

EDITORIAL

Dream Recall: Research, Clinical Implications and Future Directions

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The present article reviews the hitherto developed theories explaining the variability of dream recall. In addition to a section discussing measurement issues, the empirical findings are briefly summarized in order to evaluate the different theories. The clearest support was reported for the arousal-retrieval model and the life-style hypothesis. Furthermore, some clinical implications of dream recall research will be outlined. A possible therapeutical benefit of enhancing dream recall was suggested by the findings of Cartwright et al. To conclude, a few ideas to stimulate future research are presented. (*Sleep and Hypnosis* 1999;1:72-81)

Key words: dreams, dreaming, dream recall, dream theories

INTRODUCTION

In 1953, Aserinsky and Kleitman published their paper on the so-called REM sleep which accounts for about 20 % of the total sleep time in adults. REM sleep is characterized by rapid eye movements, activated EEG and muscle atonia. Awakenings from REM sleep are very often accompanied by reports of intense dreaming (1). Since REM sleep occurs regularly every night in every human being, it can be assumed that dreaming defined as cognitive/emotional activity during REM sleep is also present every night. Furthermore, Foulkes (2) has shown that NREM sleep is also accompanied by mental activity. Despite this stable physiological pattern the variability of dream recall is large: some persons almost never recall a dream, whereas others can relate a detailed account of their nocturnal experiences every morning. In average, adults recall at home one to two dream per week (3,4).

The present article reviews the hitherto developed theories explaining the variability of

dream recall. In addition to a section discussing measurement issues, the empirical findings are briefly summarized in order to evaluate the different theories. Furthermore, some clinical implications of dream recall research will be outlined. A possible therapeutical benefit of enhancing dream recall was suggested by the findings of Cartwright et al (5). To conclude, a few ideas to stimulate future research are presented.

Theories on Dream Recall

The previous published theories on dream recall are depicted in Table 1. The repression hypothesis of Sigmund Freud (6) says that dreams which are not sufficiently disguised to pass the censor will be repressed entirely. A major problem which arises in the process of testing this hypothesis is the impossibility to measure the non-recalled dreams in order to compare them to the recalled ones. However, it seems possible to apply indirect approaches, e. g., correlating a personality dimension repression vs. sensitization with dream recall frequency.

The life-style hypothesis of Schonbar (7) views dream recall as a part of a general life style or personality pattern. This life style is characterized by creativity, rich fantasy, introversion, introspection, field independence

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Table 1. Theories on dream recall

¥	Repression hypothesis (Freud, 1900)
¥	Life-style hypothesis (Schonbar, 1965)
¥	Interference hypothesis (Cohen & Wolfe, 1973)
¥	Saliency hypothesis (Cohen & MacNeillage, 1974)
¥	Arousal-retrieval model (Koulack & Goodenough, 1976)
¥	Functional state-shift hypothesis (Koukkou & Lehmann, 1980)

and divergent thinking. This theory emphasizes the trait aspect and the interindividual differences in dream recall frequency.

Both the saliency hypothesis as well as the interference hypothesis were derived from classical memory theory. The more salient a dream is and the less interferences are present during the recall process, the better the dream is recalled. In order to test this hypotheses also only indirect approaches can be applied, since it is not possible — in contrast to experiments of classical memory theory—to measure the original stimulus; only the recalled material can be elicited. These hypotheses stress the influence of state factors on dream recall.

The arousal-retrieval model of Koulack and Goodenough (8) hypothesized that two steps are necessary in order to recall a dream. First, there must occur a short period of wakefulness (arousal) immediately after dreaming to transfer the dream content from short-term memory into long-term memory. This assumption is supported by the findings of learning experiments with sleeping persons. Koukkou and Lehmann (9), for example, have shown that learning take place only when the brain is activated (alpha waves=relaxed wakefulness) whereas the sleeping brain was not able to store incoming information. Second, in order to retrieve the stored dream the saliency and the lack of interferences are important factors (see above), i.e., the second step of the arousal-retrieval model integrates the saliency and the interference hypothesis. The model also predicts that clues which are related to dream content can trigger the recall of the entire dream.

