorders. About a decade ago, Fawcett et al. (1990) considered insomnia to be one of the 'modifiable risks' for suicide. Agargun et al. (1997a) showed that not only insomnia but also hypersomnia is associated with suicidal behavior in patients with major depression. Agargun et al. (1997b) also demonstrated that there was a significant association between poor sleep quality and suicidal behavior in depression. Only a few electroencephalographic (EEG) sleep studies have examined the relationship between sleep and suicidal behavior in patients with depressive and psychotic disorders. Sabo et al. (1991) compared electroencephalographic (EEG) sleep of major depressives with and without a history of suicidal behavior using the Schedule for Affective Disorders and Schizophrenia-Lifetime Version (SADS-L; Endicott and Spitzer, 1978). They found suicide attempters had longer sleep latency, lower sleep efficiency and fewer late-night delta wave counts than normal controls. They also demonstrated that non-attempters, compared with attempters, had less REM time and activity in the second REM period, but more delta wave counts in the fourth non-REM period. Interestingly, Keshavan et al. (1994) examined both hand-scored and automated measures of REM sleep in psychotic patients with and without a history of suicidal ideation or attempts. They showed that patients with suicidal behavior had significantly increased REM activity and time both in the whole night data and in the first REM sleep period. In addition to these sleep laboratory studies, there are two more recent studies showing a significant relationship between nightmares and suicide. Agargun et al. (1998) examined the association between repetitive and frightening dreams and suicidal tendency in patients with major

depression by using the SADS suicide subscale. They reported that the patients with frequent nightmares, particularly women, had higher mean SADS suicide subscale scores and were more likely to be classified as suicidal than the others. A prospective follow-up study in a sample drawn from the general population (Tanskanen et al., 2001) also reported that the frequency of nightmares is directly related to the risk of suicide. The present study hypothesized that dream variables such as the nature and sequence of the affect reported from dreams collected during REM interruptions and REM sleep abnormalities are related to suicidal tendencies in depressed individuals. More specifically, these hypotheses were that those with a higher proportion of negative dreams in the second half of the night, and whose REM latency is abnormally reduced are more likely to score higher on suicidality. These were tested in a sleep laboratory-based study comparing REM sleep variables and dream reports of volunteers with and without suicidal tendencies.

## 2. Materials and methods

### *2.1. Subjects*

This study was part of a larger project on sleep in untreated depressed persons. The sample was drawn from a group of community volunteers to examine the effects of a stressful life experience, a marital breakup, on sleep, dreams and the ability to mood regulate over night. To be included, one partner had to have taken an overt step to end a first marriage, moved out of the shared dwelling, and/or filed for divorce. Treatment for depression either by medication or psychotherapy was an exclusion criterion. The volunteers completed the Beck Depression Inventory (BDI) (Beck et al., 1961) and were interviewed using the Structured Clinical Interview for DSM-IV Axis I disorders (SCID) (First et al., 1994) to reach a diagnosis of depression. The Hamilton Depression Rating Scale (HDRS) (Hamilton, 1960) was also used to assess the severity of depression. Twenty-six volunteers (10 males and 16 females) met a diagnosis of current major depression, had a HDRS score of 18 or above, and had a BDI of 14 or above. None were on medication or in psychotherapy nor had a history of psychotic or bipolar disorders. Participants had no current substance or alcohol abuse. The study was described to all the subjects and written informed consent was obtained. Suicidality was assessed using item 9 of the BDI and item 3 of the HDRS. Volunteers were classified as 'suicidal' if they had at least a score of 1 on the suicidal items of the BDI or HDRS. Those who had a score of 0 in both depression scales were classified as non-suicidal.

### *2.2. Sleep studies and dream collection*

Sleep was monitored for three consecutive nights using a minimum of five channels of recording: EEG C3/A2 or C4/A1, EOG ROC/A1 and LOC/A2, chin EMG and EKG. To rule out a sleep disorder, a 12-channel polysomnogram including monitoring of respiratory effort, air flow, oxygen saturation and EMG of anterior tibialis was added to the first night sleep study. All nights were controlled to end after 420 min of bedtime. The second night was used as the baseline to establish the sleep architecture, and the third to collect dream reports. Each REM period was interrupted on a fixed schedule, 5 min into the first REM, 10 min into the second REM, 15 into the third, and 20 into the fourth and any subsequent REM period. This is the standard protocol first developed by Foulkes for dream collections and used in previous studies from our group (Cartwright, 1992; Cartwright and Wood, 1993; Cartwright and Lloyd, 1994; Cartwright et al., 1984, 1998). At each REM awakening, subjects were asked to give a report of what they could recall of the mentation occurring just before the awakening. Following this, the experimenter asked two questions concerning the type of affect experienced and its strength: 'Would you say that dream was negative, neutral, or positive?' and then 'Would you say that dream was unemotional, mildly emotional, or strongly emotional?' Each response was assigned to one of four categories. For affect type 0 = no report, 1 = negative, 2 = neutral, and 3 = positive, and for affect strength 0 = no report, 1 = unemotional, 2 = mildly emotional, and 3 = strongly emotional. All reports were tape recorded, transcribed and coded.