The following assumptions make up the basis of the functional state-shift hypothesis of Koukkou and Lehmann (10,11). These authors divide mental activity into distinct functional states and their corresponding memory stores and postulate that information of lower levels

of brain activation can only sparsely recalled by functional states of high activation. The closer the two functional states are the better is the transference of information. In regard to the process of dream recall, recall will be best if the two functional states (REM sleep prior awakening and waking state after awakening) are as close as possible, i.e. high activation during REM sleep and low brain activation subsequent to the awakening will enhance dream recall.

These six theories will be evaluated in a separate section after reviewing the empirical data gathered in this research domain.

Measuring Dream Recall Frequency (DRF)

Prior to the evaluation of the theories on dream recall in view of the published findings, the common used methods of measuring dream recall frequency (DRF) and their intercorrelations are introduced. In addition, some important methodological issues will be addressed in this section.

The three most often used measurement methods are: rating scales as part of a questionnaire, dream diaries and laboratory awakenings. The simplest method for measuring DRF is to utilize a questionnaire. The participants are asked to estimate their dream recall frequency over the last few month for example on a seven-point scale (see Table 2).

Table 2. Rating scale measuring DRF

¥	How often did you recall your dreams during the last few months?
¥	Almost every morning
¥	several times a week
¥	about once a week
¥	twice or three times a month
¥	about once a month
¥	less than once a month
¥	never

The presentation of categories designating absolute frequencies is recommended since relative categories (e.g., never, rare, seldom, often and very often; 12) may not exact enough in measuring DRE The participants estimates how often is often or seldom may vary considerably. The advantage of using a retrospective measure is clear; dream recall is not affected by the measurement procedure and one can elicited the natural DRF. The

most important disadvantage is the possible bias due to faulty recollections; how exactly one can enumerate the mornings with dream recall of the last month. Since dreams, especially mundane dreams, are rapidly forgotten in the course of a day, this measurement method may underestimate DRF.

In regard to dream diaries, the participants are asked to complete every morning upon awakening a checklist whether they have recalled a dream or not. This method minimizes the bias of retrospective measures but several studies (13,14) have shown that DRF is strongly affected (increased) by keeping a dream diary. In general, the correlation coefficient between DRF (questionnaire) and DRF (dream diary) is satisfactory high ($r = .57$). However, Cory et al. (15) have pointed out that biases due to so-called floor effects can occur; low dream recallers can increase their DRF during the diary period, whereas high dream recallers remain about the same level of recall.

The REM awakening method conducted in a sleep laboratory is the most expensive approach to measure DRF. The shortcoming of this method is the pronounced influence of the procedure on the participants (unfamiliar setting, EEG electrodes, nocturnal interruption by the experimenter etc.), so that one cannot assume to measure natural or home DRF. However, previous studies (16,17) have proven that home dream recall is in general substantially related to DRF measuring in the sleep laboratory. On the other hand, Meier Faber (18), however, found very different patterns for persons who recalled very few dreams at home: some became high recallers in the sleep laboratory whereas others remained despite the REM awakenings low recallers. Due to the expenditure it is difficult to investigate larger samples which are necessary for correlational studies. The clear advantage of the laboratory method is the opportunity to measure physiological parameters (EEG, EOG, ECG, respiration and heart rate) prior, during and after the awakening. A new ambulatory measurement unit called night cap combines this advantage with the sleeping in the home setting (19).

Subsequently, a few methodological issues which may affect the results of a dream recall study are briefly discussed. Belicki and Bowers (20) have shown that the variability of DRF within a person affect the relationship between

personality and DRF. For persons with stable DRF over the last six month the correlation coefficients were considerably larger than that for persons with fluctuating DRF. A retest study over three months (21) yielded a coefficient of $r = .50$ which can be interpreted to indicate low to medium stability of this variable. This variability has especially taken into account when trait factors are correlated with DRF, since coefficients can be dramatically reduced if the DRF measure is not reliable. Another factor which has to be considered is the selection of the participants. Bone (22), Spanos et al. (23), Armitage (24) and Schredl, Bozzer and Morlock (25) have reported substantial gender differences in correlation patterns, e. g., dream recall was related to sleep quality for males and to stress for females (25). Similar, age, socioeconomic status and education level may moderate the relationship between DRF and its influencing factors. Although Herman (26) has described that DRF is affected by participants expectations and by the expectations of the experimenter, systematic research investigating possible experimenter biases has not been carried out yet.

To summarize, the selection of the appropriate measurement method depends on the specific rationale of the study, e. g. measuring natural DRF or correlating DRF with data of the physiological level. The above mentioned methodological considerations should be kept in mind during the planning phase of a research project.

Empirical Data

The review article of Schredl and Montasser (27,28) carefully compiled the previous published research on factors influencing DRF. In general, no systematic effects were detected for general intelligence, verbal memory, repression, introversion, introspection, trait anxiety, field independence, habitual sleep duration and physiological activation during sleep. On contrary, the factors depicted in Table 3 were found to be significantly related to DRF in the majority of the studies.

Several studies (15,25,29,30) found a positive correlation between frequency of nocturnal awakenings and DRF. Similar, poor sleep quality was related to elevated DRF (25,31,32). Further evidence was provided by studies (33-35) showing that patients with sleep disorders which are characterized by

frequent nocturnal awakenings / arousals such as insomnia, myoclonia and sleep apnea syndrome recall their dreams more often than healthy controls.

Whereas verbal memory was not related to DRF (36,37), a substantial relationship was found for visual memory (15,37-39), i.e., persons with marked capability to recall visual stimuli/images recall their dreams more often. Similar, it was shown that high dream recallers have better recollections of personal experiences such as childhood memories (40,41).

On the one hand, personality dimensions such as repression or introversion were not substantially correlated with DRF (e.g. 42), but on the other hand marked relationships were found for absorption (23,43,44), hypnotic ability (45) and thin boundaries (37,46,47). These three personality dimensions load on the factor openness to experience of the Big five personality inventory (48) which also correlated significantly with DRF (49).

Several studies have demonstrated that frequent day dreaming (50,51) and rich fantasy life (42,52-54) is associated with high dream recall. Similar, persons with creative interests recall their dreams more often (3,55,56). Especially high dream recall is present in persons who paint in their leisure time (56) and art students (55). In addition, divergent thinking which is often associated with creativity was positively related to DRF (57,58).

Whereas a dream diary study (24) yielded contradictory results regarding the effect of stress on DRF (enhancement in women and reduction in men), studies eliciting the subjective causes for phases of elevated DRF proved that stress such as interpersonal conflicts and occupational stress increases DRF (27,28,59-61).

A marked relationship to DRF was found for the variables interest in dreams or positive attitude towards dreams (62-64). The causality, however, remains unclear since the following two explanations seem plausible: first, a positive attitude towards dreams may cause a heightened DRF since the interested person applies training methods such as autosuggestion to enhance DRF. Second, persons with high DRF develop a heightened interest in dreams over time since they want to know what is going on in their minds at night. I. e., the variable positive attitude towards

dreams or interest in dreams can not be interpreted as pure causal factor.

This short review highlights the essential factors research has extracted; for a more detailed survey the article of Schredl and Montasser (27,28) is recommended.

Evaluation of the Theories

Utilizing indirect approaches to test Freud's repression hypothesis, research findings did not support this hypothesis. However, the lack of a relationship between the personality dimension repression and DRF can not be interpreted as refutation of Freud's theory. As stated above, this hypothesis is not directly testable since latent dream content can not be measured.

In regard to the life-style hypothesis, a differentiation seems to be necessary. On the one hand, personality factors such as introversion, field independence are of minor importance but, on the other hand, substantial correlations were found for creativity, fantasy life and the personality dimension openness to experience. These findings can be interpreted as corroboration of a slightly reduced life-style hypothesis.

Whereas the effects of interferences on dream recall were demonstrated in controlled experimental conditions (65), this effect was not found in the home setting (27,28), i. e., interferences which occurred between awakening and filling in the dream diary did not affect dream recall. A final evaluation of the interference hypothesis should not be undertaken till further evidence is brought together to shed more light on this divergent findings.