Each dream report was also rated on a 5-point dream-like quality (DLQ) scale (Brown and Cartwright, 1978): 1 = no recall; 2 = a non-perceptual report; 3 = a single visual image; 4 = two or more images with some story connecting them; and 5 = two or more images with an elaboration of detail and a well-developed narrative. This was a modification of the original Foulkes Dream-like Fantasy Scale (Foulkes, 1966). Each subject was given two DLQ scores, a mean for the reports from REM periods 1 and 2 (the first half of the night), and a mean for the reports from the later REM periods (the second half of the night). The difference between the two scores was then calculated (DLQd). A positive score represented the normally expected lower dream-like score for the first half of the night than for those that followed, and a negative score represented an equal or higher score for the first half of the night than the mean of the reports from the last half. This score has been reported in a previous sample (Cartwright and Lloyd, 1994).

Before the dream-collection night, subjects were instructed that they would be awakened periodically and asked to report what they had been experiencing. They would be asked also to report the type of affect experienced and its strength. All dream reports were taped recorded, transcribed and blinded. Two raters of the dream-like quality did not know the sleep data or other clinical information about the subject when they rated the dream reports. Reliability was established between these raters on 10 dream reports from each of the subjects. Agreement was 72%.

### 2.3. Statistical analysis

The Statistical Package for the Social Sciences (SPSS), release 9, was used for data analyses. Pearson correlations were computed between the sleep measures and the self-report BDI and clinician-rated HDRS suicide scores. Two groups were formed on the basis of their suicidality scores. These were compared using the Mann–Whitney *U*-test or Fisher exact test, as appropriate, on REM sleep variables and DLQd scores.

Table 1
Correlation coefficients between BDI and HDRS suicide scores and EEG sleep data

| Sleep variables | BDI | | HDRS | |
|---|---|---|---|---|
| | $r^a$ | $P$ | $r$ | $P$ |
| REM latency, min | −0.56 | <0.01 | −0.38 | Ns |
| REM % | 0.41 | <0.05 | 0.14 | Ns |
| Number of REM periods | 0.25 | Ns | 0.32 | Ns |
| Slow wave % | −0.19 | Ns | −0.11 | Ns |
| Slow wave, min | −0.04 | Ns | −0.10 | Ns |
| Total sleep time | −0.22 | Ns | −0.21 | Ns |
| Sleep efficiency | −0.17 | Ns | −0.19 | Ns |

[a] Pearson correlation analysis.

## 3. Results

The mean BDI and HDRS suicidality scores of the sample as a whole were 0.50 (S.D. = 0.51) and 0.96 (S.D. = 0.99), respectively. Table 1 gives the correlation coefficients between the two suicide scores and EEG sleep data. As seen in Table 1, there was a significant negative correlation between the BDI suicidality score and REM latency. REM percent was positively correlated with the BDI suicidality score. The correlations with the HDRS score failed to reach significance.

Table 2 compares the suicidal and non-suicidal groups. Suicidal subjects had a shorter mean REM latency and a higher mean REM percentage than non-suicidal subjects. When a cut-off level of 65 min or less was used to define a reduced REM latency, 12 subjects, 46% of the sample, met this criterion. Ten of the suicidal subjects and only two of the non-suicidal subjects had a shortened REM latency (Fisher exact test; $P = 0.003$).

Table 3 shows the percent distribution of the dream affect scores in each half of the night by type and strength for the groups. Both groups showed a reduction in the number of dream reports with neutral affect in the second half of the night. The suicidal subjects had an increase in the frequency of reports with negative affect in the last half of the night while the non-suicidal subjects had an increase in reports with positive affect (Fisher exact test; $P < 0.05$). No difference between the two groups in the affect strength measure reached significance (Fisher exact test; $P > 0.05$).