The findings that stress increases DRF support the salience hypothesis since quite a lot of studies have shown that stress increases emotional intensity of dreams (overview: 35). Nevertheless, future studies should investigate whether other causal chains may explain the enhancing effect of stress on dream recall. It seems plausible that stress increased the frequency of nocturnal awakenings and, therefore, DRF is heightened.

The clearest support was reported for the arousal-retrieval model of Koulack and Goodenough (8) which stresses the significance of nocturnal awakenings and of visual memory and memory for personal experiences. In addition, the findings that

clues can trigger dream recall (66,67) or that hypnosis facilitate dream recall (68) can easily be integrated in the arousal-retrieval model.

The investigations regarding the functional state-shift hypothesis (10,11) yielded contradictory results. Lehmann et al. (69) have demonstrated that the closeness between the functional state prior to the awakening and the functional state after awakening correlated with dream recall, but Moffitt et al. (17), Meier Faber (18) and Morel, Hoffmann and Moffitt (70) were not able to replicate this finding. A refutation of this hypothesis seems premature since very few EEG studies have been carried out in this area and some of the methodological problems (e.g. deriving valid quantitative measures for the closeness of functional states) remained unresolved. New technologies, e.g. neuroimaging (71) may stimulate this kind of research.

To summarize, the research findings seem to fit best into the arousal-retrieval model and the life-style hypothesis. Final conclusions, however, are not possible since large-scaled studies including all relevant factors (see Table 3) have to be carried out for estimating the explained variances of each factor and the interactions between them and to formulate an integrative model.

Table 3. Factors influencing DRF

¥	nocturnal awakenings/poor sleep quality
¥	thin vs. thick boundaries, absorption
¥	visual memory
¥	fantasy
¥	creativity
¥	stress
¥	attitude towards dreams

Clinical Implications

In order to assess the clinical significance of the research on dream recall, a few remarks on the function of dreams in general are helpful. Till today, many theories on the function of dreams have been published: dreams as guardian of sleep (6), dreaming as iterative, genetic programming (72), dreaming in order to forget (73), the mastery hypothesis (74), dreaming as mood regulation (75) and so on. If one reviews the findings of modern dream research (e.g. 35,76), one has to acknowledge that all these theoretical explanations are plausible but remain speculative. Direct

evidence support one or another hypothesis is scarce. Kuiken and Sikora (77) suggested that dreaming may serve many purposes and that the above mentioned theories would not exclude each other.

For the aim of this section, the mastery hypothesis of Wright and Koulack (74) seems to be most fruitful. The authors hypothesized that the (or one) function of dreaming is problem solving just as it is valid for cognitive activity during the waking state. According to this line of thinking, one would predict that intense working with dreams (and—as precondition to do that — high DRF) will be of benefit for that person.

Despite the fact that many case histories and books on dream interpretation were published since Freud's *Traumdeutung*, systematic research investigating the effectiveness of working with dreams is scarce. The studies of the Hill group (78-81) have demonstrated that dream groups and single dream interpretation sessions lead to a beneficial outcome. Furthermore, Hill et al. (49) have shown that for high dream recallers the benefit of dream interpretation sessions was more pronounced than for low dream recallers; a finding one would intuitively have expected. Since dream recall can be enhanced by simple suggestions (82-84), future investigations can test whether enhancing dream recall contributes to the success of psychotherapy.

The single study directly investigating the effect of enhancing dream recall on psychotherapy outcome was carried out by Cartwright et al. (5). The authors hypothesized that persons whose recollection of their dream life was intensified by REM awakenings were more motivated to complete the subsequent psychotherapy successfully. One group of participants were awakened out of every REM period over four consecutive nights and were asked to report their dreams. A control group was awakened out of NREM sleep and the remaining participants started therapy without laboratory awakenings. Forty-eight students who applied for help to the counseling service of a large university were included in the study. In order to obtain large effects by the REM awakening procedure, only clients with low baseline therapy motivation were selected. The results confirmed the hypothesis: 69 % of the persons who were in the REM awakening group completed the therapy, 54 % out of the

NREM awakening group and only 38 % of the participants without laboratory awakenings. Furthermore, the participants in the dream enhancing condition disclose more personal and emotional material to the therapist and showed more rapid progress during therapy. The findings, however, have to be interpreted with caution since the non-treated group was not randomly assigned to this condition, i. e., these persons refused to participate in the laboratory awakening procedure and were, therefore, less cooperative than the two other groups. Another group of eight participants viewed every day over a two-week period a short film about a laboratory awakening of another person and had then the opportunity to talk about their own dreams. Out of this group 62 % completed successfully treatment. In view of the shortcomings and the small sample size of this study, it will be most fruitful for future research to investigate the effects of deliberate enhancement of dream recall (either by REM awakenings or other training methods) on therapy success.

Of similar interest are accounts that persons who experience drinking dreams after alcohol withdrawal have a reduced relapse risk (85-88). Schredl (89) has shown that the probability to stay sober at the one-year follow-up was related to high dream recall in the period after acute withdrawal (during an inpatient treatment program). Therefore, one can speculate that elevated DRF may contribute to successful therapy, e. g. drinking dreams may serve as relapse prophylaxis since persons with such dreams will develop appropriate coping strategies preventing relapse.

The few systematic studies seems to support the idea that enhancing dream recall can contribute to treatment success. Future research may apply similar designs (5) and investigate whether distinct groups of persons or distinct kinds of mental disorders are especially responsive to such procedures.

A very different problem arises when dreams, especially negatively toned ones, become troublesome and disrupt sleep. For handling this, methods of reducing DRF should be available. The group of Barry Krakow (90,91) have developed a simple and effective treatment for nightmares and named it imagery rehearsal treatment. In essence, the dreamer is asked to change the dream ending in a way she/he liked and rehearse this new

dream once a day (about 10 minutes) over a two-week period. This new coping strategie will be incorporated into the dream and the nightmares fade away. A controlled study (91) have clearly shown the efficacy of this method. Further research projects may focus on the possible positive therapeutic effect of reducing nightmares/bad dreams for patients undergoing psychotherapy for treating a mental disorder such as depression which is sometimes accompanied by intense negatively toned dreams (92).

Future Directions

As previously mentioned, surveys including a broad spectrum of factors stemming from different areas such as sociodemographic variables, personality, cognitive parameters, sleep behavior and day-time stressors are lacking. Such studies, however, are necessary to develop an integrative model of dream recall including all relevant factors and their interactions. This model may draw from the arousal-retrieval model (8) and the life-style hypothesis (7).

Another kind of research may investigate functional relationships between trait factors and DRF. One can imagine, for example, that trait anxiety increases the frequency of nocturnal awakenings and, therefore, is related with heightened dream recall. On the other hand, persons with trait anxiety may experience more often intense anxiety dreams and, therefore, recall their dreams more often. A study including measures of trait anxiety, DRF, frequency of nocturnal awakenings and dream intensity can answer such a question. Schredl, Jochum and Sougenet (44) have tested the hypothesis whether visual memory moderate the relationship between absorption and DRF. The results, however, did not confirm the hypothesis, i.e., persons with high absorption scores did not score higher on tests of visual memory and, as consequence, recall their dreams more often, although both measures (absorption and visual memory) correlated substantially with DRF. In a similar way, it could be investigated what factors are responsible for the gender difference in dream recall; several large-scaled surveys (24,25,93) have shown that women tend to recall dreams more often than men. Likewise, it will be very interesting to study the gender specific patterns of the factors influencing DRF (stress

for women and sleep parameters for men; 25). A possible explanation seems to be the different levels of DRF since Schredl and Montasser (28) have shown that DRF of high dream recallers is affected by stress and presleep mood whereas DRF of low dream recallers is related to sleep parameters such as nocturnal awakenings and sleep duration. Further studies could extend this preliminary findings and may support this specific line of thinking.

Another research area is the investigation of factors associated with the outcome of specific training methods to enhance dream

recall. There may be personality dimensions such as openness to experience or cognitive variables such as visual memory which are related to large changes in pre to post-training measures of DRF. On the other hand, it seems fruitful to test the effectiveness of different enhancing methods, e. g. autosuggestions (The next morning I recall a dream), keeping a dream diary, applying varying awakening schedules, acquiring specific mnemonic techniques etc. This research may contribute valuable data to the approaches investigating the effect of enhancing dream recall on therapy outcome.

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