Table 2
Comparison of suicidal and non-suicidal subjects on REM sleep variables and DLQd

| Sleep variables | Suicidal subjects ($N=13$) | | Non-suicidal subjects ($N=13$) | | Mann–Whitney $U$ test | |
|---|---|---|---|---|---|---|
| | Mean | S.D. | Mean | S.D. | $z$ | $P$ |
| REM latency, min | 56.6 | 18.8 | 127.1 | 73.5 | 2.83 | $<0.01$ |
| REM % | 22.6 | 5.9 | 17.6 | 5.7 | 2.41 | $<0.05$ |
| Number of REM periods | 4.1 | 0.8 | 3.5 | 1.1 | 1.09 | ns |
| Slow wave % | 17.7 | 7.6 | 18.1 | 8.1 | 0.87 | ns |
| Slow wave, min | 69.2 | 29.1 | 71.7 | 29.1 | 0.35 | ns |
| Total sleep time | 394.3 | 31.1 | 406.4 | 24.1 | 0.97 | ns |
| Sleep efficiency | 0.93 | 0.8 | 0.96 | 0.3 | 0.74 | ns |
| | | | | | Fisher exact test | |
| | No | % | No | % | $P$ | |
| REM Latency $\leq 65$ min | 10 | 77 | 2 | 15 | $<0.01$ | |
| DLQd− Higher first half of night | 6 | 46 | 0 | 0 | $<0.05$ | |
| DLQd+ Higher last half of night | 7 | 54 | 13 | 100 | | |

Twenty subjects had a positive DLQd (DLQd+) and six had a negative DLQd (DLQd−). All six with DLQd− were in the suicidal group (Fisher exact test; $P=0.015$) (Table 2).

## 4. Discussion

The study confirms that within a non-patient depressed sample of volunteers, disturbed REM sleep variables are associated with suicidality. Suicidality was also related to the sequence of affect distribution of their dream reports. Previously, an association between REM sleep variables and suicidal behavior has been reported in depressed (Sabo et al., 1991) and in psychotic patients (Keshavan et al., 1994). This is the first study to examine the association between a full night of laboratory-collected dreams and suicidal tendency. Although a dream–suicide association has been suggested previously (Raphling, 1970; Firth et al., 1986; Evans, 1990; Maltsberger, 1993; Gutheil, 1999; Agargun et al., 1998; Tanskanen et al., 2001), this report demonstrates the association using reports from all REM periods.

The main finding in this study is that suicidal subjects have a shorter mean REM latency, a higher mean REM percentage and different within-night distribution of dream quality and affect than non-suicidal depressed subjects.

Table 3
Percent distribution of the affect scores in each half of the night by dream affect type and affect strength of groups

| | Negative | | Neutral | | Positive | | Unemotional | | Mildly emotional | | Strongly emotional | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | First | Last | First | Last | First | Last | First | Last | | | | |
| | | | | | | | | | First | Last | First | Last |
| Suicidal subjects | 8.3 | 27.3 | 58.4 | 36.3 | 33.3 | 36.4 | 53.8 | 36.4 | 7.7 | 45.4 | 38.5 | 18.2 |
| Non-suicidal subjects | 15.4 | 15.4 | 69.2 | 46.1 | 15.4 | 38.5 | 58.3 | 53.8 | 25 | 23.1 | 16.7 | 23.1 |

In addition, the present study found a difference in dream-like quality of the REM content reports between the first and second halves of the night associated with suicidal tendency. Interestingly, all subjects who had higher dream-like quality in the reports of the first than those from the last half of the night were grouped as suicidal. The research literature on dreams in depression is at present, limited and controversial. Dreaming has been reported to be enhanced during mild depression (Cartwright, 1979) and to serve an adaptive function, processing emotional information and resolving conflict (Breger, 1967). Other studies report dreams to be bland, short and devoid of strong emotional content (Trenholme et al., 1984; Riemann et al., 1990). More recently, Armitage et al. (1995) found morning dream recall rates were extremely low in depressed patients. These authors also suggested that the emotional content of dreams was unaffected by the depressed state. A recent study by Landolt et al. (2001) reported that phenelzine nearly eliminated REM sleep during 3–5 weeks of treatment in depressed patients; interestingly, antidepressant responders initially recalled more dreams than non-responders prior to treatment, but reports declined during the course of treatment; the opposite occurred in non-responders. Cartwright (1992) reported higher rates of masochism and negative events in the dreams of depressed women than depressed men when symptomatic. Cartwright and Wood (1993) suggested that depressed women might be characterized by a more negative cognitive style when euthythmic. Recently, Cartwright et al. (1998) showed that untreated depressed subjects reporting more dreams with negative affect at the beginning of the night than at the night's end were more likely to be in remission 1 year later. They suggested that early negative dreams might reflect a within-sleep mood-regulation process taking place while those that occur later might indicate a failure in the completion of this process. The present study also demonstrated that a reduced dream-like quality in the last REM reports was associated with suicidality. This finding suggests that when end-of-night dream narratives are more negative in affect type but low in narrative quality, the affect appears to be less integrated with older affective memory material close to the morning awaking, indicating a failure to regulate negative mood. It might be that this pattern of affect processing is pathogenic. However, it is not clear whether such dream characteristics are a state or a trait marker for suicidality in depressive disorder. The next step is to examine the association of our findings with clinical outcomes. This will be reported in a forthcoming article tracing these subjects' sleep, dreams and waking depression states over 5 months.

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